KERATITIS

Thesis for

M.D.

BY

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In choosing Keratitis for the subject of my thesis I have not done so with the expectation of being able to add any important new facts to our pre-existing knowledge. In my opinion, after reading the article on affections of the Cornea in De Wecker and Landolt's "Traité Complet D'Ophthalmologie", we can but come to the conclusion that there is little or nothing to be added to it, at least not with our present methods of investigation. My object in writing on this subject has been to classify and describe, as well as I am able the various inflammatory affections of the cornea, as well as the treatment which I myself have found the most satisfactory in the course of my two years Hospital practice. I have availed myself of the above mentioned work on Ophthalmology also those of Saleyowski - Juler -

Lockey Wells. Brudenell Carter, Nettleship - Marcus Gunn &c - as well as the practice of Messrs Healey and Jefferson at the Northumberland and Durham Eye Infirmary.

Anatomy and Physiology of Cornea.

The cornea is the anterior, transparent one-sixth of the external tunic of the eyeball. It is slightly prominent which is due to the fact that its radius of curvature is shorter than that of the sclerotic. At the same time it may be mentioned that in the normal eye the radii of curvature of the horizontal and vertical meridians are not identical - the radius of the vertical being the shorter.

Structure

The cornea consists of five layers, from before backwards and these are —

(a) Anterior Epithelial layer. consisting of stratified epithelium and being continuous with the conjunctiva.

(B) The Anterior Elastic Lamina or membrane of Bowman - This is a homogeneous structureless layer.

(C) Substantia Propria - a ground substance of the cornea - made up of lamellae of fibrous connective tissue arranged in bundles and parallel to the surface of the cornea, between these bundles are spaces called. "Lacunae", which are branched, and contain the corneal corpuscles their branches being contained in the offshoots from the Lacunae which are called Canaliculi - these are not completely filled by the corpuscular processes but allow the passage of lymph - thus forming a lymph system. They anastomose with one another and also with the lymphatics of the conjunctiva which surrounds the Cornea. The corpuscles themselves are very finely branched, contractile and contain an oval nucleus.

(D) Posterior Elastic Lamina or the membrane of Descemet. This is

a · thin, resistant, elastic, layer which splits up at its circumference to form the ligamentum pectinatum which gives attachment to a few of the fibres of the ciliary muscle and then passes to the Iris & Ciliary body.

(2) On the posterior surface of this elastic lamina there is a layer of endothelial cells.

Blood vessels are not found in the healthy cornea except in foetal life, but the nutrition is kept up by means of the circulation in the canaliculor lymph system

Nerves These are derived from the Ciliary nerves. They form several plexuses in the anterior part of the Substantia propria - from these plexuses branches perforate Bowman's membrane; these perforating branches split up again to form a plexus just beneath the anterior epithelial layer and terminate in a network between the cells of that layer. There is a posterior plexus in the membrane

of Descemet and the posterior part of the substantia propria - from these plexus there are given off a large number of fibrilla which are in intimate relation with the corneal corpuscles.

Physiology

The cornea does not to any appreciable extent alter the course of rays of light, as its two surfaces are parallel, and the indices of refraction of the medies in front of and behind it are the same. The anterior surface of the cornea is one of the three important refracting medies - the other two being the anterior & Posterior surfaces of the lens. The centres of curvature of these three surfaces lie in the same straight line which is known as the optic axis. The radius of curvature of the anterior surface of the cornea is 8 m.m.

The cornea being the transparent medium through which all rays of light have to pass to reach the retina we

can at once understand the importance and necessity for carefully treating any disease likely to interfere with its transparency.

Mode of Examining the Cornea

The patient should be placed rather obliquely near a window or other light and told to keep his eye fixed on the examiner's finger, which should be moved about in all directions. The image of the window or light on the cornea ought to be distinct & clear, if it is not but appears dull or fretted then there must be some affection of the epithelium or some alteration.

Oblique illumination By this means we can investigate the two surfaces and substance of the cornea in a thorough manner. The patient should be placed in a dark room with the light about a foot from the side of the head, and rather towards the front - then by means of a 2½ inch lens the light can be focussed on the cornea - this again can be magnified by means of another lens

of about the same focal length.
Opacities on the cornea may be detected by directing the patient to move his eye about in all directions & keeping the examining eye fixed on the pupil. In this way every part of the cornea can be in turn brought over the dark pupil and if the opacity is of a light color as is usually the case it can at once be detected. In a similar manner foreign bodies of a dark color may be seen by bringing the various parts of the cornea over the colored Iris.

The depth of the anterior chamber and the curvature of the cornea may be estimated by observing the eye in profile.

Insensibility of the Cornea to Touch

The cornea in its natural and healthy state is extremely sensitive to the touch, and in most diseases this sensibility is markedly increased, while in two alone is it greatly decreased viz. in Staphyloma and in a rarer disease known as Hydrophthalmos or Buphthalmos.

General Pathology

For a long time it was denied that inflammation of the cornea was possible - owing to the fact that it contained no blood vessels - the latter being considered essential to the processes of inflammation. It was not until 1807 that keratitis was first described by Vetch and Wardrop previous to that Scarpa had spoken of ulcers following abscesses immediately below the conjunctiva covering the cornea but had said nothing of keratitis.

If we were to examine microscopically a section of an inflamed cornea we should find the bundles of fibres were separated by spaces containing a milky fluid and later a number of small cells or leucocytes - this infiltration gives the opaque hazy appearance seen in commencing inflammation of the cornea. As time goes on these cells may become absorbed without leaving any permanent injury to the cornea - but on the other hand they may cause destruction of the corneal

Elements by cutting off their nutrition from obstruction to the flow of lymph. These cells themselves may become organised to a certain extent and lead to opacities.

When this small cell infiltration leads to destruction of the corneal elements the epithelial covering soon becomes affected, undergoing fatty degeneration and breaking down - so we have the formation of ulcers - this is more especially the case when the infiltration takes place between the anterior layer of the cornea and the epithelium covering it. In some cases the cells of the anterior epithelial layer become hypertrophied as in staphyloma.

With regard to the origin of the small cell infiltration there have been many theories advanced, but more especially two diametrically opposite ones - viz -

(a) That of Virchow - who argued that they arose by division from the pre-existing connective tissue corpuscles, as in this case from the corneal corpuscles.

(B) That of Cohnheim - who held that they were leucocytes which had immigrated from the neighbouring blood vessels, the irritation of the corneal nerves spreading to those of the surrounding conjunctiva favoring this immigration.

Bowman - (Annals of Ophthalmology 1855) says - The first change which takes place on puncture or incision of the cornea is a mechanical interruption to nutrition. Soon the blood flows in an increased quantity in the vessels nearest the wound bringing material to fill it up, which partly consists of small cells he terms "Cytoblasts": and which he states, though small in number, pre-exist in the cornea. These cells soon fill up the wound, leaving only the small cicatricial opacity.

Salzowski says that keratitis is not so much due to an infiltration of leucocytes as to an irritation of the trophic nerves of the cornea, caused by the leucocytes giving rise to an alteration of the elements from defective nutrition - A deposit

of new cells in textures with the exosmosis and endosmosis which are continually going on in the cornea - and so degenerative changes are set up ~~from~~ by the altered condition of nutrition.

The new cells which are deposited take up the nutritious fluid coming to the cornea, to the detriment of the true corneal elements, swell up, compress the neighbouring cells and so increase the irritation, which soon extends to the vessels of the conjunctival surrounding the cornea and causes dilatation of the vascular loops of the conjunctival border, and blood is poured into them in increased quantity - in this way we have formed the zone of injection we see surrounding an inflamed cornea.

In a short time new vessels are formed appearing at the margin of the cornea and advancing towards its centre to the injured or diseased part, conveying nutrition and bringing elements of repair. These new vascular loops are formed in precisely the same way as those

seen in the process of healing of wounds and fulfil identically the same purpose - when their mission is accomplished they become smaller and gradually disappear.

We have thus seen that the formation of new vessels is essential to the process of repair of the cornea - therefore the term "Vascular Keratitis" - is one which should be either abolished or used with very great discrimination.

Classification of Keratitis

Authors have greatly differed in the number and varieties of inflammations of the cornea they have described, and have adopted various & in many cases totally opposite modes of classification. Some describe as many as seven or eight different varieties - whilst others are contented with three. In the ensuing pages I have adopted the arrangement of Galezowski which is in my opinion is one of the best and for practical purposes the most complete - it differs very slightly from that of Jules.

Galezowski

Phlyctenular Keratitis
Suppurative "
Ulcerative or necrotic "
Granular " or Pannus
Diffuse or Interstitial "
Proliferative "
Punctate "

Sulzer

Interstitial or Diffuse Keratitis
Punctate "
Vascular " or Pannus
Phlyctenular
Suppurative
Ulcerative { Superficial / Deep / Serpiginous

The above tables coresponed very closely the chief difference being that in the first there is a variety described under the name of "Proliferative" which is not specially mentioned by any other author - The variety named by Sulzer "vascular" and as such described by most writers has, in the former table received the name of "Granular"

which in my opinion is the most suitable term - as it affords some information as to the cause of the disease.

There are four varieties which are most constantly described by authors viz -

Diffuse or Interstitial
Suppurative
Vascular
Ulcerative

Many writers do not describe phlyctenular keratitis at all under the head of Inflammations of the cornea, but combine it with Phlyctenular ophthalmia, with which it is frequently but not by any means invariably associated.

Ulcers of the cornea are too often described as a primary affection, whilst in reality they are in most cases the result either of Phlyctenular or Suppurative keratitis, and as such they should be classed and not according to any trifling variety of shape or position that they may happen to present. In other cases they result from

some nerve lesion as in cases of injury to the Fifth nerve.

Solbery Wells describes a variety which he names "Fascicular" - and which appears to resemble closely the ordinary Phlyctenular form, and as such hardly worthy of separate classification. He states that it is extremely common in Germany though rare in England.

Wharton Jones classifies keratitis according to the particular anatomical part of the cornea that is affected.

(1) Inflammation of the proper corneal tissue
" " - Conjunctival cornea
" " - Descemet's membrane

This is I think very incomplete & an improper mode of classification.

Perhaps one of the best forms of classification is that adopted by Becker and Landolt - who divide keratitis into three groups.

Infiltration of the cornea
Abscess " " "
Ulcer " " "

Infiltration

Superficial Keratitis.

Superficial Vascular keratitis.

(α) Phlyctenular

(β) Pannus.

Superficial non-vascular keratitis

(α) Vesicular

(β) Ulcer by absorbtion

Deep keratitis

Deep Infiltration

(α) Circumscribed

(β) Vesicular

Deep Abscess of the Cornea

(α) Following Purulent Conjunctivitis

(β) " Phlyctenular "

(γ) " Small pox

(δ) " Some nerve lesion

Deep Ulcer of Cornea

(α) non-inflammatory

(β) Inflammatory

(γ) Spreading

The above is undoubtedly the most complete form of classification but is rather apt to lead to a good deal of unnecessary repetition.

Phlyctenular Keratitis

Synonyms

Herpes corneae - Pustular or Vesicular Keratitis. Strumous Ophthalmia.

Characterised by

The appearance of small transparent vesicles on the cornea, generally towards its margin. Common from 2-15 years of age - rare later.

Pathology

The phlyctenules are generally situated just beneath the anterior Epithelial layer, between it and the anterior elastic lamina. In the most superficial form there is little to be found microscopically with the exception of some small cell infiltration, and a few broken down Epithelial cells which have undergone fatty degeneration & given way from the pressure of the new deposit beneath.

The leucocytes probably arise by emigration and in most cases set up a sufficient amount of nerve irritation to

cause a development of new vessels, which are generally seen in the form of a blush running from the conjunctival border to the Phlyctenule.

In many cases the pressure of the new cell deposit causes the epithelium covering it to give way entirely - and the result is that an ulcer is formed.

The resulting ulcer is small and superficial at first with raised and slightly undermined edges, and the base filled with a small slough which very soon separates - the edges rapidly become smooth and the ulcer is gradually filled up. - The process of repair advances from the edges and base - the result is that a cicatrix more or less dense on the cornea.

In cases where the Phlyctenules have ulcerated in the anterior cortical lamina the resulting ulcers are deeper. The Phlyctenules often appear in successive crops.

Aetiology

Extremely common among children especially those who are strumous-ill

fed and generally neglected. Galezowski states that out of 423 cases of eye affections in children 211 were cases of Phlyctenular keratitis.

The use of strong astringent collyria to the eye is said to give rise to it, also that the irritation may be propagated to the ciliary nerves from other branches of the fifth, as in cases of eczema of the cheek or affections of the nasal mucous membrane. It is also commonly seen in conjunction with a scrofulous eruption of the ears, nose, or mouth, together with some glandular enlargement.

Cold and damp weather favor its development, especially in the spring and early summer. The commonest exciting causes are - Catarrhal Ophthalmia, measles - scarlatina, small pox or other acute exanthematous fever.

Symptoms

(2) Objective -

The Phlyctenule generally makes its appearance near the circumference of the Cornea - It is rarely single, but the

number varies greatly and they may be scattered over the surface of the cornea or confined to one part. The development of the phlyctenules is attended by a certain amount of vascularisation of the cornea, which may be very extensive and in some cases, occurring chiefly in chronic girls, the whole cornea may be entirely covered by small vessels which can only be individually seen by means of a lens. The vascularity commences round the phlyctenule at first and then gradually extends towards the circumference of the cornea, until we often see a triangular bank of vessels running from the conjunctival border to the centre of the cornea, the base of the triangle is towards the surrounding conjunctiva and the phlyctenule is situated on its apex in the form of a small prominence. In a few cases the bank of vessels becomes so highly developed that it has received the name of "Pterygium" -

These vessels appear in 2 to 6 hours

after the appearance of the Phlyctenules, they are at first quite superficial and are extremely tortuous and in some cases almost varicose. The conjunctiva surrounding the cornea usually becomes red and injected as the disease advances.

The Phlyctenules first appear in the form of small transparent vesicles or small whitish projections. and when there is only a small single one it may only be recognized as a roughening of the cornea. They are often to be found on the conjunctiva as well. In some cases the fluid they contain may become absorbed - or when superficial the resulting ulcer is so slight that it heals in a very few days. The deeper ones usually pass way on the 3rd or 4th day.

The resulting ulcer is at first superficial, with rapped edges, and the base filled with a slough which soon separates - while in a short time the ulcer becomes perfectly transparent and is extremely difficult to see if we do not

pay attention to the difference of the level of the surface of the cornea. The anterior epithelial layer soon covers in the edge of the ulcer and the base becomes filled in with a deposit of new material derived from the new vessels. The redness and vascularity of the cornea rapidly diminish and in a short time the ulcer, if very superficial, may become entirely filled up and leave no traces. In a few rare cases the ulcer does not progress favorably but causes perforation of the cornea, and sometimes even of the sclerotic.

In the great majority of cases the result is that some opacity of the cornea remains which is due in the first place to the infiltration of lymph around the ulcer - and the formation of a cicatrix which remains after the ulcer has healed. The density of this cicatrix varies in different cases, in some, where the patient is in fairly good health and the ulcer is superficial, it may be very slight and may soon become absorbed, while in other cases, especially in scrofulous and weakly subjects, it may

be so dense and extensive as to totally interfere with vision and remain for the rest of the patients life. These opacities have received various names according to their size and density. as - Leucoma which may be partial or total - Albugo. Nebula &c.

Subjective Symptoms

The formation of Phlyctenules on the cornea is preceded as a rule by heat and itching of the eyelids - which soon develops into intense "Photophobia" and is accompanied in some cases with much pain. The Photophobia may amount to Blepharospasm and is a constant symptom. It is not proportionate to the amount of inflammation but often depends on the constitution and temperament of the individual. The pain is often very severe especially in the deeper forms of the disease, and is often much worse at night.

In common with other affections of the cornea there is an increased flow of tears in Phlyctenular Keratitis.

It has been shown that irritation of branches of the 5th nerve even at their periphery is transmitted to all the others, and leads to an increased secretion of tears - which explains this constant symptom. As a consequence of this increased secretion of tears we find a serous running from the nose.

Sneezing is also common and may be due to a reflex irritation of the nasal branch of the ophthalmic nerve.

Course and Duration

No particular time can be given the duration depending on the number and depth of the phlyctenules and the resulting ulcers. In many cases we find the phlyctenules appearing in successive crops, another lot appearing when the first are nearly well. The length of time depends also on the constitution of the patient. An ordinary ulcer requires 8. 15 days or more to heal.

In some cases where the phlyctenules are deep their external covering may slough away but their contents become more-

lent and form an abscess in the layers of the cornea; which may even become perforated allowing the pus to escape into the anterior chamber - forming what is called "Hypopyon" - and may lead to iritis with adhesions. The deep phlyctenule may give way externally but the resulting ulcer may increase in depth and perforate the cornea or even the sclerotic.

In some cases of interstitial infiltration of the cornea the conjunctiva may become involved, and intensely swollen, which may lead to the cutting off of the corneal blood supply and so necrosis of that structure may occur. In other cases the resulting opacity of the cornea may be so great as to cause entire loss of sight.

Diagnosis

Whenever we see a child suffering from photophobic and excessive watering of the eyes, we may suspect this disease - and upon separating the lids and examining the cornea we find the characteristic vesicles and the

characteristic triangular bank of vessels running towards the centre of the cornea we may be certain of our diagnosis.
In the ulcerative stage the recognition of the ulcers and their multiplicity will be sufficient to distinguish it from abscess of the cornea which has resulted in an ulcer, this latter when it is deep and single. Of course a deep phlyctenule may give rise to an abscess of the cornea but there will probably be other ulcers as well and such an occurrence is rare.
Pannus has sometimes been confounded with Phlyctenular keratitis. but if we examine the under surfaces of the lids we will find in the former the characteristic granulations which we will not in the latter.

Inflammation of the conjunctiva may be distinguished by observing the character of the secretion, which in Phlyctenular keratitis is never purulent, as it is in the former. but simply consists of tears. In the former the palpebral conjunctiva and the conjunctival cul-de-sacs are

affected while is never the case in the latter - the palpebral conjunctiva being at the most only slightly injected.

Prognosis

Usually good - the worst results being some opacity of the cornea. Destruction of the cornea is very rare.

Treatment

In treating this disease we wish to allay the pain and photophobia, diminish the vascularity and promote the regeneration of the corneal tissue and prevent the spreading of the ulcer.

With regard to the first indication there is no better agent than the neutral sulphate of atropia in the form of a solution dropped into the eye three or four times a day. The general strength of this solution is two grains to an ounce of distilled water. but this should vary with the age of the patient and degree of inflammation. Atropine acts locally by anaesthetising the ciliary nerves, it lessens the rate of circulation in the vessels & causes them to contract, so doing away with the

Mazis which may be present and diminishing the vascularity. At the same time it paralyses the accommodation muscle and diminishes the intra ocular tension. and so relieves the cornea of a good deal of pressure.

The insufflation of powdered Calomel is a very old remedy, and one which is extremely useful in cases where the Patient have not given way, or where the ulceration is very superficial. It facilitates the absorbtion of the Phlyctenules and lessens the photophobia. It is easily applied either being blown through a glass tube or else by means of an india rubber ball with a specially made barrel fitted to it. If the pain is very intense a little powdered hydrochlorate of morphia may be added with advantage, in the proportion of one part of morphia to forty of Calomel. The calomel should be used once or twice a day.

In cases where the resulting ulcer is deep and suppurating the ointment of the yellow oxide of mercury (Payen's Ointment)

is useful of a strength of 8 grs to the ounce of vaseline. The following I have also found useful. ℞.

Pulv Hydrag Oxid flav grs viii
Atrop Sulph grs iv
Vaseline ℥i.

F. Ung.

Bis die utend.

This ointment should be placed in the eye twice a day, the lower lid being drawn down and a piece the size of a split pea placed within it. If the pain is very intense Belladonna ointment rubbed on the forehead may be of use, or else the warm Belladonna lotion applied to the eye. A blister behind the ear may also be of service.

If the inflammation is spreading and if there is a fear of the iris becoming affected two or three leeches should be applied to the temples.

In cases where the vascularity is rapidly spreading over the whole cornea in spite of treatment we should first try Atropine and Eserine alternately and

of local pain we may proceed to scarify the vessels at the border of the cornea, or in very severe cases even remove a small strip of conjunctiva around the cornea. Some authors recommend puncture of the vesicles and evacuation of their contents. In chronic cases and those in which relapses are common scarification is of great use, also douches of steam or warm water to the eye. three or four times a day, and the use of the yellow oxide of mercury ointment, but on no account should any strong astringent be used.

When relapses are common we should continue the interpolation of Calomel for a fortnight or more after the ulcers have healed. When the photophobia is very intense and prolonged painting the surface of the eyelids with Tincture of Iodine or a strong solution of Nit. rate of Silver may often be very successful.

Combined with this local treatment there should be careful attention

paid to the constitution and general hygienic conditions of the patient.

At the onset of the disease an emetic & purgative is often useful - followed by calomel and rhubarb or in children the mixture of soda - rhubarb and magnesia. Small doses of Tartar Emetic are said to be of service in relieving the pain and photophobia in the acute stage.

When the alimentary canal is in a healthy condition Sulphate of Quinine combined with a mineral acid should be given - this is also is vaunted by some practitioners as a sort of specific for the disease. But beyond improving the appetite and tonically acting as a tonic I do not think it has any specific virtue.

In stubborn cases it is well to give cod liver oil when the stomach will bear it. It may be given either alone or combined in equal parts with the Syrup Ferri Phos Co. beginning with half a drachm, a dose, of each and gradually increasing

the dose according to the age of the patient.

The diet should be abundant and easy of digestion. and should consist largely of milk and farinaceous foods. Porridge and milk in the morning is an excellent thing. The clothing should be light and at the same time warm. and same applies to the covering of the childs' crib or bed. The sleeping and living rooms should be airy and well ventilated and above all things the patient should not be confined to the house but should have the benefit of as much fresh air as possible - the eyes being protected by smoked glasses. If practicable, a change of air is to be preferred.

Suppurative Keratitis.

(Abscess of Cornea)

Characterised by.

An inflammation of the cornea consisting of an infiltration of small cells between the lamina and the formation of pus. The inflammation may be Diffuse or Circumscribed.

Pathology

The abscesses are formed in the substance of the cornea itself between the lamellæ or in some cases just below the anterior elastic lamina. The disease commences by a small cell infiltration between the lamina which soon becomes separated and the cells compressed & fatty degenerated. which is due not only to the pressure of the infiltration but also to the interference with the nutritive processes. Pus cells are formed both from the breaking down of the corneal elements and also from the leucocytes. Thus an abscess is formed which may terminate in various ways if left untreated. From the continued pressure of the pus it may

infiltrate the whole of the corneal layers and so on to destruction of the whole cornea. It may cause the layer either in front or behind it to give way in which case the abscess is discharged either externally, forming an ulcer or internally into the anterior chamber (hypopyon) - In some cases there may be both an external or an internal opening - Corneal fistula. In the case of an ulcer forming we find the vessels developing as before described.

Ulcerology

Is commonly caused by a wound of the cornea - it sometimes follows the extraction of cataract and I am inclined to think that in some of these cases at any rate it is due to some septic influence as the number of cases have markedly diminished since the use of antiseptics in Cataract extraction. It sometimes arises from the continuous irritation of foreign bodies - Chemical injuries &c. and may arise from the spread of disease in neighbouring parts as in purulent conjunctivitis - It is often found in people

beyond middleage who have been unhealthy and then have undergone want & exposure to cold &c It is said to occur occasionally as an epidemic.

Symptoms

In the circumscribed form we notice a small whitish grey patch on the cornea generally towards its centre. This patch may be extremely small and varies in shape. often being nearly circular. at the same time the cornea seems roughened and hazy. This patch may increase in size and if we examine the cornea in profile we may see that the portion corresponding to the patch is bulging forward. This patch is gradually shaded off into the healthy cornea. being surrounded by an area of medium opacity. In a very short time the cornea becomes encircled by a zone of cabillary injection. and new vessels may even shoot at the circumference of the cornea.

This patch is due to the formation of pus between the layers of the cornea. and if we examine the cornea by oblique illumination

we can see whether the pus is situated in the anterior or posterior part. When in the former the same superficial layers give way and the pus is discharged leaving an ~~abscess~~ ulcer. Or it may so separate the corneal layers as to dissect off to the lower half of the cornea. "Onyx" When situated in the deeper part it often opens into the anterior chamber into which the pus is discharged forming "Hypopyon" In examining a case of Onyx we can see that the upper border of the deposit of pus is generally ~~Convex~~ Oval and that when we move the patients head from side to side the pus does not move. In Hypopyon the upper border is horizontal and the pus can often be varied in position by changing moving the head.

In the diffuse form the opacity rapidly spreads and soon involves the whole of Cornea. The Epithelium is shed and the whole cornea becomes tumefied & bulges forward owing to the fact that in its weakened condition it cannot resist the intra ocular pressure. There is often perfo-

ulcers and destruction of the entire cornea which becomes entirely opaque.

In more favorable cases the opacity may extend to the whole of the cornea but is unfortunately most frequently situated in the centre over the pupil.

Photophobia is a constant symptom and is especially well marked before the abscess has given way. Galezowski says that this is due to the compression of the corneal nerves by the pus. The same cause gives rise to the increased secretion of tears which are found in these cases. Circumorbital pain is usually very intense in these cases and is often particularly exasperated at night. This pain is often most severe in the cheek or eyelid & forehead. and is due to the extension of the irritation to other branches of the fifth nerve. In some cases swelling of the neighbouring part has been noticed. it is stated that when the abscess is in the lower part of the cornea the pain is referred to the cheek - when in the upper to the eyelid and forehead - (Galezowski). This may be

tion in certain peculiar cases but in the majority the pain extends to both the supra & supra orbital branches of the fifth. There is one form of abscess which occurs in weakly badly fed people in which there is no pain - owing to the fact of the cornea being so deprived and weakened that it sloughs after little or no irritation to the pus.

Course and Duration.

In most cases the abscess opens externally and the pus being discharged an ulcer is left. The ulcer is of the same nature resulting from Phlyctenules and the wound requires longer to heal. But the process of healing is identical - viz. the formation of new vessels & gradually filling in of the ulcer - finally the resulting opacity is larger and denser than in the latter. When the ulcer is deep the posterior elastic lamina may by the intra ocular pressure be forced with it & may project from the surface in the form of a transparent bead. These membrane soon pass away and so causes the anterior

chamber to disappear. This giving way of Descemet's membrane often occurs very suddenly when the patient is making some sudden exertion or when the eye is being opened for the purpose of examination. For this reason we must be extremely careful when separating the lids. It often leads to adhesions between the anterior surface of the Iris and posterior surface of Cornea. (anterior synechia). The surface of the capsule of the lens often becomes involved and opaque resembling congenital capsular cataract.

In some cases the anterior chamber does not entirely disappear and a fistula is the result through which the aqueous humour is discharged as soon as it collects.

Sometimes the abscess does not open externally but bursts into the anterior chamber where the pus collects. Hypopyon may be unrecognised at first owing to the conjunctival margin being swollen and the pus small in amount but it rapidly increases and fill more than half of the anterior chamber. Sometimes Hypopyon is due to

Iritis. or in some instances Iritis has been set up by the pus.

The deposit of pus may rapidly increase in Size and involve the whole Cornea. which becomes tarnished and opaque - and in a short time becoming a Greyish white mass with a surface gradually breaking down. The Iris may become involved and the whole mass may project forming what is known as "Staphyloma Racemosa" -

The Duration of the clinical depends on the cause. age of the patient and his state of health and upon treatment of the abscess. When superficial & well treated recovery may result in two months or less. When deep it may go on for many months and in very many cases there is some permanent opacity left.

Diagnosis

When the abscess or resulting ulcer is superficial we are apt to confound it with Phlyctenular keratitis - in the latter case however the ulcers are usually multiple - while in the former there is only one. But in the second or healing stage when the

ulcer is transparent and healing then it resembles scarcely another due to rupture of a Phlyctenule. The eye will also in most cases be of assistance.

It is often extremely difficult to tell whether there is any Iritis owing to the opacity of the Cornea. it is of extreme importance to diagnosis this on account of adhesions. The diagnosis between Hypopyon & Onyx is often difficult and they are often co existant. Oblique illumination is often of great service the layers of the cornea being seen in front of the pus in Hypopyon.

Prognosis

Depends on the situation, extent, and character of the abscess. Superficial abscesses which are not increasing in size soon heal after their contents are discharged but often some opacity remains. Large deep abscesses are to be feared as they are especially likely to be followed by complications which are always serious. such as prolapse of the iris. Staphyloma either partial or complete. Hypopyon especially when the pus is increasing in amount;

and above all things the diffuse form which is always followed by permanent injury to the eye - generally complete loss of useful vision. In young healthy people abscess in many cases heals with very slight opacity being left. In other cases the prognosis is grave with regard to the retention of proper vision in the affected eye -

Treatment

When the case is seen early and the abscess has not burst way and the pus small in amount we may try ~~and~~ to get absorbtion without having recourse to operation - but in most cases this is not possible - Atropine here is the great factor - it should be used in a mild solution (gr 1 - ℥j) frequently dropped into the eye which should be kept covered by a pad of lint soaked in warm Belladonna lotion (Ext Bellad grs v - ad ounce ℥j) - and a bandage applied - while at the same time a purgative may be given and the patient kept in a dark room. The diet should be light & plentiful and

in cases which have been badly fed some slight stimulant may be given. Leeches to the temples may relieve the intense pain but we generally require to have recourse to hypodermic injections of morphia.

In about four or five days of this treatment the abscess usually pints way & then the pain and photophobia rapidly diminish. The resulting ulcer is in most cases best treated by insufflations of calomel. Atropine should be still used and if the abscess has been at all deep a pad and bandage should be kept applied to counteract the intra ocular pressure and avoid protrusion of Descemet's membrane or the Iris. When the ulcer commences to heal Pagenstecher's ointment or the simple Hydrag Oxid flav may be used instead of the Calomel and tonics should be given. The treatment should be continued for some time as relapses are apt to occur.

When the abscess is at all deep or seems to be increasing in extent then one should have recourse to puncture. This may be performed in several ways. either by

Triangular knife passed from the lower margin of the cornea upwards into the abscess - in which case the patient should be placed on a couch in a good light and after a 4 p/c solution of cocaine has been several times dropped into the eye it should be steadied by means of a pair of fixation forceps and the knife passed into the abscess. The contained pus is in many cases very thick and so the opening requires to be large. After the operation Atropine should be dropped into the eye and a pad soaked in warm Belladonna lotion applied. The incision should be kept open for a few days by means of a blunt probe.

Bucknell Carter (Quains Dict of Med p 477) recommends that the operation should be performed by means of a cutting needle passed first into the anterior chamber from the corneal margin and causing its point to penetrate the abscess cavity the contents of which together with the aqueous humour escaping on withdrawal of the needle. The incision should be kept open by passing a probe

and as twice a day to insure the complete removal of all inflammatory products until the healing process is well established.

Sokolnicki's method Jalet p 88

The patient is anesthetized in the horizontal position (Cocaine may be used). the lids separated by a Speculum and the Globe steadied. A Graefes linear cataract knife is passed through the cornea about 1 mm from the abscess into the anterior chamber behind it and brought out through a counter puncture in the cornea 1 mm on the opposite side - the blade is now made to cut its way out through the affected part and to admit of escape of the pus. The elastic compress is applied and some antiseptic lotion used. In 24 hours the wound should be opened with a probe and this should be repeated daily until the suppuration diminishes.

In cases where the abscess is central and of some size Lockey Wells recommends that in addition to evacuating the contents of the abscess an iridectomy should be performed at the same time

as the resulting opacity is sure to require such an operation and it exerts a beneficial influence on the course of the disease.

The result of the puncture of the abscess is a rapid diminution in the pain and redness of surrounding parts. The ulcer is at first rapped but soon takes on a healing process and becomes smooth. The cornea surrounding it becomes clearer and in a short time the ulcer is healed.

Hypopyon requires in most cases a similar treatment. When the pus in the anterior chamber is very small in amount we may try to avoid puncture and use Atropine to dilate the pupil and so avoid any adhesions of the iris. but in most cases puncture is required. Constitutional treatment is required in all cases. Tonics such as Sulphate of Quinine - Iron and Arsenic are of great service - Calomel has also been recommended. Fresh air & cleanliness are absolutely indispensible - combined with good food and in many cases some slight stimulant.

Complications must be treated as they arise - it is of great importance to keep the pupil fully dilated to prevent adhesions of the Iris.

Prolapse of the iris if towards the centre of the cornea should be treated with atropine - if towards the margin with eserine.

Prolapse of Descemet's membrane. The prolapsed portion should be punctured and the aqueous humour allowed to escape - and atropine dropped into the eye two or three times a day. A light pad and bandage being kept constantly applied.

The resulting opacity frequently requires an iridectomy to be performed corresponding to a clear portion of cornea. Opacities themselves when not very dense and thick often clear up in time. Calomel dusted into the eye is of service - also the use of Iodide of Potassium drops. of the strength of 2 grs of the Iodide to an ounce of distilled water.

Ulcerative or Necrotic Keratitis.

Syn.

Neuro-paralytic keratitis. Necrosis of cornea. Non-inflammatory suppurative keratitis.

Characterized by

A marked absence of pain or irritation but by a rapid softening, breaking down and destruction of the Corneal tissue.

Pathology

In this disease we find the tissues of the cornea undergoing fatty degeneration and breaking down forming pus. but in this case the small cell infiltration is wanting. This breaking down of tissue seems to be due to an interference with the trophic nerves of the part which are probably transmitted by the ciliary nerves of the fifth nerve. as division of that particular part of the nerve in rabbits has been followed by this disease. while in other cases no changes have followed division of all the rest of the nerve with the exception that as the cornea loses its sensibility foreign bodies

bodies on it are not prevented and in the course of time set up inflammation. This disease sometimes follows Conjunctivitis with much Chemosis where the vessels are much compressed before entering the Cornea.

Aetiology.

Any cause which leads to injury or compression of the trophic nerves. In some cases due to some disease at the cerebral origin of the fifth - in other cases due to compression of the corneal nerves at their entrance into the Cornea. It is found after Purulent & Gonorrhoeal Ophthalmia. Extraction of Cataract - or injuries to the Cornea from foreign bodies. Sometimes seen in Staphyloma - and in tumours of the Orbit or brain.

Symptoms

This affection appears either in the form of a yellowish white patch towards the centre of the cornea or else as a ring more or less complete at the circumference. In the former case the patch rapidly spreads both in size and depth but is perfectly distinctly defined from the rest of

the cornea and not gradually shaded off into it as in the ~~form~~ case of abscess. The rest of the cornea is perfectly clear. In a short time the epithelium covering the affected part becomes ruptured and gives way. the contents of the abscess are discharged and a large ulcer is left. which may have perforated the Anterior Chamber & even involved the iris. In favorable cases the edges of the ulcer become surrounded by a zone of grayish white infiltration and new vessels are developed in the cornea. in fact it presents the ordinary characters of a healing ulcer. In other cases the whole of the cornea may be destroyed and the lens may escape.

In the case of the disease taking the annular form it may extend so as to surround the whole cornea and cause its entire destruction but as a rule it does not extend entirely round and thus forms a crescentic marginal ulcer.

This form of keratitis is accompanied by deep pain & photophobia. in fact it presents those of the ordinary characteristics of inflammation. If the ulcer goes on to in

when the iris then there is pain and photophobia.

Course and Duration

Depends much on the cause. If due to some cerebral affection as disease of the Gasserian ganglion then the disease is likely to go on to complete destruction of the cornea. but as a rule especially when there is some local cause if it can be removed the disease becomes limited and recovery takes place. It is very rapid in its onset the destruction of corneal tissue spreading extensively even in a few hours. The healing process is usually slow and the resulting opacity dense.

Diagnosis.

The appearance of the whitish spot on the cornea and its rapid increase. at the same time the entire absence of inflammatory symptoms will serve to distinguish it from suppurative keratitis. The existence of some cerebral or orbital tumour may be discovered. and the disease often occurs in elderly people in those who have the senile degeneration developed.

Prognosis

This is always grave especially in those cases which follow purulent Ophthalmia. If some cases which can be removed can be discovered then the result is more hopeful. In young people the disease after a time often takes on an inflammatory form when then is more hope. In cases due to paralysis the entire cornea is seldom destroyed the disease generally being limited to a portion.

Treatment

This is a most unsatisfactory disease to treat often resisting all manner of remedies and but too often in spite of all our endeavours and when there is any risk of the cornea becoming affected in Purulent Ophthalmia &c. we should be extremely careful to make punctures when there is Chemosis and to do our utmost to prevent it. When once established I have found that the best form of treatment, after having if possible removed the cause, is by means of Atropine drops and the warm Belladonna lotion

constantly applied on a pad of lint and linen by a light bandage. This relieves the intra ocular pressure and avoids the chance of perforation & its attendant evils as much as possible. When there is a large quantity of pus and where the outer layers of the cornea have not given way we should puncture it. and the same should be done when there is a collection of pus in the anterior Chamber.

When the cause is discovered but not able to be removed we should treat it as far as it is our power. and when removable it should be got rid of as soon as possible.

The resulting ulcers may be treated in the usual way & where very indolent they may be scraped or in bad cases cleared by Saunders method.

Constitutional treatment should be attended to and a generous diet should be given together with some stimulant and tonics as ammonia and bark or Iron and Quinine. Arsenic is also beneficial in these cases.

Granular Keratitis or Pannus.

Type — Vascular keratitis.

Characterised by

The development of blood vessels in the epithelial and sometimes the superficial layers of the cornea - generally in its upper half.

Pathology

The cells of the epithelial layer are flattened and their contents become granular and their nuclei swollen and often double - while the cells of the anterior elastic layer become swollen and detach broken down leaving only their nuclei - (Salzowski). At the same time there are signs of new formation observed in the epithelial & subjacent layers. These vessels are derived from those of the conjunctival border and are at first nearly straight - ~~extreme~~ and arise at a very acute angle - in their course they become exceedingly tortuous - and form a large network which may cover the greater part of the cornea.

Iales (page 76) says that there is an infiltration of nucleated cells in the deeper

Epithelial layers of the cornea. This I am inclined to think is due to the continued irritation of the Epithelial cells and their superficial ones become flattened and granular.

These vessels are probably produced as His states by a formation of filiform cells in the tunica adventitia of the capillaries. The cornea itself remains clear until the disease has continued for long when patches of infiltration are to be found.

Aetiology

Granular ophthalmia is the most common cause of pannus. and may which acts in two different ways - either by the irritation of the granulations on the upper lid constantly affecting the cornea, or by the spread of the granulations from the palpebral to the ocular conjunctiva and so to the cornea. Dalyowski is not inclined to admit that the irritation of the granulations on the upper lid causes pannus. as he states that in cases of thick fleshy pannus the granulations are soft and swollen & their papillae

flabby & vascular and not rough. In this opinion I venture to differ from him as I have seen many cases in which the disease seemed undoubtedly due to the irritation of the granulations. and when only the upper part of the cornea has been affected - by - the part upon which the upper lid moved.

The disease may follow Purulent. Phlyctenular or Scrofulous Ophthalmia. Also may arise from the irritation of inverted eyelashes - and the extension of the cornea from some affection of the lids. This has sometimes been called "Granulated Pannus"

Symptoms.

In examining a case of pannus in its early stage we may find that the blood vessels are not yet developed or if they are they may be so small as to be invisible to the naked eye. We should find that the white tissue covering the upper part of the cornea was swollen & opaque - and probably slightly more prominent than that of the rest of the

cornea - and that there was a ring of vascularity around the margin of the cornea. On careful examination we would find that the opacity did not include any very considerable depth of cornea but was confined to the superficial layers. As the irritation continues the opacity and thickening becomes more marked as well as the surrounding vascularity which is due to a spread of the irritation from the corneal vessels to those of the neighbouring conjunctiva causing dilatation of pre existing vessels. As this continues new vessels are formed these arise directly from those of the conjunctiva and soon extend across the cornea. At first they are few in number and small in size, but straight in a little time they increase both in size and number and becoming tortuous they anastomose freely with one another forming a vascular net work over the cornea. This has received the name of "Pannus" - and according to whether it is thick and fleshy or thin

course has been named Pannus Crassus - or Pannus Tenuis.

If the disease is allowed to go on unchecked the corneal tissue proper becomes affected. There is a small cell infiltration which has a tendency to develope into connective tissue and the result is that the opacity which may remain is extremely dense.

When the disease first commences there are few subjective symptoms - beyond a feeling of discomfort in the eye - but as the irritation continues then the eye becomes sensitive - and we have the usual symptoms developed. Eg - Photophobia - lacrymation and circumorbital pain. These are not constant but are usually present to a greater or lesser degree.

Course and Duration

If the disease is not treated it may result in opacity of the whole cornea or of a portion - new vessels arising not only in the superficial layers but throughout the whole membrane until the cornea is reduced to a fleshy mass. In some

cases we have suppuration in the cornea which may lead to perforation and collapse of the c. Granulations may form on the upper part of the cornea x invade the whole structure of the cornea may become softened and yield to the intra ocular pressure forming staphyloma.

Diagnosis

It is of great importance to distinguish this disease from the vascularity attending healing of wounds or ulcers of the cornea. and it is often only by careful attention to the history of the case that we can do this. Ulcers of the cornea are often multiple. especially those due to Phlyctenular Keratitis and at the same time are frequently situated towards the lower border of the cornea. while in pannus the disease is usually confined to the upper part of the membrane. The presence of ulcers or their absence will confirm the diagnosis.

The second stage of Interstitial keratitis resembles Pannus but in it the vessels are deeper and the conjunctiva is not

Prognosis

If the disease has lasted for some length of time this is grave - and there usually a certain amount of opacity left - but at the same time it is remarkable how even in old standing cases the cornea clears up and becomes again transparent when the source of irritation is removed. In a case which is seen early and the cause removed the prognosis is good - Complications are always to be feared - deep seated abscesses - softening of cornea &c. making the prognosis very grave indeed.

Treatment

With regard to the treatment we have two opposite opinions to deal with in cases where there are granulations of the upper lid.

1 - The opinion of those who hold that the disease is caused by the granulations & therefore argue if the cause is removed the effect will disappear.

2. Those who hold that the granulations are not the cause of the disease and therefore that they do not need any

special treatment except in certain cases. The latter is the opinion of Galezowski who states that it is only in cases where there is no inflammation that the granulations require special treatment. Bundenell Carter (Diseases Eye p 678) describes Vascular keratitis as a totally different disease from pannus. but in this ~~case~~ I cannot agree with him. he states that astringents should on no account be used - but recommends the use of Atropine & Eserine alternately. this treatment is of undoubted service in many cases but I am inclined to think that the use of astringents is absolutely necessary in many cases.

In a case of pannus the first thing I consider necessary is to discover the cause and proceed to treat it. if this should be any deformity of the lids there some plastic operation would be required - in. growing eyelashes are best removed by the knife & not simply plucked out. but in the greater number of cases we will find that we have to deal with granulations

on the palpebral conjunctiva and there
requires active treatment. If cases are
not of very long standing the daily ap-
plication of a crystal of sulphate of copper
is usually sufficient. This is applied by
everting the lid & gently rubbing the crystal
over the granulations - which should then
be washed with warm water and the lid
returned. The sulphate of copper may
be alternated with the weak nitrate of
silver stick or lapis divinus. If the
granulations are very large they may
be removed. Dr Wolfe of Glasgow recom-
mends scarification. Combined with
this we should use Everins drops
(℞ ℥ii - ℥iv - ℥j) alternately with Atropine.
In most cases this treatment will be
successful but in some we may have to
have recourse to other measures. The
old remedy was to excite purulent opth-
thalmia in the affected eye by means
of a drop or two of pus from such a case
or even from a case of gonorrhoea & covering
up the other eye by means of a watch glass
This was an uncertain and dangerous

method of treatment - In some cases the resulting inflammation being very severe and leading to sloughing of the cornea. De Wecker has recently introduced the use of pyocidy seeds for this purpose, which should be prepared in the following way - Take 3 grammes of the pulverised seeds & macerate for 24 hours in 500 grammes of cold water & then add 500 grammes of boiling water - allow the infusion to cool & use immediately.

The patient is to bathe his eyes with this two or three times a day & if inflammation does not follow it should be repeated for two or three days. The resulting inflammation is severe and accompanied by copious serous exudation - it lasts for some five days and then gradually diminishes & should have ceased by the 15th day. When the cornea begins to clear the granulations having disappeared - (Soler pp 77-8)

In my experience this treatment has not been invariably successful - in some cases the granulations were diminished and afterwards yielded to treatment,

while in other cases no inflammation at all followed. but in no case were the granulations entirely cured.

I have found the removal of a ring of conjunctiva around the margin of the cornea to be of great service. The patient should be cocainized and in the horizontal position. the lids separated with a speculum & the eye steadied. the conjunctiva should be divided with scissors entirely round the cornea and about 1/4 in from it. this strip is then to be dissected off as close to the cornea as possible. The resulting inflammation is often very severe but in a short time the cornea begins to clear. In the most intractable cases scarification around the cornea may be successful. this will require to be repeated daily for some time.

Complications must be treated as they arise. abscess punctured &c &c.

Constitutional treatment may be required - chiefly tonics such as Quinine Cod Liver Oil. Parrish's food &c. Food abundant & pure air.

Diffuse or Interstitial Keratitis

"Syn"-

Syphilitic - Parenchymatous or Strumous keratitis -

Characterized by

The appearance in the centre of the cornea of a patch of opacity which rapidly spreads and involves the whole cornea. The cornea is surrounded by a zone of vascularity. Both eyes are usually affected one somewhat later than the other.

Pathology

In this disease as in the other forms of keratitis we have an infiltration of new cells, but in this case the deposit has no tendency to break down & become purulent or to ulcerate. The changes are stated to commence in the corneal cells themselves which swell up and become granular - probably from some cause acting on the trophic nerves of the part. In a short time we find a deposit of small cells in the deeper layers of the cornea and many cor-

tions shall these new cells are derived from the pre existing corneal ones. This deposit is thickest in the center of the cornea. Commencing at the periphery close to the membrane of Descemet and extending nearly to the anterior elastic lamina in the center: At the same time the Epithelium undergoes changes becoming broken down and infiltrated into new cells.

In a short time the irritation caused by this deposit spreads to the surrounding tissues and new blood vessels develop running into the cornea towards its center and are derived from branches of the Ciliary vessels. These new vessels are deeply situated and when seen from the front have a peculiar color resembling that of Salmon. hence they were termed by Jonathan Hutchinson "Salmon patches". These vessels are extremely minute. Sometimes they are developed in the upper & lower margins of the cornea where the disease has received the name of "marginal keratitis".

In the course of time the deposit becomes lessened and the vessels disappear. a process of repair being established. The cornea however seldom recovers itself entirely and there is usually some opacity remaining.

Aetiology

In the greater number of cases there is a distinct history of Syphilis. It usually occurs in Children & young adults and frequently about the time of the second dentition. In Strumous badly nourished Children who have inherited Syphilis the second dentition is often accompanied by much pain and the teeth present the peculiar notched & key top appearance that has received the name of "Hutchinson's teeth". Whether the irritation is conveyed by means of the dental branches of the fifth nerve to the ciliary nerves is uncertain - but very probably it has a certain influence as the disease commonly appears at this period and also at the time when the wisdom teeth are cut.

Predisposing causes are Stamma - bad feeding and imperfect hygienic conditions. I am not inclined to think that Stamma has anything to do with this affection beyond predisposing to it. Diffuse keratitis has been observed in people with acquired Syphilis.

Symptoms -

This disease may be conveniently divided into three periods. viz - (1) Infiltration. (2) Vascularisation (3) Absorbtion. These three periods are of course common to most forms of keratitis but during the second there are usually certain distinctive changes such as ulceration - formation of abscesses &c. in this form however the infiltration includes no particular change.

(1) Infiltration - We first observe an opacity of the cornea this may be central or simple or may be multiple. If simple it soon extends and involves the whole of the cornea - When multiple the various patches spread

and become united. and so affect the whole cornea; which has an opaque appearance often compared to ground glass. the Epithelium on the surface is suspend and uneven, at the commencement the opacity may be so slightly that it can only be made out by careful oblique illumination; when it has continued for some time we notice the usual Zone of vascularity around the cornea and as the disease progresses this becomes very distinct, and in this we observe new vessels shooting into the cornea and passing towards its centre and then we have the second stage developing. In some cases the infiltration is not very great and seems to become absorbed without going on to the second stage. but in the greater number of cases the infiltration is very well marked and of a greyish white color very opaque and entirely hiding the Iris and pupil from view.

In this stage we have at first little discomfort beyond a slight feeling of

roughness in the eye. but as the disease advances we have photophobia and lacrymation accompanied by circumorbital pain often to a very intense degree. the eye being extremely sensitive to light.

This stage is described by some authors (Wells amongst them) as a separate disease from the second stage. and they have named it "non-vascular diffuse keratitis. This is in my opinion an obvious mistake as the vascular form is simply a further stage of the first.

(B). Vascularisation - second stage -

The irritation caused by the deposit of small cells soon affects the corneal nerves probably by affecting their nutrition. This irritation spreads to the nerves in the surrounding conjunctiva and causes the blood vessels to dilate, in a short time this vessels begin to give off minute new vessels which encroach on the margin of the cornea. as a rule a number of this small vessels enter the cornea together

and pass towards its centre in the deeper layers. In other cases they enter at the upper and lower margins - constituting what is sometimes called marginal keratitis.

When we examine the cornea in this stage we see the vessels through the infiltration and they do not appear of a very bright red color but more pinkish and have been called by Mr Hutchinson a "salmon patch". The vessels themselves are so minute that they cannot be individually seen without the aid of focal illumination and a lens. To the naked eye they resemble an extravasation between the corneal layers a mistake which must be carefully guarded against.

If the disease is not treated this vascularity may increase more & more until a condition of pannus is set up. It is generally of long duration.

(f) Absorption. Gradually these patches disappear. the vessels becoming smaller & then vanishing - the cornea becoming clearer until repair is accomplished.

This is a very slow process taking some 3 or 4 months and then is seldom quite perfect.

As a rule both eyes are affected but one at a later period than the other The Photophobia and pain are much diminished in the second stage but there may be exacerbations.

Course and Duration

The disease is always extremely chronic seldom lasting less than 6 months while it may continue for much longer. As the disease is constitutional we may expect to have complications. The most common of these is - Iritis - which is often difficult to make out owing to the opacity of the cornea. Opacities of the cornea are commonly left after the disease. Choroiditis & irido-choroiditis are common - and sometimes sclerotitis.

Diagnosis

In this the various constitutional symptoms are of great service - In the earlier stages of the first period when the opacity is first seen it may be mis-

tubes for Suppurative keratitis - but the age and general appearance & history of the patient should be sufficient guide. In the second period we must guard against mistaking it for pannus - but in the latter the blood vessels are much more superficial.

Prognosis without there is much cachexia this is a rule is fairly good - most cases recover more or less completely in time - we should be careful to warn patients that the disease is infectious or otherwise they are very apt to become impatient and to have recourse to all kinds of worthless modes of treatment.

Complications of course increase the gravity of the disease especially iritis - which is very apt to be followed by adhesions - or to go on to Iridochoroiditis. In an ordinary uncomplicated case recovery generally takes place with little or no opacity remaining on the cornea - although in some cases this is very considerable.

Treatment

May be divided into Local and Constitutional, the latter being of great importance owing to the nature of the disease.

Local. In the first period we desire to stop the infiltration and promote its reabsorbtion as much as we can. To accomplish this we find that in most cases some warm-moist application combined with the use of Atropine is the best. I believe with Galezowski that the best way to apply the former is by means of the Steam vaporizer either with plain or medicated steam. The patient should place over his eyes two compresses of linen, three or four ply thick and it is of advantage to soak them in the following lotion -

℞ Extract Hyoscyam grs 20
Extract Belladon. grs 25.
Aq ferment ad ℥j

The steam jets of the vaporizer should be allowed to play on these pads for a

period of time varying from a quarter of an hour to an hour. and should be repeated three or four times a day. Atropine Solution (gr ii – ℥i) should be used two or three times daily and if there is much photophobia leeches may be applied to the temples or Unguentum Belladonnae rubbed in. and in severe cases a hypodermic injection of morphia given.

When the second period has been established Eserine may be used alternately with the Atropine and as the photophobia and pain will have diminished the warm applications need not be used so frequently.

As the vascularity is diminishing Calomel may be dusted into the eye or the yellow oxide of mercury ointment may be used twice a day and this should be kept up for some time as a relapse is not uncommon.

With regard to the use of bandages surgeons differ – but I think it may be accepted as a general rule that where the photophobia is not excessive

The use of smoked glasses will be quite sufficient the patient avoiding any bright light. When the photophobia is pronounced and the pain troublesome then a bandage with a pad soaked in warm Belladonna Lotion had better be used and the patient kept in a dark room. Still it is of the utmost importance that he should have fresh air, and if unable to go out the windows should be opened.

In these cases astringent lotions should always be avoided. I have seen weak solutions of Hydrag Perchlor used extensively but cannot say that the results seem at all satisfactory.

Constitutional. Some mild mercurial ought to be invariably given and continued for some months - care being taken to avoid the least salivation. The particular form in which the mercury is given should vary according to the age and state of health of the patient - in adults the ordinary Pil Hydrag ppitat ter die may be given

℞ — Liq Hydrag Perchlor ℥j
Tinct Cinch Co ℥ß
Aq ad ℥j.

Misce.

Ter die Sumend.

In children the mercury may be given in the form of mercurial ointment rubbed into the axilla or inside of the thighs twice a day. Iodide of Potass has been recommended and in debilitated children the Syrup. Ferri. Iodidi is certainly of use. In addition we may give Cod Liver oil. and in adults some tonic such as Iron & Quinine or Arsenic.

The food should be easily digested and nourishing. and the patient should be warmly clad. The hygienic surroundings should where possible be carefully attended to. Salt water baths are of service when practicable and a change of air either to the Sea side or the country is always beneficial. For the vomiting sparingly Calomel or Liq Hydrag Perchl Mur should be used.

Keratitis Punctata

Characterized by

The appearance of dots of a white or brownish color in the deeper layers of the cornea. often arranged in a triangular form

Pathology

In the superficial form I am inclined to think it is simply a variety of the Interstitial form - the pathology is almost the same.

In the deeper forms, which is invariably secondary to some disease as iritis - inflammation of the ciliary body and more especially common in sympathetic Ophthalmia. There is deposit of epithelial cells in the membrane of Descemet & at the same time there is a thickening of the epithelial layer.

Aetiology -

Either a form of Interstitial keratitis - or else when the opacities are deeper secondary to some other affection, most commonly Iritis - Cyclitis - and Sympathetic Ophthalmia - also irido-choroiditis &c.

Symptoms.

There are seen on the cornea a number of small opacities - they may be so small as to require the use of a lens for their separate identification - in other cases they may be larger. These opacities may be seen in the deeper layers of the corneal tissue in which case they are a form of Interstitial keratitis and follow the usual course of that disease.

In the deeper forms these opacities are often arranged in a triangular manner the base of the triangle being towards the circumference of the cornea and its apex over the pupil. These opacities are not attended by any inflammatory symptoms nor does the rest of the cornea become in any way affected. It is invariably a secondary disease and in fact may be regarded more as a symptom of these diseases than as a particular form of keratitis.

Prognosis

Depends on the disease to which this is secondary.

Diagnosis.

The appearance of the opacities, their peculiar arrangement and the total absence of Inflammatory Symptoms.

Treatment.

In the more superficial form the treatment is that of Interstitial keratitis.

In the deeper form treatment should be directed to the primary disease and when that has been alleviated the opacities of the cornea soon disappear.

Proliferative Keratitis (Salzmann)

This author is the only one who describes this peculiar form of keratitis. It seems to consist of a proliferation of the epithelial cells of the cornea which forms a patch on that membrane. It usually begins in the centre of the cornea forming a white patch which at first closely resembles an abscess. but it is quite superficial and the epithelium over it is raised. This patch increases slowly it may last for long causes no pain or inflammatory symptoms

On examination about the fourth or fifth week we will find the patch projecting distinctly from the rest of the cornea, and in a short time it commences to exfoliate but does not ulcerate but remains prominent though the surface may be roughened.

When a zone of injection appears around the cornea and the eye may become sensible to the light and painful- the vessels do not encroach on the cornea in any case.

The disease lasts for a long time especially when produced and kept up by local irritation. but often disappears on the removal of the cause.

The cause is little known. it has been known in three cases to follow some disease of the lacrymal passages

It seems to consist of a proliferation of the epithelial cells- those on the surface of the patch having undergone some fatty degeneration and broken down, some of the cells are swollen and have a double nucleus.

With regard to treatment some cause should be looked for & removed when found.

Examine the lacrymal passages most carefully and attend to any disease that may exist there. Otherwise the disease should be treated as Suppurative keratitis - with Atropine and warm fomentations. The surface of the patch may be scraped and then insufflations of Calomel used & afterwards a solution of Argent Nit.

I have never come across a case of the above disease nor can I find it described in any other book. I therefore make no comment on the above which is taken from Galezowski's work. I am unable to give the exact reference as I cannot obtain a copy of the work and my extracts are made from memory & notes ~~taken~~.

FINIS