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EDITED BY CHARLES P. NOBLE, M.D., Surgeon-in-Chief, Kensington Hospital for Women, Philadelphia.

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SURGICAL SHOCK.

BY CHARLES P. NOBLE, M.D.,
PHILADELPHIA,

Surgeon-in-Chief of the Kensington Hospital for Women.



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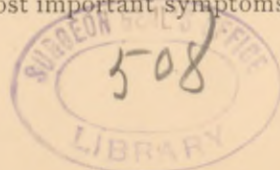
Surgeon-in-Chief of the Kensington Hospital for Women.

It is proposed in this communication to briefly consider the nature of surgical shock, and then to take up its treatment in detail. Shock is a condition of the body which is characterized by feebleness and rapidity of action of the heart, by the shallowness and frequency of respiration, by the lowering of the temperature of the body, and by the lessened activity of most of its functions. Intellection, digestion, and the secretion of urine all are more or less in abeyance. It is probable, also, that the processes of assimilation and metabolism are profoundly interfered with. Perspiration is usually free, the body being covered with a cold, clammy sweat. This, however, is due not to the increased activity of the sweat glands, but rather to an arrest of the activity of their cells, so that they simply act as strainers for the watery part of the blood to pass through them.

There can be no question that vitality is at a low ebb when shock exists, but there is some difference of opinion as to the real physiology or

pathology involved. It is generally accepted that shock is a manifestation of paresis of the nervous system, its symptoms being due to lessened and irregular innervation. The question as to whether the cerebro-spinal or the sympathetic system is most involved is in dispute, and we do not propose at this time to attempt the elucidation of the question. As a matter of fact, injury of the body in any of its parts can bring about shock. Injuries to certain parts of the body are especially liable to produce shock. These parts are the testicle and urethra, in the male, the ovary (in a lessened degree) in the female, and the abdominal viscera. Examples of shock from injury to these structures are common, and familiar to every one of experience. The familiar experiment of temporarily arresting the heart's action of the frog by a blow upon the abdomen is a striking illustration. Leaving aside the disputed points at issue, we wish to consider certain facts because of their very practical bearing upon the therapeutics of surgical shock. Among the most important symptoms of shock is

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the lessened force and greater frequency of the heart's beat. The activity of the respiratory centre, also, is much lessened. The superficial blood-vessels are contracted, so that the surface of the body is pale and even blanched. The temperature of the body is lowered below the normal. These facts are indisputable, and a recognition of the existence of these conditions forms the basis for rational therapeutics. Heat must be restored to the body; the heart and respiratory centres must be stimulated to do their work; and the superficial blood-vessels must be dilated, so that the circulation may be equalized by affording a channel for the blood which has been retained in the great veins of the abdomen. The practice which I have followed for some years to accomplish these results will now be given.

Treatment of Shock.—The most important point in the treatment of shock is its prevention. Much can be done by prudent management, either to avoid shock or to lessen its degree. In selecting the date for operation, a time should be chosen when the patient is in good condition. Almost always this is possible. It is only in emergency cases, and in patients who are suffering from a disease whose progress is steadily and rapidly downward, that preparatory treatment will not put them in better condition. All patients requiring operation should receive careful study, and every therapeutic indication should be met before operation. Especially should the condition of the emunctories be looked after. The bowels, skin and kidneys should be put in good condition by the use of baths, purgatives (especially broken doses

of calomel and salines), and the abundant ingestion of water. The *morale* of the patient should not be neglected, as much can be done, by stimulating the courage of the timid and allaying the fears of the despondent, to make the patient look forward to the operation with courage and without dread. All these matters should be attended to prior to the day of operation. The temperature of the room in which the operation is done should be high, from 75° to 85° F. In such a room the loss of heat from the patient by radiation is much less than when the operation is done in a cool room. Loss of heat from the patient can be lessened also by the manner in which she is dressed. It is best that she be well wrapped in blankets, and that as little of the skin surface be exposed to the air as the necessities of the particular operation permit. For the same reason the use of wet towels or gauze about the patient is to be deprecated. Evaporation from such wet materials chills the patient. Much can be done also by the proper administration of the anæsthetic. Patients should not be drowned in ether. Enough only should be given to maintain anæsthesia, unless to meet a certain indication, absolute relaxation is required. The prevention of hæmorrhage, and the avoidance of rough handling of the patient, especially of the abdominal viscera, are matters of the greatest importance in preventing shock. The careful surgeon gives due attention to each and all of these matters of detail, and no one so much appreciates their importance as he who has to deal constantly with grave operations. This applies especially to the abdominal surgeon, because, in many cases, when he begins an opera-

tion the life of the patient depends upon its completion. He cannot do a part of it and postpone the rest to another day. In many of the long, tedious operations which he is called upon to do, involving multiple visceral adhesions, the very life of the patient itself depends upon attention to every detail to prevent shock, so that he may have time to complete the operation *secundum artem*.

The active treatment of shock consists in supplying heat to the body which has been lost, in stimulating the heart to better work, in counteracting nervous depression and in overcoming irregular action, especially on the part of the vaso-motor nervous system, until reaction shall occur and the vitality of the patient can be sustained by alimentation. In describing the treatment of shock I shall simply give an account of my own practice in the treatment of this condition.

If during the operation the patient begins to suffer from shock and there is reason to expect that this will increase, especially when the operation is not yet completed, I begin at once actively to treat it. One-fifteenth of a grain of sulphate of strychnia and one-fiftieth of digitalin is given hypodermically, and the dose of strychnia is repeated every fifteen minutes until some improvement is manifested in the pulse, until a fifth of a grain is given. If improvement does not manifest itself promptly, and especially if shock be profound or if the patient has been markedly prostrated before the operation, a hundredth of a grain of atropia sulphate and two or three minims of a 1 per cent. aqueous solution of nitroglycerine are given hypodermically. In still other cases from three to six grains of

citrate of caffein are administered in addition. During this time hot-water bottles have been put about the patient, and if the operation is an abdominal section, at times warm water is poured into the peritoneal cavity. I have also employed hot beef-tea enemas, but, as a rule, an enema is not given, because it interferes with the completion of the operation, which is just as important as any one detail in the treatment of shock, if not more so. In fact, it is of the highest importance to complete the operation as rapidly as is consistent with safe work. The same is true of the after-dressing of the patient, who should be put to bed as promptly as is feasible.

The bed should have been warmed by having hot-water bottles in it while the operation was in progress, and in all cases in which shock is a marked feature, the sheets should be removed and the patient placed between warm, dry blankets. At this stage the use of whiskey by enema is of service, and at times it is proper to use whiskey during the operation, especially if shock is not another name for too much ether. The use of whiskey or alcohol in any shape is not good treatment for an overdose of ether. The best way to employ whiskey, as a rule, is to give it by enema with hot beef-tea, about two ounces of whiskey and six ounces of beef-tea. Dry friction with the hand or with a dry cloth, especially to the extremities if they are covered with clammy perspiration, will do much to bring about reaction, and also will lessen radiation from the surface by preventing evaporation of the perspiration. Morphia in small doses, one-eighth of a grain or less, is also

useful as a heart stimulant and as an anodyne, if, when the patient becomes conscious, there is marked pain. The morphia not only acts as a stimulant itself, but prevents depression which would result from severe suffering. So much for the immediate treatment of shock. Under ordinary circumstances, when the shock is marked and yet not so profound as to be alarming, within half an hour strychnia can be pushed to a fifth of a grain, atropia to a fiftieth, caffein to five grains or more, and digitalin to a twenty-fifth of a grain, or what is really better, tincture of digitalis to half a drachm, with the fiftieth of a grain of nitroglycerine.

If the crisis passes and yet the patient remains in a markedly depressed state, the question of treatment for the ensuing twenty-four or forty-eight hours comes up. The use of external heat should be continued until the temperature of the body becomes normal, and even longer should the patient complain of chilliness. But the sheet-anchors of safety are strychnia, digitalis and whiskey. In a marked case it is my habit to give the following order: To give hypodermically sulphate of strychnia, one-thirtieth of a grain one hour; tincture of digitalis, fifteen drops, with the one-fiftieth of a grain of nitroglycerine, the next hour; three grains of citrate of caffein the third hour; and an enema of whiskey, two ounces, and beef-tea, six ounces, the fourth hour. This order I have had carried out many times for twenty-four, forty-eight and even seventy-two hours. In the worst of cases, for its temporary effect, cocaine has been employed in addition to the above, also small doses of morphia if much

pain and especially if great restlessness were present. It is my experience that most patients will take a fifth of a grain of strychnia in twenty-four hours without manifesting symptoms of strychnism. I have not employed the heroic doses of strychnia described by some writers, such as half a grain within two hours, but in a desperate case, watching it carefully, I should not hesitate to give repeated doses of one-fifteenth of a grain every half-hour for a short time until some symptoms of irritation appeared. We certainly have no more reliable exciter of the nervous and muscular systems than strychnia, nor any drug which is more capable of maintaining its effect.

Digitalis is also a very reliable drug in the treatment of shock. It is capable of whipping up the heart to increased work, especially for a few days and until a sustained effect can be secured by alimentation. This is exactly what is required in the treatment of shock. Digitalis has, however, one effect which is undesirable. It causes a contraction of the arterioles, and thus increases arterial pressure, so that, while it whips up the heart to do increased work, it also hinders the heart through the increase in arterial pressure; hence, it is wise, in the treatment of shock, to combine digitalis with nitroglycerine, which overcomes this bad effect of digitalis. The combination is much more effective than either drug alone. Caffein is a pure heart stimulant, and can be administered freely without evil consequences. Alcohol used judiciously and in not too large quantities, is one of our most important remedies. In shock following abdominal operations, it is best administered by enema combined

with beef-tea, which is itself a stimulant. Later in the case champagne by the mouth is often of service, but it fills only a partial indication and is not to be compared in value with whiskey when this can be ingested and retained.

The management of the diet in the treatment of shock is also important. Immediately after an operation accompanied by much shock, the stomach, as a rule, is not retentive; hence it is wise for a time in no case to administer much aliment of any description by mouth. Some hot black coffee or hot beef-tea is as much as should be given. When the stomach becomes retentive, light, easily assimilable food should be employed, as beef-tea, broth, milk (preferably peptonized), egg-nog, punch, etc. These foods should be administered in small quantities frequently repeated. The question of alimentation in the treatment of shock following abdominal operations offers certain peculiar difficulties. Under ordinary circumstances, when shock is not a special feature, it is the rule to administer no food to the patient, who has had a coeliotomy, for from thirty-six to forty-eight hours after the operation. Then broths or beef-tea from two drachms to one ounce, or two drachms of milk with one of lime water, are given every half-hour, and if retained the quantities are increased and the intervals lengthened, until about the fourth day after operation the patient is put upon liquid diet, the amount being regulated largely by the appetite. But in cases accompanied by marked shock, if the stomach proves retentive, it is wise to begin the administration of milk or beef-tea at the earliest feasible time, the quantity

being increased as rapidly as in the judgment of the surgeon the patient is able to digest and to assimilate. In some critical cases lives will be saved by judicious alimentation, which would be lost were the usual rules, applicable in abdominal surgery, followed.

It may be questioned whether the term shock should be applied to conditions which persist for one, two, three or more days. It is customary to consider that shock is of temporary duration, and that it ends either in the prompt death or in the recovery of the patient. But there are cases in which it is difficult to assign a name for the condition of patients, if it be not shock. I refer to those cases in which the patient exhibits marked shock after operation, and in which, although after a time the temperature of the body becomes normal and remains so, yet the patient's vitality remains at a very low ebb, the pulse continues rapid, small and feeble. The cutaneous circulation is not restored, the surface of the body being cool and pale; and where no other symptoms are present, except those of pronounced asthenia. This condition must be called shock, or else inanition or asthenia following shock. The condition persists until it is relieved by alimentation, as the nerve and heart stimulants, strychnia, digitalis and even whiskey, are not curative. I have had patients to die in this condition as long as a week after operation, without having manifested other symptoms than those of pure asthenia, and in which the post-mortem examination showed no cause of death. On the other hand, I have seen patients recover from this condition, improvement becoming mani-

fested upon the third, fourth or fifth day, when it had appeared that death was imminent from failure of the heart and respiratory centres. It is in such cases that judicious alimentation is of the highest importance.

In this class of cases the administration of oxygen gas by inhalation, is at times of service. All the vital functions are at such a low ebb, that any agent which is capable of improving the processes of metabolism is of value. My experience with the use of oxygen for this purpose is limited to one case, which was one of marked shock following an operation for dou-

ble pus-tubes, in a woman reduced to the last extremity by hectic. She went to bed with a pulse of 180, with cool and blue skin, and every other evidence of the profoundest shock. The pulse did not fall below 145 for three days, near the close of which period there was every indication of early death from pure asthenia. The plan of treatment already detailed was followed out in her case, and in addition oxygen gas was administered during one day. It seemed to be of great benefit; at all events, she passed out of the shadow of death and made a good recovery.

