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Project Folio 2

FOREWORD TO TRANSLATION OF THE REPORT OF THE FOURTH CONFERENCE OF THE MEDICAL CONSULTANTS TO THE GERMAN ARMED FORCES.

Here, in this report of the last conference of the Medical Consultants to the German Armed Forces, held 16 to 18 May 1944, one would expect to find the best available medical opinion concerning the problems confronting them at the time. This was just prior to the Allied invasion of Normandy. The breadth of interests and the number of papers delivered indicates that this was a busy but not a hurried conference. It is apparent that Germany was deep into its man-power reserve because of the number of discussions of "fitness". It is interesting to note the emphasis on forensic medical questions, tropical hygiene and tuberculosis.

The translation of this report has presented repeatedly the problem of literal or free translation. That some of the reports are stenographers' notes from what appear to have been extemporaneous discussions has only made this more difficult. The one question "Is it understandable?" has been adhered to as a guide. Thus some of the articles admittedly are not in the best literary style. The sentence and paragraph arrangement of the original has been retained in so far as possible to facilitate comparison with the original text.

The only original text known was shipped to the Medical Department of the Army in the files of the Medical Intelligence Section of the Office of the Theater Chief Surgeon, USFET, when that section was discontinued in December 1945. This translation was prepared from a photostat copy borrowed from Lt. Col. James Blaisdell, Medical Corps of the Royal Canadian Army while he was the Head of the Scientific Branch, F.I.A.T. (British). At one time consideration was given to publishing this and the reports of the three previous conferences as an Annex to the FIAT Reviews of Medicine. This idea did not mature for a variety of reasons.

The translation of the reports of the first three conferences is presently in progress. When all these are combined with the translation of the Classification of Fitness, considerable insight may be obtained into the medical thinking in Germany during the war.

HARRY J. ALVIS,
Commander, Medical Corps,
U. S. Navy.

INDEX FOR

R E P O R T

OF THE

FOURTH CONFERENCE OF SPECIAL MEDICAL CONSULTANTS

FROM 16th TO 18th MAY 1944

AT THE SS-HOSPITAL HOHENLYCHEN.

* * *

Translation prepared by:

U. S. Naval Technical Unit, Europe (Medical Section)
Office of the Naval Advisor
Office of the Military Government (U. S.)

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"R E S T R I C T E D"

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Speech

of the Chief of Medical Service.

Gentlemen!

The last consultants session of the East was a year ago, and it has proved necessary to call the fourth session of the Consultant Physicians now despite all the difficulties of the war.

The question of the choice of a place for this session has been solved in a very agreeable manner by the Reichsfuehrer SS' being so kind as to place at our disposal the SS-hospital of Hohenlychen. We are very grateful to the Reichsfuehrer SS for his kindness. At the same time we owe many thanks to the Chief-Physician and master of the house, SS-Gruppenfuehrer and Lieutenant-General of the Armed SS (Elite Guard), Prof. Dr. GEBHARDT, for his kind and characteristic hospitality and active collaboration in the preparations for this session.

The circle of participators, of course, had to be much smaller owing to location and time, than was necessary for former sessions in Berlin. For that reason every member of this session has all the more the duty, within his own sphere of activity, to attend to the publishing of the results of our discussions amongst the physicians at the various fronts, in the occupied territories and in the homeland so that a prompt and extensive success may be achieved.

The choice of the points to be discussed had to take into consideration first of all, the necessities of problems of the Army Medical Service as required by the fifth year of the war. From this point of view the problems of the injuries to health caused by the air war had to be made an important subject of our deliberations.

The Section for Therapeutics of Teeth, Mouth, and Jaw as well as the Section for Army Physiology are represented for the first time, having being added to those sections represented previously. This is to extend the hearty collaboration which has existed for a long time to the new sections as well. I give you all a hearty welcome, requesting of you at the same time your collaboration at this session with your well-tried advice, so that we may continue in the right way, leading the medical service in the physician-scientist field, and so that we can find a solution to those problems which are important and decisive for the war efforts.

I address a special greeting to the Commissioner-General of the Fuehrer for Medical and Public Health Service, Surgeon-General Prof. Dr. BRANDT. He has given us this year too, much help and assistance in various ways. Where there have been difficulties and critical situations or when questions under debate had to be decided he always helped, promptly, in an administrative and cooperative manner owing to his Fuehrer-Commission.

Furthermore I give a hearty welcome to the Reichsgesundheitsfuehrer (Chief of the German Public Health Service) and Secretary of State Dr. CONTI. We have had to work together with him during the last year not only in the common tasks of the advancement of health in the home, especially of the male youth, but also concerning the war auxiliaries in the areas under air-raid which led us to a very intimate collaboration. Civilian Doctors and Medical Officers stand in a common front against the menace to the health

of our people and against the annihilation desire of our adversaries.

Looking back over the last year we see that since the last conference in the East, a great array of new experiences, scientific results and practical proofs has been developed by Army Medicine or, when they came from outside, were of influence on the latter. Let us consider the following details, selecting them from the whole:

In ophthalmology the newly developed giant-magnet has been introduced every where and even in those medical units near the front. To these troops being especially in danger of eye wounds, shatter - proof spectacles have been given.

A new opportunity for alleviating the suffering of the wounded has been offered by using periston as a vehicle for local anaesthetics by the surgeon. Besides, it shows new technical possibilities. The marrow-nailing by KUENTSCHER was the object of scientific and practical experiments at the hands of some specially commissioned men. The results permit us to hope that the method is an important progress for frontline surgery, but it requires a careful selection of the cases and exact procedure. We will thus be able to adopt the method on a large scale. In the case of gunshot-wounds of the pleural-space the application of the BUEHLAU-drainage has increased, and thus we can use it now in front-units successfully with a resultant diminution of the number of rest-holes (persistent cavities). Preservation of serum has been developed under surgical-clinical conditions and represents at present the best substitute for human blood-transfusion, even for the front units. We must state, that the dry preservation has not been successful in a similarly large scale clinical manner and thus, owing to fewer experiences, we cannot compare it to the liquid serum-preservation as yet. The scientific statement of the method of RANKE-BROEMSER concerning the measurement of the speed (velocity) of the pulsewaves has given good results in the sphere of shock and collapse as well as for the different disturbances of the circulation in general.

As regards in internal medicine wide experience had the result that some sulfa drugs may be considered to be the medicine of choice. The investigations concerning the etiology of hepatitis contagiosa have been continued. I have made arrangements for a general discussion of all German hepatitis-scientists to take place soon after this session. Its object is to find out ways for a regular interchange of ideas and results as well as for a comparison and examination of the etiological types isolated till now.

In Army Psychiatry the method of using galvanic currents for treating psychogenic or psychogenically superimposed diseases has been proved effective and led to further very important experiences. In contrast to the first world war neuroses appear only rarely in spite of the enormous stress the troops have to bear. The fever treatment of the neuritides with injection malaria or with non-specific remedies such as pyrifer f.e. will be further investigated.

The investigations of the pathologists have been completed. The study of spotted fever and war nephritis can be considered as concluded in so far as concerns the pathologic-anatomical problems. Particularly successful work has been done by the pathologists in the sphere

of combating epidemics. Their organization has been proved to be a good one.

The Army Physiologists have decisively collaborated in the development of spectacles with special optical qualities. These spectacles are expected to become very significant in respect of their army-medical-scientific results. The study of the results of the review of the military allowed the formation of an opinion about our food conditions and distinctly showed that former difficulties which had arisen during the war have disappeared.

Discussing the work in physiological chemistry we must mention the dry serum preservation. The scientific examination having been performed serums can be preserved in mass production. As regards the feeding of the soldiers, the physiological chemist has collaborated in a general advisory and medical-consultant capacity within the Army-Administration. This was especially so when the different kinds of rations were established to meet the various demands of military and climatic conditions. The physiological-chemical investigation of questions like wound-shock, collapse etc. is being worked on.

Concerning the Army Hygienists the work on the atlas of epidemics is nearly completed. We have maps from nearly all the important territories which were intended to be under supervision. This project is expected to be finished by the end of the present year. The specific epidemic strains of the pathogenic-intestinal bacteria of the eastern aereas have been analysed in bacteriological and sereological respects. Thus important bases for the production of inoculation-material from appropriate strains have been found.

The pharmacologists have moreover, worked in the sphere of therapy of the injuries caused by poison gas and about decontamination. A part of the results will be referred to at this session. In the sphere of toxicology the experiments of the pharmacologists have been very important. With the aid of these studies a definitive means for attacking noxious insects has been developed. You will hear a report about it.

Corresponding to the special nature of the problem, the chemical food-control of the soldier's nourishment was the main task of the Army-Pharmacists and the food-chemists. In this respect important results about the proportion of theoretical and practical values have been found. In the sphere of chemical determination of vitamins the work confirmed the accuracy of the values obtained previously. The collaboration of the Army Pharmacists on the question of purifying and decontaminating water had definitive results.

I am sorry to state that, corresponding to the very voluminous program of our session, the review of the work of the past year must be restricted in these crowded and incomplete reports.

We have to announce with regret this time too, the death of some comrades of the circle of Special Consultant Physicians who have died since the last session:

In June 1943 Prof. Dr. MUEHLHENS, Consulting Medical Officer for tropical medicine and Medical Officer of the German Navy died quite suddenly and unexpectedly. Head of the BERNHARD NOCHT INSTITUTE for ship- and tropical diseases, Dr. MUEHLHENS, Medical Officer of the German Navy, has achieved singular success for German tropical medicine.

Numerous wellknown tropical physicians are his students; his institute is especially esteemed in Germany and in foreign countries. Many of his works and their influence on therapy have a basic signification. His death is a great loss to us.

In autumn 1943, as a victim of an air-raid, the Consultant Internist Prof. Dr. HEGLER, Medical Officer of the German Navy, died in Kassel. With this man the German Navy and all the armed forces have lost a physician who had a great reputation not only within our fatherland, but who was well known as a physician and as a scientist, in foreign countries by his excellent merits in the sphere of internal medicine and especially the treatment of infectious diseases.

In February 1944 the Consultant Psychiatrist Prof. Dr. BOSTROEM, Colonel of the Medical Corps of the German Army, died. He was a man with high human and medical qualities. As a prototype advisor he devoted his work especially to the question of neurosis under war conditions, which questions are of intense interest for army-physicians. He influenced the directives in this sphere in an authoritative manner.

Prof. Dr. PANNING, Colonel of the Medical Corps of the German Army, Consultant Physician for forensic medicine, died in March 1944 as a victim of an insidious disease. A medical officer, whose career would have been very promising, was thus snatched away from very productive work. Owing to his systematic management of the Institute of Forensic Physicians the leading medical officers at the front and in the homeland now have valuable advisors on this important special sphere at their disposal.

These men have lost their lives for their country as prototypes of their loyalty and high sense of duty. We shall always bear them in faithful and grateful remembrance and at the same time we remember the many German medical officers of all ranks who have died for the Fuehrer and folk as medical officers and soldiers.

Let us rise in tribute to these soldiers.

(EDITORS NOTE - Licensed physicians who were not in the reserve and who thus held no commission were first enrolled as enlisted men. After having received a basic training of about three months they were promoted to the relative rank of Warrant Officer. Promotion through the various ranks up to the relative rank corresponding to Captain (U. S. Army) took about two years.)

As has been mentioned before, the necessities of the fifth year of the war have influenced the present program in a very decisive manner. The plans for the course of our three days discussions are in your hands. We need not lose time by mentioning details.

When we regard the experience of our former Army Consultations we consider their value and use to consist in the possibility of discussion between various disciples of different branches of science. Though a definite program has been fixed, they can discuss without restriction and without undue pressure those problems which still habe to be clarified. All interested participators agreed very gra-

fully to the new method of giving general and clear directions as to the different problems as a result of the discussions. These directions, in the form of orders, are to be handed to the medical officers in the homeland as well as at the front. We have arranged for the rapid printing and mailing of the directions established during the present session. They will therefore procede the detailed report about the session containing the speeches and discussions.

The work of the German Medical Officer was always based on the solid foundation of the science of their times. Let us review the history of the German Army Medical Corps. We see the leading men of the Army Medical Service collaborating with the representatives of the medical sciences in a most intimate manner, since the time when such a service was first established a century and a half ago. Furhtermore, the leaders were not only influenced by the results of science, but they also gave important inspiration to science, especially in times of war, which is a teacher par excellence in all periods of history. Also in former war times, consultations such as the present one did take place and the results of them were useful to the soldiers. In peace times there were the sessions of the Scientific Senate of the Army Medical Service, the discussions of which took place only within smaller circle. The leadership of the medical service has constantly advanced since the first days of its existance. The reports about these consultations and sessions are so to speak, the milestones of their scientific development. These reports thus prove the strong impulses were effected by war. HECKER discussed the "Maturation of Surgery" in 1806. In 1809 MURSINNA gave a lecture on the "Union of Medicine with Surgery". The same author discussed in 1812 the "Old and New Surgeries". In the times of the Wars of Liberation, William HUMBOLDT's intuition defined the ideas of authors as the realization of the ideals of humanity. In the periods of the German wars for union, surgical problems were again discussed by LANGENBECK and GURLT and BARDELEBEN. On the other hand, VIRCHOW discussed problems of internal medicine as well. As the part played by the physicians in World War I is well known to us I need not mention it here.

In both world wars the German medical officer has justified the soldier's respect and has proved his own love of his profession as physician to be the same as it was at the time of Surgeon-General GOERKE, Captain MC, who created the solidly built up Military Medical Institution a century and a half ago. You thus see the same readiness to be a soldier and a physician. It is not always easy to attain, that the new knowledge and discoveries of science and technics become common possession of all medical officers on all sectors of the fronts as quickly as possible, so that the physicians at the fronts and in the hospitals are able to make early use of the best equipment according to special purposes for the welfare of the soldiers. Such a task is a very difficult one, especially in wars of world wide dimensions. An enormous amount of work in this respect has to be done by the leaders of the medical service. On the other hand, it is important to point out to military leaders the necessities of the medical service in time, and to keep them interested in such problems.

A Physician's work does always imply the leadership of men. That is so in times of peace and especially in times of war. Thus it may happen that the physician has to lead a single man, namely

the patient treated by him, or that he has to lead numerous individuals living together. In order to obtain a speedy convalescence or - and this will be often the task of a medical officer - for the supervision of recovering soldiers of the troop he is responsible for, he has to use all the psychological values and knowledge at his disposal; and this objective - to keep the troop healthy and thus strengthen their efficiency - will be fulfilled in that way. The work of the physician is therefore a task of leadership in the real sense of the word, and not a matter of mere providing. And for the fulfilment of such tasks there must be a relation of confidence between the physician and his patient. The physician must be superior to the patient and always the one who gives; therefore he must always be conscious of his own inward security and he must feel strong enough to be the stronger of two men. This applies not only to the physician in charge of convalescents but also to the oen who intends to prevent illness among the healthy men and who thus has a particularly important task. The physician wishing to do preventive work has to use the whole power of his personality; it is only in that case that he will be successful.

In times of war the Consultant Physicians as representatives of the medical sciences will stay in the front lines when such tasks have to be performed. The conditions of the homeland have become practically the same as they are on the fronts, so we now have had to organize a correlation between science and practice in the homeland just as we did on the fronts. Having excellent reputations and some knowledge as a result of their work and experience, combined with sone judgement and a nice sense of responsibility the Consultant Physicians as authorities in their branches are to be the teachers and mediators of science for the medical officers with the troops and in the hospitals.

The work of this conference which I open herewith is to be done on these lines, fixing our position and our route for the present and for the future.

(EDITORS NOTE: The followed a presentation of decorations by General Professor Dr. BRANDT, the Secretary General of the Fuehrer for Medical and Public Health Service. The men decorated and their decorations are listed below.

SS-Gruppenfuehrer GEBHARDT (Lt.Gen. of the Elite Guard) — Ritterkreuz zum Kriegsverdienstkreuz mit Schwertern (Knight Cross with War Service Cross with Swords).

GEBHARDT got the decoration as an acknowledgement of his merits in the organization of the SS-Hospital of Hohenlychen and its special tasks not further specified.

TOENNIS — Knight Cross with War Service Cross with Swords.

TOENNIS is wellknown as a specialist in brain-surgery and is the head of a special hospital.

Professor GUTZEIT — Knight Corss with War Service Cross with Swords.

GUTZEIT is a consulting internist and well known scientist in internal medicine; as an assistant of HANDLOSER his influence was important.

Professor BACKMEISTER — Knight Cross with War Service Cross with Swords.

BACKMEISTER was head of the hospital in St. Blasien, during World War I, and in a hospital in Helgoland. His special merits concern works in the sphere of tuberculosis.

I.

PROCEEDINGS OF THE COMBINED SESSION OF ALL CONSULTANTS' COMMITTEES.

INJURIES TO HEALTH THROUGH AIR RAIDS

Translation prepared by:

U. S. Naval Technical Unit, Europe, (Medical Section)
Office of the Naval Advisor
Office of the Military Government (. S.)

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1. Causes of death and sanitary dangers in aerial warfare.

by
Professor ROSE

Areal warfare against the civilian population, especially as far as big towns are concerned, has increased so considerably within the last two years and has become such an important factor in our life, that the medical questions resulting from aerial warfare need a thorough and careful consideration.

These questions were in the topic of a conference of medical officers of the German Air Forces in December 1943. This conference lasted 2 days and as one of the results, the Inspector General of the Medical Corps of the Luftwaffe (Air Corps) formed special medical emergency units. It was their task, in connection with medical officers of other branches of the Wehrmacht (Armed Forces) and of the Civil Administration, to investigate the injuries which had arisen, to disseminate information about errors and to point out immediately any new points of view which resulted from these aerial attacks. It was however not their special task to render immediate first aid.

The work of the emergency squads, the results of the conference mentioned before and my own experience during several large-scale air-raids, have formed the basis of this brief summary.

Up to the present all such summaries have given first consideration to the causes of death, i. e. the state in which the corpse was found. A collection of these causes of death was not of statistical importance only. The frequency of the various fatal injuries offers a chance of finding out how often they befall the survivors to a lesser degree. At no time should we neglect to use these results in choosing our measures for treating the survivors. The points for which we have to be particularly on the alert as well as the preventive and protective measures for the future, must always be observed.

The assumption, that external violence, immediate effect from splinters, the fact of being buried alive in its many varieties and the effects from fire, ought to be given first consideration has been born out by the actual development.

These 3 main groups, together with the shock-effect, constitute most of the physical injuries resulting from aereal warfare. We found some other significant effects resulting from aereal warfare injuries. These effects do of course not include so many varieties as the 3 groups mentioned before. They must, however, be recognized, in order to protect the survivors from serious harm through a wrong diagnosis of their conditions. It is also very important to recognize them in order to be able to appreciate properly the importance of these effects as due to aerial warfare.

It is well understood that aerial warfare with its associated terrors worries and troubles the population concerned very much. Here the casualities whose cause of death cannot be immediately recognized, find special consideration. Such casualties led to certain rumors and attempts at explanation. This is all the more true as we can find in

this group of casualties the more infrequent causes of death, for the appearance of which one was not prepared, at least not during this early period. These casualties have been misjudged and overestimated not only b y the population concerned, but by many medical officers and doctors as far as the actual number of their appearance as well as the kind of damage is concerned.

These rarer causes of death are injuries due to blast, CO_2 poisoning, heat effects, suffocation caused by dust, the shock on being rescued, as well as death hastened by an already existing organic disease.

In accordance with a schematic plan, we have to make the following distinctions:

1. The effect of external violence, which can be recognized:

   a. effects from splinters,

   b. being buried with earth. In this case we must distinguish destruction as well as suffocation.

   c. secondary injuries, which are due to explosive effects: drowning, scalding, chemical burns, poisoning caused by harmful substances being liberated.

   d. 1) Burning caused by direct effects from the flames,

      2) Burning by the burning parts of exploding incendiary bombs. In this second case the purely phosphorous burnings are neither very numerous nor so very important.

   e. Tetanus after burning without serum prophylaxis.

   f. Injuries due to the person being thrown about by an explosion, and

   g. Effects from blast.

      In both cases (f and g) the injuries may show no external evidence, but they are often combined with external injuries.

2. Effects without externally recognizable injuries: (see 1, f and g)

   a. CO_2 poisoning in air-raid shelters and cellars and while doing firemen's emergeny and life-saving work.

   b. Heat-effects by transmission and radiation at very high temperature (burning not caused by flames).

   c. Overheating in case of the protracted influence of temperatures, which can be tolerated for a short spell (disturbance in the metabolism of heat).

   d. Death from suffocation by dust, obstruction of the up-

per air passages and inhaling through the mouth.

e. Shock while being free, occurring after liberation from being buried with earth.

f. Poisoning by illuminating gas due to bursting of a gas-pipe (compare also 1 c) though without external injuries.

g. Casualties through heart failure, caused by the effect of extreme fright or overstrain in case of patients suffering from heart trouble.

h. Single casualties by deterioration of a previously existing organic disease.

While these causes of death have been proved beyond doubt, although they are partly of minor importance, there is no evidence at all for the following causes of death, which have been frequently discussed not only in publicity, but in medical and many other official reports as well:

1. Death caused by insufficient oxygen in cases of fire.

2. Death caused by poisoning by carbonic acid.

3. Death caused by high frequency vibrations in case of explosions.

4. Gas-poisoning by phosphorus gas.

5. Phosphorus poisoning by absorption from burns.

In practice we find many cases where one of these causes of death mentioned before alone was of influence. Considerably higher however, is the number of cases, where at the same time several injuries occurred. Especially in case of survivors one has to think of this possibility because of their further treatment. Also in case of the fatal injuries it must always be considered that the diagnosis which we think of first, is by no means always the correct one. It is however impossible to give generally authentic percentages concerning the causes of death. The respective extent of injuries varies from town to town, from attack to attack and according to the kind of ammunition dropped on the day in question.

The extent of fires is of influence on the frequency of injuries caused by heat, burning and carbon monoxide.

Furthermore the attitude of the population, which depends on the amount of "aerial warfare experience"as well as on the element of surprise, finds its expression in the kind of injuries which occur.

A summary by BUECHNER shows the following causes of death, assumed by specialists in pathology, out of 267 casualties:

1.	Direct effects from bombing	224
2.	Suffocation in case of being buried	19
3.	Carbon monoxide poisoning	13
4.	Burns	4

5.	Effects from blast	12
6.	Deaths resulting from air-raids, but actually due to organic diseases	3
7.	Suffocation by dust	2

Both these last 2 groups (6 and 7) however might prove to be very doubtful on critical examination.

The vast majority of the cases of direct effects from bombing shows beyond doubt, that the majority of those thus injured were outside the air-raid shelters.

A summary of other 135 causes of death showed 11 lacerations and other injuries, 70 cases of being buried by earth, in connection with serious injuries, 6 cases of being overwhelmed with earth, without external injuries, 19 carbon monoxide poisonings, and only 2 burnings, but 2 casualties on the basis of organic disease.

The fact and the observation, that a diagnosis of the cause of death founded on autopsy cannot be regarded as absolutely reliable even by physicians, not to mention laymen, and moreover, that autopsy is an indispensable requirement for a careful and reliable diagnosis, is accepted as a matter of course by scientists. This fact must however be considered very carefully over and over again. For the majority of completely wrong diagnoses and false rumors can be traced back to opinions which have been stated on the basis of autopsy.

Autopsy by the police as well as by physicians is liable to lead to the statement of causes of death which are not quite clear in case of casualties and such misinformation will soon spread as "rumors" in the damaged area. It is really necessary to be extremely suspicious of such statements as have been founded only on material of inquests on dead bodies.

If such statements are checked thoroughly by autopsy, characteristic statements will usually be the result, as for instance:

"The laceration of the lungs - as given as cause of death by the physicians performing the inquest - which could be proved by no means."

It is absolutely necessary to supplement the autopsy by further investigations concering the actual occurrence of the injury and the conditions of the surroundings in question.

Only those statements can be considered complete, which are based on the autopsy of the dead bodies recovered, on clinical observation of the survivors, on examination of the surrounding conditions, on the particular details regarding the occurrence of the damages, on collection and examination of observations from eye-witnesses and emergency-squads.

Many casualties which are puzzling to laymen, will be explained by autopsy as due to internal hemorrhage and disintegration of organs, effects from fracture of the skull or concussion, a concealed laceration of vessels or by some other similar injuries. Sometimes the autopsy shows that a small "entrance of a missile" has been overlooked when the corpse was first examined externally.

Especially in the case of persons buried with earth, one often finds the cause of death only by autopsy. It certainly must not be forgotten, that fat-embolism too is a possibility and in many cases is the decisive factor in a fatal end, as far as injuries due to violence are concerned. Here we find fatal fat-embolism not only in cases of bone fractures, but also in case of injury to the soft parts without fractures.

If the effect of force causes unconsciousness, one may find an aspiration of dust or of the vomited stomach contents, which latter case occurs under conditions which do not make us think of suffocation as far as the external state, in which the corpse was found, is concerned.

Suffocations caused by dust, mortar and masses of debris or also by compression alone, are very often the causes of death with persons being buried by earth. Such cases of suffocation therefore cannot be considered exactly as cases of "death caused by dust" in the true sense of the conception of "death caused by dust" as formed during the course of aerial warfare.

The manner and degree of the part traumatic shock plays as cause of death in air-raids cannot be ascertained from the material which I have at my disposal and which frequently was material gained from the state in which the corpses were found. According to clinical statistics shock is supposed to be of a considerably high percentage, about 12.6 percent, as far as the carefully observed injuries are concerned.

A "condition similar to shock" may develop when digging out buried persons. The explanation of that kind of shock caused a great deal of trouble in the beginning. The buried person displays at first no signs of severe external or internal injury after being freed. It seems as if he or she had escaped without being hurt at all. Afterwards his or her conditions grows worse, either suddenly or by slow progress.

The bruised parts of the body swell, blood pressure decreases the amount of urine is reduced and finally a suppression of urine develops. Examination of the urine shows plenty of albumin and tipically dark colored cylinders. A fatal end is frequent, happening very early in most cases. The cause of the injury is supposed to be poisonous agents which have been liberated in the injured muscles. An autopsy however shows besides an injury to muscles a degeneration of the kidneys as well. There have been attempts at treatment. Beginning distally the compressed extremities are firmly wrapped in an elastic bandage. In addition to this plenty of plasma-transfusions are given.

Through the investigations we have discerned certain details about the "effects from violence". One of the most frequent effects is "blast".

I shall restrict myself to the essential facts. For the laymen it is very hard to grasp that in cases of injury suffered by the human organism, conditions are to certain degrees entirely contrary to those in the case of damage to material.

Damage to material resulting from "blast" may also spread over a wide area and may be recognized by evidence of the destruction of glass and the blowing away of roof tiles. The area of genuine blast affects appears to be very small as compared to the area of material damage just as the danger caused by splinters appears to be insignificant when compared to the damage to materials.

In case of physical injuries just the contrary is true. Naturally the danger from splinters will be reduced as the distance is greater. But even at greater distance the explosive splinter may still cause severe and deadly injuries, while blast results in a fatal end only when very close to the place of explosion, not above 25 - 30 meters out of doors.

Human beings in air-raid shelters are hardly ever endangered by blast or only when the blast is strong enough to cause the complete destruction of the cellar. In that case other effects will predominate.

Blast is very unimportant as far as the civil population is concerned, while the effects from blast are much more frequent if combat units are concerned, especially A. A. - Artillery units which have little chance of protection.

Outside the area of 25 - 30 meters, danger to human beings arises only when the blast is prevented from free expansion by special conditions. The damage will then be of compressive character.

Repeated erroneous conclusions make it necessary to point out the fact, that the negative pressure following blast is not injurious at all to human health and furthermore, causes little material damage. The pressure of blast, even under the most unfavourable conditions, will never amount to more than half an atmosphere.

Blast does not effect the organs of respiration, as has been erroneously assumed, because the lungs are the organ which was most frequently injured. The effect rather starts from the surface of the body. Most of the recognized injuries are alveolar hemorrhage spread widely over the whole area, obstructing the bronchi and trachea with foaming blood, so that mechanical suffocation may result. Also the circulation of the blood becomes very difficult because of the hemorrhage of the lungs.

In cases of fatal "blast" we have found arterial "air-embolism" of coronary arteries. Injuries caused by "blast" need not necessarily be immediate fatal. Cases where death occurred after one hour and even later have been recognized beyond question.

Very important is the state of the ear drum. Injury to the ear drum, which occurred at the same time as lung hemorrhage, always proves that it was caused by blast. It does however not result from "blast" in cases where the ear drum of the injured person was specially protected against effects of "blast".

Therefore in cases of pulmonary hemorrhage one must think of the possibility of "blast", even without having found actual damage to the ear drum. As regards the survivors, symptoms in the upper part of the abdomen ask for particular consideration. In such cases it is difficult for the surgeon to come to a decision and his responsibility is

very grave indeed, because a laparotomy in case of a person injured by "blast" will turn his originally favourable chances of survival immediately to the contrary. Pulmonary damage can be easily proved by means of X-rays.

It therefore must be demanded that before any proposed operation an X-ray examination of the lungs must be made. This ought to decide the question whether the operation proposed may be performed or not. In case of proved pulmonary injury and damage to the ear drums, which are the two most dangerous kinds of injury due to "blast", practically no operation should be performed. Narcosis is of a particularly unfavourable influence.

Although pulmonary injuries are taken into first consideration when one has to deal with effects from "blast", we must also take into account the fact that the abdomen may be hurt by "blast" as well as the chest. Serious internal injuries to the abdomen from blast are much less frequent than pulmonary injuries. A discrimination between the various injuries caused by the person being thrown about is particularly difficult. The limited area in which damage due to blast can possibly take place leads us to expect that splinter- injuries whould always be connected with it. This is, however quite unusual, although on the other hand in cases of severe injuries resulting from splinters at close range one naturally may find damage from blast in the lungs and air embolism of the arteries. More frequently than the above combination we find cases of pure blast effects combined with severe injuries due to the person being thrown about. Serious and even fatal internal injuries may arise in consequence of the person being thrown about without any obvious external signs. It is necessary to discriminate between injuries from blast and injuries due to the person being thrown about.

A possibility of injury which has been discovered only through the development in aerial warfare is "death caused by dust".

It is very important to be clear about the real meaning of the term "death caused by dust". If we talk of "death caused by dust" we do not mean the frequently occurring cause of death by suffocation due to the inspiration being obstructed by mortar, sand or piles of earth as in the case of a person's being buried by earth. This is an occurrence that has been known for a long time. Nor do we mean the inspiration of corresponding material by unconscious human beings, in which case it may also result in suffocation through inspiration of the vomited stomach-contents. When we speak of "death caused by dust" we really do mean the fatal effect from such concentrations of dust as are never encountered under peace time conditions.

The concentration of dust, which necessarily leads to a fatal result, according to statements by DESSAGA amounts to 100-200 g in 1 m^3. Such concentrations of dust may take place in case of the destruction of whole buildings. It also may arise in rooms, even though the walls remain virtually intact. This may happen in case of heavy explosions in the immediate neighbourhood of the respective room. Such tremendous dust development usually arises through the mortar's falling from the walls. In such cases not only the upper respiratory passages will be obstructed by dust, but the dust will be inhaled also into the lower respiratory passages.

Up to now cases of this kind establilshed beyond doubt have been reported only from Antwerb by DAUTREBANDE and from Mannheim by TEUTSCHLÄNDER.

That these really are cases of real suffocation by dust was proved by a singular observation of the case from Antwerp. There a nun happened to die from suffocation by dust, while 3 children, who had hidden themselves under her wide cloak, remained alive. The fact that this cause of death has gained a certain publicity accounts for its appearing so frequently in official reports as a cause of death. This statement is however nearly always wrong. The quantity of dust which generally rises in case of a destruction of buildings, does indeed cause a tremendous inconvenience, but it does not amount to the concentration which necessarily has fatal result.

It is wrong to give the diagnosis of "death caused by dust", just because some dust is found in the upper and lower respiratory passages. The experiences of the survivors prove beyond any doubt, that the upper canals of respiration are not only able to hold tremendous amounts of dust in such circumstances as described, but that the lower canals too inhaled so much dust that the vomited matter shows different color due to the dust, even a couple of hours after the ocurrence. I have been able myself to verify this fact even 6 hours after a case of being buried by earth.

Because of its comparatively rare occurrence, the cases of "dust death" are only of academic interest. To make general recommendations as regards protective measures against such an occurrence would mean to over-estimate its practical importance. If the protection of the face by a dry cloth is recommended against dust, this has been done much more to provide a mechanical protection from the more frequent inconvenience caused by dust, than out of fear of death due to dust. The same applies to the use of wet towels.

Whenever suffocation has been alleged as the cause of death, it should be stated unmistakably what was the exact cause of this suffocation, as for instance: compression of the respiratory passages, suffocation by foam of blood in case of blast, aspiration of vomitus, caused by dust suffocation while the person concerned was unconscious being buried by earth.

Death by CO poisoning is of much greater practical importance. In the course of aerial warfare this is the typical cause of death in a cellar. It occurs when the exits of the cellars are blocked by earth or fire. Fear or orders to stay inside, given in ignorance of the real danger, may be the reasons for the person's staying in the room, even though there was a good chance of escape. CO poisoning during aerial warfare as a rule befalls all the occupants of the same room. CO will be wafted into the cellar from smoldering places in case of fires in the same or nighbouring houses.

One accident which happened, where the deadly CO was introduced by the operation of a ventilation plant with a gasfilter, must be considered as a special case. The ventilation plant had been started apparently because of unjustified fear of oxygen-scarcity and had introduced the CO from the central fire into the cellar which otherwise was not endangered at all.

Typical of the cases of CO-death in aerial warfare is the so-called "peaceful position" of the bodies. Their posture does not give any suggestion which would help to form an opinion, that before death a distinct realization of the threatening danger existed. Also in case of persons' being buried by earth, CO poisoning often is the real cause of death. If one recalls how frequently it can be recognized in case of fires breaking out in the ruins of houses which were shattered by explosions, this fact is not surprising.

Sometimes however, CO poisoning is the cause of death with casualties which have been found in the streets. The additional strain of trying to escape, along with its increased need of oxygen was far too much to be stood by the poisoned organism.

It is well known that the sensitivity of damaged heart-muscles to CO is increased. Also in cases of physical overstrain such as firemen's work, attempts to liberate oneself from being buried, the absorption of CO as well as its poisonous effect will be much worse than with calm respiration.

In the open air, danger from CO is insignificant, as it is also in case of large-scale damage in aerial warfare. The enormous atmospheric movement of large-scale fires will produce such quantities of fresh air that a dangerous accumulation of CO does not arise.

CO-poisoning in case of fire defence work is rather frequent.

Edema of the lungs points to the fact, that other poisonous products of combustion besides CO may have an injurous effect.

Two final considerations are important:

1. For the physician the necessity arises, in all cases of persons injured by aerial warfare, to consider first of all the possibility of CO-poisoning. This holds good also when the casualties have been found in the open air or under other circumstances which do not suggest CO poisoning, because the partial injuries may have cropped up only in consequence of the strain in escaping, or of emergency work.

The immediate treatment of the survivors, unconscious patients suffering from CO poisoning is one of greatest urgency. It is more important than the treatment of the injured ones, because delay might produce more serious harm. The CO-poisoned person is especially endangered owing to the fact that in his case the harm done is not so obvious as external injury which does not jeopardize life so seriously and because the person concerned does not report himself as being poisoned.

But also in the case of persons who are not fatally poisoned the conditions following poisoning will frequently be misunderstood, for usually the possibility has not been taken into account.

2. The second important consideration concerns the attempt to avoid this danger. A reliable chemical indicator, to be handled by laymen, which will record and reveal a dangerous CO-concentration is not known even today. The fact that small birds are much more sensitive to CO than human beings, made me recommend taking them along to the air-raid cellar. I believe, however, the practical benefit of

such expedients will not be very important, since in the case of large-scale damage a careful observation of the animals will simply be neglected, as there will be no time for it. So there remains only the fundamental recommendation to leave the cellars as soon as one realizes that gas from fires is entering the room. And moreover the fundamental recommendation is: to leave the cellar of burning houses, even though one may risk other damages outside. It ought to be recommended not to use ventilation plants, especially not plants with gas-filters in areas where fires are raging.

The recognition and treatment of CO poisoning in the course of aerial warfare does not offer any new ideas. As regards the findings on autopsy it must be remembered, that the CO in the tissues is said to disappear eventually, so that it becomes impossible to prove it where there has been a strong heating of the corpse.

While we are able to make exact post mortem statements about the cause of death in case of CO-poisoning, such statements are much more difficult to make in case of death by heat.

As regards a burned dead body as well as bodies burned to cinders and ashes, a statement as to whether the burning was the cause of death or not, will always be difficult.

In many cases it may be reasonably assumed, after a critical examination of the surroundings, that the burning occurred shortly after death.

In other cases we have the unquestionable report of eyewitnesses, who state that death by burning was certainly the cause.

In many cases where CO poisoning was the cause of death, later on the burning of the dead body was added. Also a simultaneous mixed effect of heat and CO must be taken into consideration. On the other hand, the temperatures of persons who die from pure heat-effects only, usually do not rise to such degrees, that a burning to cinders and ashes must necessarily be the result. It is wrong indeed, in every case of a dead body being found burned to cinders or ashes, always to assume that heat or burning was the cause of death. In an extraordinarily high number of cases burning after death has been proved beyond any doubt. The judgement of pathological findings is often very faulty in cases where over-heated and dessicated dead bodies are concerned. This picture is very strange. The effect of dessication is not given proper consideration, in fact it is even neglected. Bodies exposed to temperatures above 45° C are not so liable to moist putrefaction but will react on the contrary rather as if embalmed and dessicated.

It is often impossible in single cases to establish heat or fire as the cause of death beyond doubt but we do have some facts at our disposal, which prove the importance of heat as a cause of death quite clearly.

First of all, based on experiences in case of other forms of violence, one is justified in assuming that the great number of injuries from burns which are not primarily fatal are matched by a relatively high number of primarily fatal burnings. Recording of high temperatures in cellars under the centers of fire are evidence for the fact that it is just impossible to survive in such a cellar, where the

exits are blocked.

Accordingly we find in such cellars, after they have been opened, dead bodies without a sign of their being poisoned with CO. These dead bodies are so hot, that it is impossible to touch them, although they have not been burned.

Also suicides and other signs of the behavior of people, who realize that they have no chance of escape, have been ascertained which can be explained only as efforts to get away from the heat.

Of course there is no reason to consider heat as the only reason for suicides in air-raid shelters. Such a case of suicide (after having shot wife and children) has also been recognized as an act of violence due to panic, without any effect from heat.

Heat, in case of "large-scale fire" effects the organism in various ways. Besides the fact of people being immediately touched by the flames, fatal effects caused by heat may result by means of hot air as well as through radiation from hot gases and hot tools. In that case hot air is by no means the primary basis of heat effects. The chief cause is rather radiation. In the first place heat affects the bare skin or the skin when it is only very thinly covered. The result is overheating of epidermal tissue and subcutaneous tissue.

Thus, serious injuries caused by radiation have been found on the lightly covered female leg, though the stocking was neither burned nor singed. Heat from radiation of more than 225° C is able to affect hair and clothes.

Besides these local heat effects, a very great strain is put on the heat metabolism because of heat-supply from outside. Injuries through heat may happen in cellars which are blocked by fire or earth. The same may however occur in the open air as well as in the case of fighting fires.

During an escape through burning streets the danger from radiation must be taken into first consideration. Respiration of hot air is supposed to be responsible for these injuries, which have been ascertained in the respiratory canals as for instance: dessication, necrotic ulcers, and scars. How far these are really injuries due to respiration of hot air is still doubtful. Also the respiration of poisonous burning products must always be taken into consideration in such cases.

Up to today we have been informed only very insufficiently as regards the temperatures, which in some given cases have caused death or physical injury. Accurate records in case of injuries are rarely available, as they are usually taken during the final phase, if at all. The only information available up to the present was obtained from small fires.

It should be mentioned, that a tremendous amount of tetanus has been ascertained after injuries from burnings during aerial warfare, so that prophylactic treatment by means of tetanus serum is recommended.

(EDITORS NOTE: Prophylactic tetanus immunization before injury was not the usual practice among the civilian or military population. Tetanus toxoid was known, but not commonly used.)

If burning during aerial warfare differs essentially from fires in peace time, this cannot be explained by its extent in space only. One of the other reasons is that during a fire in peace - time hardly anybody will be in the cellar. Those who do not fight the fire will leave the burning house.

Protection from heat and effects from burning by dampness is of temporary value only. It can be demonstrated by calculations that the water of the much recommended wet blanket is bound to evaporate very quickly. The blanket, as does any other clothing, gives a certain protection from radiation. This protection may be improved by means of protective suits made from thin leavs of metal, as proposed by BUETTNER. As regards the possibility of rescue from heat danger, the period of "preservation of the ability to act" is decisive. This period can be prolonged by putting on thick clothing, and, best of all, BUETTNER's protective suit.

One of the most frequent faults in the judgement of burns is the fact that almost every burn is regarded as a "phosphorus burn". This tendency can be recognized not only in laymen, but also in physicians who make no attempts to prove the presence of phosphorus by the odor or by its luminosity in the darkness.

A phosphorus burn can only be assumed if an injury emits light in the dark, smells like phosphorous, burns or smokes. Injuries which do not show these characteristics have nothing to do with those caused by phosphorus. The emitting of light in the dark and the odor are not positive proof that the case is one of dangerous phosphorous effect as both these characteristics may be caused even by harmless amounts of phosphorus.

As a matter of fact, burns due to phosphorus are very seldom encountered as the term "phosphorus" has been tremendously over used in connection with aerial warfare. If some day a history of the medical importance of phosphorus should be written, the psychological chapter will unquestionably be the most important and most interesting one.

As far as the ammunition which has been dropped by English and American Forces in the past is concerned, the incendiary bomb of 4½ kg and the corresponding "burning tins" (containing phosphorus, which are set on fire on coming into contact with the air) contain about 400-500g of phosphorus in the head of the bomb as the priming charge alone, and in addition to this about 50 g of phosphorus, which is diffused over the real "burning mass". The burning bottles which contained phosphorus as priming charge, phosphorus sheets and other phosphorous means have not been seen for a long time. Pure phosphorous bombs are only used as smoke-and fog-shells. The case of pouring phosphorus from the planes was recognized only as a test a long time ago on the eastern front, which was stopped soon by the Russians because of its unsatisfactory results. "Stick" incendiary bombs do not contain any phosphorus at all.

Unquestionably it is psychologically undesirable to speak of phosphorous incendiary bombs in case of the 14 kg incendiary bombs, which contain no phosphorus for causing fires, but only a small percentage of phosphorus as priming. Using phosphorus as an incendiary agent is senseless, and has been dropped in favour of incendiary agents which are much nore effective. The statement, which was made even in bulletins from Military HQ's, that phosphorus has been used against living targets,

is really only a myth.

Statements concerning the dropping of phosphorus from altitudes below 100 meter which caught fire in the air, - dropping of granular phosphorus and the spraying of phosphorus within a circle of 70 m, have no real foundation whatsoever.

There is no report from anywhere that burning phosphorus was poured into cellars or air-raid shelters. Therefore the laying out of water -ditches and canals as a protection from such occurrances is quite preposterous.

The confusion concerning this subject will be shown by the fact that even the question of International Law has been thrown into the discussion, as to whether the use of phosphorus might be considered as "use of gas weapons" or not.

The manner in which this question of phosphorus is treated in public demonstration as well as partly in medical literature and in training camps is useless as far as the medical side is concerned. The undisputed need of instruction quickly leads to overestimation.

The toxicity of white phosphorus in case of internal use is generally known even by the most primitive human beings. At the same time the wrong assumption, made very often by laymen, on account of the similarity of names that the poison gas, phosgen, contains phosphorus, accentuates the fear of phosphorus very much. Thus the fear of being poisoned with phosphorus is roused in persons being externally touched, and in the same way the fear of "phosphorous gas"

But, as far as all this is concerned, one ought to know in Army circles, that phosphorus is the most useful agent for making artificial fog and for that purpose it is even used for creating artificial fog for the protection of our own troops. Even the irritant effect of phosphorous pentoxyd, which appears in that case, is to be expected only in case of high concentrations. According to this an irritation and injury to the respiratory canals by phosphorous vapors has, in the course of aerial warfare not been proved beyond question; in a single case and as the matters stand, this cannot even be expected.

Direct injury from phosphorus by the amount which is in the priming charge of the exploding 14 kg incendiary bomb, which is inaccurately described as a phosphorous incendiary bomb because of its small amount of phosphorus, is of a very rare occurrence and, as regards the frequency of its occurrence, corresponds approximately to the occurrence of a "direct hit" from a "stick" incendiary bomb. Also in case of an injury caused by the explosion of this 14 kg bomb, the burnings caused by the remainder of the incendiary substance is taken into first consideration.

Moreover, the rare genuine burnings by phosphorus must be compared with common burns. It is wrong to speak of poisonous effects of phosphorus in this connection. Injuries of the skin by means of phosphorus without a burning effect at the same time, have not been proved as yet in aerial warfare, even in a single case. Injuries by absorption in case of phosphorous burns are not known. In so far as human beings are concerned no case of poisoning by the ingestion of phosphorus along with food stuff, by absorption through wounds, or by inhalation have been recognized and reported in the course of aerial warfare. In

a line with this is the fact, that injuries to the eye, due to droplets of phosphorus, which have been the subject of special reports and special medical works, are in reality hardly ever seen.

Even in those cases, where a report has been made of such injuries, considerable doubt exists as to whether it is really a case of phosphorus or not, as phosphorus was only taken into consideration on account of the kind of burn, and not because phosphorus itself was detected.

Considering the actual situation, the propaganda for the conservation of scarce raw materials for treatment of an injury, which in reality occurs so very seldom, must be condemned. Moreover, experts are convinced that a treatment without copper will show at least comparable results.

It must be pointed out categorically that from the medical point of view, instead of numerous hints as to how this so-called danger might be fought, it must be stated at once and emphatically, how much this danger only exists in our imagination and of what small importance it is in reality.

Casualties on the basis of organic disease are not so unusual as far as air-raids are concerned. In the course of air-raids against the civil population, they sometimes have been the only casualties during a whole attack. In that case the acute cases of death from heart - trouble on account of already existing heart-disease are to be considered first. Most frequent is death from heart-failure in case of existing coronary sclerosis. These cases of failure are sometimes due to effects of fear, and also as a result of too much strain in trying to fight a fire or attempts at escaping or getting away. Cases of heart failure have been ascertained in dead bodies lying about in the streets. The other casualties on the basis of an existing organic disease are of statistical interest only.

As a matter of special interest, 2 casualties which happened at Hannover might be mentioned. In these cases widespread acid burns by means of droplets on the bare skin as well as injuries to the lungs and the upper respiratory passages by inhalation of acid gases have been ascertained. First these 2 cases were supposed to have been due to the use of gas. But it soon appeared that a signal-bomb, which missed its real purpose, was the actual cause.

In many discussions, the body of a person whose death was due to a "storm of flames" is treated as a special enigma. This phrase is used to describe fatal cases which have been found lying in the sreet in the vicinity of a burning public square. These casualties are not a riddle at all from a medical point of view. The cause of death may be either heat-effects from radiating heat or the results of CO poisoning in the attempt at an escape. It is especially while escaping through the burning streets that the organism, which has been already injured before by CO poisoning, suffers a final break-down. The "storm of flames" indeed is nothing else but masses of fresh air rushing in to replace the rising heated air.

Finally I would like to say some words concerning the wide spread errors as regards causes of death during aerial warfare. One of the most frequent rumors indeed is the legend of oxygen-scarcity as a cause of death. This rumor which arose at first at Hamburg, originates in

the idea, that in consequence of a large-scale fire, the oxygen in the region of the fire is consumed very soon, so that no oxygen was left over for respiration. And, very naively, the circumstances connected with a fire in a closed room are transferred to the events occurring in the case of an open fire. Similarly, the origin of the combustion products H and C_o, as well as other combustion products, is neglected and the fact is overlooked that even in the case of a fire in a closed room carbon monoxide poisoning would occur before the arising of an oxygen scarcity. In practice however the conditions are not the same in large-scale fires as in closed rooms. Owing to masses of fresh air rushing in, the process of combustion is always kindled afresh. As long as enough oxygen is available for the flame to burn, also more than enough oxygen for human respiration will always be available. The assertion and assumption of the formation of a vacuum at large-scale fires is simply a myth. Differences in pressure of that kind are immediately counter-balanced. It is just the often mentioned "storm of flames" which effects this balance of pressure. It can be sworn even by calculation that an oxygen scarcity in the "sea of flames" cannot arise and in reality has not been ascertained anywhere as yet. All other assertions are nothing else but a repetition of naive errors not based on real observations, but only on a wrong interpretation.

It can, however, no longer be excused, if the medical profession continues to spread the legend of oxygen-scarcity during aerial warfare now that experts in physics have conclusively demonstrated the falsity of this rumor.

The clinical picture and pathological anatomy of injuries caused by oxygen-scarcity is particularly well known in avia-tion medicine. Clinical and pathological findings in this sphere have been completely missing in the course of aerial warfare up to the present time. Proof of them ought to be demanded from all those who simply won't drop this legend.

Equally as rare are the cases in which the increase in CO_2, because of too many persons' being in an air-raid shelter, has been largely responsible for the death of human beings. An increase of CO_2 which endangeres human life will never become effective, not even in a case of the heaviest overcrowding of the shelter, even though the attacks should last as long and longer than they have up to the present.

If all these wrong theories were able to find such sidespread circulation, this is to be explained largely by the fact that the real reason, carbon monoxide poisoning, has not been discussed for psychological reasons, which I personally feel are not justified.

In case of large-scale damage, where the rescue of dead bodies causes tremendous technical difficulties, there often arises a rumor of sanitary dangers, which are said to be ascribed to the presence of dead bodies and to endanger the emergency squads and the population. The body of a person who lost his life through aerial warfare, even in an advanced condition of decomposition, does not produce any immediate sanitary danger for the surroundings, the physician or the personnel who have to bury these dead bodies.

The physician must, in spite of superstitious beliefs and fears, insist on the performance of the most natural duty towards the human

community, which is to rescue the dead bodies in a seemly way, to identify them accurately and to bury them as decently as the conditions at the time will allow.

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2. Pathological-anatomical experience in case of large scale fires.

by

Professor GRAEFF

According to the experience at Hamburg in determining the cause of death of the victims in case of large scale fires, the most advanced post mortem changes due to heat and moist putrefaction must be considered, which changes arise understandably because of the slow and delayed rescue of the dead bodies.

At 75° C. CO-haemoglobin will be destroyed in 2 hours in 2/3 of the cases and at 100° C. it will be entirely destroyed.

In case of "dead bodies found in cellars" one must assume as the most important cause of death CO poisoning and death due to the heat of the fire. Concerning Hamburg, immediate and indirect mechanical effects from bombing were not very important compared to the before mentioned causes. Death by poisoning on account of carbonic acid and oxygen scarcity must be discussed. The clearing up of these questions in the individual case and in general depends to a great extent on the exact determination of the state in which the casualties were found at the place where the death occurred. When dead bodies are found lying around on the streets, death by heat from the fire is probably the most frequent cause.

Discussion concerning the speeches on the topic:

Causes of death and sanitary dangers during aerial warfare and pathological-anatomic observations in case of large scale fires:

BREITENECKER: Concerning the scientific address by ROSE, one can say, that the assumption is very improbable, that human beings who have been poisoned by CO in a cellar, will collapse in the fresh air in the open street while escaping, and furthermore will die by the effect of CO poisoning in the open air. If such a poisoning occurs which might prove fatal the persons will have no chance left of trying to free themselves, as unconsciousness occurs at about 50 per cent CO-Hb and death occurs at about 70 per cent CO-Hb. If the poisoning has not yet reached such a degree, so that the person still has a chance of acting and doing something, the amount of CO-Hb will not be enough to kill this person. It is true that by moving about in a room, contaminated with CO, the relation of CO-Hb to O_2-Hb is shifted unfavorably for the matter in question, because of the increased inhaling of oxygen. And that on account of the activity, unconsciousness will set in much earlier. The moment however the person comes into the fresh air, CO will be eliminated immediately and thus the before mentioned shifting can easily be neutralized. If the poisoned person has got into the fresh air, it is nearly impossible, that he should die by the CO-effects in the cellar. If, however, clouds of CO could be proven in the streets, such cases of death might be possible, and such cases have been known to occur from hills of coke-dust where the person, after having reached the fresh air, suffers a deadly CO poisoning.

All these cases, as well as those mentioned by GRAEFF could be explained by making a quantitative estimate of the content of CO-Hb in superficial and deep blood. For by such means all those cases could be eliminated, which showed post mortem that CO had

found its way into the superficial layers of the tissue, on account of which CO poisoning might have been taken into consideration.

The light red colour of the finger nails of the hands charred to carbon does not by itself allow one to assume a CO poisoning for a light red colour is also found as a result of heat effects. In these cases the CO-poisoning must be proven by a quantitative CO determination. The same holds true for the salmonred discoloration of the muscles in case of heat and moist putrefaction. Also if dead bodies are destroyed to a great extent by charring, it is absolutely necessary to examine parts which have been under lesser degrees of heat, as for instance the inner parts of long bones. This ought to be done as it may give one a chance of obtaining by such measures a few drops of unchanged blood, which would be enough for determining the CO-Hb contents by means of spectrophotometrical investigations.

In case of an investigation of blood changed by heat, it should be discriminated, whether for instance at 60° C. only 2/3 of CO-Hb were really present or whether they could not demonstrate any more because of changes of the blood-pigment. In addition to this one must know which method was used. Anyway, there is also a so-called "test by means of boiling". As a result of that procedure, blood free of CO becomes brown, while blood full of CO remains red, which corresponds to a heating of about 100° C. It is understood that higher temperatures destroy the haemoglobin and thus the CO is freed.

BOHNENKAMP: As CO poisonings by air raids are very frequent it is necessary and important for proving this poisoning, that we physicians are able to recognize these CO effects among the survivors even 8 days later. BORKAN has shown, that the iron, which can be easily separated by reduction with HCl, is always in a reduced state in the blood after CO poisoning. After examination of the findings we have been able to prove this again in our clinic by the work of BECKMANN, by a comparison of the values of haemoglobin and erythrocytes.

New reseqrches which have been made recently have shown us again, that so far as men and experimentation animals are concerned, the reduction of the so-called "easily reducibile iron" can be proven even 8 days after a CO poisoning.

HARMSEN: The most essential matter of the war at the present time is the mental strain on our civilian population by the prolonged air raids. The backing up and strengthening of the civilians' power of resistance is also important for military reasons, because of the importance of its reaction on our fighting forces.

As regards mental hygiene it appears to be very important and urgent, to treat the fresh knowledge concerning physical injuries resulting from air raids no longer as "secret affairs". I feel rather that this knowledge ought to be made public and discussed freely among the civilian population. It is not only necessary to face the phosphorus rumor, but at the same time face the task of allaying the fears of blast effects of air-mines. A better knowledge of the danger of CO-poisoning must lead to another, more sensible attitude, especially in case of fires and considering the improbability of oxygen-scarcity even in case of large scale fires.

3. Pathologic-anatomic findings in case of "experimental blast" and injuries due to explosions.

by

Professor ROESSLE.

During the animal experiments with smaller and larger epxerimental animals, the limits of death for certain priming charges as well as the distance from the center of explosion have been proven so clearly and the pathologic-anatomical findings are so uniform that even from the beginning similar conditions were to be assumed in case of experiments on human beings. Now the comparison with the collected data of fatalities from blast and water-blows upon human beings indeed have proven an agreement which extends even to the least details.

The parenchymatous pulmonary hemorrhages which after an explosion develop in a short time and may reach the degree of hemorrhagic infarction of certain pulmonary areas are placed into first consideration. Frequently, and especially in very severe cases, these pulmonary hemorrhages are connected with internal (very infrequently external) lacerations of the lungs. They are the reason for hemorrhages from the respiratory passages, which clinically are the most certain clinical evidence of injuries resulting from explosions. In part they originate also in the numerous capillary hemorrhages of the mucous membranes of the upper respiratory passages and may even involve the sinuses.

Physically the nature of these hemorrhages can be understood as an effect of the pressure wave which runs through the skull from all sides, along with injuries of the areas of contact between tissues of different specific gravities. But they cannot be considered as a real cause of death. As far as the cause of death is concerned the primary consideration, on the contrary, must be given to the entrance of air into the blood vessels in case of pulmonary injuries and furthermore the arterial air-embolism which effects the left side of the heart. In a few cases of an especially acute death air embolism cannot be proven. These cases perhaps call for still another different explanation, which has not been given as yet.

The most important places where arterial air embolism may occur are the coronary vessels and the brain. They mean acute coronary insufficiency for the heart. Late injuries are rarely known even today. As far as the brain is concerned cases of air embolism have a chance to recover after a temporary, although severe, neurological spell such as paralysis, convulsions, unconsciousness, and similar findings.

In case of under-water blast on account of under water explosions, only those organs of swimming people which are below the water surface are injured, and the deeper they are submerged the more serious the injury.

For that reason belly-injuries of the organs of experimental animals which contain gas are much more common and more severe than in the case of blast in the air. In under-water blast the rectum, vermiform appendix, small intestines and stomach are injured most frequently. Hematomas and split wounds about parts of the body which hold gas are frequent. Destruction and lacerations of nearby organs

(pancreas, liver, spleen, kidneys, diaphragm) may happen as a result of the rapid rotation of gas-containing organs.

Pulmonary hemorrhages as an injury resulting from explosions have been recognized in various kinds and degrees as far as human beings are concerned. Air embolism of coronary vessels and especially of the heart-capillaries is much harder to prove. Arterial air embolism of the brain can be proved beyond doubt as originating from disturbances which correspond to those we already know from investigations with experimental animals, which fact I have verified myself.

Death purely caused by blast is a very rare exception with human beings, in the field as well as in case of air raids in Germany, as nearly always other very dangerous injuries exist at the same time, due to random shots being buried by earth, CO-poisoning among others (in exceptional cases also by suffocation) and also, because the range of the deadly pressure is very limited.

(The speaker quoted numerous calculations to substantiate the last statement).

4. Clinical picture and treatment of blast-injuries.

by

Captain DESAGA, MC German Army.

Injuries due to blast do not originate from the effects of the pressure wave or of the negative pressure in the lungs, but because of the pressure of the blast-wave on the entire body surface.

As a result the body media of various specific gravities are subjected to various strong acceleration forces which cause the tearing and destruction of the tissue of the contact areas. As the greatest variation of specific gravity exists in the thorax (tissue of the lungs which holds air, great blood vessels, heart) and in the abdomen (organs of the belly and the soft contents of the rectum, mixed with gas-bubbles), the most serious injuries appear in those places.

Until now altogether 23 persons who have been injured by blast have been clinically observed. When at a distance of more then 35 meters away from the explosion (even in case of the heaviest mine) injuries due to blast do not occur.

Also indoors (air-raid shelters or cellars) practically no blast injuries can be expected, if the explosion happens outside of the rooms.

The available clinical records, X-ray pictures, and electro-cardiograms, the clinical symptoms and states have been discussed. Early X-ray examination is proposed and suggested in order to eliminate urgent indications such as pneumothorax and mediastinal emphysema. I should like to suggest also the examination of the retina in order to recognize arterial air embolism at autopsy. For the same reason I also suggest electro-cardiograms.

Frequently recognized dangerous abdominal symptoms, for which laparotomies have been done, are based on harmless subserous hemorrhages. Therefore the greatest conservatism must be demanded as far as laparotomy is concerned as well as inhalation anaesthesia which is a special immediate danger to life. Treatment by rest, oxygen and hot packs is indicated. In case of the always present severe shock I suggest the most careful watching of the heart-circulation. Strophantin-caffeine, the usual stimulants for the circulation, have no effect. Most strongly contra-indicated are intravenous administrations of liquids in order to accelerate the circulation. They lead to edema of the lungs. Blood-transfusions should be used only in case of urgent danger to life.

For soothing the motor restlessness, and relief of the always present severe pains: Scopolamine-Eukodal-Ephetonine is administered in conservative doses. Sulfonamide is administered at the proper time and early. Careful watching by experts of the commonly present performation of the eardrums is desirable because of the danger of otitis-meningitis. The prognosis of serious blast injuries is generally very good.

Discussion of the papers read concerning blast and injuries due to explosions.

KINDLER: Shocks by detonation lead to a laceration of the ear-drums on both sides in about 10-15 per cent of the cases. In about 20-40 per cent of these cases subsequent middle-ear infection develops, even as late as a couple of weeks. In a high percentage of these cases (29 per cent) the mastoid process must be operated on, for the same reasons which make an operation necessary under usual conditions. Endocranial complications of middle-ear infection due to blast are rare. Sinus thrombosis and inflammation of the labyrinth associated with purulent meningitis have been recognized, once each, and were cured by operative means.

SEYFERTH: During the last few years I have investigated a great number of cases of ear disturbances after detonations and explosions. In that case the effects from the sound-waves are unimportant. In most cases ear diseases are the result of explosive and blast effects. As a rule the ear disturbance is not a pure "deafness of the inner ear". The investigation by an ear specialist showed a concentric narrowing of the entire "range of sound".

Frequent disturbances of the vestibule have been recognized. DESAGA, in his pictures, demonstrated a nystagmus in a dog which had been injured by blast. This nystagmus is a pronounced "nystagmus which is dependent on the position of the head" and for that reason has nothing to do with an ear-drum rupture.

Moreover the neurologic investigation has shown, in nearly all cases, signs of a concussion or cerebral contusion. The ear disturbances and disturbances of the vestibule therefore must be considered as part of the concussion of the brain, and the treatment must be based on a consideration of that fact.

The treatment must start as soon as possible after the trauma. Ear disturbances which still exist after 2 months and have reached a stationary state usually cannot be expected to improve any further. Treatment by the injection of dextrose for at least 10-14 days, and rest in bed have proved successful.

v. EICKEN: The illustrations shown have demonstrated the nystagmus as far as a dog is concerned. I assume that this is not the effect of an ear-drum rupture but the result of an irritation of the labyrinth.

5. Injuries and damage to the eyes in air raids.
Treatment of Eye Injuries caused by Phosphorus.

by

Captain (MC) Professor Dr. THIEL.

In the following chapter those injuries following air-raids which endanger the vision, their symptoms and their treatment will be discussed.

These injuries may be observed very frequently and require extraordinary therapeutic measures.

1. Injuries of the eye by perforation.

Our experience shows that after air raids (similarly as after the explosion of mines) in addition to the damage to the eye, extensive injuries to its surroundings can be observed as well.

In the treatment of eye injuries by performation the following must be considered: Treatment for the eye-wound is most important. As a rule it must be stated, that every eye-injury must be transferred immediately to the eye specialist, even if other injuries exist at the same time. In those cases, where danger to life exists, those injuries may be treated before or at the same time as the eye injury.

Extensive injuries of the soft parts and of the face, especially the treatment of lacerated and torn eye-lids, should be left to the care of the eye specialist. He not only has the necessary anatomical and physiological knowledge and the necessary operative skill for it, but he also knows the complications that may arise in case of improper closure of the lids or wrong position of the lids.

In case of laceration and torn lids primary suture of the wounds must be performed under any circumstances. The earlier this injury is repaired the better will be the result and the shorter the time of treatment.

2. Irritated conditions of the lids, conjunctiva and surface of the cornea, due to smoke, radiating heat, and effects from foreign matter, are most frequently observed at large scale fires. The clinical picture of this condition is similar to that of the keratoconjunctivitis photoelectrica.

The treatment includes: Removal of the painful spasm of the eye-lids by instillation of a mild, diluted aqueous anaesthetic solution (Psicain-Neu (very scarce), Larocaine), irrigation of the conjunctival sac with 1-3 per cent boric solution after it has been ascertained that no injury by perforation exists. Application of a bland, antiseptic ointment (boric ointment, Noviform-ointment) or of oily collyriums (Biseptol compositum). An anaesthetic should never be prescribed by way of routine since repeated instillations may result in damage to the epithelium of the cornea. Protective glasses should be worn. The patient should be reassured that there is no danger to his eye-sight.

3. Damage to the eye by phosphorus may be caused by the element phosphorus. The symptoms as well as the treatment can be seen from the following brief summary following a suggestion of the Wehrkreis-

physician IX.

Treatment of eye injuries caused by phosphorus.

Eye injuries caused by phosphorus. Etiology:

1. Phosphorus-pentoxide fog contacted when extinguishing phosphorus incendiary bombs.

2. Small parts of the element phosphorus in case of explosions of phosphorus incendiary bombs.

This has not been included in our directions.

Clinical picture:

First aid and later treatment:

A. First Aid

Both injuries cause the same difficulties:

Tears,

photophobia,

burns which may cause very severe pain.

a) Immediate copious washing out with water; if impossible apply moist towels to the wounds. The towels function better if they are soaked with 3 per cent sodium bicarbonate solution.

b) Repeated irrigation or continuation of moist poultice until a physician can take up the treatment.

c) Always report immediately to the next first-aid station or hospital.

B. Aid by physicians and medical personnel at first-aid stations.

1. Inflammation of the conjunctiva and cornea by phosphorus fog:

Smarting of the eyes,

after 4-6 hours, unbearable pain,

photophobia,

blepharospasm,

lacrimation.

a) Instillation of a liquid anaesthetic, for instance, Psicain-Neu of $\frac{1}{4}$-$\frac{1}{2}$ per cent, (avoid cocain and pantocain).

b) investigation to detect other severe eye-injuries.

c) irrigation of the conjunctiva sac with 1-3 per cent solution of boric acid (or water), or better with a buffer-solution (for instance boric acid-borax buffer solution)

Compare C 2, c)

2. Inflammation of the cornea by small phosphorus particles. Necrosis of the conjunctiva, cornea, and cutis vera. (With older people the picture is similar to ulcus marginatum). Episcleritic bulge.	Immediate treatment by specialists necessary.

C. T r e a t m e n t i n r e s e r v e - h o s p i t a l s .

1. Inflammation of the conjunctiva and cornea on account of phosphorus fogs:	a)-c) as above under B.
Investigation necessary by means of a slit lamp. To recognize: very fine stippling of the corneal epithelium, slight inflammation of the iris. Sight in most cases nearly normal. On the following day occasional changes of refraction such as in myopia. Irritated condition subsides after 5-7 days. Sight and refraction return to normal.	d) Mydriatics, ointments (avoid the alkaline eye ointment in case of phosphorus damage in the treatment of Lost-poisoning rather use buffer ointment, for instance boric acids-borax-buffer-ointment) oily collyrium with anaesthetics (Biseptol compositum).
2. Inflammation of the conjunctiva and cornea caused by small phosphorus particles:	a)-b) as above under B.
See B 2	c) Irrigation of the conjunctival sac with boric acid-borax buffer solution, rather with alkaline copper-salt solution (see the following prescriptions)
	d) careful and repeated scraping out of still existing phosphorus particles which have not yet become inactive. In case of severe pain (iritis) use mydriatics (for instance atropine) and analgesics.
	e) Further treatment: oily collyria and ointments (Biseptol simplex, Vogan boric ointment, Unguentolan ointment, Noviform ointment and others).

By means of curves the neutralizing effect of sodium bicarbonate solution, as well as the neutralizing effect of buffer solution, is demonstrated. It is emphasized, that buffer solutions, especially a buffer solution of boric-acid-borax is preferable to sodium bicarbonate. Even in case of damaged corneas, buffer solution cannot cause additional irritations, which would result from strong alkaline solutions and ointments (alkaline eye ointment). The fact, that they are able to neutralize acids and alkalia, speaks in favour of the use of buffer solutions in ophthalmology.

The question of the importance of copper for the treatment of phosphorus injuries is widely involved in this topic. In place of copper sulfate which is able to inactivate only the element phosphorus, alkaline copper salt solutions and the following corresponding prescriptions are recommended.

Prescriptions for the treatment of phosphorus damage to the eye.

1. Boric acid-borax buffer solution (P_H 7.0)

Acid. boric		3.0
Natr. biboraci.		1.2
Aq.dest.	ad	100.0

2. Boric-acid-borax buffer ointment (P_H 7.0)

Acid. boric. pulv. subt.		3.0
Natr, biboracic. pulv. subt.		1.2
dissolve in hot Aq. dest. 10.0, mix with Eucerin. anhydride.		25.0
and stir until cold Vaselin. alb.	ad	50.0

3. Boric-acid-borax buffer ointment (P_H 7.0)
- anhydrous to be stored for long time -

Acid. boric. pulv. subt.		3.0
Natr. biborac. pulv. subt.		1.2
Eucerin. anhydric.		25.0
Vaseline americ. alb. pur.		25.0

4. Simple alkaline copper solution (for air raid defense first aid boxes)

cupr. sulfuric.		1.0
Natr. cal. tartaric. (Seignette's salt)		2.0
Aq. dest.	ad	100.0

4a. Copper solution with sodium bicarbonate

Cupr. sulfuric. crist.		1.0
Pott.-sodium tartaric.		2.0
Sod. bicarb.		2.0
Aq. dest.	ad	100.0

4b. Copper solution with Boric acid-borax buffer.

Cupr. sulf. crist.		1.0
Potass.-sodium tartaric.		2.0
Acid. boric.		3.0
Sodium. biboracic. crist.		1.2
Aq. dest.	ad	100.0

Completely dissolve each ingredient before adding the next one.

Directions for the treatment of injuries and damage to the eye in case of air raids.

1. Injuries to the eye caused by perforation.

Experience teaches us that after air raids, as after mine explosions, besides the damage to the eye itself, most extensive injuries of its surroundings are seen. Injuries from glass splinters are predominant. They usually involve both sides.

Treatment corresponds to the previously mentioned directions concerning the early operation in case of injuries to the area surrounding the eye.

2. Irritated conditions of the lids, conjunctiva and corneal surface due to smoke, radiating heat, and effects from foreign bodies, are most frequently observed at very large scale fires. The clinical picture is similar to that of kerato-conjunctivitis photoelectrica.

Treatment: Removal of the painful spasm of the eye-lids by instillation of a diluted aqueous anaesthetic, irrigation of the conjunctiva sac (care has to be taken that no injury by perforation has occurred) application of bland and antiseptic ointments (boric ointment, Noviform ointment). An anaesthetic should never be prescribed for the patient, since repeated instillations will result in epithelial damage to the cornea. Protective glasses should be worn. The patient should be reassured that there is no real danger to the eye-sight.

3. Phosphorus injuries to the eye may be caused by the element phosphorus. Because of the fact that phosphorus injuries are so infrequent, practical experience concerning the value of the recommended treatment can not yet be determined. Damage due to phosphorus pentoxyd fog have not been confirmed. Based on experimental investigations on the treatment of phosphorus damage to the eye, 3 per cent sodium bicarbonate solutions and boric acid-borax buffer solution can be used.

6. Treatment of burns resulting from air raids. General directions

by

General (MC) Professor E. GOHRBRANDT

The burns resulting from air raids which are caused by the immediate effects from the incendiary agent on human beings or their clothes are generally quite severe. In case of the so-called "phosphorus-incendiaries" (14 kg weight) the phosphorus is of no special importance, for it is only the priming charge of the real incendiary agent. The incendiary agents alone (gasoline, benzol, artificial resins (plastics) and India rubber) are able to cause the same burns, as if they contained phosphorus, even without additional phosphorus, because of their high degree of temperature while burning, and because it can be extinguished only with great difficulty. Experiments on animals as well as observations which have been made in areas most severely hit by air raids, have proven that assumption. As regards human beings the absorption of phosphorus from burns has not been recognized up to the present, not even in case of injuries from luminous-trace ammunition.

In spite of that phosphorus particles can sometimes be shown in the burn in case of phosphorus-incendiaries. (Shining in the dark, demonstration and proof by silver nitrate).

After careful mechanical removal of the incendiary agent the phosphorus can easily be removed. A copper sulfate solution is unnecessary for that purpose, although its characteristic quality of making phosphorus harmless must be acknowledged. Pouring oil into the burns, and washing later on with water and soap will be sufficient for removing phosphorus. It also will be very useful to wash out the burn with a 5 per cent solution of sodium bicarbonate or a soda solution with additional H_2O_2 or also the use of a weak solution of potassium permanganate.

After this is done the wound is treated like a common burn. The treatment of burns must be according to the cause. One must take due precautions against those dangers, which are particular hazards to a burned person, as for instance:
Infection,
Poisoning by resorption of the protein of dead cells,
Loss of plasma.

D i s c u s s i o n :

FLURY: The proposal to use copper sulfate in case of phosphorus burns is not new. It was made during World War I in different quarters, but has been evaluated very differently. Later on the question kept coming up again but was not given much publicity.

Therefore, by the publications of STRAUB, alarm and confusion arose, not least on account of the fact that these publications have caused false ideas about the value of the methods of treatment hitherto adopted. As regards the publications of STRAUB about the reactions and toxicity of phosphorus and copper sulfate nothing important can be said against them, however, many objections can be raised against his proposals concerning the therapy of phosphorus burns. In particular he goes much too far in maintaining that

phosphorus can be rendered absolutely harmless by copper treatment and that for this reason it need be removed.

Copper has a palliative or prophylactic effect. In the first place it renders phosphorus superficially inactive, at least temporarily, and thus is a protection against absorption, but not with such absolute certainty as STRAUB assumes. In case of destruction of the thin delicate film particles of phosphorus may become active again. Copper, moreover, is of diagnostic value on account of the black and red coloring of the phosphorus particles in the wound. Possibly it can also be an aid in the mechanical removal as well as in the washing out of phosphorus particles. Last and not least, copper helps to allay the psychic shock as it immediately suppresses the alarming phosphorescence as well as the odor which may oroginate from the smallest and quite harmless traces of phosphorus.

For the civilian, however, sometimes the recognition of phosphorus particles by these signs may be important. The therapeutic value of copper is very questionable. For decades the physicians of phosphorus works have not used copper, but bicarbonate instead. The English and Russian medical instructions recommended copper sulfate for first aid. The Russians, who occupied themselves with copper and other mediums have lately named aqueous alkaline pastes as the best treatment.

Recent experience gives no certain evidence that justifies the superiority of a copper treatment. It is, however, simple, can be easily used, is harmless, and by no means worthless. The objections against copper sulfate are pretty much exaggerated. Copper sulfate is practically non-toxic. The occasional slight delay in the healing of wounds plays no important part.

We feel that copper, and not only because of the situation on the raw-material market, is not necessary under all circumstances, and that it is dispensable. Where copper is available it may be used.

It is, however, necessary to examine the copper sulfate paste proposed by STRAUB very carefully and thoroughly. According to our investigations the proportion of dissolved copper sulfate decreases rapidly and may sometimes disappear entirely.

It is important for us as physicians to fight this exaggerated fear, the "phosphorus psychosis", of the civilian population.

The medical problems are not so difficult and mysterious as is often assumed. The most important thing is the complete removal of phosphorus from the wounds. The danger of absorption of phosphorus is very small, as is shown in cases of burns by phosphorus incendiaries which have been observed. Here it is predominantly a question of thermal injuries similar to burns by gasoline, and not a question of a real chemical and toxic injury caused by phosphorus which sometimes goes deep, is of a serious character and takes a long time for healing.

According to numerous reports by the hitherto adopted treatment the so-called phosphorus burns heal satisfactorily even without copper sulfate, at any rate not more difficult than common burns.

ASAL: I should like to point out once more the importance of the tannin-treatment of burns, as demonstrated by Professor GOHRBRANDT.

It is just too bad that it has not been adopted more frequently. The same may be said of the big capastrophe at Hamburg - only extensive ointment dressings have been used in the hospitals. When I wanted at that time to know, why they had not adopted the tannin treatment OECHTECKER gave me this answer: "We simply have not time enough to adopt that tannin treatment while treating such a great number of injured peoples."

As regards this remark I should like to say that there is not anything more simple than to apply a compress which has been soaked quickly with a 3 per cent tannin solution. Afterwards by sprinkling this compress with a watering can every half hour, a nurse keeps the pads of gauze and cloth constantly moist without spending any more time. Only 2 Military Medical Units from outside of Hamburg, which had been set to work in the outskirts of the town, really adopted the tannin-treatment and they achieved very successful results. In Northern Africa also, where many burns occurred, the Africa Corps adopted this treatment and found it very successful.

In spite of these favorable results corresponding installations were missing in most air raid shelters, as I found out during my inspection tour. The necessary installations are:

Providing a bucket, a watering-can, and numerous carefully measured portions of tannin powder. These portions of tannin powder must be of such amounts that their solution in the buckets prepared and filled with water will produce a 3 per cent solution.

7. Fundamental Considerations concerning the physical strain on youths in the Wehrmacht (Armed Forces) Reserve.

by

Dr. GROH.

Youths are growing and developing and thus are not to be compared to adults physiologically, and as regards efficiency.

Instructions concerning the amount of strain on young people:

1. The development and efficiency of youths is to be increased to a level which is adopted to their age, by removing any under-development of physique and the results of partial handicap and overstrain.

2. The efficiency is to be increased until the best physiological achievements are obtained. This demands that the biological action of the young organs should be duly considered. That means the function of the entire organism, depending on physical condition and function, and the rules of functional development. Prompt action by the physicians in charge is necessary. In comparison with adults, the action of the muscles, the blood-circulation, the assimilation of food, and the function of the skin are especially liable to injuries. Some special problems will be pointed out here:

1.) Physical training by sports and work.

The muscles of youths are not so developed and efficient as those of adults. In order to the increase physical efficiency optimal stimulation must be used, such as sports and work. The best results are obtained by repeated short, moderately strenuous exertions. Continuous strain is harmful. The efficiency must be systematically developed by a gradual increase to obtain satisfactory results. The blood-circulation especially must be checked by repeated functional tests.

2.) Adequate diet.

Youth needs a diet that is both nourishing and prophylactic because of its growth and work. The diet has to consist of 4000 - 4200 calories. The higher requirements of albumin, vitamins, and minerals must be especially provided for.

3.) Conditioning.

Youth has to be taught to keep clean and avoid alcohol and nicotine. Conditioning by alternation has shown good results for the prevention of colds. It is desirable to construct and use a "sauna" (finnish hot vapour bath.) It strengthens the resistance to disease and provides the best conditioning.

4.) Variation of duties with sufficient sleep and rest.

The supply of the muscles with oxygen and its assimilation for the construction of the tissues has to be secured in the intervals between stimulations. The duties should be varied, and sufficient intervals for rest should be provided. The signs of fatigue should be observed, and it must be prevented by relieving fatigue in time. A five minutes' rest every hour is required, also one hour's rest in bed at noon time and nine hours' sleep at night.

8. Psychological and Legal Questions concerning Mental Insufficiency and Punishment of Youth in the Wehrmacht (Armed Forces).

by

Professor VILLINGER.

The juvenile age (age of development, puberty) is a very dangerous period of life for normal as well as for abnormal youths. Puberty is biologically the last part and end of physical and psychical development for the battle of life and the maintenance of the race. The main psychological defect is a strong psychical laxity and a lack of mental balance. Strong internal tensions and disturbance of the psychical equilibrium occur. The most important ones are: An extraordinary desire to play a prominent part, and an inferiority complex; awareness of the world, and quiet manner of living; super-sensitiveness, and stubbornness. Added to these is the awakening of the sexual instinct with all its concimitant effects, thus increasing the sensitivity, lack of psychical equilibrium, and diffidence of the youth. No standard can be set for the psychical development and individuality of youths, because of the multiplicity of forms of every living thing and especially the human soul. (Translator's note: If anything at all was completely missing from the Nazi ideology it was consideration for the soul of the individual). The beginning of puberty is determined by heredity and the environment of the individual, and sets in earlier in one person than in another. Sometimes its effects are stronger or milder, sometimes its progress is quicker or slower.

The normal youth usually passes through this critical phase in spite of "Storm and Stress" rather unnoticed and unmarred. But, psychically abnormal young men often meet with serious difficulties or even are frustrated. (Their lives are wrecked).

There are generally 5 classes of youths who do not stand the strain of the Army service or at least do so only unsatisfacorily, and who make very bad soldiers, are complete, or commit punishable offences. They are:

1. Individuals who are intellectually inferior, stupid, or even slightly imbecile.

2. Individuals developing late or infantile.

3. Those with hereditary abnormalities of character and temperament, or, as they are called officially in military parlance "characteropathic".

4. The comparatively rare cases of normal or rather normal talented individuals, whose minds are twisted or who are neurotic on account of their surroundings or at least chiefly for that reason.

5. Psychotic or beginning psychotic individuals.

On the other hand the military service is a good educational experience for many youths, particularly to those difficult to educate and psychopathic ones. (Sic!!)

The criminal rate among youths is considerable. Juvenile criminals who came from a convict prison into the Wehrmacht showed fairly good behaviour, so far as investigation of this matter disclosed. This fact demands a different point of view as to

juvenile criminality in war than in peace. In peace the determining reasons were the abnormal predisposition, but in war the influence of the surroundings is important. The psychiatric experience of the courts of justice shows the necessity of a psychiatric investigation of the juvenile offender; it shows also than an investigation of the reasons and the backgrounds of the actions of the younger and youngest military criminals is always needed. At least a psychiatrist should be heard in each case of a severe crime to find out if it may be presumed that the crime is due to a character defect, or a lack of intelligence, or if the crime was repeatedly committed. Furthermore, it is necessary to keep those individuals away from Army service who are still too raw. That means they will be available for service at a later time, as most of them become riper and will then make good and efficient soldiers; but, brought into an unsuitable surrounding too early, they will lose their initiative and usefulness forever.

Therefore, special care must be taken at the entrance examination for military service to detect those individuals, who went to schools for backward children, or who failed to get their promotion to a higher form at school several times, for those coming from homes with criminal backgrounds or criminal juveniles.

Among 669 Court Martial sentences we found:

15 on persons in their 18th year,
27 on persons in their 19th year,
30 on persons in their 20th year,
29 on persons in their 21st year.

This means that 15 per cent of all sentences concerned youth under 21 years.

The most frequent offence of these four groups was AWOL. This was the offence in 40 per cent of the cases among the 18 and 21 year old soldiers, but 50 per cent of all offences among the 19 and 20 year old persons.

The chief psychiatric explanation among 18 year old soldiers was imbecility; among the 19 - 21 year old soldiers, psychopathy with and without diseases. The number of schizophrenics among the 18 year old persons was interesting, namely 25 per cent (!!).

In only twelve among 101 cases it was decided that no psychic disease, disturbance, or abnormality was to be observed.

9. X-ray injuries in the Wehrmacht (Armed Forces).

by

Professor JANKER.

In comparison with the total number of injuries, those caused by X-ray are of very little importance. Altogether only 36 cases of X-ray injuries have been recorded. But even in peace time not all such injuries are published, and even less in war. The reason for this may be that the correct diagnosis is not absolutely certain in part of these cases. Sometimes X-ray injuries which require an amputation are recorded under this work, which seems to be more important. A part of the cases may not have been filed yet, as the disease is still active. Thus the number of X-ray injuries is probably higher, but whole groups of cases occur very seldom, as for instance at a reserve-hospital, where no less then 8 patients and 3 surgeons were very severely injured by X-rays.

According to the collected research material, which is demonstrated by pictures, some of them color photographs, we have to divide these cases into several groups.

Most of the reasons for injuries to patients occurring during the investigation for foreign bodies by means of X-rays are violations of the X-ray protection regulations:

1. Exceeding the maximal time of X-ray exposure.

2. X-ray fluoroscopy with a current meant to be used for X-ray pictures instead of using the correct current for fluoroscopy.

3. Shortening of the distance below the prescribed distance of 35 cms, especially if the regular tube was removed.

The reasons for injuries caused by fluoroscopy of the abdomen were:

1. too small adaptation,

2. too long exposure over the maximal time,

3. repeated examinations at too short intervals,

4. fluoroscopy without the correct filter.

A special group consists of injuries caused by trauma (i.e. pressure of the buckle, damage to the hand) in addition to a too frequent or too strong X-raying.

X-ray injuries to the sanitary personnel and officers are for the most part caused by holding the hands in the primary ray focus when correcting the illuminated sector, or at the detection of foreign bodies. These events sometimes resulted in severe injuries, once even in an amputation.

Even disturbances of the blood may be caused by a large exposure to X-rays, as it might happen with sanitary officers who have long hours of duty (20 examinations and more daily).

The use of the following schedule is suggested for the dividing of X-ray injuries according to their different causes. (This scheme

will also be used for the determination of the degree of injuries happening during active service):

Injuries due to:

1. pure X-ray effects
   a) with single dose
   b) with several doses.

2. Partial X-ray effect in connection with other disturbances.

We hope that the number of X-ray injuries will decline more and more now that the pamphlet on regulation for the protection against X-rays has been published.

Another source of danger is improvisations and new suggestions for the "improvement of fluoroscopy", which very often are made by medical non-commissioned officers without sufficient skill in X-ray technique. It was, for instance, necessary to caution people against a proposed method of fluoroscopy without adaptation. This method suggested that the apparatus should be placed directly on the skin and the fluoroscopy was made in bright day-light! The examining person himself was exposed to the primary ray-focus at the shortest distance (this procedure definitely led to severe X-ray injuries).

All these reasons show how necessary it is, if there are no X-ray specialists that the surgeons, internists, and dermatologists should be on the look-out for this matter of injuries by X-rays.

10. General questions on fitness.

by

Dr. DEIST.

(This treatise deals with errors of examining boards concerning fitness for military service and is largely concerned with questions of administration rather than medical care. It was not considered worth translating for that reason).

11. Enemy sabotage by the use of poisons.

by

Professor WIRTH.

The utilization of poisons for purposes of sabotage was strictly forbidden to the Germans by order of the Fuehrer himself. But these illegal means were previously used by the enemy during this war. Therefore it is necessary to prevent damage and to be on the alert in this matter. The sabotage of the enemy by means of poisons includes for the most part food-stuff and beverages which are meant to be supplied to the troops as well as to single important civilians. A relatively unimportant point is the intentional administration of too great amounts of potent drugs, i.e. morphine, pantopone etc. by alien nurse personnel, as has happened in several cases. Not of medical interest and therefore not to be discussed in this article are cases of intentional sabotage of chemical procedures at technical works or laboratories.

For the purpose of poisoning, arsenic was always and ever preferred, because of the easy way of obtaining it ordinarily, its good stability in aqueous solution its stability even when boiled, and its lack of odor and taste. It can, however, be easily detected chemically, if this matter is of importance. If mysterious cases of gastro-intestinal troubles occur, sometimes slowly or also violently followed by cholera-like symptoms of the intestines, the possibility of poisoning with arsenic must always be considered. The capillary-poison colchicine has a similar effect on the intestines, and it has also been used for purposes of sabotage. A characteristic effect of this drug is the latency for several hours, which makes it difficult to detect the poisoning in time and delays the emergency-remedial care.

Easily detected by its symptoms is atropine, which has been proven to have been put into the breakfast coffee by Russian kitchen helpers. There were also cases, where this drug was infused into eggs, with the result that the cocktail which was made using those eggs, was poisoned with atropine. Even unskilled persons can identify the symptoms of a poisoning with atropine by the large pupils of the eyes, disturbances of vision, suffering from dryness of the mouth, nose, and throat; but other symptoms may make it possible to mistake it for drunkenness following alcohol consumption, by the uncertain rolling motions, hyper-irritability and hallucinations, revolting behaviour etc.

Of the alkaloids we found that especially nicotine, aconite, strychinine were used for sabotage, but no cases of poisoning were known to have occurred. On account of the excellent knowledge of drugs, remedies and poisons among the population of the East, it is to be expected that other vegetable poisons may be used.

Ortho-tricresol-phosphate must especially be mentioned. This chemical is known to be a vehicle for paint and has when ingested, after a more or less long latency, injurious effects on the intestines, serious nervous disturbances, and poly-neuritis-like symptoms in the arms and legs. Ortho-tricresol phosphate was detected mixed with salad oil sold at some places.

Moreover, it must be pointed out that the choline-derivate doryl and, of the inorganic poisons, sublimate and potassium-cyanide have also been used for purposes of sabotage.

The attempted use of chemical warfare agents for purposes of sabotage, as "Lost" in sugar, salt, candy, mustard, beauty-cream, seems as curious as the use of exotic poisons like curare, whose consumption by the mouth is known to be quite ineffective.

Sabotage may also be suspected by mistake, for instance when insufficiently cleaned receptacles casks etc. are used. Cases of slight poisoning with arsenic suspected to be due to sabotage were caused by a cask oroginally containing arsenic insecticide which was used for salting meat.

It is to be suspected that the enemy may use in further attempts at sabotage especially those poisons which are effective even when the smallest amounts of them are brought into the intestines, and which are well preserved in food-stuffs, are not destroyed when boiled, have no taste and may easily be disguised but can not be detected very easily when suspected.

Finally the preventive measures in case of a suspicion of sabotage by poison are added. They include:

1. The food-stuffs and beverages must be tasted carefully before being eaten or drunk; without exception the kitchen personnel must be made to share in the consumption of the cooked meal.

2. All food-stuff used must be boiled, if possible, to destroy at least a great number of the poisons which may have been used.

3. Chemical laboratories must be consulted in time, to search for arsenic, mercury, and all metallic poisons, alkaloids, and cyanides. If the chemical investigation has negative results a test on animals has to be made, but exact results will only be obtained at special institutes.

The collaboration of all physicians is necessary to increase the defence against attempts at sabotage by poisoning. They have to think of this possibility in all cases of uncertain symptomatology.

12. Enemy sabotage with bacteria.

by

Professor KLIEWE.

During the years between the two World Wars alien newspapers and publications published a considerable number of articles on the use of bacteria for the purpose of warfare. Most of these articles were not worthy of consideration, because of the lack of scientific skill of the writers. According to the intention of the person ordering or writing these articles were for the most part for pacifist or war propaganda. Constantly repeated was the assertion that Germany used glanders bacteria during World War I. It has also been maintained that experiments were made in Paris with prodigiosus-bacteria in the midst of peace (1933), to study the possibilities of infecting the subways. In a few articles, and also in some books it was asserted that "bacteriological warfare" was not only possible, but also promising good results, and that it should be carried on with causative agents of contagious diseases as regards human beings as well as animals. The spreading of the germs could be accomplished in large amounts by means of special devices and in small amounts by saboteurs and agents. Reports of agents, seized records, and statements of surrendering enemy soldiers show that our enemies, especially the Russians, have been working on this matter for many years and have made practical tests on the spreading of germs over wide areas. We have no exact information about the actual stage to which these investigations have advanced. A mass-utilization of micro-organisms has not yet been made by any hostile power. If it should occur, they would find a well-protected Army and population. The use of bacteria by agents and saboteurs has been proven several times. The Poles and Russians have the honour to have been the first ever to use pure cultures of agents causing contagious diseases on men for the purpose of destroying the enemy. The number of infected persons, soldiers, and civilians, was very inconsiderable; but the way the infections were spread was as malicious and vile as the use of every means for sabotage. Efficient measures have been ordered for the prevention of and the defence against any further activity of saboteurs and agents.

II.

PROCEEDINGS OF THE CONSULTANTS' COMMITTEE ON OPHTHALMOLOGY

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1. Fundamentals and present stage of objective adaptometry.

by

Professor Dr. MEESMANN

Objective adaptometry as a basis for the unmasking of a simulated weakness of the sense of vision or night blindness originated in the experiments of my assistant RIEKEN. His early death made it my duty to continue his work, which led to the construction of a projection-adaptometer, which is produced by CARL ZEISS-Jena today. This apparatus was tested theroretically and practically. The experiments are sufficiently advanced to enable us to put this method to practical use.

Principle of the procedure: Instead of a fixed lightband such as was used in other recent adaptometers, RIEKEN used a movable strip-band, which was illuminated from the back by means of the adaptometer of ENGELKING-HARTUNG with measurable gradation. The width of the strip is 1.25 cms, the medium speed is 14 cms per second. An optokinetic nystagmus occurs if an illumination slightly above the threshold of sensitivity was used, the recording of which was used to indicate the adaptation-stage. The recording of these indexes produced curves, which run parallel to the subjective curves for a certain distance. This is considered to be the basis for objective adaptometry.

In case of twilight-vision the frequency and amplitude of the optokinetic nystagmus decreases. The front-disk of the adaptometer of ENGELKING-HARTUNG with a diamter of 10 cms was found to be too small, and increasing the distance to 30 cms and replacing the forehead-board did not bring any improvement. By theoretical and experimental investigations RIEKEN found that the optimal conditions are provided by a stimulating space as wide as possible and therefore the strips were widened to 6 cms. The maximum time, determined by GILDEMEISTER as 0.125 secs. for the light-adapted eye, is not known for the twilight values, but, although the retina is more sensitive when dark-adapted, the time is probably longer because of the simultaneous delay in the irritability of the retina. When strips 6 cms wide were used, the best values for the time of the light-impression were obtained, namely between 0.55 and 0.22 secs., that is rather more than the maximal time. Nystagmus occurs distinctly between 10.6 and 25.5 secs. It was technically impossible to construct a sufficiently large accurately graduated illuminated space. I suggested the use of projection procedure and for the diapositive a rotating photograph of a spiral, similar to the well known PLATEAU disc.

Description of the apparatus. (As it cannot be understood without illustration one is referred to a detailed description which will appear in the near future in the Monthly Journal of Clinical Ophthalmology. Only a short description is given here.)

The spiral is driven by a motor whose speed can be regulated. An 8 Volt, 15 Watt bulb is used as source of light, whose brightness can be kept constant by means of an amperemeter and a variable electric resistance. The gradation of brightness is regulated by means of two converging movable grey precision prisms. The density of these prisms can be observed at a circular blue window, dimly illuminated.

The projection-space of 100 per cent Albedo has a circumference of 56:34 cms. If the exact observation distance of 30 cms is kept the horizontal visual angle is 90°, the vertical one 59°.

The grey prisms are marked △. When △ is 0.00, the projection distance is 4 ms, and the angle of incidence is 45°, the intensity of the light at the screen is 0.05 abs (that 1/20 lux on white). If △ is altered for one unit the intensity of the light is decreased by 1/10. Thus the formula for the intensity of the light at the screen B is: $B = \frac{B_o}{10^{\triangle}}$, that is $\log B = \log B_o - \triangle$. The indexes for B, calculated according to this formula are recorded in steps of 0.05 △. The sensitivity E has the formula $E = \frac{B_o}{B} = 10^{\triangle}$, viz. E is the index (numerous) for △.

These indexes too are recorded in the schedule.

To produce nystagmus only one eye is used, the other eye is covered with a small black contact cup with a small central white point. It is illuminated with twilight-free red light.

The findings are appropriately recorded in a special table; the upper normal limit is about △ = 4.0.

Testing the apparatus. Testing is done at three different speeds. The facts given in this schedule have to be tested.

cms/secs	angle speed per sec.	length of illuminat.	frequency of light	nystagmus
36.27	61.52°	0.17 sec.	2.94 sec	+ + +
27.93	47.48°	0.22 sec	2.27 sec	+ + +
14.49	24.64°	0.41 sec	1.22 sec	+ +

This shows that as regards the maximum time and the nystagmus, the medium speed between about 35° and 50° is the best.

Blending depends on the period of illumination. In the light-adapted eye, blending occurs around 35-70 impulses per second; in case of the dark-adapted eye substantially less, according to CORDS and NOLZEN with 4 cms of the strips width, 59-56° angle speed, and about 10-15 impulses per second. This is much more than our indexes Slowing down the speed to below 20° per sec. produces an irregular nystagmus, caused by a conscious fixed gaze at the strips. As regards the above table, our own findings correspond to its statements rather well. A real blending would not be attained even when the speed is increased as much as possible with this apparatus.

Threshold-indexes in cases of standing, slow, and quick moving strips. An increase of the sensitivity is to be expected in the projection-adaptometry by the movements of the object. Comparative serial examinations resulted in the lowest threshold when slowly moving strips were used, the next higher ones when moving quickly, and the highest when standing strips were used. The differences are distinct although not very considerable. The range of mistakes is remarkable. It was quite variable when standing strips were used, up to △ = 0.22; in case of slow movements very few mistakes, without exception under △ = 0.09; in case of quick movement less favorable, up to △ = 0.12. This shows the superiority of subjective (!!!) adaptometry with moving strips over the previously adopted methods with a standing disc.

Distance between subjective and objective curves. In cases of impulses near the threshold a fog-like varying light-impression occurs at first (1. phase), when the brightness increases the direction of movement can be seen (2. phase), then strips are beginning to appear, small at first but soon at the normal width (3. phase). The nystagmus does not occur except in the third phase, starting with an irregular movement in the same direction, followed by the characteristic movements in the reverse, finally the first jerks occur. This moment is the base for the determinations. For subjective recording only the first phase is used. The exact determination of this distance, which should not be missed in any method, was of basic importance. It was exactly recorded with 10 especially suitable individuals after 15 minutes of light-adaptation at about 3000 lux, then the medium values of both curves were determined at intervals of 5 minutes and the dispersion calculated according to the NEWTON formula. The result is checked on the forms in faint print to indicate the normal distance and to get the normal values at any time. This table shows the indexes for the normal curves and the distance in $\angle$.

min.	0	5	10	15	20	25	30	35	40	45	
subj.	0.91	1.94	2.73	3.18	3.37	3.50	3.54	3.52	3.56	3.54	$\angle$
obj.	0.37	1.29	2.25	2.66	2.90	3.01	3.09	3.08	3.08	3.10	$\angle$
dist.	0.54	0.65	0.48	0.52	0.47	0.49	0.45	0.44	0.48	0.44	$\angle$

The curve rises rapidly at first when the distance is greater, about $\angle$ = 0.65, but after 20 minutes it goes down to a rather constant value about 0.50 $\angle$. These indexes have to serve as bases for all cases of malingering. The problem of further experiments must be to determine, whether the same rules obtain for pathological cases. According to the previous experiences a smaller distance will probably not occur.

If these facts are not sufficiently estimated the method will not be effective. Rarely does the malingerer make such erroneous statements that the subjective curve will be far below the objective one. The average patient will soon be aware that his statements are being checked, and both curves will become more or less congruent. When the examiner has an insufficient knowledge of the basis of the method the result will be a false judging of the experimental individual, as his statements are not only taken to be true but in addition a weakness of the visual sense is considered to be present.

Discussion:

KYRIELEIS: A mechanism has been described which records the movements of nystagmus as electrical shocks by means of a small lever-device fixed on a spectacle, by which electrical shocks are recorded by a writing arrangement on a kymograph. This device enables one to get exact time comparisons, as the threshold indexes and the time are recorded automatically, viz. a comparison between the subjective observation and the occurrence of the optomotoric nystagmus.

HEINSIUS: The RIEKEN procedure has proven excellent for practical purposes of the Navy in unmasking malingerers. All suspected malingerers are sent to the University Hospital at Kiel for further examination.

2. Dark adaptation and acuity of night vision.

by

Dr. v. BEUNINGEN.

The results obtained with the COMBERG nyctometer suggested to us to investigate a possible correlation between dark adaptation and acuity of night vision. The statements of BRAUN have to be particularly considered, that in cases of defects of the adaptation of the periphery of the retina the immediate response of the center in twilight also decreases. Moreover, the schools which examined night-vision asked for practical purposes that the methods of examination should be shortened. A saving of time and apparatus could be made if any correlation could be ascertained. Thus the thought occurred to us to investigate first the question of the correlation of central and peripheral dark adaptation, and then the correlation between dark adaptation and acuity of night vision.

In the course of these experiments we observed that central dark adaptation in four hereditarily night-blind individuals was 30 per cent less than the central dark adaptation of normal persons. In the same cases a distinct correlation between the center and the periphery of the retina was found. Moreover we investigated the correlation of the central and peripheral dark adaptation on the one hand and its correlation to the central and peripheral acuity of night vision on the other.

Thus our experiments showed that both thresholds, that of dark adaptation and that of acuity of night vision, are foveal as well as parafoveal functions of the time. A delayed dark adaptation is, according to our recent experiments, always associated with a reduced acuity of night-vision. How far these effects influence the findings of the COMBERG nyctometer can not be determined as yet. It may be presumed that our results prove the statements of BRAUN, according to which a disturbance at the periphery is always combined with a decrease of central acuity. The importance of these experiments is not only the possibility of shortening the examination at the schools and a simplification of apparatus, but it may also be seen from another angle.

In any battle the individual having better and quicker sight is superior from the beginning. Therefore our results not only suggest a special selection of night seeing persons, but they also point to the importance of parafoveal visual training. The quick assimilation of dark adaptation and acuity of night vision and good training in conscious parafoveal vision can be a decisive factor for the individual in action.

It was especially helpful to us when we received the order from the Chief of the Armed Forces Medical Corps (Chef des Wehrmachts-sanitaetswesen) to make a choice of apparatuses for testing night-vision in connection with these researches. As a matter of course we continue the investigation for a possible correlation of dark adaptation and acuity of night vision. It can only be mentioned here that these researches are made not only with the HEINSIUS and AUER apparatus, but also with the adaptometer as a basic device, (that of NAGEL and ENGELKING), the NOWACK-WETTHAUER instrument, a vision-test device of Miss Dr. SCHMIDT, and the COMBERG nyctometer. The experiments are being made at the Army E-mess-schule (range-finder school) at Weimar. In that way we have developed interesting aspects of the correlation of acuity of dark vision and stereoscopic vision during reduced illumination.

For the present one can say of these apparatuses only that the AUER radium adaptometer without doubt measures the definition of the thresholds and the acuity of night vision as well to a certain extent; but, the illumination test of HEINSIUS only measures the acuity of night-vision. The apparatuses were taken out of production at various stages and tested carefully as to light-intensity to determine their eventual deterioration in the different stages of production. The HEINSIUS illumination test seems to deteriorate quickly, because of the fluorescence of the luminous paint and thus decreases the reported acuity of night vision.

The thresholds tested by the adaptometer are defined as appearance- and disappearance-thresholds.

The NOWACK-WETTHAUER apparatus has, according to recent evidence, undoubtedly too weak a light intensity.

The correlations have to be based principally on the differences of light intensity, the subjective contrasts and the objective differences of brightness, but naturally the angle of acuity of vision has to be regarded as well. All these investigations are not complete as yet, thus we are not able to state final facts.

Discussion:

KYRIELEIS: The base of acuity of night-vision is dark adaptatio Its increase during the first minutes can be easily observed by continuous automatic recording. It is of practical interest to get approximate indexes of the minimum light intensities which can barely be recognized after a given time. For example let us consider a light intensity of 10^{-8} Stilb. This will be recognized after a good bleaching (break-down of visual purple) with artificial light (Intensity of the bleacher 0.17 Stilb.) after an average of 9 minutes. After a short exposure (dazzling of 5 seconds) of the open eye the maximum sensitivity (in the range of light intensities between 10^{-9} and 10^{-10} Stilb.) will again be obtained after 7-8 minutes of dark adaptation. If the lids were shut by reflex this value will be obtained after 2-3 minutes of dark adaptation, and if the lids were closed all the time as soon as ½-2 minutes (rather wide individual variations). The protecting effect of the closed lids, including a red filtration in addition to the decrease of light, can be demonstrated especially well if a sun bleaching is compared for open and closed lids. In the first case the complete sensitivity will appear again after ½ hour. In the case of closed lids exposed for 10 minutes to sunlight, filtered through a hollow hemisphere of frosted glass, full sensitivity is regained even after 5 minutes. Concerning the problem of acuity of night-vision, in addition to the dazzle-effect, the irritation caused by visual images seen after the eyeis closed and their prevention is of importance.

HAMBURGER: The statement made in Nov. 1942, that the results of examination made with the nyctometer or the NOWACK-WETTHAUER apparatus may not be analogous in different individuals, was interpreted to indicate that the rod- and cone-adaptation are independent from one another to a definable degree. This presumption could be proven in that the curve of the relation of acuity of vision and light intensity varies individually, not only concerning its absolute height but its inclination as well. Anyhow, the methods are not yet satisfactory. The investigations indicate, and the experiences of the Anti-Aircraft-Artillery School V at Baden, near Vienna, show the same fact, that the greatest individual differences occur in the

so-called twilight, viz. light intensities of the surroundings of about 10^{-6} to 10^{-7} Stilb. An apparatus is desired therefore for the practical purpose of selection which works at a light intensity of approx. 10^{-7} and a corresponding visual space (about 10°). The HEINSIUS nyctoscope is considered to be such a device. But this has the disadvantage that one depends on the accommodation of the experimental subject. Even among young persons I found that there are about 5--10 per cent who have a small accommodation in the dark and therefore give low nyctometer values.

The explanation for the individual variations of night vision is not very clear as yet. A variation of the power of dissolution of about 6/4 - 6/8 thus 100 per cent (even in case of emmetropia) can be expected even in case of day vision. Thus the great differences in twilight vision are considered to be due to varying sensitivity for contrasts of the elements of sensitivity. In addition it must be mentioned that errors of refraction, especially astigmatism, has an important influence on twilight vision. Furthermore, undesirable accommodation, in case of strained night vision, and the peripheral aberration which occurs with a wide open pupil may play a part, but the individuals react differently.

Concerning the intensive experiments on the reconstitution time after interim exposure (readaptation), it can be stated that it is much shorter than was supposed previously. It can be taken for granted that light adaptation, in the sense of loss of dark adaptation, takes about the same time as dark adaptation itself. For these reasons the strict observation of the time interval for adaptation is especially important before testing the twilight vision. The individual variation of the sensitivity of the dazzling (i.e. readaptation time) is unknown yet, but it is considered to be important. This matter is examined by nyctometer-tests in the same way.

GRAF has proven that great differences occur if the same individual is retested by the same night vision test. This is true for any of the known testing methods. Thus only one examination, no matter by which method, can never lead to an exact opinion as to whether or not the tested individual is to be classified as good or bad. It seems better to me to make a choice for good observers out of a large number of persons, after repeated tests of the troops with a more primitive device, than with scientifically and technically exact apparatuses which can be used only by an ophthalmologist at a single test in the hospital.

HOLZLOHNER: Concerning the question of examination of the night vision in great numbers, until permission to test such large numbers is obtained, theoretical suppositions may be granted. The matters to be tested are:

1. test of the rod-vision,
2. test of the visual power,
3. test without any influence of the results by accommodation.
4. test after a fixed bleaching.

Considering these factors a procedure was developed for mass-examination. After a bleaching of 6 men in a transportable adaptation room, visual signs are given after 5, 20, and 30 minutes which are exposed at definite degrees of illumination. The light intensity is controlled with a simple photometer, in which a radium-luminous screen indicates the normal light intensity. The experimental individuals write down what they have seen by means of a writing-grill. This self examination can be recorded simply and

eliminates any influence by the examiner. The observation distance is 5 ms. By training the night-vision not only an increase of the parafoveal vision can be expected. The power of dissolution of the retina requires difficult nerve reactions, in the course of which a great number of sensory cells have to be connected, whose colume changes with the different degrees of the power of dissolution. Our own experiments show that even in cases of good parafoveal fixation and practically constant adaptation the visual power can increase, as, once a device appears it may be constantly improved by new development.

BRAUN: One should not make too nice a distinction between rod- and cone-vision in night vision, as far as practical experiments are concerned. But the phase of the change of function is of decisive importance.

HEINSIUS: It is of practical importance to record the point on the curves of acuity of night vision at which rod- and cone-vision is below the smallest nyctometer illumination (thus about 10^{-7} to 10^{-8} Stilb.). That presupposes the use of the nyctoscope with a suitable color of illumination.

It was already mentioned before that in cases of night-blind individuals (2 of my cases) good nyctometer curves can sometimes be obtained.

According to the latest experiments of GRAF, variations in the daytime may occur to a considerable degree, which will have to be explained (probably rhythmical variations).

ECKEL: The influence of short dazzling shocks of different intensity on the dark adapted condition, after a rest in the dark of 30 minutes, was tested on 6 experimental individuals in a total of 12 experiments. The dazzling was by means of a COMBERG globe with a light intensity at the observation window of 10 lux and 1300 lux respectively. The time of dazzling was in all cases 5 seconds. Moreover, they were also dazzled 5 seconds with the stimulation space of the ENGELKING adaptometer at the brightest intensity. The illumination at the eye was 0.01 lux. During the dazzling the experimental individuals had to keep their vision fixed on a red fixation point, just as in the case of the threshold determination. In that way the dazzled point of the retima was the same as the one whose adaptation-situation was tested in the threshol determination.

These dazzlings with 10 lux and 0.01 lux enabled one to return to the same stage of adaptation as before the dazzling within 1-3 minutes. 20-30 seconds immediately after the dazzling the sensitivity decreased only to $\frac{1}{2}$ - 1/5. The dazzling with 1300 lux caused in all experiments a much quicker increase of the sensitivity after the dazzling than at the beginning of the experiment. To obtain a hundredfold increase of the sensitivity only $\frac{1}{4}$-1/3 of the time is necessary. In case of dazzlings which do not lead to a total light adaptation, the adaptation effects seem to be continued after a short while, as would have been the case without the dazzling This explains an observation of W. KYRIELEIS (Luftfahrtmedizin 2,333'1938'), that after a long and continuous dazzling of the same intensity the curve of adaptation is flatter at first, but finally obtains higher values of sensitivity than before the dazzling.

W. KYRIELEIS did not continue the adaptation test after obtaining the first value of the beginning and only supposed such a development.

VAN BEUNINGEN: As HAMBURGER mentioned before, it is certainly advisable to repeat the examination of the night vision several times. We did not obtain variations of more than 3-4 dazzle units in 10 experimental individuals in tests with the NOWACK-WETTHAUER apparatus at the same time of day during the course of one week.

According to KYRIELEIS: At the Institute for general and Army Physiology dazzle experiments were made as early as 1929 on healthy persons and persons with liver complaints. In the cases of individuals with liver complaints the curve of the peripheral dazzling is flatter than in those of the normal ones.

The central dazzling in cases of night blindness, which can only be recorded automatically, disappears more quickly than normally If dazzled with 150 lux peripherally for about 6-7 minutes, the peripheral dark adaptation may be considered to have disappeared, and the regeneration takes the same time as in case of dark adaptation.

General directions for the examinations of night vision.

There are three chief reasons for the measuring of dark adaptation in members of armed forces, and these measurements are made in different degrees:

1. For clinical purposes the time of the dark adaptation has to be measured. It depends on the eye hospitals which instrument they will choose for measuring. It is recommended to use a uniform recording system with a logarithmic base, using the light intensity as unit.

2. For military purposes the test of dark adaptation is necessary to unmask malingerers. The most effective method in that case is the subjective and objective comparative procedure of RIEKEN-MEESMANN. This examination can only be handled by experienced persons at eye hospitals or larger eye wards in hospitals. The further invention and manufacture of a sufficient number of objective adaptometers of RIEKEN-MEESMANN is urgently needed. In that case also it is recommended to record the results on tables with the light intensity as the unit. Provisional instruments should only be used to judge cases of suspected malingering. Final opinions should be stated only if an apparatus of RIEKEN-MEESMANN has been used.

3. In the selection of men for special arms of the service especially night observers of the navy and air force, and range finder operators of all branches of the armed forces, it is necessary to eliminate individuals with adaptation defects and to choose individuals with superior efficiency. In a selection from great masses only a random test can be used. Very likely the procedure of the Air force of Prof. HOLZLOHNER-JAEGER and that of the Navy of HEINSIUS-TSCHERMAK (nyctoscope) is suitable for these purposes. All those persons who are classified as good or bad in these tests have to be examined most carefully. For that reason the dark adaptation and the acuity of night vision have to be tested separately. In the examination of dark adaptation an adaptometer with fixing-point and a stabilostat may be used, and in cases of suspected malingerers, by objective adaptometry. For measuring the acuity of night-vision the NOWACK-WETTHAUER instrument or the COMBERG apparatus are to be used, according to the purpose and kind of service. For an exact selection one examination alone is not sufficient. The practical choice is made at the end of a

good training. Therefore it is recommended that the choice of good night observers should not be centralized but that large numbers of persons should be tested by different boards of examiners.

4. A general examination of the whole visual power is considered to be unsuitable for the purpose except for some special units. The actual usefulness, including night visual power and psychic factors, can be ascertained with the troops during night duty easily and correctly. It is recommended that the commanders of a troop unit should be instructed to ascertain, which of his men are known as excellent night observers and also to discharge any bad night observers from responsible observation duty. Medical examination without objective adaptometry would render malingering very easy. It should be used only with special arms of the service and in cases of obvious defects.

5. According to these points of view it is necessary to supply and use the following instruments:

a) Instruments for scientific experiments: The production of special instruments for the improvement of the methods should be unlimited. The Chief of the Army Medical Corps has to testify the necessity for new instruments.

b) For clinical purposes at eye hospitals and at the large optical wards in hospitals with medical experts and for the boards of examiners for special units of the Army, a sufficient number of instruments of the following kinds should be provided:

1.) Adaptometer of ENGELKING-HARTUNG or NAGEL,
2.) Objective Adaptometer of RIEKEN-MEESMANN,
3.) Nyctometer of COMBERG,
4.) NOWACK-WETTHAUER instrument, if possible, to be replaced by the combined instrument of THIEL.

c) For testing large groups it will probably be necessary to supply the instrument of HEINSIUS-TSCHERMAK (Nyctoscope) and the AUER instrument.

6. The present stage of the scientific knowledge concerning the correlation of the selection made with these measuring instruments and the practical efficiency of the troops does not yet permit the choice of a single instrument alone. It is absolutely necessary to improve all the instruments of HOLZLOEHNER, HEINSIUS, and AUER. It is expected that an increased use of these instruments will be found most useful. Therefore it is necessary to get into close contact with all the units of the army and the schools which are using these apparatuses, and to know all about their experiences and results. It is suggested that a final report on this question should be made within a year from now.

7. The question as to which instruments will be most efficient for the treatment of patients with eye defects will be settled in another way.

3. Diseases of the retina among front-line troops.

by

Professor MUELLER.

Following up the researches of GSCHEIDEL and BRAUN, investigations of the retinal disease discovered by GSCHEIDEL were carried on in Finnland.

Among the various symptoms of the disease two are especially characteristic. The first type of the disease is a more or less diffuse disease of the macula. The second type shows a local disease (usually located about the macula) of the retina. According to the examination of 750 patients, especially according to the differences in the appearance of the site of the disease in the same eye or in both eyes of the same patient, and also according to examinations repeated at intervals of 5 days, the following statements can be made about the symptoms and the progress of the disease:

In the first type a dark-red color of the foveola can be seen at the beginning of the disease, which colored spot may have a circular, egg- or bean-shaped rim. Usually the foveola still has its central reflex. The retina around the foveola is edematous, slightly dull, and of a form like a "Napfkuchen" (dome shaped with a depression on top). Sometimes one gets the impression of a slight cellular infiltration encircling the foveola. In a few days the edema spreads, the "Napfkuchen" form disappears, the foveola becomes flat, the central reflex spreads and the outline becomes irregular. The eye background appears dark-brown in the vicinity of the macula. At the further decrease of the retinal edema the color in the pigment epithelium becomes granular. The grains are small, of different size, and not uniformly distributed, so that the spaces to be seen between them appear like pale lines.

In the second type limited areas of edema of the retina are to be seen, shaped like blisters of the retina, with a fog-like veiling of the color of the eye-background. In some cases a slight infiltration of the retina can be seen in the blister. The blisters may be very small, but may also be of considerable size. Very often they are found at junctions of precapillaries and prevenules. Sometimes they hang at the end of a retinal vessel like fruit on a tree. For the most part they are rather far from the macula, but may reach the retinal foveola as well. In the further progress of the disease the color in the area of the blister is bleached. The bleached area is circular, oval or may become shaped like garlands, grapes, or maps by running together. Sometimes the impression of cysts appears. In process of time the cysts and blisters disappear and only the bleached area of the pigment epithelium is left. Very often the color condenses in lumps and rings.

Besides these symptoms small yellow points can sometimes be seen in the retina, which have some resemblance to the bubbles in a pane of glass. They are probably sediments of products of metabolism. Also small punctate hemorrhages may occur, usually singly. No morbid changes could be observed at the papilla, the retinal vessels, or the periphery of the eye-background. The symptoms are usually very similar in both eyes, but considerable differences may also occur, especially differences of types. Both types of the disease may occur in the same type. The process of the disease is of short duration. In general no severe

irritations of the vision occur, only exceptionally. Thus the disease can be considered comparatively harmless.

15 per cent of 5,000 soldiers examined in Finnland showed distinct signs of the disease. Only 10 per cent of the soldiers who were found ill, had signs of recent illness. Among young soldiers under 35 years only 12 per cent showed symptoms of the disease, but the older soldiers from 36 to 65 years old were found ill in 24 per cent of all the cases examined. No regional differences in the appearance of the disease could be found, but single units of the troops were like foci of the disease.

The internal and bacteriologic-serologic investigations did not give any real proof as to the etiology of the disease. Interrogation about the illness as of recent years did not supply a clue either. No proven association with the eye-disease could be found for epidermycosis, gastro-enteritis, and helminthiasis. Also alcohol- and tobacco-abuse can be eliminated as cause. It is not likely that lice, bedbugs, or fleas could be the carriers of infection The polar climate is of no influence on the disease, as 6.3 per cent of 411 recruits, who were examined on the very day of their arrival at the Arctic Ocean front, had the disease. Duty in the front line, belonging to train units, routine or outside duty, or car-driving do not seem to have any relation to the disease. Neither does the nourishment have any great influence on the disease. The same proportion of soldiers fell ill, who came from cities, as came from the country and who sometimes got parcels of food from home. Also Finnish workers who were not provided with food by the German Army fell ill, so the disease cannot have been caused by the typical German Army food. The time of service in the German Army did not show any relation to the disease either. Finnish soldiers who had received German food for only a fortnight and Norwegian laborers who only received German food once a day and took the other meals at home were ill as well as Russian prisoners recently captured. Finally the disease was found also in soldiers at the other section of the East front and in soldiers at home.

The rapid appearance of edema, blisters, infiltrates, and hemorrhages of the retina at the beginning of the disease point to the fact that the disease is caused by an agent of short duration. Therefore it is supposed that the disease is infectious, and, according to the relation of the seat of the disease to the blood-vessels, it is likely that the morbific agent gets into the retina by the blood.

For this reason the disease was named: Retinitis centralis epidemica 1944 (GSCHEIDEL). A further investigation of the symptoms and the course of the disease is very important. In this way it can be decided whether the theory of inflammation given here or the degeneration theory of BRAUN and GSCHEIDEL is the correct one.

The symptoms of the disease must be communicated very quickly to all ophthalmologists, to prevent a mistake, by which this probably harmless disease will not be confused with other serious retinal diseases.

4. Diseases of the retina among front-line troops.

by

Professor REINHOLD BRAUN.

In October-December 1943 2,000 soldiers in Lappland and Northern Norway, and, by way of comparison, another 1,000 soldiers in Southern Finnland and Germany were examined ophthalmoscopically because of changes of the macula of the retina. 45 men were observed at the eye ward of the Air Force hospital, Wismar, during a period of 2-4 months. 36 per cent of the examined individuals showed absolutely unchanged, uniform maculae, 33 per cent showed infinitisimal grains and irregularities of the pigment, which also could be considered as being within normal limits. 31 per cent, however, showed symptoms which could not be regarded as normal; namely 25 per cent of all the examined persons showed a coarse granular appearance with pale lines between the grains, and phenomena like broken stones, 6 per cent of all cases showed coarse changes of the bright areas of the retina like cysts or honey combs. Contrary to the findings of MUELLER, symptoms of inflammation were never found (edema, hemorrhages, infiltrates). The changes were confined to the pigmented area of the macula, sometimes a little farther, even up to the pole of the eyeball. No functional defects could be found even in cases of gross grave ophthalmoscopic findings.

The percentage of positive findings in various areas remained in general at the same level, but in the Karelic primeval forests and among travelers in the Arctic Ocean convoys it was considerably higher. No etiological factor was ascertained. The influence of the subarctic zone is not considered to be the cause, though the effects of the glaring light may lead to changes of the pigment leading to a deterioration. An infectious etiology is not to be supposed, as the ophthalmoscopical findings do not substantiate it. However, hyperergic processes around the very fine vessels require further consideration.

This problem ought to be investigated very carefully, to find out, whether the symptoms are harmless and incidental normal variations of the pigment, which were found in great number in the beginning when the new mirror-technique was used, or unimportant pigment changes without any influence on the visual function, comparable to the skin pigmentation under the influence of rays. Further investigations should not be carried out in the northern zone but at university eye hospitals. Every disturbing factor at the front-line has to be avoided. The so-called Finnish Eye-Disease does not exist. The findings do not impair the efficiency of the troops. It probably is no matter of a rapidly progressing condition, and thus there is no reason for taking precautions among the troops. The name "retinitis cetralis epidemica GSCHEIDEL" suggested by MUELLER can not be accepted, as this term presupposes facts as proven which are not sufficiently confirmed as yet. The word "epidemica" especially may lead to undesired consequences.

Discussion:

HARMS: Changes of the macula of the kind under discussion are also to be found among Italian military internees and among the civil population in similar percentages. Focal changes of the pigment outside the macula were not observed in 79 examined Italians. Among the civil population a correlation between age and frequency was clearly demonstrated.

HEINSIUS: I remember that in 1937 I remarked about the great number of soldiers whose visual power was decreased a little (6/7 - 6/8, 6/10) and who showed the same variation when examined, as has been described by MUELLER and BRAUN. A further decrease did not occur in most cases. Furthermore, if exact examinations of a great number of persons will be made, central variations of the macula will probably be found in the same percentage. We suppose at that time that the reason might be dazzle-effects caused by long ocean trips.

General directions:
on retina diseases among front line troops:

1. Examinations by GSCHEIDEL, BRAUN, and MUELLER showed, that in Finnland-Norway, in the home country, and probably also at the Eastern front remarkable variations of the retina about the posterior pole of the eyeball were found in great numbers among troops as well as among the civilian population.

2. These changes are probably harmless, as they have not led to any disturbance of the vision as yet.

3. The nature of the change cannot be explained precisely as yet. Infectious, allergic, degenerative, and other types of etiological factors have been considered.

4. The further investigation of the disease, its clinical picture, its progress, and the frequency and locality of its occurrence is necessary. These researches will be carried out as quickly as possible to make it impossible to confuse this comparatively harmless disease with similar looking, but serious diseases of the posterior pole of the eye.

5. Early operations of wounds near the eye (early plastic surgery), directions.

by

Professor DIETER.

A skilful early treatment of wounds is very important to the fate of injuries to the eyes, and should usually be made by an ophthalmologist. The same holds true in cases of injuries in the vicinity of the eye, especially of the lids. Only an immediate treatment of the wounds can prevent a severe deformation of the face. These deformations require at least a long hospital treatment and keep the soldier away from the troops.

According to the general directions a suture of every combat-wound is a great mistake. This direction does not apply to injuries to the face, especially near the eyes. Because of the rich supply of blood to the eye-lids and to the anatomic peculiarities of the lids, the tissues heal and recover very easily; but at the same time the function of the lids protecting the eye and thus the visual power, is threatened by an early and particularly strong tendency to contract.

This can only be prevented by immediate operative treatment (if possible within the first 24 hours).

The freshening of the rims of the wound and the wound-bed (center of the wound) has to be done in such a way that as little tissue as possible is removed. Crushed parts are to be removed, bruised parts not, as they will recover!

The most important thing is a very exact primary suture of the rim of the lid; wounds in the conjunctiva and skin of the lids are closed without a drain. Shrunken soft parts may unfold and stretch some time after the injury.

Tension sutures (silk over buttons, or better, wire suture, 1½ - 2 cms out in the healthy tissue) cause a relaxation of the wound itself. The sound surrounding tissue bears the tension!

The wound is closed by interrupted sutures.

Mobilization of the skin tags, blepharorrhaphy etc. are seldom necessary, but permissible.

The lacrimal glands must always be considered.

Threatened adhesions to bone are prevented by fat-implantation, fat-transplantation, pedunculated fat-lobes, and sheets of fat and fascia.

Blepharoplastic operations in the proper sense of the word can be avoided in most cases.

Burns in the face sometimes permit, following the removal of all damaged tissue, a primary free transplantation of a large piece of skin. If the transplantation is made too late, it is likely that the skin will shrink a great deal and a deformation may occur which might threaten the cornea.

Preventive treatment for infection is to be carried out according to the general directions.

If the sinuses or the capsule of the brain itself are injured, it is necessary to collaborate with an otologist or neurosurgeon from the first day of the treatment.

Discussion:

LOEHLEIN: I suggest the use of convenient-sized "Polyviol"-discs, if a scarred closure inside the orbit is to be prevented. This procedure gave good results, when used in a case of severe crushing the face, the only intact eye having grown to bone-fragments of the upper jaw at the base of the orbit, in such a way that it was absolutely immovable. The bulbus had to be detached from its point of fixation by means of a knife. It would doubtless have become fixed again at the same point, if this had not been prevented by a "Polyviol"-disc inserted between bulbus and upper jaw, which disc was removed after 3 - 4 weeks, but was borne without any irritation.

MUELLER: After an enucleation of the eye in the field it is sometimes advisable not to close the wound of the conjunctiva by a suture, in order to leave room enough for the wound-secretion to run off. The question is, whether at the later treatment any inconvenient cosmetic results might occur.

DIETER: This would lead to no further cosmetic results, but it is to be regarded as an opening for the entrance of germs. This is an important consideration with patients requiring transportation elsewhere.

6. Present stage of experience at special hospitals for the care of soldiers with very weak vision.

by

Professor LOEHLEIN.

Unlike the practice in World War I, the Office of the Army Medical Inspector General desired not to classify the soldiers with very weak vision as being practically blind, and thus to limit the possibility of their employment, which is very limited anyhow because there are a rather great number of cases of war-blind besides them.

Therefore during this war special care committees were established to enable the soldiers with very weak vision to return to a profession like other persons with normal eyesight, if possible to their own former profession. Those soldiers are chosen whose cases are not hopeless, and who can be expected to reach this goal by means of optical facilities, and if necessary by special training. By order of 28.V.1943, 13 eye wards of reserve-hospitals were instructed to gather together the soldiers with very weak vision in small groups. 12 of these special hospitals were connected with a university eye hospital. Besides these the reserve hospital at Saarbruecken was chosen. The soldiers with very weak vision (ill ones as well as injured ones) whose eyes were considered as hopeful by an ophthalmologist, were sent to these care wards. It was hoped that these soldiers might be enabled to return to a profession like any other healthy persons, after being provided with the best optical instruments or trained according to their capability. As experience has shown chiefly those patients will be concerned, who are not able to read by means of ordinary instruments, but who are able to go about in the streets alone. So far as a clue can be given by the indexes of the central visual power, the lower limit would be around 1/50, the upper limit around 1/10.

Collaborating with the representatives of the optical industry a number of optical instruments were chosen, which are suitable for these purposes, and the supply of them is guaranteed for the near future. According to the experience of the "school for persons with very weak vision" (Professor BARTELS and Rector HERZOG) it is supposed that a part of the training can be given only by skilled teachers experienced in the training of persons with very weak vision. Anyhow no teachers of that kind were appointed, as it had to be ascertained first how many would be needed.

The experience gathered in these special hospitals is as follows:

Until now about 250 persons with very weak vision have been distributed among these care-institutes. Each hospital got a different number of patients, between 4 and 121. It would be preferable that the distribution should be more equal, as the treatment has to be individual, according to the visual power left, the possibility of optical correction, respective profession, and personal talent.

About 90 per cent of the total number will probably achieve their desire to return to a profession like other people with normal sight, though final results will have to be awaited. About 10 per cent of the patients had to be transferred to a war-blind-hospital

to be trained there. Among these patients were, for instance, two soldiers with various injuries, who could be given sufficient optical correction, but as they had also lost both arms, it was very difficult for them to handle the optical devices. It is suggested that optical devices used for similar cases should be constructed. Not only those optical devices will have to be chosen which provide the patient with the optically most efficient visual power, but it has to be remembered that the patient must be able to use them properly in his new profession. Therefore, simply constructed devices were chosen like GRUETER planoconvex lenses, and lenses which are affixed, or ZEISS Katral-lenses ≠ 10, ≠ 20 and ≠ 30. Besides, some patients also learned to use the telescope-spectacles for near- and distant view with good success. In quite a few cases the use of a contact lens gives the most efficient help, especially in cases, where there is only one peripheral pupil area, or cases of severe irregular astigmatism or aphakic eye.

The training with these devices could be carried out for a part of the patients under the direction of the doctor or his helpers. In many cases it would be preferable to carry out a systematic training for which the ophthalmologist has not the time or experience. Some care wards made shift with substitute teachers. But it is advisable to use pedagogically trained teachers for this task. This holds especially true for the time between testing the best optical device and its delivery, which often takes quite a long time. In the meantime the original enthusiasm of the patients is frequently lost partially under the influence of a long leave and the surroundings. Especially for this time, systematic training courses are suggested, during which the orientation in space could be developed, also the utilization of a small field of vision, and the use of different optical devices for different purposes. The time in question could also be used to learn typewriting or some sport or handicraft, to relieve the anxiety of some of the patients with very weak vision.

The Army Medical Inspector General's Office has solved that problem by providing the Tuebingen hospital for these patients with teachers from the Dortmund school for persons with very weak vision. These teachers train more instructors for the other hospitals.

The report shows that it was sometimes possible to achieve a considerable increase of the visual power after operations. Moreover, cases occur where psychotherapy can give the patient back the awareness of an efficient visual power, which was lost under the influence of their classification as war-blinds. This shows the importance of a fixing of limits between the persons with very weak vision and the practically sightless.

Another problem has to be solved, namely, to provide some persons with very weak vision with badges to protect them in the traffic. The use of a blind-bandage for them is absolutely to be disapproved of, as they would be treated as sightless, would feel as the sightless and thus lose the initiative to learn a profession like people with normal sight. A different sign is suggested.

Sometimes difficulties arise, when the patients go to take up their new profession, because of the question of who will be responsible for them, the Army Welfare Officer or the Civilian Labor Office. It will be necessary to clear up this situation in order to shorten the time between the training and the taking up of the profession.

Discussion:

DIETER: Almost half of the soldiers with very weak vision were at the special hospital in Breslau, as patients had to be hospitalized there from other parts of Germany also, not only from Silesia.

A very great part of these patients were enabled to resume their former professions. The ultimate fate of these persons is not known yet, especially, whether they are still holding their jobs.

Contact-lenses gave good results. The time for delivery is rather long, just as for other optical devices. Leave in the meantime for the most part resulted in a deterioration of the mood and general attitude of the patients; but men must be sent on leave, because of the overcrowding of the hospitals. This time had better be used for training the patients, but skilled personnel are lacking.

Army-welfare officers do not make sufficient distinction between the sightless and persons with very weak vision. This makes the patients afraid of becoming blind eventually.

At their own request persons with very weak vision are provided with blind-bandages (traffic!), but sometimes they refuse point-blank to wear this bandage.

General directions for the care of soldiers with very weak vision:

The 13 care-wards for soldiers with very weak vision established on 28.V.43 by the Army Medical Inspector General, at the eye-wards of reserve-hospitals have given good results. 90 per cent of the soldiers sent to these places, 250 altogether up to the present, could be rendered fit for some profession like other persons with normal eyesight. The tested devices are proven adequate to serve as optical facilities for training and use; they are chosen according to the prospective profession and the personality of the patient. It is suggested to utilize besides them:

1. the principle of projection for reading, and
2. the principle of enlarging the image on the retina by means of contact-lenses and additional collecting spectacle lenses.

Besides the optical facilities a systematic training has proven to be necessary. It is regarded as a good thing that at the Tuebingen hospital skilled teachers were appointed for the training of persons with very weak vision, who will train more pedagogical helpers for other care-stations, according to their experience.

Difficulties, such as are encountered in case of complicated injuries (i.e. a need of precious optical apparatus and an arm amputation) should be overcome by providing specially constructed optical devices.

The prospective profession should be taken up immediately after the end of the training, when the patients are optically corrected and trained sufficiently, in order to prevent a loss of the hopeful mood of the person by the harmful influence of the surroundings.

7. Fitness of individuals who have lost one crystalline lens.

by

Professor VELHAGEN

Most patients with one lensless eye refuse to wear correcting lenses. The reason is that lenses cause trouble, because the prismatic inclination of rays enters on the sides; the different size of the images, and some other factors are also disturbing. The basis for the tests of fitness for service is the lensless uncorrected eye. This eye is worth much more for the binocular action of vision than a blind one. Though the central vision is very weak or impaired, the peripheral vision and the peripheral field of vision is not much less than in an intact eye. Even a lensless eye therefore widens the field of view to a remarkable degree. As a reserve eye in cases of impediment of the other eye, it has to be provided with spectacles for emergencies and is, in such cases, more helpful than an eye of weak vision, which still possesses its lens. The following general directions are suggested for the critical examination of soldiers and persons meant to serve in the Army, and who only have one eye with a crystalline lens:

1. Individuals with one lensless eye are classified as group B 25^2, if the lensless eye does not show any complications, and the other eye at least corresponds to the conditions of the defect B25. That means it has to have a visual power of at least 0.5 with authorized glasses. Persons with one lensless eye are not fit for those kinds of service, which require good stereoscopic vision and the use of binocular instruments.

2. These persons are to be provided with correcting spectacles, or they may be able to get along with the single-side cataract-glasses.

3. Individuals with one lensless eye are not classified as I like the war cripples. They are to wear the black badge for wounded soldiers.

4. The operation for cataract in one eye shall be performed regardless of the reason, on members of the Armed Forces and persons meant to serve, who are obliged to undergo it as a measure for increasing the efficiency for war.

Discussion:

HEINSIUS: It is necessary to clear up the question whether the black or the silver badge for wounded soldiers should be supplied to soldiers with perforation injuries to the eyes with traumatic cataract on one side.

HAMBURGER: Each different irritation of both foveae causes impairment of the efficiency of vision on one side. Our observations in individuals with aphakism on one side showed that even in cases of corrections with contact-lenses the increase of stereoscopy was not very important. The contact-lens causes difficulties in the movement of the eye. This leads to a limitation of the fusion, and thus has bad effects on one side, too.

KRUEMEL: Different results are often found when the ROSENBACH test is made. This variation depends on, whether the test person makes the test actively himself or is tested passively. In the case of passive test the fixing eye in question maintains its position more often than when tested actively, as in the last case the change of the test-direction is connected with a change of the fixation.

8. Sideroscopy (use of galvanometer to detect and localize iron fragments in the eye)

by

Professor DIETER.

A foreign body localized with X-rays in the eyeball, urgently requires removal. If the foreign body is magnetic the chosen procedure will be the magnet operation, which provides, as everybody knows, the best possibilities to save the eye and the visual power.

Large fragments in the eye may be detected easily in different ways; but very small particles can be localized only with great difficulty by using optical devices. Even X-rays give a very poor visual shadow, or cannot be made out at all, as they contrast so little with the shadow of the skull bones that a positive decision cannot be arrived at even by means of skeleton-free pictures.

It has been well known for a long time that very small fragments particularly are a threat to the eye and its visual power, because of the rusting of the metal. We have been trying for several decades to detect these small splinters with the sideroscope, an instrument which was introduced to ophthalmology in 1898. The most sensitive instrument of this kind was developed by HARTMANN & BRAUN, in Frankfurt in 1916, after a proposal of HERTEL. This instrument gave good results during World War I.

A negative result of a magnetic test is no proof that the foreign body consists of non-magnetic material. A fragment which can be determined to contain iron by positive results of a test with the sideroscope, can generally be removed by the electro-magnet. The technical procedure may be difficult or even impossible, especially if the fragments are old ones.

Whoever has to treat many injuries and really knows the importance of the sideroscope as a means of examination, would not like to be without it, especially in the present war, when a great number of injuries by fragments containing iron are occurring constantly.

About a year ago I introduced a sideroscope, which is easy to move and to use everywhere. I christened it "field-sideroscope". This instrument is sufficiently suitable for all ophthalmological purposes and its sensitivity can be increased to a degree which will satisfy the highest wants. The manufacturing does not involve any difficulties. The mounting is simple. Its use does not require an assistant.

A bullet lodged in the skull can be detected with this instrument, if the bullet consists of ferro-magnetic material and is of sufficient size or weight, which is to be taken for granted, if any practical steps are expected to be taken. It is even possible to localize a fragment fairly exactly, though other methods may give more accurate results.

Magnet operations are performed in recent times in increasing numbers. They were already proposed in World War I by PAYR. Now HELLER et.al. recommended this procedure as being especially safe. Some time ago I pointed out the use of the sideroscope as a preliminary testing instrument before surgical magnet operations, and I stated that the possibility of localizing a bullet with this instrument is an important help.

A great disadvantage of all former sideroscope constructions is that they could be used only in a fixed place and their sensitiveness to shocks. This excludes a use for quite a number of purposes. Accepting my suggestion Professor Dr. BERGMANN, Director of the Physical Institute of the Polytechnic, Breslau, investigated this problem in a very kind and helpful manner. Thus we could in October last year introduce an instrument at Berlin, which could not only be used as a freely movable sideroscope for the detection of materials containing iron, but could also be used for localizing these objects fairly exactly. Therefore this sideroscope is suitable for ophthalmologic as well as for surgical purposes and it has a sensitivity which is not much less than that of the HERTEL instrument. The instrument depends on alternating electric current but can be used in any place where field X-ray instruments are available.

The possibility of localizing foreign bodies with the sideroscope was improved to serve as a fragment searcher. This is, however, without practical importance for ophthalmological purposes.

Demonstration of the way the instrument works by means of diapositives (lantern slides).

Demonstration of the instrument as sideroscope and as splinter-searcher.

III.

PROCEEDINGS OF THE CONSULTANTS' COMMITTEE ON SURGERY.

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1. Clinical picture and complications of suppuration following gun-shot wounds of bones and joints.

by Professor WACHSMUTH

1. In spite of the best treatment of wounds during an operation most war gun-shot injuries become infected, partly because of primary contamination.

2. The process following gun-shot injuries of the bones and joints can be divided into three stages:

1. The stage from the actual wounding up to the domination of the acute infection: Stage of massive defence reaction.

2. The stage of a subcutaneous infection with an equilibrium changing from defence to frank infection: Stage of the balancing reaction.

3. The stage of chronic suppuration: Stage of slight reaction.

It is difficult to recognize an infection of the wound early. Temperature, pain, or local symptoms are unreliable characteristics. Often the diagnosis can only be forecast by a changing of the entire clinical picture.

The diagnosis of an acute general infection of the first and second stages can most frequently be predicted early by the symptoms of numbness, a steady worsening of the general condition, vomiting, and chills.

The chronic general infection of the second and third stages arises slowly and without acute symptoms. The decision for an amputation has therefore to be made early.

Wound cachexia of the third stage is due to the following causes: the lowered level of general vitality, the infection of the wound with its bacterio-toxic effect, the increase of the metabolism and the chronic loss of albumin. Because of the increased permeability of the walls of the vessels, any liquid introduced is discharged again by wound secretion and by diarrhoea, which also accounts for the slight degree of edema.

Only a very few germs can be demonstrated by bacteriological methods in a fresh gun-shot wound. The flora of the wound begins to develop only after 10 to 12 hours. The secondary infection is of the greatest importance. It is necessary to iodize the area. Delayed closure (after 3 to 5 days) materially deminishes the danger of a secondary infection. The constitutional resistance is of the highest importance for the defence against the development of infections. It can also influence the operative indications of the surgeon to a large extent.

The hazard of the second stage consists in the virulence of the germs and in the progress of the infection in the local area, or its spread by the circulation of the blood stream. During any surgical work among cases of infected gun-shot wounds the highest asepsis is necessary, as a new highly virulent infection may be caused by the transfer of germs from the wound of one patient to the wound of another.

In the third stage the antagonism between infection and constitutional resistance achieves a balance. The reaction is slight, perhaps because it is no more necessary, perhaps because it is no longer possible.

The expression "chronic gun-shot osteomyelitis" is a misleading expression. It has nothing to do with the haematogenic suppurating osteomyelitis, either pathologically, physiologically or bacteriologically, as it is merely a staphylococcal disease with primary involvement of the marrow cavity. In contrast to this, the marrow cavity, in cases of chronic suppuration, is blocked by granulation tissue early in the process. Therefore no marrow phlegmons are ever observed. The expression "sequestrum discharge" would describe the condition of the infected part of the body much better.

The so-called "gun-shot osteomyelitis" is a local disease, while the haemotogenic suppurative osteomyelitis is a disease affecting the entire body. No amyloidoses are observed after the latter one.

The references to this as "osteomyelitis" has often led to a false impression and to erroneous proposals for treatment. In this connection the vaccine treatment according to SCHICK must be mentioned. No success with these staphylococcus vaccines can be expected. None has been observed during our examinations.

Prophylactic doses of sulfonamide given for prevention of the change of a chronic infection into an acute one, as for instance following sequestrotomies, were unsuccessful. Also in plastic surgery, as for instance in cases of bone grafts one cannot protect the patient from a re-activation of the infection by sulfonamide prophylaxis.

Frequently encapsulated foreign bodies, especially rough missiles, act as a focus. Bacteriological examinations of these rough missiles removed by an operation have in an overwhelming majority of cases indicated aerobic and anaerobic bacteria. Even months after the foreign body was encapsulated the histological examinations of the foreign body capsules still showed inflammatory processes inside the capsule and externally. This was regarded as a sign of an exchange between the contents of the capsule and the surrounding tissue.

In the first stage, especially during the first one or two days, the condition of the circulation is related to the kind of injury, to the primary complications, to the neuro-vegetative shock and to the primary circulatory collapse. After overcoming the first danger, the general reaction leads to a considerable increase of the circulatory activity as a result of the febrile reaction against the beginning infection.

In the second stage the circulatory activity is increased according to the general defensive reaction. According to the general constitution at a given time, a relaxation collapse might arise, as for instance in case of a high febrile condition or, a tension collapse might arise in case of a toxic infectious hypothermia. The increase of metabolism finds expression in the enlarged amplitude and faster pulse rate and the increased minute volume of the circulation of the blood.

During the wound cachexia of the third stage the peripheral vascular system contains a markedly decreased amount of blood. The blood circulation is centralized and is barely sufficient to support a minimum vitality. The slightest strain on the blood circulation may lead to circulatory failure. Besides the reviving

effect on the blood volume and the influence on the metabolism, blood transfusions might have harmful results because of a mobilization of the local inflammatory focus.

After gun-shot wounds affecting the bone, a continuous observation of the differential blood picture represents a valuable auxiliary procedure in case of suppuration with regard to diagnosis, prognosis, and indications. In doubtful cases it can give considerable information concerning the general constitution. Furthermore it helps to point out surgical complications.

Surgical complications and damage to the organs can be prevented to a large extent by adequate operative treatment of the wound. This is especially important in cases of post-operative haemorrhages and tube abscesses.

It is easier for a patient to bear one large haemorrhage rather than several smaller ones. First of all this is due to the fact that the vascular system which is damaged by infectious toxins does not possess the necessary regulatory power.

Very often tube abscesses do not show any special clinical picture in the beginning. In cases where gun-shot fractures of the femur are treated with a bandage according to the splint method of BRAUN, abscesses develop four times more frequently than in cases of treatment with a horizontal position of the broken thigh.

The chronic loss of albumin in cases of wound cachexia in the third stage must be avoided by an early elimination of the discharge. Whenever these sources of discharge are found in the limbs a prompt amputation is indicated. If we have to deal with extensive infections of the trunk, especially in cases of decubitus it is advisable to dry the wound up by an open wound treatment, Marfanil-Prontalbin powder and so on.

2. Indications and technique for surgical treatment of suppuration following gun-shot wounds of bones and joints.
by Professor H. BUERKLE de la CAMP

Following gun-shot injuries of bones and joints, the course of healing, the avoidance of an extension of the infection and the prevention of all interruptions of the healing of the wound depend largely on a correct treatment at the very beginning. In all cases of small-arms fire with smooth bullets piercing and lodging in the affected part of the body we use the conservative method, even in cases of an extensive destruction of bone, as long as no severe bleeding into the tissue occurs and no symptoms of vascular damage appear, demanding other measures. On the other hand, operative treatment is necessary from the very beginning in treating injuries from rough missiles, even if they caused only slight wounds, as well as in cases of a larger splinter wound. The rough missile, tumbling over and over during its flight, in spite of the smallest visible external wound, always causes a marked destruction of the soft parts. These rough missiles are as a rule highly contaminated by pyogenous and putrid germs adherent to them. The most extensive gun-shot fractures can heal without interruption after sufficient wound treatment. To obtain this, however, not only a superficial excision of the wound but a thorough exposure of the wound in addition to this must be performed by an expert.

The fasciae have to be opened widely in length and width for the relaxation of the depths of the wound. The deep-lying dead portions of muscles and soft parts have to be removed with the knife. The foreign bodies which can be found should be removed. Drainage incisions actually reaching to the bone fracture as well as adequate drainage should be supplied. Wound drainage must always drain off towards the lowest point when the patient is supine. A thorough surgical cleansing of the gun-shot wound must place the gun-shot canal in the most favorable condition for defence against the infection which is to be expected. Only the loose bone splinters in the gun-shot canal of the soft parts should be removed, but not, on the other hand, those bone splinters which lie in the gun-shot canal of the bone and particularly not those which are still attached to the soft parts.

The splint which keeps the affected limb in a resting position is just as important as the operative treatment of the wound. Most useful will be a plaster cast with a window for the treatment of the wound or even better a plaster cast with traction maintained by wires incorporated in the cast.

Nowadays we insist that the best fixation of a bone fracture which can be obtained is a part of the first operative treatment of the wound, for only by this treatment can the pockets, which occur in case of shortening of the limb, be avoided. Otherwise the infected wound secretion will accumulate in them and lead to suppuration.

Because of the conditions of war the largest number of wound infections following gun-shots into bones and joints has developed during transport. The better the bone fracture is fixed, the more complete the drainage was made after an adequate primary wound treatment and the better fixed the injured limb is held by the bandage and the splint, the less will be the danger of infection. Patients with injuries to the bones and joints caused by gun-shots must be stopped during transport and operated immediately if the

temperature increases steadily. In such a situation it is no good waiting for conservative methods or allowing a hard and painful infiltrate to ripen by heat or moist bandages or even expecting any effect from sulfonamides. If a swelling, heat, tenderness on pressure, pain and fever can be recognized, than a phlegmon is developing in the depth. In such a case the transport cast must be opened up and a drainage must be made to prevent infection. If a gas edema or one of the severe putrid infections develops in case of a bone or a joint injury by gun-shots, limb-preserving operations are most often no longer of any value.

The splints for the transportation of wounded with a fracture from the front lines as well as the traction-method splints are all only suitable for transportation and have to be replaced by other more suitable apparatus which keep the affected part securely fixed after the operative treatment of the wound. All dressings employing these splints are only emergency dressings, which may justly be used until the patient arrives at the main dressing station or in the advanced field hospital. After the proper treatment of the wound the plaster cast will always be superior. Best, however, will always be a plaster cast employing traction. Unfortunately the circumstances and the situation only too often require bandages of the splint variety even after the first treatment of the wound.

In all cases of gun-shot injuries of the bones and joints the plaster cast must be well padded. The cast with traction comes very near to the ideal which we have in mind, namely a first bandage which keeps the affected part in a complete resting position, in which the patient can remain for the first weeks of treatment, unless some severe clinical complications appear, and in favorable cases even until the growth of the new bone during the healing process. For the advantage of the wounded the above described plaster cast is more and more frequently used and is put on in an increasing number of cases in the advanced main dressing stations and in field hospitals. The extension wire is inserted at the suitable places according to the form of the fracture and the wound is treated in extension. The fracture is placed in the best position which can be obtained and the cast for transportation is put on incorporating the traction wire in the plaster. After the plaster has dried the tension clamp is taken off. Previously arrangements must be made to keep the wire under tension using small metal plates or small plates cut out of food tins or by aluminium bars with a hole drilled through. Thus the wire can always be provided with a new tension clamp again without difficulty during the treatment in a rear hospital. In order to obtain a better fixation of the bone fracture and to keep the affected part constantly in a resting position two extension wires fixed over and under the fracture might also be used as a double wire traction. Distraction of the fracture fragments should always be avoided.

The bandages keeping the affected part in a resting position must be sufficiently large and strong and should not be split open. In cases of gun-shot wounds in the knee joint and fractures of the femur a hip spica cast is always required and it should include the sound thigh. Fractures of the upper limbs caused by gun-shots should for the most part be treated with an abduction splint or with a plaster cast around the chest and the arm. The possibility of a stiffening of the shoulder joint in case of an injured arm hanging down should not be forgotten. If an abduction bandage is applied, the injured arm must be placed across the chest but it must always be in front of the thorax in such a way that the hand, as the highest point of the arm, is in front of the breast-bone.

In cases of gun-shot fractures the half-flexed position of the knee joint and of the hip joint according to the splint method of BRAUN and BOEHLER very often leads to tube abscesses or gravity abscesses. As not every gun-shot fracture can be so well provided for during the first operation that a suppuration which might arise in the depth of the wound, can drain off freely towards the deepest point when the patient is supine, drainage incisions extending down to the bone must be made when the patient is in a half-bent position so that sufficient drainage can be obtained, if suppuration should arise in the depth of the wound. Many cases of gravity spread of infection escape detection, as they often exist without a recognizable increase of temperature and without pain. Therefore one should always think of a gravity abscess when slight fever, a discharging wound, abundant granulation tissue and a swelling exist. The blood picture, which is not used nearly often enough when treating such cases of sick, relapsing and feverish patients, gives valuable indications such as an increasing tendency to the left and a separation of numerous young cells which indicates a formation of pus in the depth of the wound. The recognized tube-abscess must be cut wide open. It would be no use opening it with small incisions and introducing a long drainage tube. The abscess tube which has been cut wide open will heal quickly and without interruption. Gauze packing should not be used with these nor with fresh wounds. In cases of gun-shot fractures large and extensive gravity abscesses may make an amputation necessary. It is not the extent of the gravitating infection that gives the indication for amputation but the general condition of the patient.

The fracture fragments may be kept in their place by forceps, such as those described by WESTHOUSE, which are incorporated in the plaster cast. One ought, however, see to it that these forceps are not put on from above. These forceps should always be put on from beneath or the lower lateral aspect and the plaster cast has to be put around them, so that the discharge can drain off along them.

The question of marrow-nailing of gun-shot fractures has not been discussed, as the general use of the method is not permitted.

Bone infection after gun-shot fractures is strictly speaking not exactly a marrow infection and therefore is not osteomyelitis purulenta, as we usually know it, arising hematogenically. The conservative treatment of the sequestrum infection is recommended. A sequestrum has to be removed only after it has separated entirely and maintains a fistula infection. In doing so the granulation bed must be treated with great care. The treatment of sequestrum cavities with vaccines has not proved satisfactory.

When treating large bone cavities the use of living tissue as a plug is better than the use of a filling with a foreign body. This is especially true in cases of bone cavities near the joints, which cannot be saucerized. For this purpose specially formed handle-like muscle lobes are very suitable, which are put into the carefully prepared bone cavity. The muscle must, however, be well nourished and not infected, free of its fascia, and must fill the bone cavity without pressure and without angulation.

Gun-shot injuries of the joints form a very difficult department of war surgery. When treating a gun-shot injury of the joint the position of the affected limb as well as the bandage are important sides of the treatment against infection. The fortune of a joint injured by a gun-shot depends first of all on the

prevention of an infection and on the methods of treatment of an infection if it ever develops. The size and extension of the capsule-like wound as well as the time passed since the wound was caused are decisive factors determining the measures to be taken during the first operative treatment of the wound of a joint.

Joint injuries caused by small-arms smooth bullets have to be treated conservatively in the beginning without taking into consideration the extent of the bone injuries inside the joint.

Injuries caused by rough bullets are far more exposed to an infection. An already sealed capsule-like wound should, however, not be disturbed. In cases of small splinters it will be better to wait, to fix the bone in a resting position and to keep it under constant observation. Wide-opened joints without any large destruction of bone have a far better chance of healing without an infection than injuries with a destruction of the joint. In both cases, however, the time which has passed since the wound was inflicted is an essential factor in the possibility of a primary closure of the joint. In cases of gun-shots only into the soft parts of the joint, as well as in cases of gun-shot wounds with slight injuries of the bone the primary closing may be performed even as late as 24 hours after the wounding took place if conditions are favorable. In cases of gun-shot injuries with considerable destruction of bone and tissue this limit of time should be limited to 12 hours. In all cases where no skilful aseptic treatment of a gun-shot injury with a destruction of bone and tissue can be guaranteed within 12 hours and where the patient cannot remain in the same medical establishment, the joint must not be closed. We must give up the idea of preserving the function of the joint as a primary consideration in cases of gun-shot injuries of joints. First of all we have to avoid an infection of the joint, giving up all considerations of the flexibility. In a great number of cases where the injured joints are full of germs the healing process improves by itself when there is adequate fixation. Even obviously infected joints improve under the influence of a subsequent fixation. We have, however, in such cases frequently to deal with mild kinds of infections. Concerning the infection, however, war gun-shot injuries belong to the most severe woundings; they are always at least partly infectious.

For the delayed treatment of suppuration following gun-shot injuries of the joints I have established the following schedule:

1. If pain, swelling, tenderness on pressure as well as fever indicate an infection of the joint, immediate aspiration is necessary for diagnostic reasons. If the aspiration shows flakes of pus in the hematoma one might wait another 2 or 3 days with the drainage of the joint. It is not necessary to wash the joint out but this might be done with a physiological solution of table salt or with mild antiseptic solutions.

2. If the fever does not fall after the aspiration of the hematoma and changes into a pus formation or if the aspiration indicates pus, the drainage of the joint has to be performed immediately in cases of war gun-shot injuries when the smear (simple methylviolet stain) indicates a mixed infection. In cases of monoinfections with the usual bacteria which cause purulent metastatic joint infections, irrigation treatment might be tried but only for 3 or 4 days.

3. Drainage of the joint must open all pockets of the joint and drain them off, especially it must drain off towards the lowest point of the joint, when the patient is lying on his back. The resection of certain parts, as mentioned by LAEVEN, has to be added to the drainage when treating large joints.

4. When dealing with a capsule-like phlegmon which can be detected by pain in the joint, by dough-like swelling, reddening, tenderness on pressure in the area next to the joint, or if pus has broken through the joint empyema of the capsule, or if gravity or tube abscesses exist, a resection of the joint or an amputation must be made. Only the general condition of the patient determines, which of the two procedures is to be chosen, but never the extent of the gravity and tube abscesses. Therefore special attention has to be paid to the fact that the resection of the joint, which is a major operation, and which causes a big wound surface in a suppurative area by the destruction of the capsule, demands sufficient power of resistance to the infection to secure a healing. In cases of the treatment of patients with a weakened general constitution one will have to decide on an amputation. In case of a resection the joint capsule has to be completely removed. In cases of a resection of the knee joint even the patella has to be completely removed.

5. Every joint injury demands in any case adequate fixation and a strict treatment according to the splint method in large, strong, and bridged-over plaster casts, which, however, leave the injured joint and its adjacent area free for observation and treatment. A suspension and swinging position without a closing bandage and without a splint can be used only in those cases where no transport is expected.

6. Sulfonamide therapy can assist the operative treatment, but it can never replace it. In cases of the suppuration of a joint one must never wait to see, whether sulfonamide treatment will be successful or not.

7. The preservation of the flexibility of joints should not be the objective of our treatment in cases of suppuration following gunshot injuries of the joints, but the preservation of the limbs, the health and the life of the patient.

If a resection of the joint is made, the joint capsule has in every case to be removed completely. Remnants of the joint capsule lead to suppurations and tube abscesses. It has been proven successful to divide the treatment following a resection of a joint into two sections: In the first part, immediately after the operation, the limb is put into a plaster cast with a window or into a bridged-over cast in such a way that the ends of the joint are separated wihtout any great pulling forces, and the lobes of the soft parts are drawn over the joint somewhat like a tent. Then the open wound is treated with a continuous drop irrigation. Only after the fever has disappeared for a couple of days, the suppuration of the joint diminished, and the wound cavity filled with good granulation, are the resection stumps placed one against the other for the purpose of a bony union and the lobes of the soft parts loosely stitched together. This is the second stage of the treatment. This additional treatment is made in the big bridged-over plaster cast with a window. The advantage of this method consists in the use of the tension clamp mentioned by WESTHUES by means of which the extension wires adjust the resection stumps in a simple way. For a

long time we used a similar system in the field, employing extension-wires and plaster-bridges in such a way that we fixed the extension wires inside the plaster, or bent the wire into notches in aluminium bars at the edge of the window in the plaster cast.

If the temperature of the injured individual does not decrease during 1-2 weeks after the joint-resection was performed, and, if at the same time the general condition of the patient grows worse owing to the great loss of albumin, the suppurating limb has to be amputated. The decision for this intervention has to be made early, as an amputation, especially of the femur, is a very serious operation which requires efficient reserves to sustain the patient. Tube-abscesses and gravitating infections still occurring after the resection usually require amputation, but also in these cases the general condition of the patient is the determining factor.

Fat-embolism due to a vast destruction of the bones by gun-shots are not so rare as it is generally supposed.

Every post-operative hemorrhage is critical. Every large hemorrhage is caused by a break-down of the wall of the vessel. The so-called granulation hemorrhage does not occur without injury to the granulation tissue. Tamponage of a post-operative hemorrhage is always an unsatisfactory and unreliable procedure. Every post-operative hemorrhage requires the application of a ligature to the source of the bleeding. Tracing the place where the channel of gun-shot and the course of the great vessels cross, it is merely always possible to detect the location of the hemorrhage. The injured individual usually can stand a single abundant hemorrhage, but each subsequent, even though smaller, post-operative hemorrhage may cause a collapse, which is not reversible even when the energy of the patient is sufficient. Post-operative hemorrhage from main arteries in cases of suppurating gun-shot fractures, suppurating gun-shot joint-injuries, and after joint resections justify an amputation, as well as pulsating hematomas of a main artery.

A general infection caused by a suppurating thrombophlebitis is often difficult to detect. A ligature applied high on the vein or a resection of the vein can guarantee a cure, if made in time. If the situation is too far advanced, an amputation might be necessary.

No sutures, not even a suture ligature should be made immediately after an amputation under the conditions of the field. Early and late suture require experience and caution. They are often followed by severe phlegmons or erysipelas.

The treatment with sulfonamide cannot make a surgical intervention superfluous in cases of suppurating gun-shot injuries of bones or joints. It is without any important influence in cases of chronic suppurations of the bones.

D i s c u s s i o n :

BRANDT: The resection of the knee-joint will meet with success only when there are small infiltrations of the capsule, especially if located at the upper recesses. Larger tube abscesses, especially discharging infiltrations in the bend of the knee, require amputation.

3. X-ray diagnosis of infected wounds in the limbs.
by Dr. A. LOB.

A. Bone injuries and infections.

It is sometimes very difficult to discriminate injuries followed by infection in X-ray pictures of war gun-shots, as two different kinds of damage occur at the same time. Both cause destructive as well as regenerative processes. Each of them could by itself lead to a significant change.

The process due to a trauma are similar to those due to an infection, and the question now is, whether it is possible to discriminate between them, and, whether these processes are of influence on one another.

To decide the first problem more easily, we observe by way of comparison the symptoms of a hematogenic osteomyelitis and a simple fracture. Thus we can decide better, which symptom is due to this or that injury.

Discrimination of the destructive processes at the infection of gun-shot injuries of bones.

In infected gun-shot injuries of the bones the destructive reaction due to the infection can be discriminated:

1. By regarding their severity and their extent, as the uninfected gun-shot injuries also show destructive processes during the first few weeks, but only a very low degree of osteoporosis. This osteoporosis is covered quickly by a formation of callus. An infected gun-shot injury leads, during the first 4-5 weeks, to the formation of distinctly visible abscess cavities. The discrimination between osteoporosis and a genuine abscess is, as a rule, possible beyond doubt by X-rays. In single difficult cases additional auxiliary means can be used, i.e. stereo-photography and tomography (sectional roentgenography). For the conditions of war the simple roentgenogram taken from a short distance has proved satisfactory. This enables one to recognize small foci of infection.

2. By the sequestration which takes 2-6 months to develop. The bone-splinters and the sequestra have to be discriminated very exactly, according to their density of structure, their shape, and their outline. In that case too roentgenography from a short distance can help to elucidate difficult cases.

The problem, whether the process due to a trauma and to an infection are influenced by each other, is divided into two questions:

a) Do they increase one another? This question may in general be denied, as even in the case of a simple split fracture the callus reconstruction is considerable.

b) Do these processes hinder one another or does the infection delay the healing of the fracture? Violent infections cause severe and extensive injuries to the surrounding soft-parts and to the periosteum. Consequence: Prevention of callus formation. Effect: Pseudarthrosis. Most of the suppurating fractures show a sufficient callus formation and heal, though they continue to form fistulae.

B. Injuries to the soft parts and their X-ray picture.

Though the relation of injuries to the soft parts of the limbs to the X-ray picture is not as important as are the pictures of injured bones and joints, which are easy to prove, they should not be neglected.

The primary conditions of the wounds are not the subject of X-ray examinations, e.g. wound pockets and gas gangrene. The secondary conditions of the wounds are doubtless proved better by X-ray procedures: roentgenography of fistula tracts and fistula systems by means of contrasting media, investigation of hidden abscesses and tube abscesses.

Distant effects from soft-part injuries to bones and joints.

In cases of infected soft-part gun-shots or wounds caused by shell-splinters, and caused by shots through nerves, the symptoms of the so-called SUDECK atrophy are often detected. Only the X-ray picture enables one to give a safe diagnosis of all stages and to use the correct therapy.

Latent infection and X-ray picture.

The question of a latent infection cannot be settled by the X-ray picture alone. Only clinical experience and the clinical findings on examination can give the correct answer. The X-ray pictures can only be used with certain limitations, as for instance when an entire series shows some inflammatory reactions by successive change and a rebuilding of the structure of the involved part of the bone.

Conclusion.

Examination by X-rays enables the physician to observe the healing of a bone injury and the development of the inflammatory process, and gives him, along with consideration of the clinical findings, a clue to the kind of therapy to be chosen. We cannot report at present on the questions of the removal of foreign bodies and joint inflammation, because of lack of time.

Discussion:

BRANDT: The SUDECK syndrome is a biological process of alteration of the bones. It is not possible to let the test treatment or the indication of an operation depend on the changes of structure which are seen in the X-ray picture.

4. On the occurrence of wound infections.
by Assistant Physician Dr. SCHALLOCK.

Two groups of processes have to be discriminated in infected gun-shot wounds of the limbs:

1. the local wound infection in the affected limb,

2. all those changes found in the internal organs or other parts of the body which can be supposed to be complications of the wound infection.

A. L o c a l c h a n g e s .

Local changes occurring in gun-shot wounds of limbs are:

1. degenerative processes,

2. hemorrhages,

3. suppurations,

4. defensive or reparative processes.

All these processes are found in different degrees in the different tissues:

In fat and connective tissue the hemorrhage and suppurations predominate, while the development of granulation tissue occurs less frequently.

In the muscles the hemorrhage is variable in extent, sometimes more, sometimes less; the degeneration may be either local or in scattered areas; suppuration may be local or generalized; granulation tissue may be sharply limited early in the process, delayed and irregular or even missing. The developments in the bone structure are not important to the progress of the wound infection. The suppuration of the bone is, however, maintained by loose bone splinters, and in the muscles by dislocated bone chips.

B. G e n e r a l s y m p t o m s .

The general symptoms include:

1. metastatic infections,

2. organic changes without metastatic infections.

Among metastatic infections, suppurating thrombo-phlebitides are very often found in the area of a local wound infection, and these act as foci of spread. Moreover, suppurating foci may occur in the lungs, in the heart valves, etc. In exceptional cases suppurating foci may occur in special places.

1. The general changes of the organs in the case of pyemia usually include low-degree changes of the parenchyma, which are understood by the collective name of parenchymatic degeneration.

2. General symptoms without suppuration metastases are for the most part characteristically developed. They either concern all the organs, among which the liver and the kidneys are usually the most

severely involved, or they only lead to changes of one organ, e.g. liver or kidneys, but in this latter case it usually causes the destruction of the organ and becomes fatal by the failure of this organ.

A third group of general symptoms appear with complications of the clinical picture. These complications consist of hemorrhages from eroded vessels, pneumonias, diphtheritic infections, dysentery, etc. In addition to these, other complications may occur but only rarely, and they are not of such practical importance.

5. Late complications in gun-shot wounds of the knee joint.

by Professor KRAUSS.

The late examination of 1000 gun-shot wounds in the knee joint showed the following facts:

condition of the wound	percent of total	plaster cast on		splints	missile	
		pelvis	leg		smooth	rough
		percent	percent	percent	percent	
injuries to soft parts	48.9	4.9	19.2	75.8	28.2	71.8
injuries to soft parts with slight bone injury	41.0	4.0	20.0	75.2	41.2	58.8
gun-shot wds, with damage to joints	10.1	9.9	18.8	71.2	39.6	60.3

Gun-shot wounds in the knee, only soft parts injured.

treated with:	fit for active service	ankylosis	amputation	exitus
	per cent	per cent	per cent	per cent
rest alone	90.5	1.7	---	---
aspiration & lavage	45.6	16.1	8.0	14.7
incision	8.4	33.4	17.4	29.1
resection	---	51.5	14.7	33.6

Gun-shot wounds in the knee joint with slight bone injuries:

treated with:	fit for active service	ankylosis	amputation	exitus
	per cent	per cent	per cent	per cent
rest alone	61.9	4.8	---	---
aspiration & lavage	34.2	20.2	10.5	11.4
incision	0.6	50.3	21.0	18.5
resection	---	57.1	10.6	28.5

Gun-shot wounds in the knee joint with severe bone injuries:

treated with:	fit for active service	ankylosis	amputation	exitus
	per cent	per cent	per cent	per cent
rest alone	---	---	---	---
aspiration & lavage	---	9.7	51.2	24.4
incision	---	34.1	26.8	39.0
resection	---	53.8	15.4	23.0

Resections:

resected during:	ankylosis	amputation living	flail joint	death
	per cent	per cent	per cent	per cent
1. week	84.5	7.5	---	7.5
2. week	50.0	---	---	50.0
3. week	50.0	8.3	8.3	33.3
4. week	35.7	21.3	---	42.8
5. week	53.3	26.6	6.6	13.3

These figures obtained from the present "mobile warfare" lead to the conclusion, when interpreted conservatively, that the surgical treatment should include meticulous cleaning of the wound by excision and then closing of the joint by a suture, and if possible, applying a plaster cast, including the pelvis, to keep the part at rest. That is the best way of increasing the number of uncomplicated healings, and preventing complications by infection.

Infected knee-joints due to gun-shot wounds in soft parts, especially those in which the bones are only slightly injured, should be resected, if incision does not bring about a prompt decrease of the temperature and control of the infection with free drainage of pus. According to the experience with these injuries the incision treatment will maintain the motion of the leg in only a small number of cases, but with less danger to life and limb. Therefore the surgeon may deliberately desist from maintaining the motion (to preserve life and leg). Resections undertaken in the first week show much better results than those made later.

Primary resection seems to be the best method of intervention in gun-shot injuries to joints which have caused much bone damage,

6. On the application of suspension. (to the pelvis)

by Professor WESTHUES.

The method of the application of suspension to the pelvis has quickly come into vogue in war-surgery. All surgeons, who have tried it practically, approve of the efficiency of this method of treatment of difficult wounds in the area of the sacrum. The only unsolved problem is the choice of technique of application.

Three kinds of technical application are known:

1. application of suspension to the brim of the pelvis,
2. application of suspension to the symphysis (SCHNEIDER),
3. application of suspension to the horizontal branches of the pubic bone.

The most frequently suggested system is the application of suspension at the brim of the pelvis, as it is very easily and quickly done. We do not mean to discuss the problem in detail yet, but we would point out especially one main disadvantage - as it is often asserted - that the wires soon cut through the bones, and that for this reason the method of suspension can be used only for a short time. Therefore SCHNEIDER tried to use the symphysis as the point where the suspension could be applied. But SCHNEIDER himself states that it is very difficult to drill a wire horizontally through the symphysis sufficiently deep, to secure the necessary contact of the wire with the bones. Moreover, the application of suspension at the symphysis is not without risk, because of the dangerous nearness of the spermatic cords. I myself have never seen this method used, nor tried it. SCHNEIDER himself seems to have given up this procedure. I do not believe that this method has any practical importance.

KLAPP Jr. tried the application of suspension to the pelvis at the horizontal branches of the pubic bones. It is beyond doubt that a cutting of the wire through the bones is not possible. In spite of this advantage I do not believe that this method will ever become popular. I never saw it used in the field. To begin with, it requires an additional difficult operation, and moreover it is quite possible that an infection might occur, even a phlegmon of the pelvic tissue is possible! Anyhow this method will have to be used in severe gun-shot wounds of the pelvis. In many cases of gun-shot wounds of the pelvis, especially in wounds through bladder and rectum, the surrounding connective tissue is infected somehow, it has to be opened wide and dependent drainage established. The branches of the pubic bone are exposed and easy to reach in the operative area. To turn the wires around the pubic bones is easy and simple, the fear of infection is pointless in this case. I have used the described kind of application of suspension in these difficult cases with good results, as the pelvis affords ideal conditions for letting the secretions drain off to the back. Except in these cases the application of suspension to the pubic bone will probably not have a great future, and for the above-mentioned reasons.

Therefore I will return to the application of suspension at the brim of the pelvis and propose the following question: Is it possible to prevent the main danger of this method, namely the cutting of the wires through the bone, or at least to decrease it materially? Yes, it is possible, by preventing the infection of the wire, as this is the chief reason for the wire cutting through

the bone. The infection can be prevented by scrupulous cleanliness and especially if one sees to it, that the wire sits immovable in the tissue, preventing thus a slipping of the wire. These requirements eliminate all methods of application of the wire. The pelvis can be fixed firmly, and can be protected against any slipping to the sides, if "ball-wires" are used. These are drilled through the edge of the pelvis from outside to the inside, so that the ball lies close to the bony wall of the pelvis. The comparatively thick ball helps materially in bearing the weight of the pelvis. The bearing wires are kept taut by extension-clamps to prevent any looseness which might cause a secondary cutting through the soft parts. Both extension clamps are connected by a strong wood-plaster bar, preventing thus any moving to and fro. WACHSMUTH tried to achieve an absolutely firm fitting of the wires by embedding them in a plaster cast of the pelvis. I have no personal experience in this matter, but I have my doubts in so far as the wire, which may cause infection, cannot be observed. Also, this method does not entirely prevent a slipping of the wire.

Besides, it is important not to aim at a total suspension but rather a partial one, in such a way that the counter-balance equals 3/4 or 4/5 of the weight of the pelvis. Care must also be taken that the wire is not drilled through the surface of the pelvis-rim only, as in that case it will pass the apophysis of the pelvis brim, which is not very strong. If one uses this method and takes proper care of the wire, a cutting of the wire through the bone will rarely occur too early, that is, not before the tenth week. Therefore I regard this method of application of suspension as the method of the future.

Now another word in favor of partial suspension and against total suspension, as well as some general remarks. In case of a total suspension a dependent edema may occur, especially in patients who are weakened by physical exhaustion and wound cahcexia, which edema delays the healing of the wound and may cause a rapidly spreading phlegmon. Therefore some of the normal pressure on the soft parts has to remain. Experience has shown a counter-balance of 4/5 of the weight of the pelvis to be correct.

In which cases should suspension to the pelvis be applied? The usefulness of this method in case of severe gun-shot wounds in the pelvis, especially when combined with bladder and rectal injuries, has been mentioned. I was able to observe in these injuries, that some of them which were not very serious originally, grew worse because the suppuration could not drain freely, owing to the unchangeable position of resting on the back, and the suppuration spread over the entire surrounding connective tissue of the pelvis. The early application of suspension can make a decisive difference in these cases.

The application of suspension seems to have its chief use in cases of large decubitus about the coccyx. Decubitus is the step-child of war surgery. No war surgical instruction book gives any details about it. It is more common than the responsible authorities, doctors and nurses, like to own, because of false shame and lack of knowledge. In cases of decubitus the application of suspension can be the best remedy, although I think that this method should be used in cases of decubitus only rarely, as it is not an ideal situation for the patient to lie stupidly on his back for weeks or even months. It is better to cure the patient by taking good care of him and by frequently changing his posture to one on the sides or on the stomach perhaps by means of the turn-bed of KLAPP. Only if these measures are not available, perhaps because of a shortage of personnel or,

because there are other wounds which prohibit a changing of the posture of the patient, in these cases alone should suspension be used.

If another serious disease occurs besides the decubitus, for instance a suppuration of the knee-joint, the application of suspension affords very novel ways of treatment. Cases of this kind ordinarily ended fatally, or it was necessary to amputate early, to make it possible to shift the patient to different postures. In these cases the application of suspension acts as a life-saving and leg-saving measure, especially, if the entire suspension apparatus is reinforced with boards by means of plaster so that it becomes a firm apparatus. In that way leg and pelvis are secured quite as reliably as by a good plaster cast. The simplicity and the effectiveness of the results of this method even in apparently hopeless cases were the reasons for using it even when no decubitus had yet occurred, but was likely to happen in an emaciated and cachetic patient. This bandage looks very complicated, but, as a matter of fact, it can be easily and quickly applied. It requires much less time than a regular plaster cast.

General directions
for the control of infections due to gun-shot injuries to bones and joints.

In the development of injuries caused by gun-shots in bones and joints can be subdivided into 3 phases:

1. Phase from the occurrence of injury until the control of the acute infection: Phase of the massive defence reaction.

2. Phase of the subacute infection with an equilibrium changing from defence to frank infection: Phase of the balancing reaction.

3. Phase of chronic suppuration: Phase of slight reaction.

An early detection of wound infection is as a rule rather difficult. Temperature, pain and local symptoms are not reliable. Sometimes the diagnosis can only be got at according to the changes of the total clinical picture.

In fresh war wounds only a few germs can be detected bacteriologically. The wound flora starts to develop after 10-12 hours. The secondary infection is very important. It is necessary to iodize the vicinity. Delayed suture after 3 to 5 days lessens the danger of infection. Close observation of the delayed suture by the operating surgeon is necessary for one or two weeks.

The condition of the body's defence capacity is of the greatest importance for the development of the infection. It also has an influence on the decision of the surgeon. The danger of the second phase is the virulence of the germs and the spread of the infection locally or through the blood stream.

Most careful asepsis during the surgical operation of infected gun-shot wounds is necessary to prevent the dislodgement of the highly virulent germs.

In the third phase the antagonism between infection and defence has quieted down. The reaction is small; perhaps because it is not possible any more. The name "chronic gun-shot osteomyelitis" is misleading. The so-called gun-shot osteomyelitis is a local disease, but the haematogenic osteomyelitis is a disease of the entire body. No amyloidoses were detected due to the first one. The hitherto name "osteomyelitis" leads very often to wrong impressions and treatments. Therefore it is suggested to name it rather: "sequestrum-suppuration".

The treatment with staphylococcus-vaccine also has some relation to this matter. Prophylactic doses of sulfonamide to prevent the chronic infection from changing to an acute infection, for instance after sequestrotomy, did not produce any effect. Thus it is impossible to prevent a flaring up of the infection by means of sulfonamide doses following operative treatment, so well as by bone grafting.

Foreign bodies which are encapsuled, especially rough missiles, very often act as "diffusion foci". Bacteriological investigation of rough missiles, which had been removed at operations, showed in most cases aerobic and anaerobic bacteria. A histological investigation of the foreign body capsule showed signs of inflammation inside

and outside of the capsule even after being encapsuled for several months. This is a sign of an interchange between capsule and surrounding tissue. An important auxiliary for diagnosis, prognosis, and indication for therapy in cases of suppurating gun-shot injuries is a constant observation of the differential-blood picture (shifting to the left - increased young forms). Belated surgical complications and damage to organs can be prevented in almost all cases by operative care for the wounds. This holds true especially for post-operative hemorrhages and fistulous abscesses.

A single large hemorrhage can be endured better than several small ones. This is for the most part due to the inability to regulate the vascular system injured by the toxins of infection.

Fistulous abscesses do generally not show any clinical symptoms. The chronic loss of albumin in cases of wound cachexia of the third degree may be relieved by walling off or by operative interference, thus preventing the spread of infection. When a focus of infection has become localized, early drainage is indicated. If a large suppurating part of the trunk is the cause, especially decubitus, an attempt must be made to dry the wound by means of open wound treatment, Marfanil-Prontalbin-powder, etc. The centralized circulation of the blood is only sufficient for maintaining the minimum vital force. The smallest additional stress can lead to circulatory failure.

Blood-transfusions may have, besides a remedial volume-effect and an influence on the metabolism, a harmful effect such as a re-activation of the infection, especially, when great amounts of blood are transfused. In cases of localization of pus, small transfusions (up to 150 ccms) are of considerable value.

B. S p e c i a l p a r t . T r e a t m e n t .

1. Suppuration due to gun-shot fractures of the bones.

One must not be content with only a trimming of the skin edges of the wound as a preventive measure against the expected infection, but in addition must perform a skilful laying open of the wound by splitting the fascias lengthwise and crosswise, and a removal of the damaged soft parts and foreign bodies, prophylactic incisions to the bone and adequate drainage. Loose bone chips in the gun-shot canal in the soft parts have to be removed, but all bone chips, especially those which are still nourished, lying in the gun-shot canal in the bone should be left, as they are important for the production of callus and the defence against infection. If the patella is split it should be removed. The best possible repositioning of the broken parts of the bones has to be made immediately, simultaneously with the operative care of the wound.

Of all kinds of dressing, the best is the plaster cast with extension-wire, padding, and windows, or the splint-bandage with extension wires. Precaution must be taken to avoid distraction of the fracture, as pseudarthroses may occur and the healing of suppurating wounds may be delayed. The bandage for transport should, if possible, be one in which the patient may be treated and left undisturbed. The formation of pus following a gun-shot injury of a bone starts from the gun-shot canal, and very often begins discharging during the transportation. The temperature of the patient has to be checked carefully during transport. Recognized phlegmons have to be opened immediately. A patient with a purulent

gun-shot fracture and temperature or a great discharging of pus is not transportable. Every detected fistulous abscess has to be laid open. The decision to amputate in cases of gun-shot fractures has to be made according to the general condition of the patient, not by the extent of the suppuration.

It is difficult to recognize a purulent thrombo-phlebitis as the source of a general infection. A high ligature or resection may save the life of the patient if applied in time.

The marrow-nailing of KUENTSCHER is not allowed at present in cases of purulent gun-shot fractures.

It is recommended to treat purulent sequestra conservatively during the hot, active inflammation phase. Do not remove the sequestrum before it is absolutely separated. They must be removed carefully and without destruction of the wall of granulation. Sequestra may lead to fistulous abscesses.

Small sequestrum cavities, up to the size of a hazel-nut, may heal after the sequestrum is removed. But when large sequestrum cavities and fistulae occur as a final stage, they create difficulties The best filling material, which is alien to the body, is cod-liver oil ointment (Unguentolan) which is filled in under a loose suture. The procedure which gives the greatest chance of an effective healing of deep bone cavities in the vicinity of joints is the pedunculated muscle graft without fascia, which is folded without pressure and pressed into the well cleaned cavity when it is free of inflammation. Every treatment with filling material should not be made before the hot, active inflammation has subsided and all sequestra have been removed. The chief advantage of this procedure is that the treated limb can be left alone for a long time and the bandage has to be changed very seldom.

2. Suppurations due to gun-shot injuries of the joints.

The use of rest and careful dressings are just as important portions of the treatment as surgical intervention, as defencive measures against suppuration of the joints.

Closure of a wide-opened gun-shot injured joint is advisable only during the first 12 hours. After that it is better not to enforce it. Not to close the joint after the incubation period of bacteria is no mistake. If kept sufficiently at rest even contaminated and already inflamed joints may heal, without the necessity of surgical intervention, especially in mild forms of infection.

If pains, swelling, sensitivity to pressure, and fever indicate an infection of the joint, aspiration of the joint is immediately necessary for diagnostic reasons. If the aspiration shows pus flakes in the blood one may wait 2 or 3 days, before further treatment. It is not necessary to rinse the joint, but it can be done with physiological salt-solution or mild antiseptic solutions.

If the temperature does not decrease after the purulent blood-effusion is aspirated, or if the aspiration shows pus, the drainage of the joint injured by gun-shot has to be made immediately when the microscopic smear (simple methylviolet dying) indicates a mixed infection. If it is only a mono-infection with ordinary pus-producing germs (metastatic joint suppuration) one may try to rinse the joint, but only for 3 or 4 days.

Drainage of the joint has to extend to all cavities of the joint, especially the point with the lowest level when the patient is in a supine posture. The partial resections recommended by LAEWEN are preferable in the drainage of the great joints.

A phlegmon of the capsule, detected by pains of the joint and dough-like swelling, reddening, sensitivity to pressure, combined with pains of the vicinity of the joints, or a breaking through the capsule of the pus, or the occurrence of dependent or fistulous abscesses all require joint-resection or amputation. The decisive factor for the choice of the one or the other of the two procedures is not the extent of the abscesses, but the general condition of the patient. It must be remembered that joint-resection is a severe operation, as the removal of the capsule leaves a large wound space in the purulent area, and its healing requires sufficient defensive power of the organism. If the general condition is very weak the decision to amputate has to be made. At the resection the joint capsule and also the patella have to be removed.

Every injury of a joint requires that the joint should be put absolutely at rest by means of large, strong, bridged-over plaster casts, which leave the injured joint and its vicinity free for observation and treatment. An open application of suspension is advisable only if it is absolutely certain that the patient will not be moved.

Treatment with sulfonamide can assist the surgical measures but never replace them. Therefore it is not necessary to wait to decide whether sulfonamide treatment may lead to good results in cases of joint suppuration or not.

The maintenance of the mobility of the joint is not the goal of the treatment of suppuration in joints due to gun-shot injuries, but rather preservation of limbs, health, and life.

The treatment after joint resection is divided into two important parts: First the joint stumps are placed at rest and separated to treat the open wound (therefore no suture of the soft-part lobes). After the temperature has fallen and good granulations have been secured the resection stumps may be put into the correct position for fixation (soft-part lobes may be placed back and loosely sutured).

The treatment after severe purulent gun-shot injuries to bones and joints has to continue the operative and dressing technique and must always provide surgical asepsis.

With regard to the X-ray picture a clear distinction has to be made between the occurrence of purulent foci and sequestra. The small formations of purulent foci, which often are at some distance from the injured area, look like the picture of an abscess cavity in cases of hematogenic osteomyelitis. The formation of sequestra is much more difficult to detect, because of the sometimes far advanced sclerosis of the bone. Stereoscopy and roentgenography from very short distances permit a differentiation and facilitate the diagnosis of sequestra.

7. Result of arteriographic studies of gas gangrene.
by Professor WILDEGANS.

It was supposed that arteriographic studies of gas gangrene might give information about the conditions of circulation and might not only solve the problem of the initial pains but also give particulars about the efficiency of the usual therapeutic treatments.

First the amputated limb was examined arteriographically and anatomically immediately after the operation. Then the main arteries were laid open at the intended site of operation or shortly above it, and arteriograms were made of the severed limb before the operation and immediately after it. (Always by the same operator, Uroselectan B).

The evidence thus obtained will be illustrated by the following pictures:
(Editors note: No pictures in the Berichte).

Picture 1.: X-ray picture immediately after amputation in the area of the thigh.

Soft parts of the lower leg are strewn with missile fragments. The striped appearance due to gas bubbles, with nice feather-like calf muscles can be seen distinctly. The art.poplitea, art.tibialis ant. and fib. are well filled, also the vasa genus. The art.tib.post. is as thin as a knitting needle and interrupted in the lower third (Obliteration and thrombosis). The branches of the muscles and bones on the extension side are well illustrated. On the flexor side only the art.surales are seen, which extend downwards along the muscles as well as in the inside of them. No further filling of the arteries of the calf is found. The muscles are absolutely cut off from the circulation.

Picture 2.: Arteriogram before the amputation.

Striped and spotty accumulations of gas in the area of the calf and above the knee, heavily feathered muscles, a thrombus on the wall of the arteria poplitea. Art.tib.post. is well filled; art.fib. shows only for a short distance, just as the art.tib.ant. The latter runs into a point like a lance and then ends. Except the arteriae surales and the vasa genus there are no arteries illustrated on the flexor or extensor side of the leg.

Picture 3.: Immediately after the amputation.

In contrast with the illustration before the amputation a thread-like filling of the art.tib.ant. up to the lower half of the lower leg, and a normal appearance of the art.fib. up to the lower third, where the artery runs into a thin point; also thin muscle-branches can be seen in the distal half of the lower leg. The anatomic preparation (Picture 4) shows art.tib.post., ant., and fib. to be uninjured and with normal diameter.

Picture 5.: Gas gangrene with striped gas accumulations from the ankle to the upper third of the calf.

Obliteration of the art.tib.post. and fib. Distinct branches of the art.surales, also the branches of the extensor side of the art.tib.ant. No other vessels to be seen in the distal half of the lower leg.

Picture 6.: In the arteriogram immediately after the amputation the art.surales are much better filled; they reach up to the middle of the calf, where they become thread-like. Also the branches of the stumps of art.tib.post. and fib. are distinctly marked.

Picture 7.: Gun-shot fracture of the thigh with obliteration of the art.fem. with a well established collateral circulation. The gas gangrene spread from the bullet canal to the periphery of the lower leg.

Picture 8.: The corresponding lower leg shows no circulation in the areas with the most gas gangrene. The art.tib.post. and fib. are clearly running into a point in the distal direction. A short piece near the distal half of the art.tib.post. alone is filled with contrast medium and shows a rather normal caliber at that place. All arteries of the lower leg are anatomically of normal diameter.

Picture 9.: Gas gangrene of the thigh with a distinct feathering of the muscles. Art.fem. not even as thick as a quill. Most secondary branches are missing, especially in the proximal half!

Picture 10.: After death, the art.fem. has a normal diameter in its upper thirds. Art.circumflexa fib.fem. distinctly filled, also its collateral branches to the lower third of the art.fem. on the extensor side. The other secondary branches of the art.fem. are also illustrated much better.

Picture 11.: Gas gangrene of the thigh with art.fem. as thin as a knitting-needle and obliteration of the art.prof.fem. Only in the lower third are some side-fibers illustrated. Air accumulations like honey comb cells in the area supplied by the art.prof.fem.

Picture 12.: The disturbances of the circulation of the blood are much less in cases of phlegmons containing gas, than in cases of gas gangrene. Obliteration of the art.poplitea at the level of the hinge of the knee joint. Excellent blood circulation of the collaterals on the flexor and extensor side of the lower leg, with retrograde partial filling of the art.tib.ant. and post. In the lower third, faint illustration of the arteries and striped gas accumulations.

Thus gas gangrene shows regularly recurring features. Injuries to large and medium-sized arteries are a much more freuqant forerunner of gas gangrene than is ordinarily supposed. Moreover, it is remarkable that usually any shadow of the arteries is missing in the area of gas gangrene. The injuries to arteries cannot be the only explanation.

The pinching off of the incoming main arteries and of important side branches in the region of the center of inflammation is important. The pointed, thread-like, or lance-like termination of the arteries, which otherwise are well filled, suggests that these occurrences are caused by spastic-functional disturbance of the vessels. To explain the disturbances of the blood circulation on account of the compression by gas and gangrene on the basis of an increase of the inner pressure of the vessels is not satisfactory, as it can be supposed that this inner pressure will be unchanged after the amputation, or will even increase, but not decrease. (Editors note: Translation is literal).

Spasm of the vessels as a direct effect of the injection of contrast medium occurs only seldom. Besides, the spasms of the vessels were only found in the infected area, whereas the distal sections of the vessels in general were well supplied with circulating blood. Very likely the poisons of gas gangrene cause the vaso-contriction, acting in such a way that the contraction of the arterioles in the area of stasis extends also into the small, medium, and large arteries towards the heart. In this way, by an inadequate supply of blood, the poisons create the possibility of a further spreading of the infection.

The spasms of the arteries are also an explanation for the very marked pain during the early progress of gas gangrene. Ischemic pain on account of organic spasm of the vessels after the injury occurred are seldom as strong as those in the beginning of gas gangrene. If the ischemia is followed by spastic plugging of arterial side branches or even of the main vessels, the nerves of the vessels may cause very strong pain, which will not disappear until the spasm is relieved or the progressing damage of the tissue prevents the transmission of the sensation of pain. This point of view is proven by the fact, that in cases of phlegmons containing gas the initial pain characteristic of gas gangrene does not occur along with the arterial spasms of ischemia.

It is to be understood that because of the isolation of the area of the gas gangrene from the circulation, in the advanced stage of the disease chemo- and sero-therapy does not lead to any improvement, as the remedies cannot be brought to the centre of the disease. It is a pity that the ordinary sulfonamide and serum-prophylaxis does not give good results for the same reasons.

The operative treatment of the wounds, including the care for the vessels is limited under present conditions, as the body of the patient is often strewn with countless bits of missiles.

8. The treatment of patients who have lost their hands (handless persons).

by . Professor SAUERBRUCH

We call persons "handless" who have lost both hands or even both arms. This pitiable condition is only seldom caused by the embryonal development and therefore is congenital. In most cases the loss of hands rarely is due to severe injuries in war and peace.

Our discussion is confined to the fate of soldiers injured during the war, who have lost their hands in action for their country. This loss makes them unable to grasp and to hold things, and to feel, as it is possible with the organs of touch at the fingers.

The severe damage in these cases makes it impossible to compensate this loss by adaptation, which sometimes answers the purpose surprisingly well with persons with only one arm. This will be impossible especially if, besides the hands, large parts of the arms above or below the elbow were lost.

The loss of both hands produces a pitiable condition of the patients. It has a fatal influence on their whole course of life and rendering them quite helpless. In addition to that, the patient is not able to get a job, as at least one hand is needed for any kind of work. Even purely intellectual work is much restricted. The loss of vitality and spirits causes a deep depression in these persons and a feeling of being useless. This holds true especially if the patient lost the hands in addition to other organs, for instance loss of a leg, blindness, or dumbness.

Every physician who knows the conditions of such unlucky individuals has the desire to help them. He will try to make them independent and to lead them back to a regular life and satisfactory work.

One has to distinguish between individuals with one arm and those who have lost both arms. A person with one hand or who has even lost the entire arm can still use the other uninjured arm. He can increase its efficiency by adaptation, training and will power, so that the loss of one hand is compensated by utilizing the other for all purposes of daily life. He is able to fend for himself, not needing the help of other persons. This explains the fact that some one-handed persons refuse to wear a prosthesis, at least one which can be used only as an "ornamental hand". Only special professions require an artificial substitute for the lost hand, especially in so far as technical occupations are concerned. The technique of the prosthesis is so much improved at the present time, that a return to the previous profession is usually possible by using the voluntarily movable hand or the KRUKENBERG arm.

Handless individuals depend on entirely different conditions. They lack any functional apparatus which may be utilized for independent eating and drinking, even for the simplest tasks such as personal hygiene and cleanliness. The individuals concerned suffer under these circumstances. Therefore the chief problem of the physician is to rid the patient of these depressions. But this goal can only be reached if it is possible to provide the patient with a sufficient substitute for both hands. If on both sides a sufficiently large stump of the arm below the elbow is available with strong muscles it is possible to achieve satisfactory results with the movable hand or the KRUKENBERG arm. The situation will be

more difficult if only short stumps are left of the arm below the elbow, or if even a part of the arm above the elbow is lost. But even in those cases good results can be obtained by skilfully using the remaining sources of power. This will be demonstrated to you later by some amputees.

An important consideration for the effectiveness of our work is the early care for handless individuals. The earlier the remaining available power of the stumps is trained and utilized for the new purpose, the better will be the result. Therefore it is proposed to start with the training of the remaining muscles and joints of double amputees even in the hospital, even when the wounds are not yet closed. Handless patients have to be taken care of by surgeons who have not only sufficient experience and technical surgical knowledge, but who also have a warm heart for the patients. It is not wise to bring them into welfare institutions, where efficient skill and surgical-orthopedic help is lacking.

A critical survey of the efficiency of the modern technique shows considerable progress. Even during World War I it was possible at the hospital for amputatees, Singen, to take care of a fairly great number of handless individuals to such good purpose that they could be employed as elevator operators, drivers, switch-board operators, office clerks, and supervisors with a surprising effectiveness. The supposition hitherto was that sufficiently long stumps were left on both arms.

A great help for the surgeon is the fact that fate forces the handless patient to try to improve his condition with an iron will, while the patient with one arm depends too much on his intact side. In any case the taking care of double-amputatees is a very difficult problem, which requires surgical-orthopedic skill and understanding of the mental and physical individuality of the patient. But if it just for this reason that its solution is one of the finest achievements of surgical orthopedics.

Before discussing this particular kind of work, I regard it as necessary to describe the different groups of handless individuals:

1. We speak of "fingerless" persons, if all the fingers and perhaps even a part of the middle hand is lost or cannot be used.

Surgery is able to give enormous help to these fingerless persons. The methods are well known. They include the plastic transformation of any remnants of the fingers or of the hand into useful prehensile organs. The pictures show the main types and the possibilities of successful treatment. A transformation of the stumps into prehensile grip-pliers has to be attempted. They allow the patient to seize and grasp things with tactile sense and power. Sometimes it is even possible to transform handstumps on both sides, which could not be used for any purpose, in such a way that their owner is able to use them quite efficiently at his work, and thus to restore joy of life and work to him.

2. The next group are the "handless" individuals, who still have a fairly long piece of the fore-arm left. This remnant can be utilized for carrying things by bending the arm at the elbow, and in an extended position for pushing and pressing. No seizing and grasping things is possible. For a long time it has been the task of surgery to enable these handless people at least to take up and hold things and to do easy work. Surprisingly good results were obtained with double amputees with long stumps below the elbow. Four

procedures have proven practical:

a) If the long stumps of the lower arm still possess efficient pronation and supination, good results can be obtained with the "PROTH rotating hand". The rotating movement of the stump is transformed into a lever effect, which enables the artificial fingers to bend and stretch and thus to take up things and hold them.

b) With long stumps the construction of an artificial joint at the lower end of the arm can be used, as proposed by WALCHER. The mobilized stump end moves up and down thus bending and stretching, and in that way achieving an opening and closing of the artificial hand. This procedure was improved upon recently by Dozent SCHULZE at Hohenlychen.

c) The third method is the so-called KRUKENBERG arm. The idea of KRUKENBERG was to construct arm grip-pliers similar to the cleft hand, which opens and closes by the rotation of the radius. This ingenious idea has proven practical; the KRUKENBERG grip-pliers have the advantage over all other methods, that its bearer can feel and touch with the new hand and only needs a prostesis for special purposes. The KRUKENBERG grip-pliers are similar to the cleft hand, a living hand with a sure sense of touch. The indications for this operation are very limited, as in a great number of cases the stump is not sufficiently long.

d) Just as serviceable as the KRUKENBERG arm is the "voluntarily movable hand" of VANGHETTI. The principle is well-known. The muscles left on the stump are provided with ivory-pegs, one on the flexor and one on the extensor side, which are fastened into tubes inside the tissue. The "living power sources" thus obtained move the artificial hand. One great advantage is that its use is like that of a living hand, in antagonistic dependence on and harmony with the flexor and extensor muscles. This functional relation gives a muscle sense, which enables one to adjust the power to any desired degree. After a short time the patients learn to replace the lost touch of the living hand by using this muscle sense.

The value of this voluntarily movable hand has been proven with several thousand patients. Some objections raised formerly have been disproved. The tubes have to be inserted in the correct place and must be sufficiently wide to prevent necroses and inflammations, which can be very troublesome. The general principles of plastic surgery must not be neglected. Only a very small number of one-armed persons refused to wear their voluntarily movable hand, because the tubes were too tight, in the wrong place or inflamed. Sometimes the construction of the prosthesis was faulty. These mistakes can always be prevented now. One-armed persons may sometimes refuse to wear a prosthesis, as I have mentioned above; but the handless person must have a prosthesis. What is to be desired for one person is absolutely necessary for another one. Some cases of handless persons with long stumps of the arm below the elbow were provided with a KRUKENBERG arm on the one side and a voluntarily movable hand on the other. This arrangement gave good results. Possibly it will be the usual technique in the future.

3. Besides these cases of handless persons with long stumps, many persons are found with short stumps. The KRUKENBERG hand and the voluntarily movable hand cannot be used with these individuals. Other procedures are proposed for them:

a) The first scheme is to try an artificial hand moved by means of a BALLIF traction. This arrangement has not been particularly successful.

b) It is better to try to use the short stump as a lever for an artificial movable hand. The power available is rather strong, thus accomplishing a strong and secure taking up and holding of things. The bending and stretching movements in the elbow have to made with a shoulder strap for traction. Not quite the same results can be achieved by these patients as by those with long stumps, but anyhow a quite powerful though limited movability can be obtained.

4. It is most difficult to take care of handless persons who lost both their arms at the shoulder joint or slightly below it. Only if it is possible to utilize the muscles of the shoulder, especially the pectoralis muscles, and thus to provide sources of power for moving an artificial hand, and of the entire prosthesis by means of BALLIF tractions can a satisfactory result be guaranteed. LEBSCHE has especially proven, that by this procedure a considerable improvement of the patient's situation can be obtained. You will see some of these specimens later on.

5. If the patient still has half or even more of his arm above the elbow left it is possible to move a voluntarily movable hand by means of the biceps and triceps. Naturally the bending of the artificial arm at the elbow has to be accomplished by a shoulder traction strap. Although this group of double amputees can be promised quite satisfactory results by the described method, even they can not be compared with the persons who lost only a part of the arm below the elbow.

After this short description of the different forms of losses of hands and arms it must be mentioned, that it very seldom happens, that both arms are amputated at the same level. The practical problem is quite different. It may happen that the patient has a long stump of the arm below the elbow on one side and a short stump of the arm above the elbow on the other side. Another patient may have a long upper and short lower arm left. In any case the best device has to be carefully decided on. For instance the handless person may get a voluntarily movable hand on one side and a KRUKENBERG arm on the other side; or on the right side there may be a short lower arm stump used as lifting power, and on the other side a voluntarily movable hand may be attached to a long stump on the arm above the elbow. An appropriate choice of the correct method is the only way to provide the patient with satisfactory devices.

Then follows the introduction of 22 double amputees with different forms of lost arms. The efficiency of the voluntarily movable hand and the lever arm was demonstrated in the different forms of stumps. The demonstration of the KRUKENBERG arm was left to Professor KREUZ.

Specially admired were the cases of two persons amputated on both sides with only very short stumps left at the arm above the elbow, whom LEBSCHE has provided with pectoralis tubes, obtaining thus a surprisingly good result with the voluntarily movable hand, on account of the power of these muscles to raise the arm high.

9. The taking care of handless patients

by Professor KREUZ.

The name "handless persons" is now generally used for individuals injured in war or at their work, who have lost on both sides fingers, hands, parts of the arm below or above the elbow, or even the entire arm. Therefore it is necessary to specify different groups, as there are fingerless, handless, armless persons. Their treatment depends on very different facts with different chances of success. The treatment of fingerless persons is relatively simple. In most cases it is possible to split off the first (or the first and fifth) metacarpal bone and thus to obtain strong and reliable organs for seizing and grasping things which enable the patient to do almost every kind of work required in daily life.

More difficult is the problem of the operative treatment of patients who have lost both hands or parts of the arm below the elbow. The problem is not only the replacement of the lost hand or part of the arm by a prosthesis, but it must be remembered that even the best prosthesis is only a substitute for the lost hand, and cannot compensate for all its functional efficiency. It has been demonstrated several times and at different places, why a prosthesis cannot fulfil some requirements of function. We may take this fact for granted and will only add here, that in cases with both hands lost the defects of an artificial hand are much more irritatingly obvious.

What is the prosthesis able to do? It can seize and grasp. But it does not have sensation. If the patient only used the stump he has the advantage of feeling, but cannot seize and grasp. If we want to increase the efficiency of the prosthesis we must try to give a kind of sense of touch to it. If we want to improve the stump, we have to add a better capability of seizing and grasping things. We can obtain this result with stumps of the arm below the elbow in such a way that the ulna and the radius are separated, according to the procedure proposed by KRUKENBERG. It must only be observed technically that no muscles are cut away unnecessarily and that the arm is not split too far. Both mistakes may weaken the power of the parts of the arm supposed to seize and grasp. There are only two practical procedures for the treatment of persons whose arm is amputated below the elbow. In cases of amputees on the one hand who come from intellectual professions, and for whom a prosthesis promises good success, the method of SAUERBRUCH and his prosthesis is the best. In cases of manual labourers and mechanics we regard the use of the stump as the most efficient, even with one-side amputees, possibly the stump provided with simple devices or changed into a prehensile arm. For the great group of handless persons who have sufficient stumps of the arm left, the change of the arm into a prehensile arm is the best means to obtain independence or ability to work again. The possibility for the use of this method is limited to stumps which still have one third of their original length. Handless persons from intellectual professions are very successfully provided with a KRUKENBERG arm on one side and a SAUERBRUCH arm on the other one.

This article cannot give a detailed description of the difficulties encountered in the training of this prehensile arm or mention all the different ways for a successful reemployment of the patient. This matter will be discussed in our other publications.

We regard it, however, as our duty to point out these difficulties. Providing the handless persons with a prehensile arm is not only a matter of technical surgery. Of course the incidations for a correctly made intervention have to be observed and the operating surgeon

must know the sources of mistakes which may occur, and which may technically jeopardize the success. But the fact has to be stressed as well that the final result depends to a great extent upon the subsequent training and the directions given for the use of the prehensile arm. Therefore the way in which the regular occupation of the patient can be attained, has to be accompanied with a realization of the difficulties to be encountered. Our work can only be successful, if the patient himself has the stubborn will to overcome all these difficulties. Therefore we always leave it to the decision of the patient, whether he wants the operation for the KRUKENBERG arm to be performed or not. The advantage and usefulness of the prehensile arm was demonstrated to those men by their fellow patients. Finally the ideal advantages as well as the disadvantages have to be mentioned which occur in the use of this device. An important advantage is that its owner is independent of any prosthesis and thus achieves the greatest possible independence which can ever be reached by amputees. It does not matter, whether the patient may use a prosthesis sometimes or in public or not. The decisive fact is that he really does not need an artificial hand. One disadvantage is the mental depression caused by the ugly appearance of the prehensile arm. But even so far as this point is concerned, the prehensile arm, as we are able to construct it at the present time has many advantages over the previously used form which looked like a stork bill. The relative shortness of the tong-like parts give a better appearance to the arm. We dare even to declare that a lessening of the aesthetic appearance is not so important as the gain of the greatest possible independence of the patient provided with this device.

D i s c u s s i o n :

R. SCHULZE: The ideal of a voluntarily movable artificial hand is the SAUERBRUCH hand. The usefulness of the KRUKENBERG arm cannot be achieved by any other device. Both procedures require another amputation on too long stumps of the arms. I considered it as important to preserve these peripheral parts which were considered as useless for these methods, and moreover the preservation of the completely closed long stump of the lower arm as a functional unit. This would enable the muscles to retain their usual collaboration of power, tension, and sensitivity. It is a well-known fact, that muscles can only obtain the highest efficiency, if they act over a joint.

Therefore I provided the unshortened stump of the forearm with an artificial joint attached to both lower arm bones, to give the muscles the possibility to bend and stretch with the most efficient power. The dorsal and ventral flexion of the segment acting with considerable force is an excellent source of power for accomplishing the opening and closing of an artificial hand. I used a different method from WALCHER's who resected a large part of the ulna and applied a pseudarthrosis on the radius. This so-called artificial thumb was pressed into a metal plate to secure an strong grip. Thus he did not transform the movement of the segment into an active closing of the fist or active opening of an artificial hand. Moreover the functional unity of the stump was lost by the loss of the ulna.

The process of operation for the construction of the pseudarthrosis is simple: ulna and radius are exposed by two small incisions into the tissue laterally about 6-8 cms from the end of the stump, from both bones a piece is resected of 1½-2 cms length including the periosteum. Fat tissue is placed between the bone stumps without sewing it in position. The prosthesis is first roughly constructed.

By a lever transmission the motion of the distal segment is transformed into an opening and closing of the artificial hand. Up to now I have treated 40 amputees in this way. After careful consideration (the stump of the arm must not be shorter than 2/3 of the total length) this procedure is superior all the other methods. It does not limit the use of the SAUERBRUCH tubes or the KRUKENBERG arm. The segment of the limb, which formerly was regarded as useless has been utilized. The main advantage is the absolutely closed stump of the lower arm. The muscles work again on a natural insertion and work over a joint which gives the changing equilibrium for tension and counter-tension in regulating the tonus.

IV.

PROCEEDINGS OF THE CONSULTANTS' COMMITTEE ON DERMATOLOGY

Translation prepared by:

U. S. Naval Technical Unit, Europe, (Medical Section)
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1. New results of chemo-therapeutic research.

Dr. Dr. KIMMIG

The further development of chemo-therapeutics within the group of sulfonamides has come to certain conclusions in the last few years. It has become evident that of all the compounds only three groups answered the purpose: the sulfathiazoles, the sulfathiodiazoles, and the sulfadiazines. Of the sulfathiazoles the best compound is the sulfanilamidothiazole (Eleudron, Cibazol), in the group of the sulfathiodiazoles the most effective and most compatible is sulfanilamido-ethyl-thiodiazole (Globucid); the sulfadiazines have as their most effective compound sulfanilamidopyrimidine (Pyrimal, Debinal). With the last group, the difficulty of preparation has still to be overcome. These three compounds can be used equivalently for all indications as for sulfonamides. "Prontosil rubrum" and sulfanilamide have, compared with the above mentioned compounds, too harmful an effect and therefore are not to be used any more. Among the sulfones, diamiodiphenylsulfone is the most effective. Use of this compound with human beings is impossible because of its high toxicity (methemoglobinanemia, (sic) gastro-intestinal anemia, etc.). Tibatine, derived from it, though detoxified, is extraordinarily ineffective.

A new group of highly effective chemo-therapeutic substances has been isolated from Ascomycetene, particularly from some kinds of Aspergillus and Penicillium. The most effective compound is penicillin, detected by FLEMING in 1928 in Penicillium notatum. Penicillin arrests the development of streptococci, staphylococci, pneumococci, gonococci, and diphtheria bacilli even in dilutions of 1 : 1 000 000 to 1 : 1 000 000 000. In 1940 CHAIM and his assistants were successful in isolating it by a rapid extraction of nutritious liquids from the fungus with amylacetate at pH 2,5. By a further purification and "chromatography" on aluminum oxide a compound could be obtained with the empiric formula $C_{24}H_{32}O_{10}N_2Ba$. Penicillin is a strong acid with two carboxyl groups; the compound is dextrorotatory for polarized light. On the basis of the absorption spectrum aromatic rings could be eliminated in the penicillin. The structural formula is still unknown. Experiments with animals showed a chemo-therapeutic effect with the streptococci-, staphylococci- etc. infection in mice. The dosage amounted to 7 - 30 milligrams per 20 grams of mouse body weight of a compound which contained only 10 per cent of pure penicillin. The penicillin is standardised on an arbitrarily chosen unit, the so-called Oxford-unit. A penicillin solution contains one Oxford-unit per cubic centimeter, if it produces a sterile circle with a diameter of 24 millimeters in the test auxanogram. Most of the compounds contain 15 000 Oxford-units per milligram. Penicillin was used with excellent success with:

1. Acute and chronic infectious diseases, particularly with bacteremia which were caused by hemolytic staphylococci, streptococci etc. With acute infectious diseases the dosage amounted on an average

to 15 - 20 000 Oxford-units with the first dose, subsequently 5000 units per hour for 7 days, with chronic diseases 10 000 units every 2 hours or 15 000 units every 3 hours.

2. Gonorrheas resistant to sulfonamides, dosage 10 - 15 000 Oxford-units every 3 hours, intravenous or intramuscular, or five divided doses of 20 000 units within 24 hours.

3. Meningococci- and pneumococci meningitides. Intracisternally 2 doses of 10 000 units per diem, and intravenously, or intramuscularly 20 000 units were administered in this case. Pneumonia was treated according to the effect with 60 - 90 000 units a day for 3 - 7 days.

The compound is well absorbed; (side effects, fever and urticaria) are probably due to contamination. VON-KENNEL, KIMMIG, and LEMBKE demonstrated the presence of such substances in a large number of microbacteria. They proposed the name of "Mycoines" as name for this group. DUBOS and his assistants isolated "Gramicidin" and "Tyrocidin" from bacilli breves. "Gramicidin" acts extraordinarily stronger on gram-positive micro-organisms, 1 gamma arrests the development of a billion of bacteria. "Tyrocidin" apparently acts on gram-positive as well as gram-negative micro-organisms. Both compounds can be administered therapeutically only locally since they are too toxic both for the animal and the human organism. WAKSMAN and WOODZUFF isolated "Actinomycin A and B" from an Actinomyces-culture. Actinomycin arrests the development of gramposi-tive bacteria even in dilutions of 1 : 100 000 000. This compound can be administered only locally, since it also is too toxic for the human organism. "Notatin" which was isolated by COULTHARD from Penicillium notatum Westling, is a ferment that acts even in dilutions of 1 : 1 milliard on staphylococcus aureus, is, however, inactivated by catalase. "Notatin" is probably an oxydase which is active through the hydrogen peroxide developing during the oxidation of the glucoses by gluconic acid. "Patulin" has been isolated from Penicillium patulum and its constitution has been explained by RAISTRICK. It is anhydro-3-hydroxo-methylen-tetrahydro-pyrone-2-carbonylic acid which, in concentration of 1 : 64 000, arrests the development of the staphylococcus aureus. Hitherto good results have only been obtained by GYE with colds of the nasopharyngeal area. The preparation was administered locally in the form of a solution of 1 per mille. The toluquinones "Spinulosin" and "Fumigatin" which have been known for a long time and were likewise isolated from fungi, are according to our own investigations, in contradiction to American authors, only slightly effective in the auxanogram and absolutely ineffective in experiments on animals. The "Blastocolines" which are capable of arresting the development of seeds, pollen, yeasts, and bacteria, are said to be effective even in dilutions of 1 : 400 000. Experiments on animals are not available. A compound of this group is the para-sorbic acid. (Hexen-2-olid-1,5). The pigments of the group of the phenazines, pyocyanine, iodinine, and chlororaphine, which have been isolated from bacillus Pyocyaneus, bacillus Chlororaphis, and Chromobacterium Iodinum, act as bactericides, but they are of no use chemo-therapeutically. The

mechanism of action of some chemo-therapeutic agents can be largely explained. The sulfonamides are all immediately active. Their action consists in removing the para-amino benzoic acid, which is essential to life for many pathogenic microorganisms. On the contrary, para-amino benzoic acid if concentrated more highly is capable of neutralizing the action of the sulfonamides. The Mycoines also act directly on the etiological agent of the disease. Particulars of the mechanism of action are not yet known. Antagonists to the Mycoines, particularly of penicillin, have not yet been found. The organic arsenic compounds (Salvarsan) used in the therapy of spirilloses likewise act immediately on the excitants; in contrary to the sulfonamides, however, the active substance with this group of compounds develops within the organism. In this case arsinoxides very probably are concerned, which operate through the obstruction of active Sulfhydril groups. The terms chemo-therapy, bactericide, and bacteriostasis are to be sharply discriminated from each other. According to VONKENNEL, chemo-therapy is an arresting of the function, bactericide is a destruction of the cellular structure, and bacteriostasis is the prevention of growth. On account of the chemo-therapeutic action of the sulfonamides with lymphogranuloma inguinale, which is considered as one of the virulent diseases, it is possible that even the group of virulent infections, though not susceptible chemo-therapeutically through sulfonamides, is so at least on principle. With tubercle bacilli, LEMBKE was able to ascertain an arrest of growth on culture media with the typus humanus, the typus bovinus, and the typus gallinaccus. The clinical investigations of lupus, made by VONKENNEL, proved an absolute ineffectiveness of sulfonamides.

2. Chemoresistance in gonorrhea and other bacterial diseases.

Oberstabsarzt (Major, M.C.) Prof. FELKE

Owing to its frequency and the easy accessibility of its excitants during the progress of the disease, gonorrhea proved a remarkable subject for the study of sulfonamide therapy. The gonococci are easy to test in the culture on ascites agar plates mixed with the adequate quantities of sulfonamide, as to their sensitiveness to sulfonamide or their resistance. These experiments yielded the following results:

1. The quantities of sulfonamide, required for the arrest of growth in the culture are in the range of the concentrations occurring in the organism.

2. The extent of the resistance to sulfonamide to be ascertained in the culture coincides largely with the clinical effect. Strains, resistant in the culture, show a far higher figure of therapeutic failures than strains of low resistance. This is shown by the following table:

figures of resistance:	0 - 3	4 - 6	7 - 9	10 - 12
number of patients :	77	29	37	79
failures among them :	2	10	21	63

Comment: The resistance ascertained in the culture rises from 0 to 12, the failures increase at the same rate.

The results described in paragraph 1 and 2 are considered a confirmation for the working hypothesis on which a real chemo-therapy is based, i.e. that the action of the sulfonamides consists in a direct attack on the bacteria. Therefore, one can properly speak of a chemoresistance of the gonococci in a great number of the failures. Investigations with meningococci in a small number of cases indicate the same conditions.

3. Many, though not all strains of gonococci, meningococci included, can be inured to increasing quantities of sulfonamide in the culture. An increase of chemoresistance was observed in cases where repeated doses of sulfonamides were used because of the failure of the usual sulfonamide treatment.

4. The amount of resistance to sulfonamides as well as the ability to develop it or its absence is a peculiarity of the strain. It is recorded in passages on plates and with transmission to the partner. The following table shows the results of the examinations of partners:

51 pairs = 102	patients showed rapid cure,	expected 26,64
34 pairs = 68	patients were failures,	expected 27,65
20 pairs = 40	patients responded variably,	expected 52,71

The medium errors as regards the three expected values are respectively:

0.488, 0.488, 0.976.

The discrepancies between observation and expectation considerably exceed the degree of accidental variations. Certainly, a greater number of equally reacting partners has come together than would have been expected in the case of any accidental mixing. (The evaluation of the figures was undertaken by Dr. von SCHELLING, who on this basis ascertained the share of the strain in the course of the treatment to be two thirds, that of the organism to be one third).

5. Under the influence of a treatment of gonorrhea with sulfonamide extending over a number of years, a relative increase of the chemoresistant strains has occurred. This is illustrated by the following figures:

1938/39 Among 140 strain tests, 22 strains were found with a figure of resistance in the range of 9 to 12.
1943/44 Among 222 strain tests, 94 strains of the same resistance were detected.

The resistant group has risen from 15 to 42 per cent. From the clinical point of view a considerable increase of the failures corresponds to these findings.

In order to explain the phenomenon of chemoresistance, the following facts may be stated: American authors have proved, that a strain of staphylococci adapted to sulfonamides, after the adaption forms up to 80 times as much p - amino benzoic acid (PAB) as before. Since the PAB counteracts the sulfonamides, as is well known, the mechanism of chemoresistance might be due to this altered metabolism. For these bacteria, however, which react best therapeutically, i.e. the gram-negative diplococci and the pneumococci, the importance of the role of PAB has not yet been ascertained. In these cases also it acts in the culture as an antidote, but considerably less than with streptococci and coli bacteria. In the living organism the PAB effect can be obtained by the use of higher doses; with pneumococci it is more difficult to obtain, and with gonococci not at all.

In our own experiments chemoresistant gonococci did not produce an anti-sulfonamide factor in sufficient quantity to be ascertained biologically (see also KIMMIG). It is quite possible that the PAB has two independent qualities, being on the one hand a factor promoting growth with certain bacteria, on the other hand acting as anti-sulfonamide factor. If so, an explanation of the influence of sulfonamide as a substance eliminating the PAB factor of growth would no longer apply to all bacteria concerned.

In particular it would not explain the chemoresistance with pneumococci and gonococci.

The antagonistic effect of PAB may, however, explain the unsatisfactory result on some other bacteria even under favorable conditions which permit an abundant formation of the PAB. Streptococci in the tissue of erysipelas with a satisfactory blood supply and free of metabolic products such as PAB, are affected, while the same bacteria in a septic suppurative focus with stagnant environment escape the effect of sulfonamide. The different reaction of the

coli bacteria in the wall of the bladder and in the intestines might also be compared to this.

This variation in the effect produced on the same bacteria is in these cases dependent on the milieu and is not necessarily due to chemoresistance.

The presence of the latter with gonococci leads to the conclusion that it should be possible to avoid their formation by an appropriate, i.e. by a sufficiently high dosage, and to remove the primarily resistant strains altogether, probably by combined methods. With meningococci and pneumococci, the indiscriminate use of the sulfonamides at any increase of temperature may have the effect that chemoresistant strains develop or are left over on the mucous membranes which may occasionally cause resistant infections of accidental carriers.

The mechanism of the resistance to medicine is - as is well known - largely explained as concerns protozoa. It consists in a change in the membrane which prevents the absorption of the medicine. A corresponding parallel as regards bacteria has not been proved. Therefore, one should speak of the chemoresistance of the bacteria in contrast to the medical resistance of the protozoa.

3. Treatment of acute gonorrhea.

Stabsarzt (Captain, MC.) Prof. PROPPE

The question is no longer one of finding the smallest possible dose for healing gonorrhea but rather how to detect the strains most resistant to sulfonamides. The compatibility of the sulfonamides sets a limit here. A dose of 6 to 7 grams per diem for three days has been proposed. The chemotherapeutically important phenomenon of the development of gonorrhea, which occurs in the presence of the sulfathiazoles after failure of the treatment, again raises the question, which would be the most favorable moment for the beginning of the chemotherapeutic treatment. A delay of the beginning of treatment does, however, not seem to be required for the time being, since positive disadvantages are not known even with a failure of immediate treatment. The gonococci might indeed become accustomed to the sulfonamides by an untimely beginning of the treatment; since, however, systematic determinations of resistance concerning this question are not available, it is impossible to determine to which degree cases of failure and cases treated before without success, were not from the very beginning caused by strains resistant to sulfonamides.

Approximately half of the fresh cases of gonorrhea are still cured by sulfathiazole. It is, therefore, not indicated to recommend energetic measures (Olobintin, Pyrifer) from the first as a standard treatment for the improvement of the initial successes and as an aid to chemotherapy. Only when the first course fails, is the second one to be combined with Olobintin or Pyrifer, in which case the action of the fever seems to be decisive. It is, therefore, essential to administer the therapeutic agent (sulfadrug) at the same time as the fever. It is, however, to be remembered that the temperature in the urethra is lower than the general body temperature, and in fact the difference is the greater, the higher the body temperature. This fact accounts for failures with fever treatment alone.

4. Sulfonamide resistance in gonorrhea.

Oberfeldarzt (Lt.Col., M.C.) of the Police
SCHLOCKERMANN

The treatment by sulfonamides or sulfathiazoles carried out and improved systematically since 1937 in the dermatological department of the "Staatskrankenhaus der Polizei" (National Police Hospital) led finally, in 1941, to a rate of success of 97.6 °/o (!). In 1942 a slow and in 1943 a rapid decline of successful results set in. The rate of failures increased 1941-1943 from 2.4 to nearly 40 per cent. Not only did a marked increase of chemoresistant cases of gonorrhea occur, but the treatment of these failures by Olobintin (40 per cent) was successful in only about 50 to 60 per cent of the cases. The rest of them had to be treated in the manner known before the era of chemotherapy. In the failures, however, the question was not one of patients with traceable local foci. A reexamination of the cases according to the view-points of geomedicine did not clear up the matter. The biology of the strain of gonococci is of importance with regard to the cases of partners and the equal clinical course with several infections from the same source.

Already after the first unsuccessful course: fever treatment (Olobintin of 40 per cent, Pyrifer, vaccina), and in addition to this, irrigations with weak silver- or potassium permanganate solutions. Even during or immediately after the parenteral treatment, one or two other chemotherapeutic courses. Careful local search for latent foci and their intensive and conservative treatment. The immediate treatment of acute gonorrhea with Olobintin strong and immediately followed with chemotherapeutic drugs (WAWERSIG) yielded very good results. This therapy necessitates the patients remaining in bed most of the time. Hospitalization in areas highly exposed to air raids has therefore brought about considerable difficulty in moving the patients to air raid shelters, bunkers, or cellars (often several times a day).

5. Some remarks on the chemoresistance of gonorrhea.

Oberarzt (1st Lt., M.C.) WAWERSIG

The idea of a primary "resistance of gonorrhea to sulfonamide" was corroborated by experiments very early. In the meantime it has been proved more than once that there are other gonococcus strains besides these, which have become resistant by getting accustomed to sulfonamide, "secondary resistance", in which the gonococci are not influenced by a change of the preparation. A third kind of sulfonamide resistance could be assumed on the basis of the antisulfonamide action of para-amino benzoic acid, although clinical tests did not confirm these results.

It is not possible to consider the food conditions as the cause for the decreasing effectiveness in the case of gonorrhea, which is proved by convincing counterevidence from the occupied Eastern area and neutral countries. The cause is probably to be seen solely in the increase of chemoresistant gonococci strains, the transferable chemoresistance on the one hand and the strains becoming rarer which are easily influenced, make probably a further decrease of primary cure in the future.

Eleudron (Cibazol), Pyrimal, Debenal, Globucid are considered nowadays as the most effective sulfonamides. In the combination of Globucid with Pyrifer after a certain scheme, a method promising success could be found for the treatment of resistant strains of gonococci difficult to influence and lying at the so-called border of resistance.

Olobintin (40 per cent) as a non-specific stimulating therapeutic agent combined with sulfonamides seems to be the most successful at present. WAWERSIG treats only fresh cases of gonorrhea, by giving intramuscularly 1.0 cubic-centimeter "Olobintin strong" on the first day of treatment and adds the sulfonamide dose as early as the second day. The irritation test takes place from the 7th day on with special regard to the prostatic findings. The patients may regularly be discharged on the 12th day and come back once a week for examination during the following 4 weeks.

Among 250 cases treated in this way, the remarkable success of 96 per cent cures could be otained. The formation of secondary resistant strains is avoided by this energetic treatment.

Discussion on the reports concerning gonorrhea:

VONKENNEL: We have looked for all possible causes of the increasing failures, and have thought e.g. of the sanitation which is frequently carried out by very different means. It is of no importance, and the so-called focal infections or complicated gonorrhea also cause only a small part of the failures. According to the manner of action of the sulfonamides an accomodation to the excitants is possible, which may even be promoted by the lower dosage and the use of less active compounds. In cases where these failures can still be managed by a simultaneous therapy of Pyrifer or Olobintin or sulfonamide, it is solely the fever which increases the mechanism of reaction. There is no non-specific

therapy of the stimulants. In spite of all catch-words it has not been proved by any clinical or experimental example. If the leucocytes increase after the use of Olobintin, this does not mean that these leucocytes have a share in the defense against an infection, just as the absorption of a dyestuff into the cells of the reticuloendothelial system does not prove that the system would be stimulated to the defense against an infection. On the contrary, its function is exhausted, and it is naive to try to intensify the action of the sulfonamide by an injection of India ink and charcoal, nor has the fever alone any effect whatever. There exists no curative fever, but it is only the combination of a rise of temperature and chemotherapy which leads to success, just as in cases of syphilis we nowadays combine malaria with bismuth and salvarsan.

LOEHE: While the curative success with the patients treated with sulfonamides since 1938 (total number of the patients more than 10 500) shows a steady increase in the curve, an extending slow decline is observed since 1943, even when the hitherto most effective sulfathiazole compound "Eleudron" is used. On an average from the total numbers of men and women treated with Eleudron, the figure of curative results dropped

from 88 per cent to 75 per cent after 1 dose of Eleudron
from 97 per cent to 87 per cent after 2 doses of Eleudron.

After Olobintin 40 per cent had been injected in my clinic in the beginning of the treatment according to the method of WAWERSIG to wit:

0.7 cubic centimeters with a woman,
1.0 cubic centimeters with a man,

an increase of the curative success up to 83.7 per cent after 1, up to 94.3 per cent after 2 sulfathiazole doses could be recorded again. This treatment, which has proved excellent, can be recommended for a quick restoration of the fitness for military service or for work even with a shorter time of treatment in the hospital, in spite of the above mentioned painful attendant symptoms (2 curves).

FUNK asserts the superiority of Olobintin and observed the best results after the use of 2 cubic centimeters of Olobintin 40 per cent. The pain after the injection was hardly more intense than after using 1 or 1½ cubic centimeters; the period of fever lasted two days longer which probably accounts for the better therapeutic result. Tablets were always administered on the 3rd day, that is, at its peak, when the fever becomes continous.

UEBERSCHAER: The advantage of the treatment of Olobintin combined with sulfonamides consists in the strict confinement to bed to which the patient is forced by the intense pain. The maximum temperatures after the injection are observed on the 2nd day. They vary between 37.5° and 39.° C. On the 5th and 6th day the fever reactions had disappeared in all the cases. Altogether 685 cases were treated in this manner, 87 per cent of which were cured by one dose, and this was increased to 92.4 per cent following the second dose.

VOHWINKEL: A report is given on 822 cases of gonorrhea patients treated in Oslo. VOHWINKEL in the beginning used Olobintin only with the failures, but later on he administered it immediately after the reception into the military hospital. Contrary to other authors he gives the high dose of 2 cubic centimeters Olobintin intramuscularly with a resultant fever which hardly ever rises to 39° C., but lasts for 8 days. A fresh dose of tablets is given from the 5th to the 6th day. VOHWINKEL does not believe that an important change of the organism is responsible for the favorable healing success, but he assumes that the absolute rest particularly of the sexual sphere is of great importance. The very violent pain must be endured because of the necessary shortening of the stay in hospital.

KRUSPE: Some doctors hesitate to use the primary treatment with Olobintin of 40 per cent strength before the beginning of each sulfonamide therapy of an acute gonorrhea (WAWERSIG) under the conditions of the front. In Russia it sometimes happened with units of cutaneous and venereal diseases near the front, that these patients had to be sent into action on account of the sudden penetration of our lines by the enemy, even though they were not yet cured. Going into action becomes impossible when the patients are confined to bed because of violent pain. The use of the Olobintin treatment 40 per cent depends entirely on the situation in the area where the unit for cutaneous and venereal diseases is stationed.

VONKENNEL: The production of the numerous sulfonamide compounds put on the market at present must be limited to some compounds which are known to have a reliable effect. The Consultants' Committee submits a resolution to the Chief of the Army Medical Services (Chef des Wehrmachtsanitaetswesens) and to the Chief of the Public Health Service (Reichsgesundheitsfuehrer).

Text of the resolution.

Just as doctors must be warned against using sulfonamides in cases of slight infections, a sufficient quantity of every form should be available for the physicians at the front and in the home country for use when properly indicated. Since there is no specificity between the different excitants and the different compounds of sulfonamides, the following drugs will be sufficient:

Eleudron - Cibazol,
Globucid Tablets and Ampullas,
Pyrimal - Debenal.

Therefore we suggest production should be limited to these compounds in order to increase it and to prohibit above all the introduction of new compounds, which do not imply any progress.

Furthermore the Consultants' Committee must insist on the availability of a sufficient quantity of bismuth, even at the cost of other compounds (e.g. Dermatol, bismuth mash for the radioscopy) because one can on no account dispense with the bismuth preparations (Casbis - Bismogenol) for the treatment of syphilis.

Directions for the treatment of acute gonorrhea and of recurrent gonorrhea.

(Addition to Information Paper Nr. XXV of Army Manual 209/1, Navy Service Manual Nr. 284, German Air Force Service Manual 800).

With the manner of action of the sulfonamides the possibility of a different limit of resistance and an accomodation of the bacteria to the chemotherapeutic agent is given. The increase of the failures observed in practice after the first course is due to these factors and is increased by the use of ineffective compounds and too small a dosage. Cibazol, Eleudron, Globucid, Pyrimal, and Debenal are a sufficient variety of compounds. Therefore, for the initial treatment of acute gonorrhea a course for at least three days of three times four tablets a day must be proposed. The tablets are to be taken under control of the medical personnel.

The failures are to be treated with a simultaneous fever- and sulfonamide treatment as early as the administration of the second course and great importance is attached to this simultaneous use. 1 cubic centimeter of Olobintin 40 per cent and Pyrifer (very scarce drugs) are recommended. A careful preliminary examination and support of the blood circulation are essentials of the fever treatment. Pyrifer is to be used in doses according to the reaction of the patient.

This simultaneous fever-sulfonamide treatment can be applied even as first procedure combining the best prospects for a cure with a shortening of the time of treatment so that in special departments this treatment usually reserved for failures can be recommended even as an initial procedure.

Title page for the Army Manual 209/1, Navy Service Manual Nr. 284, German Air Force Service Manual 800 are in course of preparation.

6. Ascertainment of the procreative power in the man.

Prof. STUEHMER

Certain questions in medical practice require the ascertainment of the procreative power in the man. They are:

1. Paternity cases force us to answer the question, whether it is "obviously impossible" that some man is the father of a child.

2. The childless marriage requires in every case the determination of whether or not the man is responsible for the childlessness before surgical measures are resorted to with the woman.

These questions start from various suppositions. The question is forensically decided in the sense of possible fatherhood whenever spermatozoa are found in the microscopic picture. It is far more difficult to ascertain the responsibility of the man for the childlessness of a marriage. The enclosed examination sheet which is used in the dermatology clinic at Freiburg shows which of various facts must be ascertained from the previous family history and from the individual history.

Even the psychological inhibitions which are partly caused by the conditions of wartime and the morbid effects of nicotine and alcohol, must be taken into consideration. Careful palpation of the sexual organs and a microscopical examination of the secretions of the prostate, the seminal vesicles, and the urethral secretions are necessary.

The ejaculated sperms must be examined according to a definite scheme. The observation of the fresh preparation alone is sufficient only in rare cases. In particular the mobility of the spermatozoa is often overestimated in importance. It is not necessarily an adequate criterion for deciding the question whether the patient is prolific or sterile. Men with temporarily immotile spermatozoa are able to impregnate and some with briskly moving spermatic cells may be sterile. Exact directions for staining are given. When evaluating the stained preparation it is necessary to ascertain how many normal, how many immature, and how many pathological forms are present. The propositions for a decisive judgement are recorded in 9 degrees on the examination sheet.

SPERMA EXAMINATION

Date.....

Polyclinic Nr..... Station..... Current Nr.....

Name..... Christian Name..... Date of birth..... Trade or Profession..... Address.....

Family History: Prolific Family..... Brothers and Sisters..... Children.....
Tendency to Twins in the Family, Remarkable Congenital Infirmities, Mental Diseases, Epilepsy etc.....

Personal History: Children's Diseases (Mumps)..... Tbc.....

Syphilis..... Wa.....) (Wassermann)
SG.....) (Saebs-George)
M. Tr.....) (Meinecke-cloudy)
M. Kl.....) (Meinecke-clear)
K.....) (Kahn-Test)

Diseases of the Bladder or the Kidneys..... Urethral Catarrh.....

Gonorrhea: When..... how often..... how long.....
Epididymitis on the right, left..... other complications.....

Accidents: Blow, push, contusion of the testicles

Sport : Football, hockey, cycling, motorcycling, riding

Tendency to nervous diseases: Professional..... in the family.....
Nervous Trauma: Shock, Fright
Alcohol..... Nicotine.....
State of Nutrition..... Loss of weight.....
Illegitimate Impregnation..... When.....

FINDINGS

General: General Condition..... Type of structure of the body.....

Conditions of the skin.....

Hairiness, Color.....

Hairiness of the Genitals..... Baldness.....

Genital: Praeputium..... Phimosis..... Hypospadia.....

	Urine I	Urine II	Casts	Epithelial	Mucus	Bact	Gon.
Urethra.....							
Prostata.....							
Seminal vesicle.....							

Picture of the Secreta

Testicle right..... Epididymis, right.....

Testicle left..... Epididymis, left.....

Varicocele..... Hydrocele.....

Cryptorchidism.....

Ejaculated: Discharged when..... Time..... Examination..... Time.....

Manner of discharging..... How long since the last previous time.....

Frequency of the coitus formerly..... and lately.....

Potency..... Libido.....

SPERMA EXAMINATION

	Ist on the...	IInd on the...	IIIrd on the...	Normal
Quantity				2 - 3 cm
Appearance				
Liquidation after minutes				5 - 10
pH				7,2 - 7,4
Number — Estimation				on an average
Number — Counting				1 - 200 millions
Mobility				
Duration of the Mobility — with 20° C.				72 hours
Duration of the Mobility — with 37° C.				18 hours
Morphology a) Normal Spermatozoa b) Immature Spermatozoa Spermatogenic Cells c) Abnormal forms				

A. Forensically: Fatherhood is possible if there are any living spermatozoa (Identification of person).

B. In case of childlessness:

I. Single examination sufficient only if there are obviously briskly moving spermatozoa in large numbers. Experience must show the importance of morphology.

II. In all the other cases an exhaustive examination two or better three times is required during intervals of abstinence of 10 days.

Decision:

1. Constant Azoospermia) 2. Constant Immobility)	Sterile
3. Occasional Azoospermia) 4. Occasional Immobility) 5. Distinct Oligospermia) 6. Slow Mobility)	Probably Sterile
7. Somewhat numerous spermatozoa, but only partly good mobility) and more than 25 per cent of) abnormal forms.)	Possibly Sterile
8. Somewhat numerous spermatozoa) of partly good mobility and) less than 25 per cent) abnormal forms.)	Probably prolific
9. Numerous mobile spermatozoa)	Prolific

Advice given to sterile men:

1. Irregularities of the spermiogenesis: Treatment with hormones is not entirely hopeless, but must be continued for a long time. (Hormones of the generative glands and the hypophysis, vitamine E.)

2. Prevention of the ejaculation of semen: By atresia on both sides. Surgical treatment is sometimes successful. Experiment recommended (also repeatedly) when spermiogenesis obtained. Artificial impregnation sometimes successful in case of failure of the surgical treatment.

Discussion:

WAWERSIG: Points out the necessity of the use of chemical means of reanimation if the spermatozoa seem to be immobile, in the microscopic fresh preparation. Immobility of the spermatozoa need not mean extinct vitality. The diagnosis of "necrospermia" therefore, should not be made too hastily. The method of reanimation by 10 per cent dextrose as suggested by KOELLIKER, is recalled to mind and reference is made to the modification lately recommended by JOEL (dextrose-solution of 5 per cent with a mixture of $MgCl_2$, $MgSO_4$, and $Mg(OH)_2$).

VONKENNEL: Nowadays we know, that, in ascertaining the procreative power of man, several factors are to be taken into consideration; but the practical importance of the subject is considerably limited, since we have not yet found a therapy for the cases of azoospermia, necrospermia, and oligospermia. A great number of the published cases are only apparent successes of a hormone therapy, and are simply the result of a second examination. People must be warned against an unlimited hormone treatment when young men are concerned: it may lead to an atrophy of inactivity of the gonads.

7. Endogenous Eczema.

Oberfeldarzt (Lt. Col., MC.) Prof. GOTTRON

Endogenous eczema does not mean that the attendant alteration of skin is to be attributed to a sensitization from within or on a changed internal readiness for reaction on the basis of changes of metabolism, but it implies a disease state due to a certain predisposition. Thereby the genotypical part of the phenotype is emphasized in comparison to the importance of the role of the associated factors concerning the clinical process. It is a matter of personal predisposition in which, besides the skin, other organic systems are affected by the progress of the disease.

The hereditary factor is to be seen in the manner of reaction which is characteristic of the individual. With the disease a hypersensitiveness can be proved with intracutaneous doses of skin tests. The materials contained in them, only rarely produce alterations in the tissue of the skin. The occasionally seen antigen - antibody effect cannot be used for an explanation of the phenomena of reaction in the skin. The influence of special conditions on these changes is, however, not denied. The decisive factor is an irritability of the nervous system which is shown e.g. by the fact that the manifestation may come about by an irritation of the central nervous system without any material cause from outside.

The nervous system of the patient is hypersensitive and therefore, amongst other things, the vagus is particularly liable to an abnormally strong reaction. Influences of the climate, e.g. the aero - electric potential difference may cause the manifestation while other climatic influences may lead to its disappearence. The fitness for active service should therefore not be decided until the success of the employment has been tested under other climatic conditions. Other irritants from outside too may lead to the manifestation.

In pathogenesis, other factors occasionally are important e.g. the inner secreting glandular system, the blood supply, the conditions of absorption in the stomach and intestines, and perhaps also the function of the liver. The development of the alterations in the tissues of the skin has many phases which again are manifold. Often a characteristic restriction to a certain area is found which varies in the single phases. The primary efflorescences in their turn are manifold and significant and are extremely eczematous, chronically urticarial and appear in the form of primary and secondary licheniasis. Intense itching is usually present.

Interesting, particularly from the point of view of the Army Medical Officer, is the juvenile cataract occurring in various combinations which is to be differentiated from the X-ray cataract. Belonging to this clinical picture are asthma, catarrhal conjunctivitis, hayfever, ulcerative colitis and sometimes perhaps also migraine.

The treatment is difficult, relapses are not avoidable. First to be taken into consideration is the symptomatic procedure, if no monovalent irritant is of outstanding importance which can be eliminated. The aim must be to influence the vegetative nervous system. One must see what can be achieved by irradiation of the paravertabral column of the sympathetic system, with Tannin and Atophan preparations and by fever treatment as well as by therapeutic anesthesia.

The predisposition does not limit the fitness for active service. The presence of L 3 (chronic diseases of the skin and its outgrowths, lesions of the skin, produced by frostbites) is to be considered, as a rule "fit for general service" may be assumed, possibly conditionally fit for service. During the evaluation patients are not to be judged under the climatic conditions of their home country but under the conditions of their new environment.

Discussion:

FRIEBOES: So far there does not exist a precise definition of the concept or of the picture of the disease which we for practical purposes call endogenous or constitutional eczema. Just because many such serious pictures of disease extending over a long period and occurring combined with lichenification in the form of lichen simplex or neurodermatitis, which seem to prove beyond doubt a most serious endogenous hypersensitiveness, all methods of differentiation of this kind which are at our disposal prove to be negative. And it is just for this reason that they are in my opinion the clearest cases of endogenous or constitutional eczema. But since we are not able in this as in many other cases to prove juridically and by sound reasons the matter of "endogenous or not", with the means at our disposal, there remains, unfortunately, for the final decisive examination in many of these cases only that quibbling or haggling about words which, though doggedly pursued, practically leads nowhere, in spite of the use of all possibilities of a philosophical interpretations of words and terms. In practice one has to rely on the general directions of experience and always consider that the patient's "constitution" may manifest itself in the form of an eczema at any time of life in very different forms and that it may be of very different duration.

8. The chronically ulcerous pyodermias limited in area, ecthyma simplex, pyoderma papillaris vegetans et exulcerans, and the ulcus cruris, without ulcus varicosum.

Oberstabsarzt (Major, MC.) Prof. FUNK

Ecthyma is a disease of the skin which is closely related to contagious impetigo and chiefly caused by streptococci. The clinical progress begins with a red spot, mostly with a small flat pustule on a red ground and dries up to a gray, brown, sometimes stratified crust while the edge of the pustule increases in redness and infiltration. Healing takes place with a depigmented or hyperpigmented scar. Complications occur only rarely and consist in lymphangitis, lymphadenitis accompanied by fever. Diphtheria, with the wellknown subsequent clinical results, was also observed. Besides the streptococci, more seldom staphylococci or mixed infection are to be considered as the cause.

Predisposing and provoking factors: Inadequate care of the skin, impossibility to change one's clothes and underwear. The area chiefly affected is on the legs below the knee as shown by such symptoms as the thin skin, acroasphyxias, and the unfavorable conditions of the peripheral circulation. The influence of the seasons: In winter asphyxia caused by the cold and by the friction of stiff frozen clothes, wet (rain, boggy water), in summer: sweat, and dust. Under the conditions of war, zoonoses, scabies, and pediculi vestimenti with lesions of the skin, caused by scratching, have a positive provoking effect. The diagnosis must exclude papulonecrotic tuberculids, erythema induratum "Bazin", and the late forms of syphilis.

Therapy: Mild cases are to be treated by the Field Medical Officer, severe cases, however, are to be sent to special hospitals, where delousing and if necessary treatment of the scabies will take place.

Because of the danger of auto-inoculation, the sound section of the skin round the area is to be protected by a drypainting with Rivanol of 1 per cent. For the further treatment of the ulcers 1 per cent Rivanol-Solution or similar zinc pastes will be used, also sulfonamide-zinc paste of 10 per cent. Frequent use is to be made of complete baths of potassium-permanganate (twice to three times a week). Slow progress with slimy exudate on the ulcer and fever suggests the suspicion of diphtheria.

The tendency of ecthyma to develop vegetations, leads to an atypical condition, particularly when it lasts for a long time and shows some tendency to healing.

Since the affection (described by E. HOFFMANN as pyodermia chronica papillaris et exulcerans) may develop most frequently after trauma to the limbs, also in amputation stumps, but also from an impetigo, a slight ecthyma, even from an infected herpes (DARIER), it is clear that pyodermia vegetans is more frequently observed nowadays than in normal times.

The picture of disease is characteristic only in its complete development, but then its essential components are unmistakable such as pustules, ulcers, spongy thickening of the tissue with papillary granulation, or scarred, central healing, or with an exuberant growth in the shape of a ring. Besides this, flat, purely papillary, or even verrucous, pyodermias are observed, often the size of a coin or even of the palm of a hand.

The differential diagnosis has to make sure that fungus affections, blasto- and sporotrichoses, trichophytosis, iododerma and bromoderma, tertiary lues, tuberculosis fungosa serpigmosa and verrucosa are out of the question.

The crural ulcer shows a very manifold picture; in the beginning the ulcers are small, round, flat, with a slightly secreting, discharging basis. If there are several of that kind, they run together and form polycychic arches; their bases then show greasy, necrotic, sometimes even gangrenous (Pyocyanic) coat. By a slow progress the borders of the ulcer are infiltrated and become gradually hard like callus. The location is almost exclusively confined to the lower third of the leg below the knee, especially the area of the malleolus.

The complaints may be slight, but also very violent. The causes are of a complex nature: constitutional conditions (flat feet, heredity); local circulatory conditions: hemorrhages, thromboses, and thrombophlebitis with focal infections may be the causes besides the manifold influences of the war which are predominent with soldiers.

The complications increase in a vicious circle from edema to elephantiasic or atrophic variations with hyperkeratoses and hemosideroses. A common complication is erysipelas in its chronic reoccurring form. A differential diagnosis has to make sure that late syphilides and erythema induratum, and sometimes even carcinoma are eliminated.

The therapy of the crural ulcer is successful if one manages to change the local conditions. If there is an insufficient tendency to granulation one must resort to the whole array of dermatology medicines (argent. nitr.-ointment, Pellidol zinc pastes (danger of sensitrization) irrigation with warm potassium permanganate solution, cautious doses of quartz lamp, zinc-gelatin dressings), particularly when the unfortunately rather frequent suspicion of an artificial prolongation of the state of disease should arise. Besides this, the customary local methods are used: fixation by means of the VOLKMANN-SPLINT, zinc-gelatin dressing, particularly when there is a suspicion of artefacts.

Directions concerning ecthyma diseases.

The so-called Russian ulcer in the leg below the knee, Wolchow ulcer, tropical ulcer is an ecthyma.

Ecthyma is a disease of the skin (cutis) which is closely related to contagious impetigo and is chiefly caused by streptococci. The clinical progress begins with a red spot, mostly, however, with a small flat pustule on a red and infiltrated ground. The pustule dries up into a gray, brown,

sometimes stratified crust, while the edge of the pustule increases in redness and infiltration. When the crust is removed, a thin, purulent or slightly bloody liquid is discharged so that a sharply outlined, granulating excoriation or ulceration covered with a gray coat in the form of irregular nodules appears. Healing takes place with a scar which may be depigmented or hyperpigmented. Complications occur only rarely and consist of lymphangitis, lymphadenitis, and attendant fever. Also diphtheria with the well-known secondary phenomena: pharyngeal diphtheria, flaccid paralyses, polyneuritis and myocardial injuries has been observed.

Besides the streptococci, staphylococci or mixed infection are to be considered as the causes.

Predisposing and provoking factors are: lack of care of the skin, the impossibility to change one's clothes and underwear, the skin of the legs below the knees is the most frequently affected area because of its thinness, acroasphyxias, and the condition of the peripheral circulation (including the complex of symptoms due to varicosities). The influence of the seasons: in winter;asphyxia due to cold and the friction of stiff frozen clothes, the dampness (rain, boggy ground), in summer; sweat and dust, are contributing causes. Conditions of war contribute to the development of zoonoses, scabies and pediculosis and the subsequent violent scratching may result in deep lesions of the skin.

The diagnosis must make sure that papulonecrotic tuberculides and erythema induratum "Bazin" and syphilis (late forms: tuberoserpiginous and ulcerous gummata) are excluded.

The prognosis is favorable.

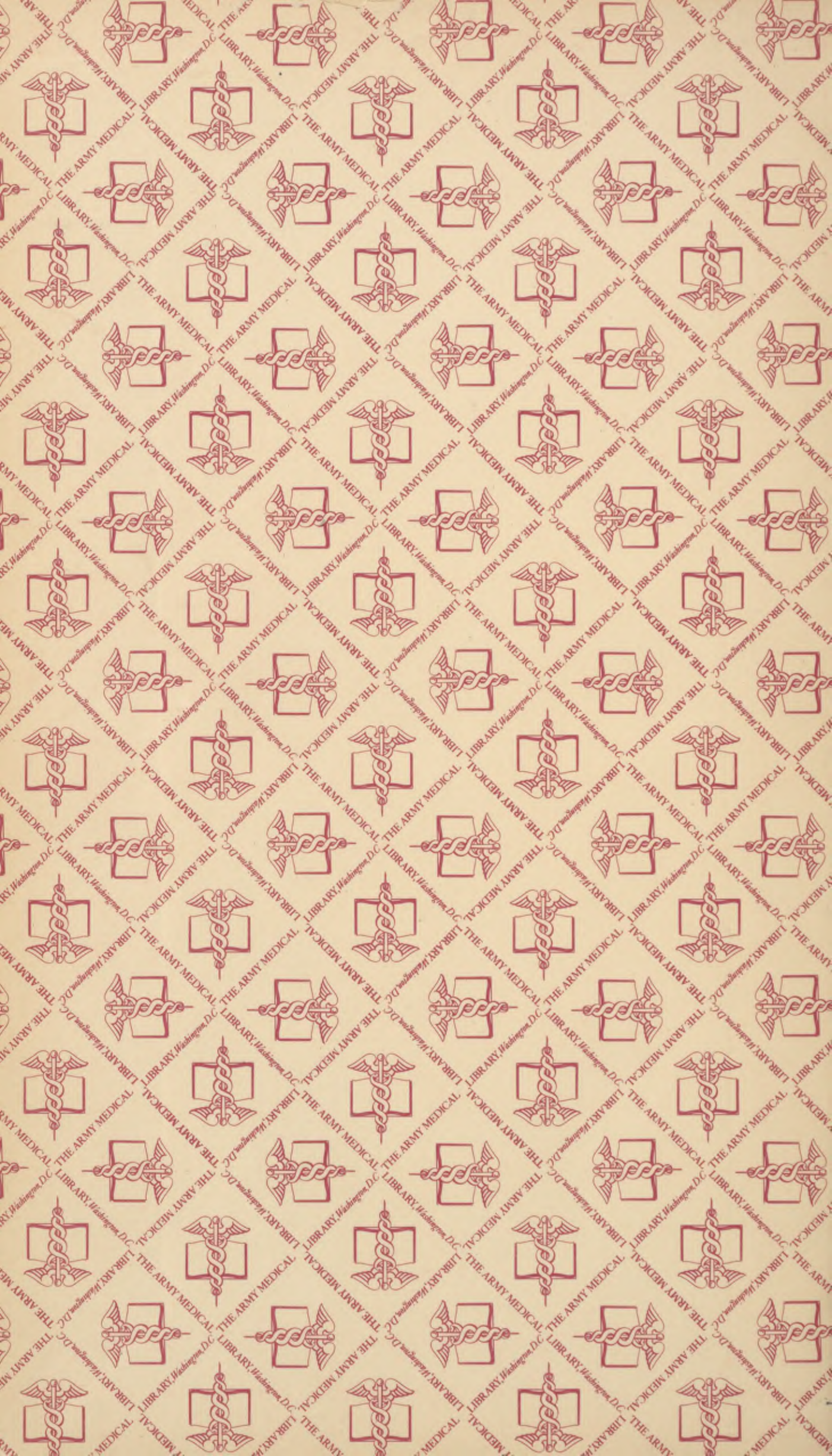
Mild cases are to be treated by the field medical officer in the sick bay; serious cases, however, are to be sent to special hospitals. The treatment requires at first a successful disinfestation and a thorough cleansing bath. If scabies is present at the same time, this must be cured first.

Rest in bed: The crusts and greasy coats of the ulcers can be removed easily in one or two days by means of salicylic vaseline of 5 - 10 per cent or "Rivanol" of 1 per cent by salicylic ointment of 2 - 5 or 10 per cent. Because of the danger of auto-inoculation it is recommended that the sound skin of the surrounding parts be covered with 1 per cent "Rivanol" paint. For the further treatment of the ulcers until the formation of new skin, one can use 1 per cent "Rivanol" or similar zinc pastes. Frequent use is to be made (two or three times a week) of complete baths of potassium permanganate. Slowly progressing ulcers with greasy films and fever lead to the suspicion of diphtheria. The use of serum is indicated only in case of complications (paralysis etc.) (sic).

9. The prophylaxis and control of fungus diseases of the hands and feet.

Geschwaderarzt (Senior Medical Officer of a "Geschwader (81 planes) of the German Air Force) Prof. MEMMESHEIMER

The number of soldiers and civilians suffering from mild and trivial hypomycosis and saccharomycosis is very great. Many of these trivial cases develop into serious, even very serious cases, particularly during the hot season. They keep the medical officers in the sick bays and in the hospitals busy and cause an incapacity for service of more or less long duration. If the large number of mild cases could be limited by simple measures, so that the serious diseases which make a man unfit for military service would disappear, the state of health of the troops could be materially improved. For the last few years the pharmaceutical industry has occupied itself particularly with the prophylaxis and treatment of fungus diseases by chemical means. It is necessary to test these preparations as to their inhibitory or fungicidal effect. Hitherto more than 40 remedies put on the market have been examined in the laboratories and clinics. According to this "Hexylresorcinol" butylized cresols, propionic acid and boric acid are the most suitable remedies. General hygienic measures, such as careful drying between the toes after every bath and every washing are combined in the army with the application of a bactericidal preparation. The most practical are "Phebroconserol" or"Ovis", since they are available in small packets. Prophylactic treatment is particularly necessary with the Labor Service and with recruit units, since many of these men infect themselves with worn and insufficiently disinfected boots and socks.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