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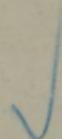
UPON

Granulations of the Conjunctiva.

BY

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*From the "Archivès Générales de Médecine." Translated
by Miss A. V. Culbertson, Zanesville, Ohio.*

SYNONYMY.—Conjunctival granulations; granulations of the palpebræ; Egyptian ophthalmia; military ophthalmia; ophthalmia of armies; hypertrophy of the papillæ; trachoma; aspritudo.

Upon glancing over the numerous synonyms which we have enumerated, it would seem that great confusion exists in relation to this subject. This disorder in truth does exist, even in our day and throughout our country, under the name of granulation of the conjunctiva; whereas, granulations of the conjunctiva are separable into two distinct forms.

Another source of this difficulty is that the malady has been thought by some to be endemic to certain countries or premises; but this supposition, is fictitious and results from a false interpretation and imperfect hygienic measures.

In giving an account of the first of these causes of error, it will be sufficient to glance over the recent works relative to this subject.

We notice at once that those who have attempted a description of this ophthalmia are much mistaken in grouping under one name two affections absolutely distinct. Thus, Professor Gosselin gives the following definition of conjunctival granulation:

"In France," says he, *"we thus denominate the numerous red protuberances of a round form which appear upon the surface of the palpebral conjunctiva, in quite a number of cases of chronic blepharitis; and we recognize that of these, some are consecutive to suppuration of the conjunctiva, while others appear after non-purulent blepharitis."*

Still more recently, M. Hairion, professor in the University of Louvain, while seeking to avoid this confusion fell into new trouble in the nosology of granular ophthalmia by describing as neoplasms, transformations that take place in one of the states that have hitherto been described under the collective name of granulations of the conjunctiva.

This point once established, even from a simple cursory view, we should observe, first, that there exists in what has been described under the name of granulations of the conjunctiva two states absolutely different, and that the confusion has been caused by the great analogy between the determinative causes of both states, by a certain similarity in their symptoms and the secondary derangements which they occasion, as well as from the fact that the name "granulation" has been applied to both.

This confusion moreover arises because histological acquaintance with the normal and pathological structure of the conjunctiva has remained even to this late day inaccurate; in fact, under the name of granulations have been included:

1. Exaggerated development of the papillæ of the conjunctiva.
2. Engorgement of the lymphoid cellules contained in the fundamental reticulated conjunctival tissue, or the adeniform tissue of this membrane.

It will be seen by this short preamble that our intention is to describe separately:

1. Exaggerated development of the papillæ, papillary hypertrophy (papillary trachoma, Stellwag de Carion), or rather hypertrophic engorgement of the papillæ, as we propose to call it.
2. Granulations properly so called, acute granulations, vesicular granulations (Hairion), trachoma (properly so styled by the Germans), or engorgement of the lymphoid cellules.

HYPERTROPHIC ENGORGEMENT OF THE PAPILLÆ.—*Objective symptoms.*—If we examine the internal surface of the palpebræ, we shall

find the entire surface of the conjunctiva occupied by a mass of little elevations presenting more or less a cuboid or pyramidal form. The bases of these elevations are merged into the neighboring conjunctiva, and the free portions are more or less round. They present four faces, flattened by the pressure of one against the other; they all have a form analogous to that of the "pains de mie," which we see in bakers' windows. Their color is a bright red, varying sometimes to carmine or purple. They are accompanied by a thick, viscous, conjunctival secretion, more or less abundant, which accumulates toward the great angle of the eye and at the base of the lashes. The palpebral cleft is narrowed; the superior palpebra droops in consequence of its increased volume and weight, so that the levator muscle can only elevate it imperfectly. We observe, at the same time, that the inferior palpebra presents a marked tendency to ectropium. From these last three symptoms results a peculiar expression of countenance which often enables one to make a diagnosis at a distance. It is not always thus, however. An observer, even though attentive and experienced, may not be able to discover anything about the exterior to awaken his suspicions, and will be much surprised upon turning back the lids to find hypertrophied papillæ. If we turn back the lids, we observe that these little elevations do not begin at the edges of the lids, but at a certain distance from them, varying from one to two millimètres. The most numerous lie toward the angles of the eye, and in the direction of the posterior edge of the tarsus, beyond which they are prolonged upon the cul-de-sac. At these two points of the palpebral conjunctiva each elevation is pressed against the other, so that one can no longer distinguish the surface of the conjunctiva upon which they are elevated. Their favorite seat is the superior lid. Toward the angles, where their development, far from being impeded by pressure against the globe, is on the contrary facilitated by the free space which exists between the globe, the orbital wall, and the tarsal cartilage, these elevations obtain their greatest height, and this may vary from one to two millimètres. The lowest are seated at the region corresponding to the middle portion of the tarsus. These little tumors, as one might call them, are accompanied by considerable augmentation in the dimensions of the conjunctiva itself. There may also often be observed back of the tarsus in the conjunctival cul-de-sac one or two large folds of the mucous membrane, under which, frequently, the adipose tissue will be seen to be more abundant than in the normal state. In a marked case these

folds of the cul-de-sac are themselves covered with a large number of such elevations.

All these tumors are inclined one toward the other from the external toward the internal angle, and this explains the course of the mucus secreted toward the latter, and its accumulation at this point. They present absolutely the same anatomical disposition as the papillæ of the conjunctiva in its normal state.

These hypertrophied papillæ often present an aspect analogous to that of proud flesh. Often, also, they have a fungous appearance and consistency, which causes them to bleed at the least touch; at other times, instead of being pressed against each other in several rows, they are isolated or arranged in a single row—an arrangement which procured for them from my late father, the name of discreet granulations in the first case, and cock's-comb granulations in the second. Figures three and four, plate second, of my father's "Iconographie," give *strikingly* exact representations of these.

The conjunctiva itself, at the points which are not invaded by pathological productions, shows a free injection as well of the conjunctival vessels proper as of the sub-conjunctival vessels. This injection reaches to the bulbous conjunctiva, and extends occasionally to the edge of the cornea. When the malady has existed for a certain length of time, we observe a roughened aspect of the cornea. A little later, there succeeds to the roughness of the cornea a vascularity more or less marked by roughness. This vascularity, situated in the deeper part of the second layer, or Bowman's membrane, may be so confluent as to render the cornea nearly opaque. This state of the cornea, in many cases, is limited to the superior half or two-thirds. In some cases, however—and these are the most numerous—it extends through all the membrane, but there exists free spaces between the vessels, which allow the intermediate parts to be seen. This is what is ordinarily designated *pannus tenuis*.

The height of these pathological productions may vary from three-tenths of a millimetre to two or three millimetres. Sometimes isolated, but nearly always pressed against each other, we observe some of them grow larger and larger, encroaching upon their neighbors. These drain most easily, and show a consistency essentially fungous and friable.

The red, bristling aspect presented by these elevations, caused the ancients to give them the names of "*traxomata*" (Hippocrates) and "*aspritudinis*" (Galen), and has gained for them the name of

papillary trachoma, under which they are described by Stellwag de Carion. This denomination, perhaps, merits preservation.

Subjective symptoms.—The patients complain, on awakening, of the lids being glued together, and of a photophobia more or less intense, and are especially tormented by a sensation as of the rolling of a foreign body between the lids and the globe of the eye. When the malady is of long standing, and when the cornea presents the roughened aspect of which we have spoken, there results an affection of the sight much complained of at times, and which may even go so far as to render the patient incapable of locomotion.

ENGORGEMENT OF THE LYMPHOID CELLULES.—*Objective symptoms.*—That which first attracts the attention of the observer, is a peculiar expression and appearance of the patients. The upper eyelid droops, and is thickened and swelled. The lashes, instead of being directed toward the front and slightly upward, point downward and slightly backward. The external commissure is more or less concealed by a vertical cutaneous fold, whose presence is exaggerated whenever we attempt to separate the lids. Lastly, one is impressed with the generally miserable expression of countenance. These symptoms, which sometimes enable a diagnosis to be made without close examination, are not, however, always to be depended on, and in certain cases nothing in the external appearance indicates the presence of the disease.

On reversing the upper lid and examining the surface of the palpebral conjunctiva, we observe a variable number of smooth, round white spots projecting but little above the tarsal membrane. These are generally injected and slightly infiltrated. The most numerous are found toward the internal angle of the upper lid, where they are united in little groups. Again, we find them accumulated toward the middle of the tarsus, especially when we examine them upon the first appearance of the malady. Others are ranged along the posterior edge of the cartilage, especially toward the cul-de-sac, or upon the tarsus itself. Under such diverse forms these productions resemble somewhat the lesions we find upon the small intestines in dothinenteritis. No sanguineous vessels pass in front of them; sometimes a vessel, on reaching them, may divide and pass around their circumference. Gradually these spots increase in volume and extent, becoming more prominent upon the surface of the mucous membrane, and presenting a darker hue—a grayish rose-color.

Soon their dimensions become greater; their color grows paler

and varies to a yellow tint, and they now resemble *the spawn of frogs or grains of cooked tapioca*. They have a glutinous appearance, and from this moment the granulations are formed, or, if we prefer, they have reached their highest state, and constitute what are called vesicular granulations. (Hairion.)

After a variable period, the color is again modified. It becomes a more decided yellow, and the little tumor is transformed into a caseous mass resembling softened tubercle; in fact, this kind of vesicle often becomes softened and discharges its contents. At the spot where it was situated, we soon after observe a cicatrice in the tissue of the conjunctiva. As in the preceding state, the cornea is not long in being invaded by a more or less confluent vascularity, which has its origin in the superior cul-de-sac and the neighboring bulbous conjunctiva, and descends on the superior half of the cornea, where it forms an abundant, thick, and fleshy film. This state has received the name of *pannus crassus*.

We observe, in addition, that in the midst of this film of new formation, as well as in the neighboring conjunctiva, and even near the cul-de-sac, are scattered among the vessels a number of the pathological productions which we are now considering, and which sometimes are of a more advanced age than those we meet with upon the palpebral conjunctiva. Again, at the same time with the tumor just described, we notice the preceding form develop, and then observe upon the conjunctiva the two different species of granulations we have thus far described—viz., true granulation and papillary hypertrophy—forming thus what has been described as mixed trachoma. (Stellwag de Carion.)

In still other cases we can not observe any form of protuberance. The conjunctiva presents a swollen infiltrated appearance, and a grayish or yellowish-red color, with little or no embossments. The general aspect of the mucous membrane is gelatinous; the rare elevations met with, may be traced to one or the other of our two types of granulation, and the microscope itself affords but slight information by reason of the general inflation of the mucous membrane. This state has been described under the name of diffuse trachoma. (Stellwag de Carion.)

Whatever may be the aspect of the mucous membrane, we may state with certainty that there is always a more or less pronounced secretion, analogous to that which occurs during the declining period of catarrhal ophthalmia. The secretion is especially abundant when the rupture of these little vesicles and the escape of their

contents occurs. To this discharge is added a more or less abundant flow of tears.

Subjective symptoms.—Nearly the same as in the first form. They are characterized, however, in the larger number of cases, by a greater tenacity, and are often accompanied by general constitutional morbid phenomena. Visual symptoms are also more pronounced, and photophobia more intense. The sensation of a foreign body rolling about under the lids is very marked, and leads the patient to rub the eyes continually, notwithstanding the formal prohibition of the surgeon.

In some cases, on the contrary, we are surprised at the slight objective symptoms complained of by the patients. They scarcely mention any defect of their eyes—a fact of which we have already spoken; in short, we realize, in considering the complications, that they are far more frequent, much more intense, and more formidable in this than in the preceding form.

PATHOLOGICAL ANATOMY.—*a. Engorgement of the papillæ.*—Upon the surface of the elevations which we have described in the first variety, we can not detect with the naked eye any vascular networks which will account for the intensity of their color; but, if we excise one or more, and examine them under the microscope, it is easily seen that they include all the curved and spiral vessels corresponding to the vascular arrangement in the normal papillæ of the conjunctiva. But here there is dilatation of the vessels and sanguineous engorgement of the papillæ themselves, which is abundantly proved by the relatively enormous amount of blood which flows from the point of excision.

When the tumors have reached their greatest development, we can no longer observe in the intervals which separate them from each other, the normal vascular plexis of the conjunctiva more deeply seated than they; in fact, these conjunctival vessels ramify through a layer of tissue situated beneath the papillary bodies. The microscope reveals upon each tumor a more or less thick epithelial layer. This epithelium, at the surface, is of the tessellated form, and at the point of contact of the epithelium and papillæ, is transformed into the cylindrical variety, inclosing oval nuclei in the midst of the granular contents of the cell.

Gradually, and in proportion as we approach nearer the interior of the papilla, this epithelial layer disappears. Below the papilla we find a granular amorphous mass, in which are disposed the several fibres and cells proper of the conjunctiva. Numerous fibro-

plastic cellules and a large number of free nuclei encounter each other in the mass, and we may observe a number of nuclei in course of segmentation, and giving rise to the formation of new cells. In the midst of all these elements, numerous vessels form a close network around the base of the papilla.

This exaggerated development of nuclei, their segmentation, the numerous cells of new formation, show clearly that this pathological state is one of proliferation, or, if we prefer, veritable hyperplasia of the cellular tissues.

The general swelling of the conjunctiva is dependent upon a serous infiltration of that membrane, occasioned by vascular engorgement following the arrest of blood, and also, in part, upon the increase in number and volume of the elements of the mucous membrane.

As we approach the cul-de-sac, the different alterations tend to diminution, and in this region we encounter only great injection, not only of the conjunctival vessels, but also those of the subjacent layer.

b. Engorgement of the lymphoid cellules.—As we have seen, the conjunctiva, in its normal state, includes in its reticulated connective tissue, cellules resembling lymphatic follicles, which are there distributed in considerable number. (Henle.)

If the lymphoid cellules have just become engorged, and the contents be in proliferation at certain points, these small structures become spherical and hypertrophied. This was discovered by the late De Graefe, and described by him, for the first time, in one of his clinical lectures in 1864. (P. Blumberg.)

On the other hand, we must observe that all the authors who have given a micrographical description of these bodies, indicate that their contents are composed of cellular corpuscles, whose characteristics are those of lymph corpuscles (globules), more or less altered by the reagents to which they have been subjected. (See, among others, Hairion, *Annales d'Occulistique*, t. lxiii., 1872.)

In order to show in a more decided manner that these productions are not neoplasms, it will be sufficient to remark that upon the death of the patient affected with them, all these so-called neoplasms disappear as if by enchantment. These bodies not being neoplasms, and the word "granulations," as we have seen, inducing a most troublesome confusion, it seems proper to us, in considering what we have just written, to replace these two terms by "engorgement of the lymphoid cellules."

In an anatomico-pathological view, it is possible to distinguish in the evolution of the disease of which we treat, four periods or states. If most authors have described only three, this is due, possibly, on the one hand, to the pioneers among them, as we have seen this state described in anatomy by distinguished anatomists as a normal condition of the conjunctiva as "trachomatous glands," or closed follicles of this membrane; or, on the other hand, by the fact that in the evolution of this first stage, the patients feel little or no inconvenience, and so it quite frequently escapes the observation of the physician, who discovers the granulations accidentally while examining the conjunctiva in order to arrive at a diagnosis of another disease, with which the patient is simultaneously affected.

First period or stage.—Upon examining the internal surface of the lids, we notice upon the surface of the more or less injected conjunctiva, small, round, glossy white spots, not elevated above the surface of the mucous membrane, and surrounded at their circumferences by slight vascular networks, which stand up more or less clearly from the neighboring parts of the conjunctiva. If we pick them with the point of a fine needle, they discharge a small quantity of liquid of a whitish color, which, examined under the microscope, shows numerous round hyaline corpuscles, identical with the colorless corpuscles of the blood, or with those of the lymph (globules), and consequently with those of pus.

M. Hairion has distinctly observed the presence of these round cellules, and assigns to them a size two or three times those of pus. Their enlargement is doubtless due to the fact that he examined them after the addition of water, which addition occasioned imbibition and distension. After a variable time, these little spots become more conspicuous, and present a grayish-red color. I style this the period of invasion, or "acute period." It corresponds to the acute granulations of other writers.

Second period or stage.—The conjunctiva presents a more marked injection, accompanied by slight effusion, especially at the circumference of the trachomatous areas. These little spots increase in volume; they extend noticeably above the level of the conjunctiva; they present a decidedly grayish color, a gelatinous aspect, and resemble grains of cooked tapioca, or the spawn of frogs. If, as in the preceding stage, we examine the contents, we find it to be of a gluey, viscous consistency, and the microscope reveals the proliferation and segmentation of the globules. Veritable trach-

oma exists from this state, and constitutes what our Belgian confères have named vesicular granulations. I denominate this the period of acme.

Third period or stage.—The trachomatous point loses its gelatinous aspect; it becomes yellow or whitish-yellow in color; its dimensions are either slightly greater or slightly less. The conjunctiva is more injected, its engorgement has increased, its surface has become slightly reddish, and at times engorged papillæ show themselves in the parts situated between the papillæ, thus giving rise to what has been called mixed granulations. (Stellwag de Carion.)

On examining the contents of the so-called vesicles, we observe a caseous mass of a yellow color, identical with softened tubercle, and which, under the microscope, appears like an amorphous mass, inclosing here and there colorless globules, numerous detached nucleii, and, above all, adipose vesicles.

We see, then, that the mass contained in the engorged cellules has undergone fatty regression. During this stage the mucous secretion is most abundant. This might bear the name of the "period of decline." It corresponds to the "chronic granulations" of certain writers.

Fourth period or stage.—The vesicles break, allowing their contents to escape, which are eliminated with the tears, and the secretion having partly dried up, becomes more consistent. The general red tint of the conjunctiva diminishes, and its infiltration becomes less. In the place of vesicles we observe small blank spaces formed by the cicatrices, to which succeed atrophy and retraction of the conjunctival tissue. This constitutes, according to myself, the period of termination, which hitherto has been very slightly or indifferently described.

It should be added that, in certain cases, this engorgement of the lymphoid cellules of the palpebral conjunctiva, may extend to those of the ocular conjunctiva, to the semi-lunar fold, to the caruncle, and, in complicated long-continued cases, to the cornea itself; whence the presence, according to some authors, of veritable trachoma or vesicular granulation at these different points. These cases are always extremely rare, and the malady must have existed for a long time before we can observe the engorgement of the lymphoid follicles of these regions. We observe, however, that all authors agree in considering that the presence of granulations upon the cornea, is seen only in the oldest chronic cases of granulation.

The favorite seat of the disease, in order of frequency, is the in-

ternal angle of the upper lid; the internal angle of the lower lid; the external angle of the upper and lower lids; the neighboring points of the posterior edge of the tarsus, especially of the upper lid; the culs-de-sac, especially the superior; the semi-lunar fold; the caruncle; the upper part of the ocular conjunctiva; finally, the upper half of the cornea. As to their histological location, it is sufficiently indicated by the denomination "engorgement of the lymphoid cellules."

We can not terminate the pathological anatomy of this disease without adding several words as to the so-called "diffuse granulation"—a variety which, properly speaking, constitutes but one state, which, happily however, is observed in only a very small number of subjects.

In this the conjunctiva develops a general grayish-red tint, a lardaceous appearance, a manifest yet faintly pronounced infiltration, accompanied by variable thickening; the vessels are hidden at some points, and at these the gray color is especially noticeable.

The surface of the conjunctiva in general is reddish, rough (*traxus*), especially toward the internal angle and the posterior edge of the tarsus, although it may be modified throughout its entire extent. The lids show a marked tendency to entropion in the upper, and ectropion in the lower; the mucous secretion is thick and viscous. If, in the parts of the conjunctiva where the color is especially gray, we make a series of scarifications, the tissue sounds under the instrument, and from a number of incisions we observe a limited discharge of a non-transparent liquid, more or less yellow, that escapes from the lymphoid cellules, which are not visible in the conjunctiva when examined by the naked eye.

However, with the lens and oblique illumination, we can perceive those cellules of the conjunctiva whose engorgement is most pronounced, and the practiced observer may venture upon the puncture and evacuation of each of them one by one, as it were. In this form, by reason of the want of prominent vessels upon the surface of the conjunctiva, it is difficult to determine the different *periods* of the engorgement which exists, however manifest, while attentively following the course of the disease. But, we repeat, this form is, happily, rare, and merits only a simple mention.

COMPLICATIONS.—The complications which may supervene in the disease of which we are treating vary according as they relate to one or the other form. In papillary engorgement the complica-

tions most to be feared are vascularity, opacity, and softening of the cornea. Vascularity is due to the rubbing of the engorged papillæ upon the surface of the cornea, and in this the upper lid is the principal agent. We also observe, in the majority of cases, when the disease has existed a certain time, that the superior half of the cornea presents a markedly polished appearance; shortly this is replaced by thickening of the epithelium, which then becomes the seat of a proliferation analogous to that which takes place in induration of the epidermis.

Soon after, we notice that the corneal border is invaded by confluent injection, resulting in the development of numerous newly formed vessels, which pass over from the conjunctiva to the cornea, proceeding toward its centre, and ending in what my father called the *panniform* state, and which other writers designate as "*pannus tennuis*."

In the beginning, there are only a few vessels in direct connection with those of the conjunctiva, and which, having reached the cornea, proceed in a radiating manner toward its center. There they fold upon and inosculate in arcades with each other. If this state exists long, and treatment is badly conducted, these vessels become more and more numerous and more confluent, inosculating in arcades with each other in their course, and constituting at first a delicate, compact network. The meshes of this network become finer and finer; the vascular stratum continues to thicken, and there soon results a true fleshy thalamus, which has received the name of vascular or fleshy pannus—the "*pannus crassus*" of writers. At the same time, the layers immediately beneath the cornea become infiltrated, and there occurs in addition hypergenesis of the cells proper of the cornea.

If this state continues, this perturbed proliferation of the cellular elements of the cornea closes with segmentation of the cellules, whence results soon, softening of the cornea, change of its curvature, and sometimes its perforation. We have neither the time nor the space to enter into more ample details of the different changes that we have just mentioned. We must restrict ourselves to remarking that, after these different phases of the complications in the state of the cornea, vision always remains sensibly altered, except when the complication has continued restricted to a slight thickening of the epithelium or to a sparse development of vessels.

These two alterations, when the treatment has been instituted in time, disappear rapidly with the cause which has produced them.

If, on the contrary, the disease has existed for a long time, or if the treatment has been badly conducted, interrupted, or too soon suspended, there remains nearly always a more or less marked affection of the cornea, modification of its surface, or changes in its curvature.

If the patient is troubled with engorgement of the lymphoid cellules, then, to the complications of mechanical origin, which we have just mentioned, may be added two of a still graver character: To the vascular pannus must be added that which has been called granular or trachomatous pannus, produced by the development, on the ocular conjunctiva in the neighborhood of, and sometimes on the cornea itself, of so-called vesicular granulations, which are only the extension of the engorgement of the lymphoid cellules of the palpebral conjunctiva to those of the ocular conjunctiva.

At this stage, the lymphatic network of the conjunctiva spreads toward Bowman's membrane, which shows a pathological thickening, and the engorgement of these same lymphoid cellules soon supervenes as in the conjunctiva.

The truth of this assertion is easily shown by the fact that in the case of granular or trachomatous pannus, we often meet with vesicular granulations on the mucous membrane of the culs-de-sac. It will be readily understood that this alteration of the cornea must involve as a sequel other serious injuries to the corneal tissue besides simple vascular pannus. The modifications of the lymphoid cellules extending over the cornea—the different stages, previously described, of the evolution of the disease—must terminate in destruction, atrophy, and retraction of the tissue of the cornea; whence the numerous facets, the deep and ineradicable scars, sometimes even the leucoma which granular pannus always brings in its course, and which constitute the greatest danger in this troublesome complication.

Let us add to this the tenacity, I might almost say the rebelliousness of this complication against ordinary treatment, and the necessity of the surgeon's employing the strongest measures—as inoculation with blennorrhagic muco-pus and conjunctival incisions—and we can easily understand the apprehension with which "pannus crassus" inspires all experienced physicians.

Another complication, not less troublesome than engorgement of the lymphoid cellules, is that which supervenes after the extinction of the pathological processes. To the solution of continuity of the mucous membrane, in the points where vesicular granula-

tions have existed, succeeds cicatrization, followed by atrophy of the tissue of the mucous membrane and its secretory elements. This atrophy involves inevitably the contraction of the conjunctiva *en masse*, which causes retraction and diminution in the dimension of the lids by inversion of their free edges and of the tarsal cartilage. From this results narrowing of the palpebral cleft, blepharophimosis, and a veritable entropion, which increases the pressure of the lids against the globe, and especially upon the cornea, and keeps up in the latter a state of chronic vascularity, over which no medical means can triumph.

This blepharophimosis and entropion is the case of the angular erosions so frequently observed with granules, and which disappear only with the efficient cause. But, notwithstanding their gravity, nothing is easier than to put an end to these complications by the aid of a simple operation, which we shall describe in detail when considering the treatment.

The complications which we have just described, are followed in the most fortunate cases with sequelæ of three different orders :

1. Opacities, which induce in their course amblyopia, the more pronounced according as they are situated nearer the center of the cornea opposite the pupil, and later, they may render necessary the operation for artificial pupil. (See further on.)
2. Changes of curvature, which may induce myopia, or irregular astigmatism, which renders necessary the employment of proper means for remedying these two defects of refraction ; and we have not in this case great therapeutical resources at our command, for the myopia is caused by the affection of the cornea, and the astigmatism, resulting from irregular changes of curvature, is but slightly susceptible of correction.
3. Finally, the facets of the cornea cause monocular polyopia—an affection the more troublesome, because, up to the present, we have at our command only very inefficient means for overcoming it.

Progress.—The disease which we are considering, presents, as we have been able to trace it, a different degree of gravity, according as we have presented one or the other form of the malady. The first, although serious, is certainly infinitely less grave than the second, especially in regard to the lesions which follow. Both forms may disappear spontaneously, but never without leaving indelible traces of their presence. Properly treated, and above all taken in the beginning, they often heal without the patient's discovering that they have been attacked by the disease.

As to the division of the course of the second form into acute and chronic, we content ourselves with remarking that it is, if not based upon a false interpretation, at least more artificial than real, and answers no practical purpose.

The disease may terminate before the evolution of the four periods, especially after the first, and sometimes after the second. This happy ending has been described as an acute progress. When the disease passes from the second period into the third, the progress is said to be chronic. We do not in any manner accept this view, and we believe that the disease in these two cases is always the same. Its progress has uniformly an essentially chronic character; its termination at the close of the second period can only be regarded as altogether exceptional.

Duration.—Variable, always as long for one as for the other, but especially for the second form. It is rare to see either form of the disease terminate under two or three months, and we have observed numerous examples where the disease had persisted for one, or even for several years.

This last is especially true of diffuse granulations.

Termination.—Papillary engorgement terminates generally by returning to the normal state, except in some, happily, rare cases where serious complications exist. We fear, most unquestionably, that which succeeds the too prompt evolution of the disease, and the too rapid disappearance of the hypertrophied papillæ. There then supervenes a sort of cicatrization *en masse* of the conjunctiva throughout its thickness.

Engorgement of the lymphoid cellules, except in rare exceptions, where the disease ceases before the complete evolution of all the periods, always terminates by the formation of bands and cicatrices in the conjunctiva, and often even in complete atrophy, which may pass into xeroma.

The most fortunate termination is where engorgement of the lymphoid cellules immediately succeeds engorgement of the papillæ, thus constituting "mixed granulations." The development of the latter generally causes the disappearance of the former.

Lastly, the most troublesome termination is that which succeeds diffuse granulation, and which is almost always atrophy of the mass of the conjunctiva.

Causes.—All the influences which can cause violent irritation of the papillæ of the conjunctiva, may also induce their engorgement; but without doubt the most frequent cause is inoculation with

mucus or muco-pus developed from one of the three affections heretofore described—catarrhal, purulent, and diphtheric conjunctivitis, but especially the first two.

We see from this that it is only to our first form that the definition of M. Gosselin, cited above, can be applied.

On the other hand, papillary engorgement always being accompanied by a certain degree of irritation of the entire mucous membrane, and by a more or less abundant mucous secretion, it is beyond doubt that inoculation with mucus derived from a conjunctiva attacked by engorgement of the papillæ, may induce the development of the same disease in a hitherto sound eye. But in order for this to occur, it is necessary that the soil should be prepared, and that there be in consequence a predisposition to the affection. Again, it frequently happens that the communicated disease confines itself to a special conjunctivitis essentially mild and tending manifestly to spontaneous recovery; hence, de Graefe has described it under the name of abortive blennorrhœa.

This mild form of conjunctivitis is certainly known to all ophthalmologists, and yet nowhere among them do we find a mention of it. It is characterized by a deep red color, almost of the hue of wine-dregs, of the palpebral conjunctiva and of that of the culs-de-sac. This color is accompanied by a very marked degree of hyperæmia of the bulbous conjunctiva in the neighborhood of the culs-de-sac, but it ceases abruptly at two or three millimètres distance from these.

At the point where injection ends on the ocular conjunctiva, we observe a reddish-yellow orange tint on the sub-conjunctival tissue, with slight œdema. The rest of the ocular conjunctiva is normal.

At the same time, in the inferior cul-de-sac and toward the internal angle of the eye, we notice the presence of a certain amount of very thick, coherent mucus of a deep yellow color.

This conjunctivitis is almost always produced by direct inoculation; though it heals spontaneously, its termination can be sensibly hastened by the employment of chlorinated water.

Lastly, there may result from this contagion simple traumatic conjunctivitis, as we have already remarked in regard to the different forms of conjunctivitis reputed to be contagious. Engorgement of the lymphoid cellules may be induced by all the causes which tend to diminish the resistance of the tissues in general, and consequently that of the conjunctiva.

Poor nourishment, bad hygiene, squalidness, crowded dwellings, exposure to miasmatic exhalations, dampness, poverty, famine, war—from all these causes arises the much greater frequency of this disease in the inferior than in the more elevated classes of society; whence, also, its development in those establishments where all or several of the above causes are united—such as barracks, poor-houses, orphan asylums, hospitals, prisons, schools, dormitories or apartments in which a great many people are crowded together under unfavorable hygienic conditions.

Let us also observe that to this same concurrence of circumstances should be attributed the endemic form in which this disease prevails among certain classes of the population of different countries—Egypt, Algeria, Spain, Franco-Belgian frontiers. As to the transmission of the disease by direct contagion or inoculation, we believe this to be an absolutely false doctrine, arising from an erroneous interpretation of observed facts. As we have seen, vesicular granulation is always accompanied by a certain degree of catarrh, whose presence is revealed by a more or less abundant mucous secretion.

Conveyed to a healthy eye, this secretion may determine one of two things: If the individual is robust, in good health, if his tissues present a normal tonicity, if the conjunctiva be healthy, inoculation causes almost certainly the development of conjunctivitis, which may be catarrhal, purulent, or even diphtheric or simple traumatic conjunctivitis. Ninety-nine times out of a hundred this is the case. Perhaps one time out of a hundred, one of these affections is accompanied by veritable trachoma.

If, on the contrary, the individual is in a bad state of health, especially if he lives in the same region as the person from whom the inoculating mucus was taken, and is in consequence subjected to the same influences, the phenomena which takes place after inoculation, follow the inverse order from those cited above. There are ninety-nine probabilities out of a hundred that the conjunctivitis developed in this case will be accompanied by trachoma, and one out of a hundred, on the contrary, that it will not. I will, later, take occasion to recur to this controverted point in treating of the ophthalmia styled military.

By the preceding, it will be seen that we reject entirely the theory of contagion by the granulations themselves, and we concur fully in the opinion of P. Blumberg, that it is not the granula-

tions themselves which are contagious, but the conjunctival catarrh which always accompanies them.

TREATMENT.—This should be directed to the malady itself, or against its complications. But let us first correct an error into which many fall, and which consists in desiring at any cost to destroy the granulations. Now, a point that must not be lost sight of is, that the destruction of granulations, whether of papillary engorgement or engorgement of the lymphoid cellules, can not be attained without inducing at the same time the destruction of the conjunctival tissue.

It is not strange, then, that we regard with the utmost disapprobation the more or less extended scarifications and excisions of the granulations or of the conjunctiva, extolled by the most ancient writers (Hippocrates "*teri opsios*," edition of E. Littré, t. ix., translation by Sichel, Sen.), and still in favor with a certain number of practitioners. This practice has for its least inconvenience the development of cicatrices and bands in the conjunctival tissue, which bring in their train the most troublesome consequences—conjunctival cicatrices—which we seek to avoid as much as possible. In our opinion, the true desideratum in the treatment, as well of engorgement of the papillæ as of the lymphoid cellules, is to favor the development of acute inflammation of the conjunctiva, which determines the genesis of a number of enlarged papillæ, leads to a more considerable bloody afflux, and which should cause the resolution of the existing granules.

In papillary engorgement, the object desired is to cause the development of the papillæ to such a degree that they will crowd each other out. In engorgement of the lymphoid cellules, on the contrary, the end which we seek to obtain is the development of "mixed granulations"—that is to say, the simultaneous development on the conjunctiva of both forms, and the substitution of papillary engorgement for engorgement of the lymphoid cellules. Now, in order to obtain these two results, it is not necessary to employ violent means. De Graefe, in fact, has shown by a series of experiments made in relation to this subject, that we may employ in the cure of papillary engorgement, applied directly to the surface of the mucous membrane, the most diverse means, provided that they act as irritants. Bicarbonate of soda, which, no one will deny, should be regarded as the lowest in the scale of medicaments of this order, has been recognized by him as perfectly suffi-

cient for attaining the desired end. We should always bear in mind that in view of the mildness of its action, its employment requires to be too prolonged, which causes great inconvenience among the laboring classes, whose time is most valuable. Our present intention not being to pass in review the entire list of means which are employed in the cure of granulations, we content ourselves with giving a statement of the method of treatment with which we have succeeded best.

In the first place, direct touching of all the surface of the mucous membrane with a saturated solution of absolutely neutral acetate of lead, followed by lavings, several times repeated, of the affected parts with distilled water, in order to prevent the formation of precipitate of carbonate and sulphate of lead, which has the disadvantage of forming a white deposit, incrusting the folds of the mucous membrane, and which it sometimes requires a long time to remove. Notwithstanding this care, it sometimes happens that deposits of this nature remain on the conjunctiva. It is sufficient in this case to touch the parts covered by the deposit lightly with a pencil of the mitigated nitrate of silver. This practice is followed by the formation of a very superficial eschar, which, in disappearing, leaves a deposit of salts of lead. However, these deposits are not here as troublesome as when the cornea is involved. In this last case, when a similar deposit is formed on an ulcer of the cornea, the deposit soon disappears spontaneously; for when the healing period of the ulceration begins, the epithelium is formed in the area of ulceration, beneath the lead deposit. Our Belgian confrères have advocated the systematic employment of this means in the treatment of granulation. From time to time, very slight touches, with a well-polished crystal of sulphate of copper, in such a manner as to avoid bleeding the mucous membrane, is advisable. Besides this we gain great advantage by the daily employment of fomentations of three parts of common to one of distilled water, saturated with chlorine. Bathing the entire surface of the mucous membrane with this chlorureted solution, produces the most salutary effects by modifying the mucous secretion. (De Graefe.)

Hairion has advocated, not without reason, the employment of tannic mucilage, of which a solution of one or two parts to a hundred of pure tannin in pure and neutral glycerine, will answer perfectly. The various means which we have enumerated will almost always be sufficient to relieve the patients in from three to four months.

In the case of engorgement of the lymphoid cellules, there is great advantage in arresting the disease as rapidly as possible, and, with this object in view, if it is practicable, the opening of each of the engorged lymphoid cellules with the point of a cataract needle, renders as great assistance as the opening of variolous pustules with the lancet, in proportion to their development. But, besides its often being impossible for the patient to submit to continued observation, it is well to remark that quite a number of engorged cellules are too deeply situated to be accessible to vision or to instruments; moreover, we are compelled to remark that the opening of each of these cellules causes the formation of a scar in the mucous membrane—an inconvenience which, as we have before remarked, should be avoided as carefully as possible. On the other hand, the manifest tendency of this disease to a chronic progress causes us to strive to obtain as quickly as possible the substitution of acute for chronic progress of the disease; as in diphtheric conjunctivitis, we have at our disposal a remedy, as it were, marvelous. This is the pencil of nitrate of silver, mitigated by the addition of nitrate of potash in the proportion of two to one, which, as it is very slightly soluble, moderates advantageously the influence of the lunar caustic; in fact, we can, with the crayon, touch only the points of the mucous membrane in which we desire to provoke acute inflammation, without affecting other portions of the conjunctiva. Moreover, by exact neutralization of the excess of caustic employed, we are sure of not causing irritation which will pass beyond the limits of an inflammation which we are able to control.

In consequence of the employment of this means, there is found in the circumscribed points of the mucous membrane a slight scar, which generally disappears, except in rare instances, in from twelve to twenty-four hours. We can then employ, without danger, the different means above spoken of, and which only serve as adjuvants to the treatment.

There should be a slight cauterization with the mitigated nitrate of silver two, or at the most three times a week, when the progress of the disease is chronic and when the mucous membrane reacts but little under the treatment. The day following the employment of the nitrate, there should be light touching with the solution of acetate of lead. On the third day, light cauterization with the crystallized sulphate of copper should be employed. The fourth day, use the acetate of lead again. The fifth day, return to the lunar caustic, and so on. This is our usual method of treatment.

Be it understood that this succession in the employment of the remedies may be modified according to the actual symptoms, and we do not pretend to lay down an invariable rule. Lastly, we derive great advantages from the employment, in conjunction with these remedies, of the chlorureted water and solution of tannin in glycerine, as in the treatment of engorgement of the papillæ.

In one, as in the other form, we observe nearly always a noticeable photophobia, as well as a certain degree of hyperæmia of the iris, for which the employment of a collyrium of atropine is of great advantage. If, during the course of the disease, a more or less pronounced degree of œdema of the lids supervenes, several light applications of the tincture of iodine will cause this to rapidly disappear.

In regard to the complications of which we have spoken as being liable to occur during the course of the disease, it is unnecessary to remark that they should be subjected to appropriate treatment, which will be considered hereafter, when we speak of the affections themselves. But, in the majority of cases, the complications often disappear and diminish noticeably in proportion as the disease on which they depend becomes less and less marked. The treatment of one of the complications merits our attention an instant. I speak of atrophy of the conjunctiva and of the contraction of the mucous membrane, which succeeds it, or which is often the consequence of the development of conjunctival cicatrices, consecutive to excision, or to extensive or ill-timed scarification, or to lymphoid engorgement in the fourth period.

When, in their normal state, we open widely the eyelids of a healthy person, by raising the superior and lowering the inferior with the aid of both thumbs, applied to the middle of each, we observe that the external commissure is greatly extended, and that the angle of the corresponding palpebral cleft remains perfectly defined. In the case of constriction of the mucous membrane, on the contrary, we notice, under the influence of the same maneuver, the external angle covered with a fold of integument directed vertically from above below, and beneath which the external commissure is more or less concealed. The formation of this fold we consider the pathognomonic sign of contraction of the conjunctival sac, and the formal indication of the necessity of the little operation which I am now going to describe, and which has, from remote times, been known as the operation for blepharophimosis or canthoplasty.

The surgeon, by means of the thumb and index finger of the left hand, stretches firmly the skin of the lids, in order to force them apart. Armed with a pair of straight scissors, one of the blades of which he introduces into the external angle of the conjunctival cul-de-sac until it reaches the bottom, while the other is passed in front of the integument, he incises at one stroke all the external commissure, thus prolonging the palpebral cleft from four to five millimetres.*

If we then renew the maneuver of separating the lids, we have before us a lozenge-shaped wound, whose great axis is vertical, and the small axis transverse. The superior and the inferior angles are produced by the union of the mucous membrane with the skin at the two former points of commissure. The other two angles are produced—the internal by the extremity of the incision in the mucous membrane, the external by the extremity of the cutaneous incision. At this moment an assistant turns back both lids, a maneuver which results in the transformation of the lozenge-shaped into a vertical linear wound, which the surgeon has only to unite by means of three points of suture—one placed at the middle of the wound, the others at equal distances from the first suture and the extremities of the incision. A strongly compressive bandage is to be applied, which has the advantage of preventing inflammatory œdema of the lids. At the end of from twenty-four to forty-eight hours, reunion by first intention is complete. The sutures are now to be removed, and it only remains to combat by means of emollient fomentations the slight traumatic inflammation which results from the operation. At the end of from eight to ten days all traces of the operation have disappeared; the lids open widely, and the only trace which remains of the operation is an external commissure slightly obtuse, and devoid of lashes for an extent of from one and a half to two millimetres on each lid.

EGYPTIAN OPHTHALMIA.

Under this name has been described at one time engorgement of the papillæ; again, engorgement of the lymphoid cellules.

The reader must not expect us to give here a description of these two diseases, upon which we believe we have dwelt sufficiently.

* In a paper just received from Dr. C. R. Agnew, New York, at this point he divides the upper portion of the external canthal ligament vertically and subcutaneously.—H. C.

We will content ourselves with mentioning the deplorable misunderstanding which prevails among the medical public in regard to this affection, and with remarking that if we are not better agreed upon this subject, it is due to no other cause than to the confusion which, as we have before said, prevails in regard to granular conjunctivitis in ophthalmological nosography. It is sufficient to remark that Egyptian ophthalmia, as well as military ophthalmia, of which I shall speak presently, is nothing more or less than now one, now the other of both forms of the disease heretofore described, developed by endemic agencies in individuals of the same constitution subjected to the same unfavorable hygienic influences, mode of life, climate, and, in a word, to the same morbid causes. The frequency of granular ophthalmitis in Egypt, and especially among a certain class of society (the Fellahs), results from bad hygiene, personal uncleanness, and especially from atmospheric causes. Every one is familiar with the fact that the desert winds—the simoon or sirocco—at times blow over Egypt. The air of these dry winds is charged with dust and sand, and in this country we find trachomatous ophthalmia accompanied with the presence, on the edge of the lids, of veritable calculous crusts, deeply imbedded in the cutis of the lids, and which, when raised, leave exposed deep and bleeding ulcerations. These dusty and sandy particles are even carried by the wind into the conjunctival cul-de-sac, and cause a continued irritation of the mucous membrane, which very soon develops into engorgement of the lymphoid cellules.

In support of the theory here maintained by us, it is sufficient to cite the following judicious remark of P. Blumberg: "These so-called trachomatous glands, before their discovery in man, had been recognized in animals toward the internal angle of the eye—that is to say, in consequence of the position which the eyes occupy in *animals*, toward the *anterior* angle of the eye. These glands come in contact with each other, especially at this point, as it is at this angle, from the constant exposure of animals to dust and wind, that particles of dust and sand blown into the eye remain there, one might almost say permanently." Let us remark, moreover, in support of the same author, that in swine the trachomatous glands have been observed to be most numerous. The probable reason for this is, that in rooting in the ground in matter of all kinds, these animals are constantly introducing into the eyes foreign bodies of different varieties.

MILITARY OPHTHALMIA.

It is difficult for us to admit, as is affirmed by certain writers, and in particular Hairion, that this disease was entirely unknown in Europe before the return of the remnants of the French and English armies from the Egyptian expedition, at the close of the last century. We protest against its being regarded as a special or specific malady. If it still prevails in the armies of certain countries, while it has disappeared from the midst of the troops of other nations, the probable reason for this would seem to be, that

in certain lands of different climates, endemic ocular affections prevail, accompanied by mucous secretions, which the recruits taken yearly from these countries and distributed among the different regiments, communicate to their comrades.

Now, in enumerating the causes of engorgement of the lymphoid cellules, we have cited among the most numerous, overcrowding, bad hygiene, want of care and cleanliness, etc., and whatever can bring on relaxation of the tissues. We have spoken also of the development of the malady in individuals living in the same hygienic conditions, and who will deny that an army presents these. Common fare, overcrowding, miasmatic exhalations, insufficient and badly prepared nourishment, want of or imperfect cleanliness, etc., all favor the development of the disease in question. These adjuvants are sufficient, and plainly account for the sudden appearance of trachoma in persons before unaffected by the disease.

If the malady disappears from the midst of an army, the reason is probably that in the countries from which the army is recruited contagious ocular affections do not exist except in a sporadic form, and doubtless the recruiting system, and especially the system of medical revision, contributes strongly to this result. It seems indubitable to us that if the army in which military ophthalmia prevails were disbanded for a year or two, and if, under a new call to active service, care were taken to eliminate vigorously every man showing a suspicious state of the conjunctiva, the prompt and sure means of putting an end to this scourge would be attained, with great advantage to the soldiers and also to pathology, one of the most obscure of whose problems would then be elucidated. Another means for combating the disease and clearing up this question, consists in recruiting regiments by the province, district, or department—a measure which we are convinced would reveal that in certain regiments the men are affected with military ophthalmia, while in others they remain completely exempt from it.

In examining individuals before forming the future contingents of the provinces corresponding to the regiments, and among whom trachomatous conjunctivitis exists, there is no doubt that quite a number of these future recruits will be found to be affected with contagious conjunctivitis, prevailing endemically in the province, and nothing would be easier than to reject as contagious all recruits affected with granulation as we reject all attained with syphilis. The changing of the garrison of regiments from one province to another must be avoided, and troops must be left cantoned in their original provinces, in order to avoid the transportation of the disease endemically from one province to another which has not been subject to it previously, and in which it loses no time in making its appearance after the arrival of a garrison of troops in which men are found affected with the disease.

