In discussing the affections of a structure like the Cornea, localized to a small tract of the organ of vision, but playing a most important part in the proper exercise of this function, it seems advisable to give a brief resume of its anatomy and physiology. The Cornea forms the projecting anterior sixth of the globe and is a perfectly transparent fibrous membrane varying in thickness from 1/3 to 1/16 inch in the centre to 1/30th inch in the periphery arranged in 5 layers of modified Epithelium yielding Brondine or boiling. The first or superficial layer is purely epithelial, the cells varying in shape from the flattened superficial ones to the middle rounded while the others are elongated ones; the next generally called the "corneal stroma lamina of Bowman is quite homogeneous and transparent" is a continuation of the Conjunctiva; the Cornea proper is composed of bundles of pale flattened laminae lying in a superimposed manner containing between these bundles stellate connective tissue corpuscles filled.
with a transparent fluid. The posterior
elastic lamina is really only a part of the
membrane of Descemet which is elastic
structureless and covered by a single layer of
polygonal transparent nucleated cells.
Numerous processes spring from this, one
to form the ligamentum pectinatum iridis
some to join the ciliary muscles others to
unite with the fibrous structures of the sclera.
In the adult the cornea is non-vascular, its
blood supply being derived from the layer of
anastomosing vessels around its circumference.
Its nerves about 30 in number are branches
of the ciliary nerves, the fibres of which end
in the nuclei of the posterior layer of
the epithelium situated at its convex surface.

**PHYSIOLOGY**

The Cornea is one of the three
refracting surfaces of the eye; it affects
the rays of light falling upon it both by its
density and convexity. Taken in conjunction
with the aqueous humour where refracting
powers differ but slightly from it, its
refracting surface is nearly 0.7 millimeters
radius of curvature and possesses a refracting
power of 1.3366. (Duodex, Retraction, and Theories of...
the eye Page 38). It affects the shape by its density in accordance with the law of vision, that "when rays of light pass from a rarer to a denser medium they are bent towards the perpendicular," or by its convexity in accordance with another law that "Parallel rays of light falling upon a convex surface, on their exit converge to a point at a fixed determinate distance called the 'principal focus,' the rays becoming more refracted as they become further removed from the centre of the cornea."

The convexity of the cornea was formerly thought to change in myopia and hypermetropia, but in the early and advanced stages of life, but Donders (p. 38) has shown by numerous measurements of its curved radius, that there is scarcely any difference.

**PATHOLOGY:** From its transparency the cornea has naturally been chosen as the structure best fitted for the study of Inflammation. The parts entering into its composition are so delicately interwoven that a well-marked opaque milky appearance follows the least disturbance in their relative position.
Either from increased tension, pressure or any other cause.

In keratitis the epithelial cells become swollen, opaque, and ultimately undergo rapid proliferation. These proliferated products along with the migratory corpuscles from the surrounding vasomotor conjunctival vessels render the whole cornea turbid, opaque, and dense. If the process is not arrested, disintegration of ulceration results.

The form of ulceration which we shall principally consider is that which commences as a small greyish opacity, either in the superficial or deep layers of the cornea situated near its margin or most frequently on its lower third. The contents of this small circle degenerate, become disintegrated, and a ulcer is formed at this spot. Exhibiting a strong tendency to extend its ravages by the rapid destruction of its marginal limits, it thereby consequently considerable danger of its encroaching the whole cornea. The ulcer sometimes increases in depth...
or thus leads to perforation, or it may stop short of this, local leaving a dense leukoma; it may cause entire necrosis or an unsightly bulging Staphyloma. In most cases where the disease is not arrested in the earliest stages, especially if of traumatic origin, it will become effused into the anterior chamber giving rise to Hypopyon, which at first may be scarcely noticeable just like a split pea at the lower edge of its floor, but the quantity may increase rapidly, so much so, that the chamber may become 1/2 or 3/4 full in the course of 24 hours. The patient complains generally of very severe pain, he cannot tolerate light; there is considerable conjunctival irritation & frequently Unda & Indo-cyclitis. This is I presume the form of Ulcer called by Latinist "Ulcus Cornæe Buprens." (Pamphlet zur Behandlung des Ulcus Cornæe Buprens 1889)

**TREATMENT:** Before entering into the special form of treatment which we have found so beneficial, we will endeavor
To trace its development from earlier times & to show that the total outcome of long experience has resulted in a most satisfactory method of treatment. There is evidence in the works of old practitioners that they were alive to the value of rest in these cases, but they were unacquainted with any successful method of obtaining that desideratum. In simple ulcers Nitrate of Silver Drops (gr. inf. in h. 23.) were dropped into the eye frequently, while willing to allow that stimulation is beneficial in exceptional cases of ulceration we must conclude that the universal application of this treatment indicates a false notion of their pathology. In ulcers with Hypopyon a more heroic, but it is to be feared, proportionately less successful plan was adopted. The solid Nitrate of Silver stick was freely applied to the upper lid up to the brow, so as to render it extremely painful for the patient to move his lids, the object being the prevention of
The irritation arising from the friction of the lids against the cornea. The eye was left untouched or untinted; sometimes for days the sad spectacle that often presented itself was a cornea almost completely necrosed.

The next advance was the application of Belladona fomentations in those cases of the comparatively recent discovery and application of that potent remedy Atropine. Point to an era in the history of Ophthalmic Therapeutics.

In the early stages the pupil should be well dilated by dropping into the eye Glaucine Atropine (gr. iv a 27) or if this is found too weak (gr. 1/10 a 27) or a little of the following may be applied with a camel's hair brush in cases where there are any iritic adhesions.

\[
\text{Pulv. Amygd gr. 60}
\]
\[
\text{Glycerini 37; 10% Eucalptu}
\]

Warm Belladona Fomentations should be applied almost constantly to the eye. Von Graefe (Arch. fur. Ophthalmol. 1849 p 133) recommends Chamomile Fomentations varying in temperature.
from 90° to 104° F, increasing the temperature as the inflammatory action becomes lessened; he is of opinion that they should be changed every 5 minutes and that they should be discontinued at intervals, but under the supervision of an intelligent nurse, we have not found it necessary to change them so frequently. Our objects in using them are to allay the pain and irritation, to arrest the ulceration, but classical advocates their use for a longer period to assist in hastening the exfoliation of the necrosed portions of the cornea.

(Klinische Beobachtungen von Zagenstecker und Sasmis)

The use of a compress bandage made of fine flannel very materially assists in the treatment at this stage by checking the destructive tendency of the ulceration, so hurrying its formation of the line of demarcation, which is one of the first indications of healing. It does thus by producing complete immobility of the Eye to secure first.
If the patient complains of great pain which he generally does, a dose of liquor morphia (30 min) may be given at bed-time, or what we have found more efficacious, a reliable subcutaneous injection of morphia and atropine combined according to a formula suggested by Dr. Achilles of Dublin: R.: Acetatis morphia g xxvi
Liquor Atropiae m xcviii
Glycerini m v
H.: Aq. at Fiv
15 drops for injection = 1/2 gr. morphia and 1/80 grains of atropin sulph. I have seen this used in fully a hundred cases without any of the ill effects that often follow the administration of opium by the mouth. Leeches give great relief in those cases where there are acute complications, where these cannot be conveniently procured I can testify to the efficacy of 2 or 3 of Baron Hewè's or Dr. Artificial Leeches as substitutes.
In some cases of intractable vascular
ulcers counter-irritation will be found very serviceable. 2 belts of
Negretto felt should be applied, one on each side of placed on the upper back
part of the temporal region, so as to lie under the hair so as to avoid any
visible scars after they are healed, & they should be moved about every morning.

Spencer Watson FRCS has published a
good list of cases in the Royal London
Ophthalmic Reports Vol I (page 30) 1859.

The following notes of a case lately under my treatment will serve to
illustrate the good effects of counter-
irritation. — Arthur Horn of Salford aged 19. Inpatient of the Royal Eye Hospital: on
admission he suffers from an irritable
punched ulcer of the left cornea for which he has been under treatment
as an outpatient for 6 months. He has a
large congenital sebaceous cyst about the size of a small orange growing from the
skin of the scalp just below the occipital prominence of which I
removed the day after his admission.
In the process of healing, there was considerable irritation and a very profuse discharge, but a marked improvement occurred in the condition of the Corneal ulcer, in a fortnight it was quite healed without using any local application.

In some cases of ulceration, especially in children and nervous women, there is great intolerance of light or Photophobia. the orbicularis muscle is in a state of spasm and thus causes the characteristic moist red chink seen in such cases. Extending outward from the outer canthus for a quarter of an inch or so, this chink is formed by the bringing into contact of two surfaces of skin which by contact and consequent friction give rise to irritation and slight serous Effusion on the contiguous surfaces. This spasmodic condition, the amount of which can be tolerably well estimated by the size of the chink, produces injurious pressure on the Eyeball and retains the tears, which
combined irritate the branches of
the 5th nerve so prevent the process
of healing & hasten dangerous
complications such as perforation.
This spasm can be efficiently relieved
by a little operation called Canthoplasty.
In most cases it is sufficient to cut
the outer canthus with a strong pair
of scissors by entering one blade behind
the commissure & the other in front,
cutting quite horizontally outwards in
direct continuation with the palpebral
aperture, or a small scalpel may
be used to transfix from within
a small director & cut out through mucous
membrane, muscle & skin; the bleeding
sometimes considerable, can be readily
checked by the application of wet
cloths or sponges. Further the lids
should be forcibly separated every
morning until the spasm is congealed.
In very bad cases where it is desirable
to obtain a permanent Enlargement
of the aperture, a few stitches may
be introduced between the skin and
mucous membrane of the lower & upper margins & if necessary at the external margin of the incision.
In some severe cases of photophobia we have found "ducking" the face into a basin of cold water every morning for a few seconds very effective.

Although this treatment by Atropine & fomentations suffices in a large number of cases, there are many in which it proves quite ineffectual. The hypopyon increases either from lymph effused into the anterior chamber from the accompanying or superinfection, or from the interlamellar abscess penetrating inwards & discharging its contents to the anterior chamber. Weber says that this is often overlooked & he has often passed a probe through the communication which assumes the form of a small sloping canal seen by oblique illumination as a white streak (Archiv. fur. Ophthalm. Vol VIII, p. 22) or as 1902 has pointed out from
inflammatory proliferation fatty degeneration of the cells lining the posterior wall of the membrane of Descemet. Along with this increased hyperplasia there is extension of the ulceration, so some operative interference is required to check a process which otherwise would end in destruction of the eye for purposes of vision. The amount and kind of operative interference must necessarily depend on the extent of the hyperplasia oronyx; when there is only a small circumscribed abscess in the structure of the cornea, it may be laid open with the point of a small scalpel, but when there is pus in the anterior chamber more active measures must be taken. Among the earlier of the improved methods we must place Paracentesis Corneae or tapping the cornea, by which the principle of relieving tension, one of the principal stimuli of increased suppuration, is fully recognized. The best account
of the value and mode of performing this operation we find by Sperino
(Études cliniques sur l'évacuation spécifique de l'Humeur aqueuse dans les maladies
de l'Oeil. Éd. pp 149. Turin 1863) and Schauder
(Klinische Monatsblätter der Augenheilkunde
1863 vol. 2 p 87 & seq). Sperino uses a
small two-edged knife slightly curved
on the flat and having a slight ridge on each side so as to render its face convex from edge to edge to facilitate penetration. The blade is about 3mm wide and is introduced to the anterior chamber through a point in the circumference of the cornea and lateral where it is desirable to avoid any trace of a scar. It should be introduced in the margin of the sclerotic where it overlaps the cornea; the point of the knife is then withdrawn and a blunt, whalebone or metal probe is carried into the anterior chamber and pressed slightly backwards so as to facilitate the escape of the aqueous humour. He (Sperino) impresses the
necessity of holding the knife parallel
to the plane of the iris, of introducing
it steadily & withdrawing it rapidly
in the same direction to act avoid
any injury to the lens.
As the anterior chamber becomes emptied
the iris bulges forwards almost into
direct contact with the cornea & in
fact is the immediate cause of
the Escape of its contents. For in Synechia
Acuta, where this pressure is not
Exercised the fluid does not Escape
spontaneously & in such cases more
frequent introduction of the probe
or a stronger pressure are required.
The patient is a little sensitive at
first, but soon gets accustomed to it;
the most painful part of the operation
is the pressure on the ciliary circle
of nerves. Where there is considerable
Hydropsyne the probe must be carried
right across the morbid product
in order to Effect its Escape or every
care should be taken not to injure
the iris.
Sperling cites two methods of performing Paracentesis:

1st. Empty the anterior chamber at the same seance and by the same opening, 2 or more times at intervals of some minutes according to the quantity of fluid and the rapidity of its reproduction.

2nd. Introduce the probe and empty in the morning and again in the evening, or several times a day.

It is necessary in some cases to continue the 2nd method for days or even weeks, if left undisturbed the corneal opening closes within 30 or 40 hours.

In the after-treatment he recommends the application of ice-compresses whenever there are any indications of pain.

In the Royal Eye Hospital we do not use the Knife recommended by Sperling, but an ordinary bent needle which is introduced towards the lower margin of the cornea and pointed well forwards to avoid the lens.
it is then tilted upon its edge to facilitate escape of fluid contents as the pupil approaches the cornea it is again laid on the flat and withdrawn rapidly but gently. The speculum may be introduced before the eye may be fixed with a pair of broad-toothed conjunctival forceps. In many cases the speculum is unnecessary and when it can be dispensed with it will conduce to the comfort of the patient. We often get the lids separated by the tips of the index fingers of an assistant, who also without exercising undue pressure may use sufficient to retain the eyeball in a steady position. In this as in many other eye operations it is an excellent preliminary to touch the external surface of the cornea with the instrument so as to accustom the patient to its touch and to give warning and caution where they are indicated. This operation has been extensively used at Moorfields and other eye hospitals.
Has undoubtedly proved successful in many cases where there has been increased tension, and in some cases of ulcers of the cornea, our experience of its use chiefly consists of slight cases of ulceration with just enough tension to prevent the process of healing; for more advanced cases of ulceration with hypopyon there are many objections to its use. To the special form under consideration it is not of very great value; it does not give sufficient ease to the pus which consequently rapidly accumulates thus the tension, ciliary neuralgia and other concomitant symptoms are only temporarily alleviated. Although serious obstacles that the risks of repeated tapping are not great, it must be admitted that they are increased in the ratio of any instrumental interference in every ophthalmic operation. In many of the successful cases it is difficult to estimate how much was
due to the accompanying application of Atropine, Belladonna preparations & the administration of Quinine & other Tonics & these considerations led to the employment of Iridectomy in these & similar cases. This operation has proved far more satisfactory than Paracentesis; it gives far more effectual relief to tension by allowing the prevalent contents to escape & also on account of the portion of iris removed. When this is the operation selected it should be done if possible downwards or downwards & inwards so as to allow the fluid to escape readily & to avoid dragging or disarranging the iris (Diseases of the Eye, Stockberg Vol. I p 107, 1889 Lord 1st Edition) He seems to think it is desirable rather to leave the iris than interfered with its removal, but we have found it most beneficial in many cases to remove portions of thick, shaggy irides & carefully with a small pair of Graefe's straight Iridectomy Forceps; even the sulcanite copper
may with advantage be used to press the pus from the anterior chamber and from between the corneal layers gradually. It is however very unwise to interfere too much, or where there is great irriation. While this operation is far more applicable to cases of Glaucoma Fredo-cyclitis in which the chief object is the relief of tension, it certainly answers admirably in some cases of ulceration with hyperopy. As examples of the cases thus benefited we may cite a few from those published by Mr. Mielke (Ophthalmic Reports Vol. III. p. 74 8 & 565) one being a case of acute inflammation of the cornea & iris caused by a splash of ammoniacal liquor getting into the right eye; the eye was irritable, cornea opaque & contained in its layers a large exud. The Irideotomy relieved the pain, the ulcer cicatrized, & the patient obtained the power of recognizing large objects. He mentions another case of extensive corneal hyphopyon & Glauco
in which a large iridectomy upwards or outwards resulted in the recovery of useful vision. These certainly are good results, but our experience of iridectomy in similar cases has not been satisfactory. It has not been sufficient to relieve the chamber completely, or to arrest the ulcerative process from the rotten condition of the iris. In many of these cases, it has been a difficult matter to excise a portion of it. But one of the greatest objections is, it is this, that in cases where the ulceration is extensive it is impossible to know where to make the iridectomy so as to leave a useful artificial pupil afterwards, for if our new pupil is covered by a dense nevula or become the result cannot be satisfactory.

Von Graefe recommends *Aqua Chlori* in the later stages of hypopyon keratitis without previous iridectomies or after them (Arch. fur. Ophth. X 2 p. 191) but in this Hospital it has not been found to give good results or has consequent been abandoned.
The next great step in advance in the treatment of this affection was that advocated by Sahmiesch in 1871 (Zur Behandlung des Ulcus Corneae Syphons a pamphlet).

The mode of operating he recommends is the following: - First steady the eyeball with a pair of seizing forceps, then set the base of the ulcer with Graef's narrow cataract knife, taking care to go beyond the edge of the ulcer into the adjoining healthy tissue on both sides. Should the iris prolapse into the wound, he recommends replacing it by means of friction upon the cornea with the upper or lower eyelid.

In the after treatment, a slight protective bandage should be applied. Atropine (gr. 1/2 or 3i) dropped into the eye thrice daily of the precision required with a Graef's knife or Weber's vasculum. Knife as long as there is any tendency for the ulceration to progress; he advocates sifting it daily until the zone of infiltration disappeared entirely, the base of the ulcer became sharply....
defined, the surrounding mound of proliferating tissue sank to the level of the surface of the ulcer and this assumed a grayish uniform hue. All symptoms of irritation disappeared. The number of sittings varied from 6 to 21. This method has revolutionized the treatment of this affection and has given most satisfactory results.

Our method, although suggested by Saemisch, differs in many respects from it and is applicable to more advanced stages and to apparently hopeless cases. We make a far shorter incision extending the whole breadth of the cornea at the level chosen, which is generally at its lower third, so as to give free exit to the pus, to be below the margin of the pupil. This avoids interference with the sight, although the scar left by the union of the edges of the incision is very little marked. These wounds heal by the proliferation of small cells from the interface between...
the lamellae of the cornea which become glued together firmly by a fibrinous cement. (Biuroth Surgical Pathology P. 59.) The freedom of the incision does away with the necessity of keeping the wound open except in a very few cases.

We shall allude to the advantages claimed for this method, precautions to be observed & after-treatment more in detail after inserting the notes of the following cases.

**Case I.**

Mr. Smith age 37 of Worsley admitted as a patient to the Manchester Royal Eye Hospital Sept 15th 1891.

History. He says that about two weeks ago he got a cold in his eye & it became inflamed & very irritable & painful especially at night.

State on admission. He had a spreading ulcer on the left cornea just to the Anterior Chamber half full of pus.

Treatment. He was ordered Gtt. Atrop. 1/2 a drop into his eye three times daily & Pet. opii; grain one every night; this gave but slight relief.
the 29th September he was admitted as an inpatient & the same day a section was made in the lower 3/4 of the cornea which spontaneously relieved the anterior chamber of its purulent contents & gave almost simultaneous relief to the patient. He was ordered to use an occasional drop of Atropine & to have a light bandage applied over the eye & to take a Morphia draught at night.

Sept 30th. He says he has slept well last night & on examination we find the anterior chamber quite free from pus & the ulceration has already been checked; the corneal incision clean & uniting satisfactorily.

Oct 6th. The union is perfect, the cornea is quite clear, no lamellar infiltration & no re-accumulation of pus. The pupil is nicely dilated & he feels no pain. He reads No 2 Säger 700 with ease. Discharged from hospital. I was ordered to use Lobo Aluminos (gr iii at 37). Nov 10th only a slight meteoric left; patient reads No I Smallest type of Säger quite readily.
Case II

Mary Morris, age 59. Admitted as out-patient Sept. 22nd, 1876.

History. She noticed a white spot on her left eye 2 or 3 years ago, which only
pained her at times, but greatly
impaired her vision, & she says she
had a fresh cold in the eye for the
past six weeks. Admitted to hospital Oct. 1st.

State on admission. She suffers from
infective corneitis extending fully
over three quarters of the whole cornea,
& the anterior chamber is fully three
quarters full of pus. Of course she is
unable to distinguish anything.

Treatment. Calomel, ergotamine. Fomentations
failed to relieve her, so on the day of
her admission a section was made
of the lower half of the cornea, though
which the pus escaped.

Oct. 4th. Has suffered but very little pain
no further collection of pus.

Oct. 6th. Pupil wide, cornea clearing,
slight lamellar infiltration, yellow
inflammation rapidly subsiding.
Oct 10th. There is considerable cæmeal
infiltration & effusion of pus to the anterior
chamber & so the incision was re-opened
with the point of a Graef's knife.
Oct 25th. Infiltration gradually subsiding
no hyperpyrexia, no pain. Discharged.
This case gradually improved for some
months. Her vision promised to be good,
but as she was a very scanty woman
(not very careful), she had suffered
from repeated attacks of corneitis
which have rendered the cornea thinned
& metealous.

**Case III**

John Taylor age 37, Burnley admitted
as out-patient Oct 3rd 1876.

History. A week previous to his admission
some lime got into his right eye
which gave rise to the following
condition on admission, ulceration of
the cornea, pretty extensive,
corneal structure considerably infiltrated &
the anterior chamber half full of
pus.
Treatment.morphine, belladonna, fomentations
& quinine improved his condition for
a few days but afterwards it became
again retrogressive & on Oct. 27th he
was admitted as an IPatient where
his anterior chamber was more than
half full of pus & the lamellar
infiltration of the cornea occupying
fully 2/3rd of its extent. he complained
of severe pain. on the same day a
section was made in the lower third
through which the anterior chamber
was quite evacuated & the infiltrates
of the cornea were also relieved &
the patient experienced a sudden
cessation of pain.
Oct 28th reports good night's rest, ulceration
quiescent.
Oct 31st. I noticed a decided tendency to
re-accumulation of pus & I evacuated
the contents of the chamber by gently
insinuating the point of a small
probe (No. 1) through the line of
incision. the case otherwise
progresses favorably.
Nov. 3rd. General appearance satisfactory, no
pus in anterior chamber; Cornea clearing
Discharged.

Nov. 24th. The outer third of the cornea
quite clear, the densest opacity
occupying the inner third which
is also clearing.

This patient has not attended lately
but probably without, certainly with
an Incidectomy, he will have a very
useful eye.

Case II.

John Grimshaw aged 27 of Cromptonsfold
admitted as patient Sept. 23rd.

On examination we find the cornea
ulcerative, anterior chamber half
full of pus. Sept 27th admitted as an
Inpatient. Treatment. The usual
remedies having been tried without
success a section was made in the
lower third. Instant relief follows.

Oct 13th. Discharged, case proceeds favorably.

Oct 28th. Only slight nebula. Reads 40 x Sigel

Nov 35th. Sight improving Reads No.8
Case V.

Cornea - Locus & Hypopyon.

Jonah Grindstaff, age 32, of Denver, admitted as an out-patient August 5th.

History. A week before his admission a piece of coal flew into his left eye, which gave rise to a great deal of irritation. The patient complains of severe exacerbations of shutting pain.

On admission, cornea ulcerative, a good deal of conjunctival Echymosis, the anterior chamber fully half full of pus & the iris appears inflamed, twisted & irregular.

Treatment. Glaucat. Forte 250 ey., slightly relieved him. On Aug 1st, the date of his admission as an In-patient, a section was made in the lower third.

Aug 12th. Slight well, progressive favorable.


October 27th. The outer lower part of cornea covered by a dense leucoma, pupil scarcely visible - he was re-admitted for sectorectomy forwards was made which left a clear artificial pupil.
October 31st. Discharged from Hospital. Patient can read comparatively small print.

CASE VI

Extensive Traumatic Kerato-Iritis Hypopyon
Eliza Scallee, aged 30 of Ardrinch, admitted as an In-patient October 7th, 1876.

History. She was accidentally scratched a few days ago with the nails of a grenet. On examination we find the anterior chamber nearly full of pus. Extensive posterior synechia. She is in very debilitated & weakly condition & has been deprived of sleep entirely by the severe shooting pains with the complaints of.


Nov 14th. Iridectomy downwards performed. the pupil appeared satisfactory but a considerable quantity of media pigment interfered with gaudy
vision. She is able to see her way about with the affected eye & we anticipate that she might be still further benefited by another -

[Signature]

---

Case VII

Ulcer of the Cornea with Hypopyon.

Robert Johnson aged 59 of Eynes Broughton admitted Oct. 23rd

History. He thinks he felt something getting into it a few days previously.

On Examination. A large central bluish-grey ulcer, lower half of the cornea infiltrated with lymph, the anterior chamber one third full of pus, upper half of cornea clear, the conjunctival vessels twigs of cotton.

Treatment. A section was made the same day through the centre of the ulcer & the pus was caused to escape through this incision; the eye was afterwards bandaged & the patient was told to sleep very quiet in bed. Oct. 24th slept well.
October 31st. The cornea is quite free from infection; there is a large central opacity but the pupil is sufficiently clear below to enable patient to read No. 16. Discharged Nov. 10th. He reads No. 8. Opacity still gradually clearing.

Case VIII

John O. Connor, aged 35 of tribal race, admitted as an In-patient August 24th. On examination, a large sloughing ulcer can be seen occupying the lower half of the cornea, hypopyon considerable.

Treatment. Section lower fourth. September 7th. Discharged in the following condition: Cornea clearing, good anterior chamber, pupil dilated, two or three slight adhesions to the lower part of the cornea. He has good perception of light.
Case IX.


History: He was struck in his right eye a week ago by an iron chipping. On admission his eye was in an inflamed irritate condition, the lower third of the cornea covered by a rapidly extending ulcer, anterior chamber filled up, pupil contracted, great pain & rheumosis.

Treatment: Sept 18th Section lower third
Sept 20th Discharged with useful vision.

Case X.

Wm. Gough, act: 34th of Chiche St admitted as an Inpatient Sept 6th.

History: A large iron chip struck him in his left eye 3 weeks ago.

On admission, white cornea infiltrated, the smaller patches of lymph uniting to form larger ones & some of them had made their way to the surface & formed an exteriorised ulcer & there is a considerable hypopyon.
Sept. 6th. Treatment. Section lowered.
Sept. 8th. Section re-opened owing to the re-accumulation of pus in the anterior chamber. Sept. 11th. Discharged.
Nov. 1st. There is still a little opac, a there is a small kind of vessels noticeable in the centre of the cornea, the circumference is gradually clearing.
This patient has not attended lately so that the notes of his case are incomplete.

Case XI
Eliza Coates, aged 59, Husband admitted as an In-patient No. 76.
On admission, Cornea almost completely necrosed, anterior chamber quite full of pus. The complaint of intense pain.
Treatment. A section was made on the day of admission a thick pus was drawn out with a pair of Graef's straight iris forceps.
Nov. 23rd. She can see fingers at the circumference. Still clearing.
Case XV

Holt Holt as to Radcliffe admitted as an outpatient Sept 20th.

History. A piece of coal struck his right eye on admission. Extensive ulcer of right cornea, the inner third is the only part not implicated, anterior chamber half full of pus.


Oct 26 admitted to hospital as the condition of the eye did not improve & a section was made through the center of the cornea. Oct 27 No pain, slept well.

Oct 30 Discharged. vision quite healed.

Nov 3rd A dense leukemia occupies the position of the pupil & an iridectomy was made to the inner side & a good clean puple was made. In a few days the wound discharged. Read Nov XVI

Feb 1879 Patient can read No X words without glasses.
Case XIII.

Mary Harding, aged 79 of Manchester, admitted as In-patient May 9th.

On examination, a large ulcer on the left eye, which had been previously operated on (Subcutaneous) for Glaucoma. Treatment Section great relief from pain. May 18th. Discharged.
June 9th only a slight oedema to be seen.

Case XIV.

James McNamee, aged 38, Collier of Blues, admitted as In-patient August 8th.

History. A piece of coal struck his left eye a few weeks ago. A druggist gave him some lotion for it.

On examination we find the cornea considerably ulcerated with lead sp limited occupying its outer lower part. Anterior chamber three quarters full of pus. He is in a bad state of health, has not slept since the accident very well & he has no appetite & complains of very severe pain.
Treatment: Section through the centre of the cornea, ordered Brandy & Gin mixed Recknat nourishing diet & a light bandage to be applied over this eye.
August 9th: Slept fairly, ulcer quiet.
August 13th: Discharged.
November 30th: A dense nebula covers the lower half of the outer two thirds of the cornea, the greater part of the pupil is hidden by it. Vision D = 14 Jagers. An Iridectomy was made inwards resulting in a good pupil.
January 8th: Patient can read.

February 10th: Beds No. 8.

**Case XII**

Daniel Shepperd, aged 28 of Bradford, 
Burned: admitted in hospital Aug 2nd.
On admission, ulcer of cornea with Hyphema.

Treatment: Section lower third.

August 5th: Discharged.
September 10th: Patient has good vision, the retinoma condition gradually clearing.
Case XIV

John Dawson, aged 62, labourer of Keswick Road, admitted as in-patient June 8th.

On admission: Extensive ulcer on left cornea, hypopyon & a c. full.

Treatment: Section lower 3rd.

Result: Good vision.

Case XVII

Joseph Marsham, aged 12, of Mapple, admitted as in-patient Oct 19th.

On admission: the lower half of left cornea in an ulcerative, hazy condition, considerable hypopyon.

Treatment: Section lower fourth.

Result: Good vision. The resulting scar did not cover the pupil.

Case XVIII

Mrs. Ellison, aged 50, laundress of Manchester, admitted as in-patient August 17th.

History. She says that a fortnight ago some hot pitch had flown into this left eye, which had caused her a great deal of pain.
On admission, all the cornea was in an inflamed condition, but the lower fourth was in a state of angry extending ulceration, & there was a good deal of pus in the anterior chamber (it was full). Treatment. The same day a section was made in the lower fourth. Aug 12th, discharged ulcer rapidly healing. Cornea wound quite healed. For 48th. The lower half of cornea nebulous, but patient has good vision & can read at 15 feet.

Case XIX

James Young, aged 32, Collier of Wigan. Admitted 6th, patient November 25th.

History. Five weeks ago he was struck in the left eye with a piece of coal which gave rise to the most excruciating attack of pain; he had tried all sorts of ointments, lotions, but got no relief. On admission, he was greatly reduced in strength. We found a small ulcer near the centre of the cornea, with slight abrasions all around it.
The anterior chamber was quite full of pus at admission. On the day of admission a section was made having its centre corresponding to the centre of the pupil; although some of the pus escaped readily, a quantity had to be gently pressed out with the volcanite forceps. Some of the thickest curdy pus was extracted with the straight forceps.

November 26th. Patient had a good night's rest, Eye quite Easy, corneal chamber quite clear.

December 5th. Discharged, incision healed, corneal surface happy, cicatrices from the damage done by the long neglected ulceration. He has however a good perception of light.

Jan 15th. Cornea clearing, sight improving.
February 18th. The cornea has cleared wonderfully since his last visit, in a few months he will have very useful vision.

Remark. Stimulants of nourishment especially indicated here.
Case IX

Traumatic perforation with Hyphema.

Jesse McGee, age 60, Stonemason, of Clitheroe, was admitted as an in-patient August 20th.

History: A few days ago while following his employment, a piece of stone flew into his right eye. He is in a bad state of health.

On examination: Two-thirds of the cornea inflamed and ulcerated. Conjunctiva chemosis anterior chamber quite full of fluid. He complains of very severe pain. There is Evidence of extensive vitreous mischief.

Treatment: Without delay a section was made in the lower third. August 31st. Patient reports good night rest it is more cheerful. Eye quiet.

December 6th: Discharged; greatly improved.

November 28th: Corneal incision can scarcely be distinguished, dense leucomas left as in the accompanying diagram.

December 12th: An iridectomy was performedwards.

Results: Useful vision.
Case XXI

Extensive Suppurative Arteritis in a child.

Frederick Watson aged 15 months of Hyde Road, admitted in patient November 29th.

Condition on admission. He is a weak, ill-fed, badly nourished and neglected child. Present symptoms include cough and fever. The whole cornea (right eye) is infiltrated with pus, tends to produce the pus into anterior chamber. Treatment. A section was made that evening which relieved the child and he slept soon afterwards. Ordered an expectorant sedative mixture.

December 5th. The child can not take any nourishment, his bronchitis is worse and consequently the matter took him home. He was not treated for 10 days and wound was not united throughout, but no. 2 accumulation of pus and cornea appeared to clear.

The further history of this child I have not been able to obtain.

Remarks. The object of the section here was not so much preservation of vision as the prevention of necrosis et aphyloma, and the relief of pain.
Case 29.

James Robinson, aged 16 of Oxford Road
admitted In-patient November 22nd 1879.
Condition on admission. He is altogether in a wretched condition; he is badly
nourished & half-starved; quite deaf
with one ear & very nearly so with the
other. His right eye is lost; the buld
being in an atrophic state. There was
a small spreading ulcer on his left cornea
near the centre & to the outer side. He
complains of great pain & cataracts from intense photophobia.

Treatment. He was ordered Beer, Grimes & nutrition diet. Subtale Atrophiæ occasionally

December 1st. The ulcer extends &
the anterior chamber has become rapidly
half full of pus a section was made
right through the centre of the cornea
which gave simultaneous relief to
the pain & pain. December 5th He slept
garnly but had to take a Morphia
Droight (30mg), at bed time.

December 15th. Slight reaccumulation
of pus, so I discouraged the idea...
between the margins of the incision so as to empty the chamber.

January 4th 1877. He was discharged. The ulcer quite healed, the cornea in a nitrogenous condition.

February 4th. Very satisfactory improvement. The retina now only covers the cornea.

March 10th 1877. Retina still smaller. Read No. 6.

Today an Iridectomy was performed forwards & a good pupil was obtained.

March 17th. He can read No. 6 without glasses in the smallest type with glasses, thus giving a most satisfactory result.

---

**Case 23**

Extensive Suppurative Corneitis.

Ann Bolton, aged 75, of Holcombe Rd., admitted

In patient December 13th 1876.

On admission. The whole of the cornea in a diffuse suppurative condition as the result of neglect & debauchery.

Treatment. Section cornea.

Result. The cornea gradually cleared & a fair amount of vision was obtained.
Case 24.


History. Three weeks ago a splinter of iron from a chisel flew into his left eye. Some unscrupulous friend had tried to remove it thereby rendering the condition of his cornea far worse.

On examination we find the cornea suppurative ulcerated & the anterior chamber choked full of pus. He complains of very severe pain.

Treatment. Dec. 15th Section of cornea.
Dec. 20th Slight gainly but the condition of the eye is not so favorable. The structure of the cornea has become so weak & brittle from the long neglect that it cannot give sufficient resistance to a portion of iris that protrudes between the margins of the wound.

Jan. 3rd A portion of the protruded iris snipped off. Jan. 10th Discharged. There is still a little iris between the margins of the wound, but rest of cornea clearing.
Case 25.

Mr. Barker aged 57. Labourer of Bradford.
Admitted January 14th, 1877.
History. Six weeks ago he received an accident to his left eye through a fall & he has used some lotion for it procured from the Chemist.
Condition on admission. The whole cornea is in an ulcerative condition, the lower three fourths covered by a dense coating of lead opacity, anterior chamber nearly full of pus, suffers great pain.
Treatment. Section lower third which gave great relief.

Jan 18th. Discharged, ulceration healed, no pain.
Feb 15th. The lead opacity was shaved off carefully with a Graefe's Knife.
Feb 14th. Owing to the extensive encroachment of the cornea, we had to perform an iridectomy.
Feb 20th. Patient has now a very good perception of light.
Case 26

Philip Conway aged 30 Patient Labourer admitted as an Out-patient Dec. 26th. On examination we found a small ulcer near the margin of the left cornea.

Treatment. Gtt. Atropine Forte & Quinine but as he was an intemperate man & much exposed to wet & cold, he preceded himself Dec. 30th with the ulcer much larger at the anterior chamber half full of pus. January 6th. The above treatment combined with Chamomile & Poppyhead pontifications failing to give relief, a section was made in the lower third of the corneal chamber & a firm bandage was afterwards applied.

Jan 8th. Ulcer healing, no pus, no pain.

Feb 11th. He got fresh cold, eye irritable, a little pus at the bottom of act. chamber. So I re-opened the incision with a Graefe's Knife.

March. Discharged, ulcer healed.

Feb 12th. Only a slight nebula, which does not cover the pupil & the stroma clears better as well as ever.
Case 279

Case showing result of neglect.

Catherine Smith, aged 37 of Alexandra Road, admitted as an Inpatient January 1st.

History - The history she gave pointed mainly to ulceration of the cornea with hypopyon but she had been treated for supposed specific trachoma with mercury externally and locally.

Condition on admission - She was in a bad state of health, suffering from symptoms of acute iritis, the cornea completely necrosed, and the globe full of pus.

Treatment - The pus was released by an incision of the bulbus; we afterward applied.

Result - In about ten days she was discharged greatly improved in her general condition, with an Atrophic Bulb.
Case 28.

Traumatic Ulcer of Cornea with Hydrops.

Mary Green aged 42, Hendon, admitted in patient's March 5th 1877.

History. She was struck in the left eye with a piece of iron three weeks ago.

On admission, carcinomatous infiltration of the whole cornea except a small rim around its margin, the suffer great pain.

March 6th. Treatment. Sectio medialis.

March 10th. Discharge cornea clearing the patient will ultimately have good vision.

Case 29th.

James Derbyshire, aged 20, of Heston Farm, Hounslow, admitted in patient March 25th 1877.

There is no history of any accident he has been suffering pain for the last fortnight. On admission, a small curved pigmented ulcer over the centre of the cornea covered with lead opacity, anterior chamber half full of pus.

Treatment. Sectio corneae.

Case 30th

Traumatic Iritis with Hypopyon.

James Davidson, aged 64, of Runcorn, admitted as in-patient March 23rd 1877.

On admission. There is a small circumcorneal abscess between the layer of the lower third of the cornea; the iris is irregular, muddy & contracted. The complainant of severe pain & is in a very low state of health.

Treatment. Atropine Drops (Gr. it. & Gr.) to be used frequently. Somnifurans. & hypodermic injection of atropin to relieve the pain. This treatment proved quite useless & on April 6th a section was made through the abscess.

Apr 10th. He is a great deal better, no pain, pupil nicely dilated, & ulceration healing.

April 26th. The ulceration almost entirely healed, no reaccumulation of fluid, pain gone & patient is in every way better & has quite useful vision.
Perhaps I have exceeded my limits in detailing so many cases, but my excuse for so doing is this; that every one in some way testifies to the value of this method of treatment. I cannot but in this place record my indebtedness to my medical colleagues at the Manchester Royal Eye Hospital for allowing me the fullest opportunity of testifying its value to increase its usefulness, by placing at my disposal all patients selected for clinical study and observation.

It is not for me to say how I have performed the task, but I may candidly say that the foregoing remains to cases are faithful and honest records of the results of study of the disease under consideration for some time past.

In analyzing these cases we are struck with the almost immediate relief from pain obtained, due to these in no doubt to the relief of the tension & arrestment of the inflammatory process, continually
giving rise to intense ciliary neuralgia.
In almost all the cases the ulcerative process has been immediately stopped and in comparatively few, has there been any reaccumulation of pus & necessity of re-opening the wound; (Exceptions Cases II, III, III, XXII). Indeed in none of the cases has it been necessary to do more than keep the margins of the wound from uniting until the anterior chamber & the corneal lamellae had relieved themselves of their purulent infiltration & it will be seen in the cases cited above that this interference was only indicated once in each case. & this is a fact that ought to be carefully noted as showing the great advantage of a free incision over the limited one recommended by Deneich. He found it necessary to keep the wound open for 2-3. or more weeks & thus complicate the treatment to a great extent & increase greatly the risk of nodularoma & other complications.
Mr. Zeale of Leeds I believe recommends crucial incisions in some of these cases but we have never met with a single case where this is indicated, necessary, or desirable.

The importance of checking or relieving the press in the anterior chamber is evident as it has a strong tendency to become organised and is no small element in the causation of closed pupil, posterior synechiae, if its presence is very apt to give rise to further mischief, Irido-Chorioiditis Panophthalmitis (Case 29, page 29) or Glaucoma.

In almost all the cases where section has been performed the improvement has been marked, the nearest to a failure being Case 24, page 93 in which the iris became prolapsed between the wound, but even in this long neglected and unfavorable case, it gave immediate relief to the pain and it also prevented the whole cornea sloughing bodily away, resulting in anterior staphyloma.
We would lay especial stress on the apparently hopeless condition of many of the cases which had been allowed to run their own course for two or three weeks, or else unskillfully treated by the Chemist or Surgeon, as is evidenced by Cases (XIV, page 75; XXIV, p. 94; XXV, p. 95; XXIX, p. 101).

In some of the cases poulticing had been persisted in to remove ulcers. In others Lead hot-tons were used & unskilful Lead ointments resulted (Cases 14, 25 & 29) which were found to complicate matters very materially. But if we have been able to get satisfactory results under such extremely unfavorable conditions we conclude that this fact greatly enhances the value of the treatment & we have no hesitation in expressing our firm conviction that most of the worst cases could not possibly be saved by any other method with which we did not present acquainted & my colleagues tell me that many
similar cases to those I have classified as successful were formerly given up as lost hopeless. It will be seen that we have conducted the enquiry into the value and range of applicability of this treatment very cautiously in almost every case, especially the earlier ones. Atropine Drops, Fomentations we have fairly tried. Section was only resorted to where these failed, but we are convinced that told as section may appear it should not be delayed too long.

Where the anterior chamber is one-third full of pus, where the ulceration shows a tendency to spread, where atropine and fomentations fail to give relief to the intense ciliary neuralgia, the section should be resorted to at once. In cases where there is a probability of the pus becoming absorbed under Atropine a hot fomentation is a question.
whether it would not be desirable to prefer early section, as the healthy process cannot be said to have set in properly, until the anterior chamber is quite empty; thus there is a prolonged risk of greater implication of the cornea, a corresponding obstruction to good vision.

As to the causation:

It will be seen that many of our cases are of traumatic origin, some are idiopathic occurring in debilitated ill-nourished people, as might be expected from the greater exposure of men; they are often fewer subjects than producers, the proportion in our list of cases being 3 to 1 respectively.

As to the eye affected:

We find that the left eye is more frequently affected than the right in the proportion of two to one respectively, although we cannot say that this is the
universal rule, in fact many ophthalmic surgeons find them occurring in pretty nearly equal proportions & it has been pointed out by Dr. Reede of Bonn that he has found that dacryocystostomy constrictions of the lacrimal duct occur most frequently in the right eye & in women & thus establish a strong predisposition to suppurative ulceration in the right eye.

Duration of Treatment:
This varies greatly according to the stage the patient is first seen, the condition of the ulceration & the health of the patient. The majority of our cases were discharged from hospital in a few days, of course some of the more neglected ones were kept under supervision for a longer period.

As to age:
It will be seen that there is no limitation.
Value of Stimulants.

We have carefully enquired into the real value of stimulants in this affection & we are quite satisfied that their careful & judicious use is simply invaluable. In debilitated subjects we advise the administration of Brandy in frequently repeated doses for the first few days until the patient is becoming united to them on the principle of economy. A belief in its equal efficiency we prescribe Beer which increases the appetite, cheers the spirit & gives an invigorating tone to the whole system.

Dict.

The diet should be nutritious. Beef Tea & Broths are especially indicated. Indigestible articles should be avoided, as in no affection so there more marked connection between the state of the spirits & the state of digestion.
After Treatment.
As soon as the incision has quite united & the ulceration healed, we should endeavor to remove the neubra remaining as much as possible.
A long continued use of Alum (ultra gris ad 37) seems to be beneficial; in some cases, in others good results may be obtained from the use of Ploegersteckers ointment, e.g. the ointment of the Yellow Amorphous Oxide of Mercury, prepared carefully according to the following formulae R: Hydrarg. acetal. flav. g. xxx
(via humida parati)
M.
Ung. Cercei 3f.
Exclusisse 1 parte ung. -
or
Hydrarg. acetal. flav. g. xxx
(via humida parati)
M. Franc. - Ung. Cercei 3f.
(Pharm.无线 Vol. 1 p. 115 & seq.)
A little of the above ointment should be applied with a camel's hair brush every night & morning to the eye (vivax), left in for a few
minutes after washed out.

In cases where an iridectomy is indicated, we should wait until all purulon has ceased or until as much of the uvea has cleared as possible, as too early interference might again give rise to fresh mischief and thus destroy an eye which would otherwise be useful.

Abraham George Jones M.B. C.M. &c. 1875

Royal Eye Hospital
24 St. John St
Manchester

April 21st 1877

free section of the cornea in cases of iridophyma was used rather than Mr. Jones seems to be unaware. Wardrop alludes to it apparently as one of the ordinary methods of treatment.