Foreign Bodies in The Eye
chiefly in relation to The
Sheffield Metal Industry
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Foreign Bodies in the Eye.

In such an important, and active centre of the Metal Industry as Sheffield, accidents of all kinds are responsible for a very large proportion of all surgical cases, that are annually admitted to the Royal Infirmary of that City. The records of the Ophthalmic Department bear eloquent testimony to the frequency with which injuries to the eyes are met with amongst workmen, employed in the various branches of the steel trade.

A study of all the different injuries to the eye, daily met with in the Sheffield workshops, would be far too wide a subject for a thesis of this description, so I shall confine myself to a very important group of eye injuries, i.e. those due to Foreign Bodies.

The term Foreign Body is rather a loose one. Many serious lesions are due to foreign bodies in the shape of knife blades, scissors, broken glass etc., which inflict penetrating wounds, without ever becoming fixed in any part of the eye. Such injuries I would class under the head of
Penetrating Wounds of the Eye: I shall in this paper take the subject of Foreign Bodies in the Eye, whether retained on the ocular surface, or in the eye itself. Cases, which come up, with an abrasion, a wound of the Eye, but give a definite history of the lodgement of a foreign body, and of its subsequent removal, by the patient or friends, before admission, are for statistic purposes, on the border line, between injuries due to retained, and those due to now retained foreign bodies, but can, I think, be fairly considered under the former heading.

In this paper, I shall make no attempt to write a systematic work on the Subject of Foreign Bodies in the Eye; I wish rather to take a general survey of this immense subject, paying most attention to such parts of it, as are best illustrated by the cases, that I am able to record.

Though I have in several places made references to the opinions of various authors, yet for the most part, this paper is written
from notes made by myself, in cases which have come up for treatment, to the Casualty, and Out-patient Departments of the Royal Infirmary, Sheffield, and from the records of cases treated in the Ophthalmic Boards of the same Institution, under the care of W. Snell, both previous to, and during the time, that I was his House Surgeon.

Foreign Bodies may be retained in any of the following situations:—

1. Ocular Conjunctiva
2. Cornea { a. In Surface }
   { b. In Substance }
3. Sclerotic
4. Anterior Chamber
5. Iris
6. In the Anterior Lens Capsule
7. In the Lens
8. Vitreous
9. Retina
(1) **Ocular Conjecture**

Foreign Bodies, such as dirt, eye lashes, etc., retained under the eyelids, are often of extreme frequency, but being easy of removal, such cases rarely come to the Ophthalmic Department; occasionally however, if unsatisfactory or unsuccessfully removed, they may set up inflammatory conditions, which compel the patient to seek advice, e.g.: Recently a man came up, complaining of pain in the eye, which was acutely inflamed. He had been using Borei Acid Solution, for some ten days, without any improvement in the condition resulting. On evoking the upper lid, a small area of granulation was found on the palpebral conjunctiva, on removal of which, a piece of coal was found embedded in its lower layer. After its removal, the eye rapidly got well.

The number of Foreign Bodies, retained on the exposed surface of the Bulbar Conjunctiva, is apparently a very small one, and confused with the number
retained on the Cornea: I only found three foreign bodies in this situation, out of even a hundred consecutive cases of such bodies retained on the ocular surface. It seems that small fragments of metal, etc., rebound more easily from the bulbar conjunctiva, than from the corneal epithelium.

Of the three cases to which I have referred, two patients were miners, the body retained, being in each case, a small bit of coal. The third patient was a metal labourer. He was sent up, with the diagnosis &quot;Steel retained in the Sclerotic;" — On examining him, I found a small steel flake, about 1/16 in. in width, embedded in the bulbar conjunctiva, midway between the margin of the pupil, and the inner canthus of the left eye; round the injured area, was a zone of acute hyperaemia. Under anaesthesia, I easily removed the steel, with forceps, leaving a wound in the conjunctiva. Though which, the Sclerotic could be seen
The case was of interest from another point of view. On ophthalmoscopic examination before his discharge, he was found to have some old Chorioiditis, in the injured eye, the existence of which he was unaware of. The history of a piece of steel lodging in the "white of the eye" associated with a patch of Chorioiditis, in the same organ, might well be regarded, as cause, and effect. In a case similar to the one just described, the history, as given by the patient, might lead to a wrong diagnosis.

**Foreign Bodies On and In the Cornea**

The retention of a foreign body, on or in, the substance of the Cornea, is a very common accident, numbers of such cases occurring daily in the Sheffield dock yards. A great majority of these are treated on the spot, by some fellow workman, most of the larger engineering shops toasting some man, who has earned a reputation for skill in removing "bitses."
as the Sheffield working classes call a
foreign body or any penetration of the
eye. This practice, as I shall
presently explain, is often a source of
great danger to the affected eye.
Many of the worst conditions following
such an apparently trivial accident, as
the lodgment of a small particle of
start or emery, being due to unskilled
attempts at removal. In spite of
this self-treatment being so general,
we yet seem a great number of
such cases among our out-patients
between 300 and 500 every year.

Occupation, in relation to Foreign Bodies
On the Cornea

From an analysis of over 100
consecutive cases of foreign bodies retained
in the situation now under consideration,
which I have examined in the Out-patient
Department, it is seen that the risk of
receiving this kind of injury is greater
amongst men employed in certain occupations.
Taking into consideration the various forms
I work, of which the cases, occurring in my statistics were employed in, I find, that the proportion of this injury sustained by each class of workman, stands as follows, the most frequent sufferer, heading the list:

1. Metal Grinders 32 Cases
2. Metal Turners 16 "
3. Metal Skaters, and Polishers 13 "
4. Unskilled Labourers in Metal Workshops 8 "
5. Metal Rivellers, and Fitters 9 "
6. Forge Men 5 "
   a. File Cutters 5 "
7. Ougynmen 4 "
8. Cutlers 4 "
9. Masons 3 "
   a. Joiners 3 "

Amongst the rest of the cases, were two blacksmiths, a civil engineer, a cooper, a metal sawyer, and a joiner.

In Sheffield, metal grinders, turners, and polishers, are by far the commonest sufferers from foreign bodies, on this "Cornea", a fact, which is not at all to be wondered at, if one sees...
These men at work.

**Metal Grinders**

![Grinder at Work]

Metal grinders for the most part work rough castings on a revolving grind stone, propelled either by steam or by the worker as in the above picture. During the process of grinding, small particles of stone, or metal, are constantly flying up and lodging on the clothes of the grinder.
Turing metal is a very important branch of skilled metal labour, and a very common cause of forest bodies on the conies.

**Diagram of Turning Machine**

In working a metal lathe, the metal (M) to be turned is fixed to a revolving collet (A) which is turned by a shaft (fixed at B), worked by steam and the cutting tool is fixed on front by a clamp (C). The turner stands...
to the right of the lathe, and
watch the progress of the work.
The metal revolves towards him, and
flakes, cast off, in the process of
turning are thrown in the same
direction. The setting of the cutting
edge in opposition to the metal to
be turned, requires skill, and the
turner nearly always inclines his
head over the clamp, when
starting the machine, to watch the
progress of the cutter. Standing,
as he does, to the right of his
work, he advances his left eye
nearer to the turning metal than
his right. Very commonly, some
irregularities of the metal to be turned
are thrown off during the first few
revolutions. Then this happens: the
left eye, owing to its advancement,
is usually the one struck. Then
once the machine is started, the
man stands well to the right, and
clear of the flue of the lathe, and the
metal flakes, and there is not much
danger of being struck, unless the revolutions of the metal are increased; when the flakes are thrown much more widely. This class of work may be considered as finishing, having removed the visible spur at the commencement of turning, or whilst turning at high speed. In the former case, the work is usually lodged on the left center, or the center, either center, or the rate of lodgment is equally common.

Instal Glassers, and Polishers

This form of industry resembles that of grinding, but in finer work. Workers of this class, turnish all varieties of cutlery, such as sword-blades, razors, and knife blades. The metal to be polished is first held against a revolving stone, and then against a revolving emery wheel. These emery wheels present an emery surfaces, and are
During the process of polishing, particles of steel or emery are constantly being thrown off, and very often become lodged in a crease of the worker. A great number of young women are employed in this work, and by far the majority of foreign bodies seen on the creases of Sheffield women's hands are due to this cause. Girls thus employed tell me that a day rarely passes without their getting some steel or emery on the 'sights' of their eyes'. But that they...
have little difficulty in removing them unless the particle lodging has become much heated through friction. In their opinion, the harder the foreign body is, the firmer it sticks on the Cornea.

General Salivary or Metal Workmen

This is a large class, and includes many occupations, in which there is danger to the eye from foreign bodies. Amongst the commonest, those come up for treatment, are Metal Chippers, Riveters, Welders, Moulders, and Fitters. Welders very often get red hot sparks, in particles of metal into their eyes during the process of hammering two pieces of glowing metal together on an anvil. Their Cornea seem to become very tolerant to this form of injury. Conjunctivitis being a more common affection seen amongst this class of workmen.

Moulders, who run molten metal into sand moulds, sometimes get into 7
sand lodged on the Cornea, during the running off of the metals.
Apart from any special kind of occupation, a great number of foreign bodies removed from the Cornea, have been received whilst walking through the workshops.

Foreign Bodies in Other Trades

The retention of a foreign body on the Cornea is a fairly common occurrence in several other trades. In Sheffield, stone masons, quarry men, brick layers, fillet cutters, and miners, often metal workers, furnish us with most cases.

Common Foreign Bodies found

Of over 100 foreign bodies removed from the Cornea, during the last few months:

52 were Particles of Steel
20 were Particles of Emery
15 were Stone, Brick dust, Sand,
5 were Coal or Coke
3 cwt. Particles of Iron
2 " Brass
1 " a fragment of Copper.
In 3 cases the Cornea was covered with Exuvi.
In one case, occurring in a Jumei, a
small piece of wood was the material
removed.
In another case, the Cornea, and Conjunctiva were
sprinkled with gum powder.
Steel then, is in far the commonest
body found, occurring practically in
half of all the cases seen. Emery,
and Stone coming next in order of
frequency. Of the 20 cases in which
Emery was removed, all were flayers, or
finishers. The relatively large
proportion of cases, in which stone dust
was removed, is due to the fact
that grinders, quangmen, masons, and
brick layers all help to swell the
total.
The Commonest Positions of Foreign Bodies in the Cornea

To determine the commonest situations in which foreign bodies are retained in the cornea, I have recorded the sites of the body removed in 100 consecutive cases. For this purpose, I have divided each cornea into five areas.

1. An Upper and Inner Segment
2. An Upper and Outer Segment
3. A Lower and Inner Segment
4. A Lower and Outer Segment
5. An Area, corresponding to the aperture of the eyelid.

I found it necessary to exclude this last area, owing to the fact that so many foreign bodies being retained in the central part of the cornea, and thus not in either of the
of 100 consecutive foreign bodies removed from the Cornea 35 were found in the left cornea, and 45 in the right.

The following are the statistics as regards position:

In Upper Half (Inner Segment) 10 particles removed.

\[ \text{Total number removed from Upper Half} \]
\[ 7 \text{ Cornea} \quad 3 \text{ Outer Segment} = 10 \]

In Lower Half (Outer Segment) 32 particles removed.

\[ \text{Total number removed from the Lower Half} \]
\[ 26 \text{ Cornea} \quad 6 \text{ Outer Segment} = 32 \]

Total number removed from the Pupillary Area was 24 (Twenty-four).

These figures show that foreign bodies are retained in the lower half of the Cornea far more frequently than in the Upper Half. I think this must be due to the position of the head and eyes during work. In many employments...
Such as sitting before a funeral scene, the head is inclined, somewhat downward, and the eyes directed horizontally forwards. In this position the lower half of the Cornea is naturally more exposed, the upper half being protected to a larger extent, by the upper lid. The large number of foreign bodies that lodge in the centre of the Cornea is noticeable.

Symptoms and Diagnosis of Foreign Bodies on the Cornea

The Symptoms - both Subjective and Objective, vary with:
(1) The Time that has elapsed since the injury was received.
(2) Whether attempts have been made at removal.
(3) The Nature of the Foreign Body.

Then a case is seen, within an hour, or so, of the receipt of injury, there is usually some pain, lacrimation, photophobia, with a little redness of the conjunctiva.
and the foreign body stands out sharply defined on the cornea. Then, as often happens, the patient comes up several days after the accident, there is often some irritated added, with the pain, photophobia, and conjunctivitis more pronounced. In these cases, if the cornea has become infected, there is often a good deal of corneitis, with some ulceration at the site of injury, with or without Hyphema.

Diagnosis. The history of receipt of the injury, in a case presenting the symptoms, and appearances just mentioned, and with a speck or some foreign material on the cornea, make the nature of the injury evident.

A good many cases, however, require a very careful examination for the detection of a minute foreign particle. The best method to determine the presence of a foreign body on the cornea is to carefully examine the corneal reflex. Place the patient facing a window with a good
light, and put a few drops of a 3% solution of cocaine on the injured cornea; have standing behind the patient, and separating the eyelids with finger and thumb, look for any interruption of the reflex obtained from the corneal rays. Turn the eye from front to front, so that the reflex falls on all parts in succession. A foreign body causes an interruption of the reflex.

Possible Causes of Difficulty in Making a Dioptric Test

It may be difficult to differentiate a foreign body on the cornea from

1. A small area of necrosis due to a minute burn caused by the cornea being struck by a hot iron metal.

2. A small area of superficial loss of corneal epithelium, the margins, and floor which are discolored or stained.

3. Pigmentation in the deeper layers of the cornea.

In the first class of case, the burn
area, appears as a minute greasy brown spot, not at all unlike a bit of stone dust; one sees such cases amongst forge and furnace men and they usually give one a history of having been struck by a spark or bit of red hot metal. On scraping, the recessed area easily comes away, leaving a small depression.

In the second class of case, the abrasion of the cornea has usually been caused by attempts at removal, and the margins and floor of the abrasion, been discoloured from contact with dirty knife blades or with the foreign body, such as emery. I have not seen a case of the third class, but such a one is recorded by Dr. Carter, in the Journal of 1899: He describes a patient with Chronic Keratitis. Examination showed a double black spot, with a connecting iris, dumb bell like, apparently lying in the corneal tissue.
This eventually underwent absorption, and was probably pigmented cell 
metaplasia—

Examination of the suspected cornea, with a lens, and obtuse illumination, usually 
clear up a doubtful diagnosis.

Removal of Foreign Bodies from the Cornea

The removal of a foreign body is usually a matter of little difficulty. With the cornea well anaesthetised with cocaine, and the patient in the same position as for examination, the eye being fixed by looking at some convenient object, careful scraping with a sterilised spud, till the foreign body is loosened, is all that is usually necessary. A watch makers lens fixed on the eye, as suggested by Dr. Jago of Nottingham, often facilitates removal, and saves unnecessary mutilation of the cornea.

The electric magnet is of little use in this operation when metal has to be removed. The only cases in
which I have found to be of any service, were those in which a fairly large piece of steel was embedding deeply in the cornea. On scraping through the overlying cornea, and introducing the magnet point, in several cases the foreign body was removed.

The Value of Anti-sepsis after Removal

From the number of cases that come up with ulceration of the cornea, pus in the anterior chamber, and threatened general inflammation of the eye, following removal of a foreign body by some unskilled person, (such conditions, indeed, being by far the most serious result of this form of injury,) one cannot help being much impressed with the very different results obtained when proper anti- and aseptic treatment is carried out. An appreciation of the necessity of treating every case of Foreign Body on, or in the Cornea, with as careful a regard to asepsis, as any other
Surgical operation is I think of far greater importance than any manipulative skill in removal. Though antisepic treatment is more especially required in those cases that are complicated by attempts of removal having been made, and the possibly of infective organisms having been already introduced.

Before attempting removal, the eye should be well irrigated with a 10% Solution of Perchloride of Mercury, and the instruments to be used, and the operator's hands, after being sterilised, should be dipped in the same strength of solution. After treatment, in simple cases, consists by bathing the injured cornea several times daily with Boracic Acid solution, but if the substance removed is septic, it is best to substitute the Mercury Solution.

Results of Foreign Body in or In the Cornea
In cases, seen early, and properly treated, there is practically no risk of any complication arising, or if any
permanent impairment of Vision following
the Dangers of Foreign Bodies in this
position depend on
1. The Risks of Infection
2. The Depth that the Foreign Body
   has penetrated
3. Destruction of Corneal tissue due to
   the foreign body being of great heat.

1. Infection
   may be introduced by
   a. The Foreign Body itself.
   b. Dirty Instruments, handkerchiefs, etc.
   used in removing particles from the Cornea.
   c. Contact of the corneal abrasion with
      the air.

The Cornea seems to be very tolerant
to the presence of some substances, such
as small particles of lint, coal, sand or
gunpowder; it frequently happening that
no inflammatory reaction follows these
injurious agents, even after long periods.

The following case illustrates the tolerance of
the Cornea to coal.
Henry Perkins a miner came up to the Outpatient Department, with the history of having been struck in the eye with a piece of coal 6 weeks ago. He said that the eye was inflamed and painful for a few days after the accident, but soon recovered. Since then he had had no pain, nor inconvenience, but a black spot remained on his cornea.

On examining his cornea, I found that the black spot complained of was a small piece of coal firmly embedded in the corneal tissue. There was not the least sign of any inflammation of the cornea or conjunctiva.

Under acetate, the piece of coal was easily removed, leaving a small round wound, at the site of retention which soon healed.

The Inoculation of the Cornea with syphilitic material is by far the commonest danger, and one of much gravity. At the best, very often some permanent damage of the Cornea
remains, after subsidence of the inflammation, whilst on the other hand, a
perforating ulcer may be formed with all its attendant dangers, and this
may result in permanent loss of sight in the affected eye.
In by far the majority of cases of syphilitic conjunctival infection seen amongst
our out-patients, the source of infection, has, I think, been the
instrument used by the patient's friends in removing the foreign body. This is
not surprising, when one sees their methods. The ordinary workman will
scrape away at his neighbour's cornea with a pin, which he carries in
his clothes, or with his knife, which he keeps usually in equally syphilitic
surroundings. The more expert man very often keeps a small lancet
that is usually carried about in his trouser pocket, and is taken straight
from thence, to the patient's cornea. He also frequently wipes the lancet
on the back of his hand, or coat.
sleeve, or the intervals between each attempt at removal. The removal of a needle satisfies the average workman, and he rarely bothers his eye, before resuming his work. Without doubt less, in many cases, this somewhat rough procedure is quite satisfactory in its results, especially when the foreign body is simply lying on the corneal surface. Yet it is a method of treatment, which must often terminate very differently.

Cases of corneal ulceration usually come up several days, or even weeks, after the receipt of the injury, with the history of a foreign body having lodged on the cornea, and of its removal in the workshop, followed by the onset of inflammation in the affected eye, which condition, the patient nearly always attributes to catching cold in it. Very often, in fact, one has to make careful enquiries in such cases, before setting
the history of a foreign body at all

Illustrative Cases


History: A week ago, he was hit in the left eye by a piece of rusty metal, whilst chipping old metal plates. The piece of metal stuck in his cornea, from which it was removed by a fellow workman with the blade of a knife. He did not bathe his eye, and has continued work since, though the eye has daily been becoming more painful, and inflamed.

Present Condition: Patient is wearing a very dirty handkerchief over the affected eye, which is very painful. The bulbar conjunctiva is very inflamed. The cornea is somewhat steamy, and in the centre of its lower half there is an irregular ulcer. The corneal surface round the ulcer is much excoriated, due to the efforts made at removal. The iris is dissected, and sluggish.
Treatment: The ulcer was at once cauterised with the platinum cautery, and the eye bathed with 1:1000 peroxide of mercury, every 4 hours. The bathing, with the instillation of Jodi Atropinum, (11 to 31) was continued daily for a fortnight, by which time the inflammation had subsided, and the ulcer healed.

Result: A small speck remains at the site of ulceration, causing slight impairment of vision.

2) Ernest Wilson: Furnace man

History: Four days ago, he was hit on the left eye by a piece of coal, which stuck on the cornea. This was removed by a fellow workman, who at the same time scraped off some coal dust, with his knife. Since then, the eye has been very inflamed, and painful. He has done nothing for the eye, except wearing a handkerchief over it.

Examination shows extensive abrasion of
the cornea, from which there is some mucous purulent discharge. The conjunctiva is intensely inflamed, and there is some tritis. This condition rapidly cleared up, with the use of 1/10000 Berchtesgaida of mercury, and Astringent ointments, the cornea eventually healing with no scarring remaining.

Cases of Perforating Ulcers, following Foreign Bodies on the Cornea.


History: A foreign body was removed from his right cornea by a workman, three weeks ago, since when his eye has been inflamed.

Present Condition: Conjunctiva is very inflamed. Cornea is very opaque, and in it situated nearly centrally, is a deep sloughing ulcer.

There is Hypopyon, and tritis.

Treatment: The ulcer was cauterised, the anterior chamber being opened at the same time, and the pus evacuated.
After treatment consisted of bathing with mercury solution, dusting the cornea with iodophor, with distillation of alcohol. After three weeks, the ulcer healed, leaving a large central scar, opaque, and staphylococci, which obscured all vision. Three weeks later, an iridectomy was done. This improved the vision which now $= \frac{4}{60}$, but the cornea is still very opaque, and somewhat staphylococci.

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**John Gault, Janier.**

**History:** Five weeks ago, a foreign body was removed from his left cornea by a man, who used his knife blade to do it. Since that time, the injured eye has been inflamed.

**Present Condition:** There is much conjunctivitis. The cornea is starchy, with a sloughing ulcer situated on its lower half. There is pus in the anterior chamber.

**Treatment:** consisted of cutting the cornea, the pus being evacuated from
the anterior chamber at the same time; the after-treatment being the same as in the last case.

Result: Cornea healed, leaving an opacity encroaching on the pupillary area

\[ V = \frac{5}{60}. \]

In such cases of sloughing corneal ulcers, with Hygrogon, the cautery is of great value. Many chronic ulcers, when uncomplicated by Hygrogon, also seem to heal more quickly after perforation of the Anterior Chamber.

In any case, a deep central ulceration will leave a dense opacity, and perforation, by relieving tension, will often hasten healing, the resulting opacity being no worse than that caused by the ulcer healing without such treatment.

Brendel Carter performs an Incision in any central sloughing ulcer, which desumps quickly in spite of treatment, selecting the locality on which the artificial pupil, which will be needed
in any case, seems likely to be most useful.

**Possibilities of Eye Protection**

The wearing of plain glasses, during turning, grinding etc., would be a great protection, but though these can be had in some shops, and factories, workmen seldom trouble to wear them. A very great deal of damage to eyes could be prevented if men could be taught the value of absolute cleanliness in all operations on the eye. Much good is now being done, by the giving of Ambulance Lectures, to those employed on large engineering works, but the precautions, that should be taken, after removal of a piece of steel etc., from the eye, are not as yet considered in any of the Lectures. I would suggest that a lecture on these Ambulance Causes should be devoted to this subject, and that work shops should be provided, with suitable
Sticks and instruments for the carrying out of aseptic principles in relation to foreign bodies on the 
Cornea.

The danger arising from deep penetration of a foreign body

These are due to:

1. Possibility of the foreign body being pushed into the anterior chamber during attempts at removal.

2. The greater risk of perforation should an ulcer form.

3. Possibility of the foreign body penetrating the cornea and opening up the lens capsule, or introducing septic material into the interior of the eye.

4. The great risk of permanent corneal opacity, resulting from loss of corneal tissue caused by ulceration.

In this last respect, the position of the foreign body is important. The more central it is, the greater is the danger of subsequent impairment of vision.
Should scattering occur.
The removal of a foreign body, which has penetrated the Cornea, may not be followed by any permanent injury to the eye, beyond a slight scar, so long as it has not injured the lens, or its capsule, a introduced septic material on which cases of corneal the prognosis must be very guarded. The formation of a Traumatic Corneal must be the best, lead to much impairment of Vision, and the introduction of sepsis, may lead to total destruction of the Eye.

Cases of Foreign Bodies in the Cornea penetrating

Case 1: Harry Cater, Engineer Fitter.
Admitted: December 15th 1899.
History: Whilst chipping a steel block, a few hours before admission, a small piece of the metal flew up and lodged near bone on his right cornea.
This was removed by a fellow
workman.

Condition on Admission
There is a funnel-shaped
wound of the cornea,
situated over the free
border of the iris,
which is protruded
into the wound.

Treatment: The protruded iris was
cut 93 with scissors under Cocaine.
After treatment, instilled 7 Institution 7
Atropine, and bathing with Benzoic Acid
Solution.

Patient was discharged on December 21st.

Result: There is a small scar at
the site of perforation of the cornea,
and a small coloboma of the iris in a
corresponding position.

Under Atropine:

\[ V = \frac{6}{24} \]

On January 17th 1879: Son: Hypodermic \[ V - 10 = \frac{6}{18} \]
Case 9: Penetrating Foreign Body on the Cornea, with Traumatic Coloboma.

William Johnson: Farm Labourer
Admitted: October 4th, 1893

History: Fourteen days ago, he was struck in the left eye by a thorn whilst cutting hedges. Patient pulled the thorn out, and thought no more about it. Since then, the right eye has gradually failed, so that now, he can scarcely see with it at all.

Condition on Admission:
The Cornea is rather dull, and on the upper inner quadrant, there is a small, darkly which looks like the scar of a minute puncture. The Iris is discoloured, and reacts irregularly under Abdomin. The lens is opaque, more or less throughout, but there are two very distinct areas of white opacity beneath the corneal scar.

Vision = slight Perception.

Treatment: On October 14th, the lens was removed, through a lower corneal
Incision.

Two months later, there was some opacity of the lens capsule remaining.
After needleing of the capsule, patient was discharged.

\[ \text{Vision} + 10 \text{D} = \frac{6}{34}. \]

Case of Loss of Eye, following a Foreign Body on the Cornea, penetrating.

Samuel Zadok: Laborer in Steel Works

Admitted: October 32, 1892

History: Five days ago, patient was chipping a piece of metal at work, when a piece of it flew up and struck on the right cornea. It was firmly wedged, and was removed by a fellow workman.

Condition on Admission:

Conjunctiva is much inflamed. Cornea is hazy, and there is a wound running across the middle of its outer half.

The iris is injured in a corresponding position to the torn edges of which one
adhered to the Corneal wound, and covered with exudation.

The lens structure are quite disorganized, the sheet having penetrated right through it, into the Viscous Vision.

Under antiseptic bathing, and ice applications, the inflammation subsided, and the patient left in a fortnight with the eye healed, but quite blind, and beginning to shrink.

Three months later, the patient came up, complaining of pain in his sound eye, which however looked perfectly healthy. The shrinking eye was then removed, after which the symptoms in the sound eye subsided.

Betsy Keenell,
Admitted: October 26th 1878

History: Five days ago, she ran a pin into the cornea of her right eye. After pulling it out, she practiced the eye. Since then, it has been very swollen, and painful.
Condition on Admission:
There is great oedema of the right orbit. Both eyelids are tense, much swollen, and suppurating.
The Cornea is in a sloughing condition, and the eye ball is suppurating.

Treatment: The eye was enucleated, the cavity of the eye ball, being afterwards well syringed out, with 1 in 1000 Mercury Solution. The syringing was continued for three weeks, after which time, the patient left, with a healthy stump, and socket.

Some other Conditions, which may result from Foreign Bodies on the Cornea.

Apart from such serious lesions, as occurred in the case just described, we constantly see eye affections, which are more or less directly due to foreign bodies on the Cornea. Amongst the commonest of these are:

1) Inflammation of the Eyes, due to
continued irritation by air, taken with minute particles of foreign material: In very many workshops, the air is much contaminated with dust of steel, emery etc., and it is amongst the emery workers that this class of case is most often seen.

The symptoms and appearances presented by such patients are those of acute conjunctivitis, sometimes with iritis, and in neglected cases, an ulcerated condition of the cornea is often added. The treatment of these cases is nearly always unsatisfactory, unless the patient can be persuaded to give up work for a week or 10 days. Then, this is done, he rapidly improves under the usual forms of treatment of conjunctivitis.

In a good many of these cases, I have tried the effect of Supra Reaal Extract Solution, dropped into the affected eye, several times daily, in addition to the usual bathing, with Braise and Solution: The results were
satisfactory; in early cases, especially this treatment seemed to quickly check the course of the inflammation.

Repeated irritation of the cornea, by small foreign bodies may set up serious inflammatory conditions, without any particle becoming permanently retained, as in the following case.

Edward Reading, Miners

History: For some six weeks, his right eye has been very painful and inflamed. He works in a coal mine (‘pitting’), and attributes his present condition to the constant irritation of the eye caused by bits of coal and dust flying up during his work.

On Admission: The conjunctiva was very inflamed; the cornea was hazy, and in its lower segment were several small suppurative ulcers. There was also some iritis, and Hyphema.

Treatment consisted of cauteryisation of the ulcers, and evacuation of the pus.
from the anterior chamber, followed by antiseptic bathing and treating the cornea with iodiform.

In three weeks the patient was discharged cured, though the resulting opacities, ulcerated somewhat with vision.

Retained and Unsuspected Foreign Bodies on the Cornea

Attention was first drawn to this important class of cases by Dr. Jackson of Philadelphia, who published an article on the subject last year.

Patients suffering from the effects of a retained foreign body usually give a history of an apparently successful removal of some such material from the cornea. Very often, however, no history of the lodgment of any such body is given. The patient being quite unsuspicous, the cause of this complaint.

The length of time that a foreign body may remain on the cornea,
without setting up inflammatory reaction depends on the nature of the substance lodged, and probably to some extent on the sensibility of the affected cornea, consequently the history of the onset of the symptoms in cases of this class may date from a few days to several weeks.

The symptoms are continued pain, photophobia, and lacrimation. Objectively, there is usually a good deal of circumcorneal injection, and a small greyish white nexosed spot on the cornea, with which is associated some degree of iritis. Sometimes, the appearance presented is not unlike that of a Phlyctenular Conjunctivitis. The white spot is an epithelial mass which comes away on rubbing, leaving a small depression; the foreign body is commonly found imbedded in the removed epithelium.

Dr. Jackson says, in his lectures, that the appearance of the cornea in a case of six weeks standing are quite characteristic, viz: there is considerable excavation of the corneal surface filled in, and
Sometimes overfilled, with epithelial masses,
in which the foreign body lies.
The bottom of the ulcer is itself
cored by epithelium.
The presence of a Corneal Ulcer, without adequate cause, and particularly one presenting the characteristics already described should awaken suspicion of a foreign body, and lead to careful examination and removal of all loose material from the ulcer.

Case of Foreign Body retained in the Cornea.

Elizabeth Smith, a Scissors Maker,
came up complaining of pain and
weakness of her left eye, which has been continuing, on spite of frequent cold
water bathing, for more than five weeks.
About three weeks ago, she first noticed a spot on her left cornea.
She had no recollection of any foreign body having entered the eye, and thought that the condition must be due to a cold.

She complained of pain, and lacrimation, and there was a good deal of
Photophobia. The conjunctiva was very hyperaemic, and the eyelids somewhat swollen. On the upper and outer quadrant of the cornea was a grey spot about the size of a large pea's head. The iris was discoloured, and sluggish. Under General, I scraped away the grey area. It came away very easily, leaving a small excavation on the corneal surface. Amongst the removed debris, I found a minute fragment of steel.

That foreign bodies may be retained for many years in the cornea, without causing much damage, is well illustrated by a case recorded by Tatham Thompson of Cardiff (Salez 1873). He removed a piece of lead, 1.5 x 5 millimetres, or 21 mm, from a cornea, in which it had been lodged for 82 years. After removal the vision of the affected eye = \frac{6}{9}
Corrosive Foreign Bodies

Patients, not uncommonly, come up with lime on their eyes. Quite half a dozen such cases have been under treatment in our Eye wards during the last six months. There are few substances met with in the eye, which give rise to more disappointing results, alike to the Surgeon and the patient, than lime. The disastrous results so often seen, would no doubt be much lessened, if the patient had only the sense to remove all the lime possible, immediately after the accident. Usually, however, these cases come up some hours afterwards, with the eye full of lime, on removal of which the conjunctiva, cornea, and palpebral and canaliculi are found to be most seriously damaged, if not hopelessly destroyed. The only thing to be done is to at once scrape away every trace of lime possible, from the surface of the eye, and thoroughly irrigate it first with a weak solution of Acetic Acid, and then with some antiseptic lotion, afterwards separating the
haloform, and boric conjugidone, with
strips of acrid bint: turpentine oil; and
Allergic does very well. By this
means, and with the occasional passage
of a paste round the eyeball to break
down commencing adhesions, and antiseptic
bathing, the eye will get the best
chance of recovery: Still, in the most
carefully nursed cases, some degree of
symblepharon often follows, healing, or
much opacity of the Cornea remains after
severe abrasion.

Impairment of Vision, following the use
of lead applications, after removal of Corneal
Foreign Bodies.

Opacity due to infiltration of the Cornea
with lead, may cause serious
impairment to Vision. I have recently
seen two such cases; the lead application
having been used, after the removal of
a foreign body from the Cornea.
The first case was that of a woman,
who often bathed her eye, daily, with a
solution which she bought from a Chemist.
She continued this treatment for some weeks, and as the sight of the eye became gradually worse, she came to the eye department for advice.

On admission, the Cornea was very opaque, being infiltrated with dead. The Cornea was at once scraped, all dead possible being removed, and subsequently, a good deal of opacity still remaining, especially in the lower half of the Cornea, an Iridectomy was performed. In spite of treatment, the vision of the eye was permanently impaired.

The second case, was that of a miner, who after removal of a small piece of coal from his Cornea, bought some "Egyptian Ointment" from a Chemist, and literally plastered the affected eye with it. If this preparation contained any special alcoholic ingredient, it was too subtle for detection. Achat or dead seemed to be the chief constituent. The ointment was immediately scraped off the Cornea, and
the case recovered with very little pigmentation remaining.

**Foreign Bodies in The Sclerotic**

The retention of a foreign body in this situation seems to be a very uncommon accident. I can only find two such cases in the Ophthalmic Records of this Infirmary during the last few years. One of the cases made a good recovery, the other was not diagnosed. All after the injured eye was enucleated.

**Case 1. Israel Parkin : Steel Jaboter**

**History:** He was struck on the right eye by some pieces of steel, five weeks ago. Some metal was removed by a medical man, but a small piece still remained embedded in his sclerotic. This has caused him no pain, no inconvenience, still he thought it best to come up and have it removed.

On admission, the fragment could be seen, embedded in the Sclerotic to the inner side of the Cornea. Under Cocaine
an incision was made over the fragment, and the piece of steel easily removed with the electric magnet. Weight of fragment was 12 grains. The patient soon recovered, with vision unimpaired, a small scar marking the site of injury.

Case 2. George Blackhorn

History: Six weeks ago, whilst of work, a piece of steel flew off his hammer, striking him in the left eye. On admission, there was a scar on the cornea, and the lens was eviscerated. The eye was extremely painful. The lens was then extracted, through a lower corneal incision, and the vitreous searched for any steel particle, with the electric magnet, with a negative result. The patient was discharged after a fortnight, the eye still being very painful. Five months later, the patient was readmitted, the eye having become inflamed, and very painful. The condition became worse on spite of treatment, so the eye was
removed.

On examining the eye after its removal, a piece of steel was found firmly embedded in the outer side of the sclerotic. It was so firmly fixed, that no electric magnet could have moved it.

Foreign Bodies retained in the Eye

Foreign Bodies which have penetrated the cornea, may be retained in any of the eye structures, the site of retention depending on the direction and velocity of the foreign body, and on its site of entry.

During the last six or seven years, metallic fragments have been found in the following situations amongst patients coming to the Eye department of the Sheffield Royal Infirmary.

<table>
<thead>
<tr>
<th>Site of Retention</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior Chamber</td>
<td>6</td>
</tr>
<tr>
<td>iris</td>
<td>7</td>
</tr>
<tr>
<td>In the lens</td>
<td>7</td>
</tr>
</tbody>
</table>
behind the eye:  

<table>
<thead>
<tr>
<th>Vitreous</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retina</td>
<td>7</td>
</tr>
<tr>
<td>Lenses</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
</tr>
</tbody>
</table>

It is seen, then, that by far the majority of foreign bodies retained in the eye, which come under observation in Sheffield, are found in the vitreous. In all the 68 cases, steel was the nature of the foreign body found, and nearly every patient gave a history of having been struck in the eye by a piece of metal during his work in the metal workshops. This kind of accident occurs most commonly among workers in those branches of the steel industry, which necessitate hammering or chipping metal, i.e. Rivetters, Armour plate chippers, and metal hammerers.

Foreign Bodies retained anterior to the lens:

Of the last 10 cases of foreign bodies found in this position, which have been treated here, 3 were lying in the anterior capsule of the lens.
I was injury to the Anterior Chamber, and these retained more or less in the Iris.

The following are the statistics of the cases, into being taken of the patient's work, the position of the foreign body, the condition of the lens, and the method employed in removal.

<table>
<thead>
<tr>
<th>Work</th>
<th>Position of Steel</th>
<th>Condition of Lens</th>
<th>How removed</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Metal</td>
<td>Hammerer</td>
<td>Lens &amp; Steel</td>
<td>Removed through Corneal Incision</td>
</tr>
<tr>
<td>(2) Metal</td>
<td>Striker</td>
<td>In Iris</td>
<td>Incision: Iris removed w/ Steel</td>
</tr>
<tr>
<td>(3) Metal</td>
<td>Caster</td>
<td>On Lens, Capsule</td>
<td>Through Lens after steel removal</td>
</tr>
<tr>
<td>(4) Metal</td>
<td>Caster</td>
<td>In Iris</td>
<td>Corneal puncture</td>
</tr>
<tr>
<td>(5) Metal</td>
<td>Caster</td>
<td>In Iris</td>
<td>Cataract</td>
</tr>
<tr>
<td>(6) Metal</td>
<td>Hammerer</td>
<td>In Iris</td>
<td>Had removed</td>
</tr>
<tr>
<td>(7) Metal</td>
<td>Chipper</td>
<td>In Iris</td>
<td>Incision in Oculus, Capsule removed</td>
</tr>
<tr>
<td>(8) Riveter</td>
<td>On Lens, Capsule</td>
<td>Colorado</td>
<td>Steel and lens removed through</td>
</tr>
<tr>
<td>(9) Metal</td>
<td>Smith</td>
<td>Lens in Anterior Chamber</td>
<td>Ditto</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Colorado</td>
<td></td>
</tr>
</tbody>
</table>
To diagnose the exact position of the foreign body is often a matter of great difficulty, especially in cases not seen soon after the accident, owing to extravasation of blood into the anterior chamber, and to the result of a plastic inflammation. It is of course a matter of great importance from the point of view of prognosis, to determine whether the foreign body has penetrated the lens capsule, or not.

The position of the corneal wound is often a valuable guide to the probable position of the metal fragment, and after dilatation of the pupil with Atropin, it can frequently be seen with oblique illumination. Then, as in some cases, the case, a suspicious spot is seen in the iris, or on the lens capsule, suggesting the presence of a foreign body, and from the history given, one knows that if present, it will be
a small piece of steel, a positive diagnosis can sometimes be made, by bringing the electric magnet, or any of the canes, when it be steel, the suspected shot call most, a even fly up to the cane. In three of the cases, included in my list of statistics, a diagnosis was made in this way. Then the plan is successful, the subsequent removal of the fragment, is an easy matter.

Traumatic Cataract

Of the six cases of steel in the iris, two had a cataract on admission, one developed a cataract, eight weeks after removal of the steel, and the remaining three cases escaped any injury to the lens. Of the three cases, one which steel was lying on the anterior chamber, the lens was cataractous in two cases on admission, and the third case developed a cataract after removal of the fragment. In the case, in which the steel was lying in the anterior chamber, the lens
was cataractous on admission.
Thus of the 10 cases, 7 of them lost their lens.

These cases well illustrated the fact, that the presence of a foreign body in the Anterior Chamber, in the Iris, nearly always sets up a rapidly advancing Traumatic Cataract, the slightest wound of the anterior lens capsule, being sufficient to bring this about.

When there is a Traumatic Cataract, and the foreign body cannot be seen in the Anterior Chamber, or in the Iris, it is almost impossible to say, with any certainty, whether the foreign body is in front of the lens, or in the lens itself, or even penetrated through it.

The formation of a Traumatic Cataract is by far the commonest sequel of the retention of a small fragment of metal, or the situation, now under consideration, and though the eye may make a good recovery after removal of the lens, and may even Vision be obtained with a suitable glass.
yet the prognosis should always be a very guarded one, as the onset of inflammatory conditions in the injured eye, or of sympathetic disturbance in the sound eye, may eventually result in the loss of the injured organ.

Apart from Traumatic Cataract, Iritis, which may cause Secondary Glaucoma, and a Syphilitic Uveitis, one perhaps most common complications, though these conditions are apparently not very often met with, in cases which obtained early, and suitable treatment.

Small particles of dust may be retained in the Irid for a long time without setting up inflammatory reactions, as in the Cornea, and other situations, still such a foreign body should always be regarded as a source of danger, and as a general rule, an attempt should at once be made to remove it.
Removal of Metal Particles from the Anterior Chamber, and Iris

In all the cases, which I have enumerated in my list, steel was the nature of the foreign body. Thus, they were all suitable cases for the use of the electric magnet in removal. Mr. Snell's instrument was used on each occasion, and I think it needs no description. All the operations were performed under Cocaine, with of course the usual antiseptic precautions.

In every case of foreign body in the Anterior Chamber or Iris, there must be a wound in the Cornea, to allow of its removal. Whether the wound of entry or one made by the Surgeon.

Then a case is seen a few hours after the accident, the steel can sometimes be removed with the electric magnet, introduced into the original wound of entry.

Then, as is often the case, the patient comes up some days after receiving the injury, with the original wound of entry.
healed, thus requiring an incision to be made for the introduction of the magnet point. It must remain a matter for the operator's discretion where the incision is to be made, every case being treated as seems best in the individual case. As a general rule, however, it is best to make the incision (with a Grafe knife) along the peripheral margin of the cornea, on a portion as much as possible corresponding to that of the foreign body to be removed.

In cases in which the steel is caught in the Iris, an ordinary Iridectomy incision, causing removal of the portion of Iris concerned, and its removal with the retained fragment, proves very satisfactory.

In cases in which a much larger metal fragment can be brought up to the posterior surface of the cornea with the magnet, a flap is made of the cornea over it, is sometimes all that is necessary for removal.
In cases, in which there is an advanced Traumatic Cataract, it is best to remove the cataractous lens, along with the steel fragment, by the usual methods for Cataract Extraction.

Some Cases of Metal Fragments, retained On, a Continua to The lens Capsule.

1. Henry Unicorn: Cutter

History: Whilst striking a punch a month ago, a piece of steel flew off his hammer, and stuck in his right cornea. A workman attempted to remove it, the patient thought successfully.

Since that time, the vision of the injured eye has gradually failed.

On Admission: the corne of the injured eye, was quite opaque: no foreign body could be seen, and under Atropin, the pupil dilated well, except of one point, there there was a small whitish looking patch of lymph. Two days later, Mr. Snell incised the cornea on the lower, and outer quadrant with a Kerotome, remaining
a piece of Iris. The electric magnet was then introduced through the wound, and directed towards the patch of lymph. This was seen to move, and soon a small piece of steel fixed on to the magnet point, and was removed. The cataractous lens was then removed through the same incision.

(2) [Name: Simonida, a: Trouhle.

History: Four months ago, he was struck in the left eye by a piece of iron metal. He suffered little inconvenience at the time, but since then, the sight of the eye has become gradually dimmer.

On admission, there was a small scar visible nearly in the centre of the cornea, and on the centre of the anterior capsule of the lens, was a small spot of a yellowish color, which suggested the possibility of a minute metal fragment. The Iris was uninjured.

Treatment: After dilatation of the pupil with Atropin, and the application of Cocaine.
the chill end of the magnet was held in contact with the Cornea: The spot on the lens capsule appeared to get gradually darker, and suddenly a minute metallic fragment flew up to the posterior surface of the Cornea. This fragment was then guided to and made to drop on the outer surface of the Iris by the manipulation of the magnet, from which position it was removed through an outer corneal incision, with the fine magnet point. The weight of the metal removed was 0.0001 gr. In this case developed a Corneal after removal of the steel, which

Thomas Holdsworth: "Rivett"
History: He was struck in the right eye by a steel splinter whilst riveting a few hours ago.
On admission: A piece of steel was seen lying in the Anterior Chamber, on, and partly under the Iris, in its outer side, and projecting into the pupillary space. The Cornea was punctured on a
corresponding position.

The lens capsule was injured, and the lens showed commencing opacity.

Treatment: On approaching a magnet to the cornea, the steel fragment could be seen to move. An incision was then made in the outer margin of the cornea, and the steel removed, along with the portion of iris, on which it was entangled. A week later, the cataractous lens was removed, through a corneal incision, the case subsequently making a good recovery.

3. Arthur Middleton: Metal Fire

History: Whilst cutting a metal bar, on the day before admission, a piece of steel flew up, and penetrated his right eye.

On Admission: There was no wound, nor scar to be seen on the cornea, but a small piece of steel could be seen lying embedded in the lower, and inner margins of the iris.

An electric magnet was applied to the
surface of the Cornea, when the steel fragment of one flew up to it, but dragged the Iris with it.

A small puncture was then made on the Cornea, over the metal, and the fine magnet pencil introduced; by this means, the steel was successfully removed.

The patient recovered, with Vision unimpaired, and on the day of this discharge, the Vision of the injured eye = \( \frac{6}{6} \)

**Steel in The Lens**

Judging from the records of the Sheffield Infirmary cases, in which steel is retained entirely within the lens, as opposed to those, which being either, in front of, or behind it, also penetrate into their substance, one case occurrence compared with those of steel found in other parts of the eye.

As to prognosti, in these cases, they run the same risks as those in the situations just considered, which are complicated by Traumatic Cataract, following
around the cornea. The possibility of iris, secondary synechiae, inflammatory reaction, following the introduction of sterile matter, and sympathetic ophthalmia, have all to be remembered. Whilst, at the best, permanent impairment of vision must follow this accident, from loss of the lens, it is also of importance, in regard to prognosis, to determine whether the foreign body is retained in the lens, or has passed through it, into the vitreous; the removal of a small fragment of metal, along with a cataractous lens, being an operation much less dangerous to the eye than that of searching for and removing a similar body from the vitreous.

Diagnosis: Very small bits of steel are practically the only foreign bodies found in the eye, amongst Sheffield craftsmen. It is noticeable how apparently trivial the accident is usually considered at the time of its occurrence. The majority of these cases, which have been treated in the Infirmity Zonds, gave a history of
having been struck in the eye by a small piece of metal during their work, and having continued working for several weeks or even months after the accident, till the loss of vision in the injured eye led them to seek advice. In few cases, have the patients been aware of the fact of the foreign body having penetrated the cornea. Thus, though cases are sometimes seen a few hours after receiving the accident, they are often not seen till after some weeks have elapsed. Consequently the appearances presented by the injured eye naturally vary.

The best method of examining these cases is by focal illumination, often dilatation of the pupil with Atropin, and a foreign body in the clear cornea usually be detected in this way. The Cornea, in all the cases which have been treated here, presented evidence of puncture, corneal laceration; in recent cases a wound entry, more commonly there is only a small scar to mark the site of
Penetration.

The condition of the lens: In most cases, often seen for the first time, the Traumatic Cataract is well advanced, and the metallic fragment, if present, can usually be differentiated from the cataractous lens matter, appearing as a spot of a different refraction. If the fragment is only just beneath the anterior capsule, a small patch of lymph in this position may indicate its presence; in such cases a magnet brought to the corneal surface may help one in making a diagnosis, by causing movement on the suspicious spot. The presence of such suspicious looking spots on the lens, however, does not necessarily imply the presence of a foreign body, as bright spots are often seen in traumatic cataracts, and may easily be mistaken for small pieces of metal, or in a case, which I shall presently describe.

Treatment: Undoubtedly, the lens and foreign body should be removed at once. Unless
There is increased tension in the affected eye, a condition which may be present in cases which have delayed coming up for treatment for several weeks. A preliminary iridectomy is unnecessary. In recent cases, with a fair sized corneal wound, the lens matter and foreign body may sometimes be removed through the wound of entry.

Then, as usually happens, the patient comes up, with a small corneal wound healed, it is best to remove the lens in the usual manner, and then to remove the steel with the electric magnet. Dr. Snell's experience in the treatment of traumatic cataracts, is a very large one, and having seen the excellent results which he obtains, I do not think that I can do better than quote one of his own cases, as indicating the best mode of treatment to be adopted.

"No anaesthetic was administered."

An incision was made in the cornea.
similar to the one, the author 
adopts in extracting for Cataract: by 
a shallow flap, and lower section. 
The punctum, and counter punctum were 
made in the Corneo sclerotic junction, and 
oppose the lower pupillary margin, 
and the knife was almost immediately 
turned forwards, the summit of the 
flap, being midway between the 
margins of the pupil, and the periphery 
of the iris. The lens capsule was 
then torn through with a Cyst Stone, 
and softened lens matter began 
immediately to escape: The electrode - 
magnet, needle was then introduced, and 
after withdrawal, a piece of steel 
was found attached to the needle. 
The remainder of the lens was then 
removed from the Senior Electro-magnet —

Illustration Case of Steel in Lens

1. Alfred Trimmings Printer

History: Three years ago, he received 
a blow on the sight of his left eye, 
with a small chip of steel. After
the corneal wound, resulting from
the accident had healed, he says,
that the sight of the eye remained
quite good, till a few months ago,
when he was struck again in the
same eye. Since this last accident,
the sight of the eye has been
gradually failing.

Condition on Admission: There is a small
central scar on the Cornea.
The pupil is round, uninnjured, and
dilates well under Adrenalin.
The lens is quite opaque, and the
presence of a foreign body on it, cannot
be made out with certainty, though
several suspicious looking spots, are to be
seen.

Treatment: Mr. Snell made his
usual corneal incision for lens
extraction, the knife being made to
open the anterior capsule whilst traversing
the anterior chamber. The electric magnet
was then introduced, and a small
piece of steel was immediately caught up
from the substance of the dissoused
Sens. The extracapsular lens was then removed, without any escape of vitreous, and the eye subsequently making a good recovery.

1. George Webster: Metal worker

History: Some few hours before admission, he was struck in the left eye by a piece of steel, which flew off a hammer, which he was using in his work.

Condition on Admission: There is a wound of the Cornea, situated in its lower and outer quadrant. There is a wound of the Iris, in a corresponding position, and the lens shows advanced opacity. On examination of the lens, there is seen to be one spot, darker-looking than the rest, which suggests the presence of a foreign body.

Treatment: The broad end of the magnet was first applied to the corneal wound, with no result. The fine point of the magnet was then introduced through the corneal wound
wound into the lens substance: A distinct click was heard, and on withdrawal of the magnet, a small piece of steel was brought up to the corneal wound, which had to be slightly enlarged to allow its removal.

The following case is of interest, as showing the difficulty of making a certain diagnosis, in these cases—

Joseph Snidell, Labourer

History: Fourteen years ago, whilst employed as a blacksmith, he was struck in the right eye by a piece of steel. He had some trouble with the eye for four months following the accident; after which time, it quieted down: The eye has not bothered him since, till a week ago, when it began to get inflamed.

On Admission: There was no scar visible on the cornea: The pupil was round, and occluded with lymph, and the iris discoloured. The lens was
Opaque, and in its lower half there was a bright yellow mark, which was thought to be a foreign body. After removal of the lens, the supposed foreign body proved to be an area of calcaneous degeneration of the lens substance.

**Metal Fragments in the Vitreous**

A study of these cases is much wished, owing to the greater frequency with which metal is found in this situation, than in any other part of the eye, and to the grave risks to the eye which this injury entails.

The dangers of metal fragments in the vitreous depend to a large extent on

1. The condition of the fragment, as regards Sepsis
2. The size of the penetrated fragment
3. The site of penetration, and the course taken by the fragment to reach the vitreous

The risk of loss to the eye, though always a grave one, yet varies a good deal on degree, in different cases. Some eyes are hopelessly lost. Then first-
seen. Regraining immediate enucleation, other cases, can at the best help for little more than a respectable clothing eye, if blind, or not shrinking, whilst others again recover with at least light perception, or with some degree of vision.

The septic infection of the interior of the eye is a helpless complication, such cases requiring enucleation or enucleation. With regard to the size of the penetrated fragment: With long pieces in half an inch long, or jagged bits, weighing 10 or 11 grains, or in two cases, which I have seen recently, the damage done to the eye in penetrating is usually quite irreparable, the ciliary and lens structures being destroyed.

Apart from the damage usually inflicted then entering, these long fragments are much more difficult to remove, sometimes requiring enlargement of the original wound to allow of their extraction, thereby increasing the risk of loss of vitreous: Small particles of metal
however, can often be removed with little extra damage to the eye, or loss of Vision.
The Site of Entry of the fragment, is of some importance as to prognosis.
The less damage done to the Capillaries, the better are the chances of the eye recovering with some Vision.
One would think that cases in which the Sclerotic was the site of entry would give the best results. The lens and zonular structures often become firmly fixed in such cases, but statistics however do not confirm this.
Cases, in which the steel enters the Cornea about its centre, and penetrates the lens without doing much damage to the Iris, if any at all, especially when the fragment is of small size, seem to give generally the best results.
The commonest Site of entry is the Cornea—Of 34 cases 31 at the Vitreous located or their Infirmary. The Cornea, was the Site of entry in 35. The Sclerotic, in 8.
being the 8th in the remaining case.
Of the 25 cases 7 Corneal penetration
3 eyes were removed for Randolph's phlebitis.
9 eyes were removed, 6 of them as
Infezled cases, and 3 later, in Chiticus
Bulbi.
8 eyes recovered with slight Perceptions, or
with some degree of Vision — and
5 eyes recovered with fair Vision; in
\( \frac{6}{36} \), \( \frac{6}{24} \), \( \frac{5}{20} \) &c.
Of the 8 cases, in which the Sclerotic
was the site of entry.
2 eyes were enucleated
4 eyes recovered, with fair tension, but
complete loss of Vision.
1 eye recovered with slight Perception, and
counted fingers at 1 foot. — and
1 recovered with fair vision — in \( \frac{6}{36} \).
The Corneal Sclerotic case was enucleated.
Thus out of 34 cases 7 still retained
in the Vitreous — 20 eyes were either
enucleated, or lost for purposes of Vision.
6 eyes recovered with fair vision, with
suitable glasses, ranging from \( \frac{6}{30} \) to \( \frac{1}{18} \).
the remaining 8 recovering with Vision.
varying from mere Light Perception, its ability to count fingers at a few feet distance from the eye.

**Symptoms and Diagnosis**

The symptoms, subjective, and objective, vary so much in different cases, that no hard and fast rules can be laid down for purposes of Diagnosis.

Subjective symptoms are often quite out of proportion to the gravity of the injury received, e.g., patients with a piece of steel in their vitreous, weighing several grains, sometimes complain of little more than impairment of Vision, while on the other hand, apparently similar cases, call suffer most intense pain.

The patient's symptoms then, are not of very great value in making a Diagnosis. The history is of some importance. A patient coming up with a penetrating wound of the eye, and with the history of the injury having been received by a blow from a piece of flying metal, should always arouse suspicions of the
retention of a metal fragment in the interior of the eye, and lead to a careful examination.

The condition of the injured parts is often a guide to diagnosis, the track of the steel fragment, if it has entered through the Cornea being often visible. A punctured wound of the Cornea, with a wound in the Iris lying immediately behind it, and with a wound in the Lens capsule or on area of commencing opacity in a corresponding situation, is, along with a history, such as has already been described, strong presumptive evidence of a foreign body being in the Vitreous.

Some Authors attach importance to the condition of the Iris, with regard to diagnosis: A corneal wound must be large and gaping to allow of escape of Aqueous; this is unusual in cases of retained foreign bodies, the wound of entry in such cases, being usually small and linear, with little, or no escape of Aqueous. Posterior to Iris, there
in, prima facie, against the presence of a foreign body.
The only circumstances under which one is enabled to make a positive diagnosis, are those in which the foreign body can be actually seen, either by oblique illumination, or with the ophthalmoscope. Though the inability to see one, by no means, precludes the possibility of its presence.

Of the 35 cases, 7 metal in the vitreous, which appear in my statistics, the fragment was seen with certainty in 12 cases, and not seen in 19. The remaining 9 cases presented suspicious appearances, suggesting the presence of a foreign body. In recent cases, the bright metal may be distinctly seen, under favourable conditions. The mere sight of it, may however be quite obtained by speculating on the media, or haemorrhage into the anterior chamber, a vitreous, inflammatory excudation, or opacity of the lens. Sometimes, in these conditions, such as haemorrhage,
cleaning up, in the course of a few days, the foreign body can then be made out.

Treatment: As House Surgeon to Mr. Snell, one of the earliest and ablest advocates of the use of the electric magnet for removal of metallic fragments from the vitreous, it has been my good fortune to have seen it used successfully in many cases.

The details of this treatment are now so familiar that there remains little for me to say on the subject. In all cases of penetrating wound of the eye, with a suspicious history, especially where there is a distinct track running through the iris, and lens, it is best to search the interior of the eye carefully with the electric magnet. Introduce the magnet point, then, possibly, through the wound or cornea, and along the track. First explore the lense and its chamber; failing to find anything
there, plunge the point into the 
Vitreous, making several distinct 
plunges, and withdrawing at various 
points of the Vitreous, before giving up 
Hope of finding. Then, the case 
is first seen, sometimes some time 
after closure of the wound of entry, 
it is often a question between trying 
to remove the foreign body through a 
wound made in the Sclerotic, or to 
proceed as for lens extraction, and 
to introduce the magnetic point, after 
clearing out the corneal lens.
Of the cases, appearing in my statistics, 
or by for the majority of them, the 
steel was removed through the wound of 
entry. There is sometimes difficulty 
in extracting large, or irregular pieces 
of metal, through the wound of entry, 
after they have been found, owing to 
the fragment coming up, with its 
longest axis, across that of the wound. 
In such cases, it is best to let the 
fragments go, by treating the cement, 
and try to get a fresh hold on a
more favourable position. Failing this, it is best to secure the present
fragment with forceps, and to carefully
enlarge the wound, till it allows of its passage. In these cases, there is always great risk of loss of vitreous.

Statistics of 35 Cases of Steel in Vitreous

In the following statistics, I have taken note of the site of entry of the steel fragment, whether it was seen before removal, the method adopted in its removal, its weight or size, when recorded, and the condition of the injured eye, subsequent to operation. It will be noticed that the majority of the fragments were small, ranging from a fraction of a grain, to 3 grains in weight.
<table>
<thead>
<tr>
<th>Site Entry</th>
<th>Seen?</th>
<th>How Removed</th>
<th>Weight</th>
<th>Result</th>
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<tr>
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<td>?</td>
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<td>?</td>
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<td>Size</td>
</tr>
<tr>
<td>---------------</td>
<td>-----</td>
<td>----------------</td>
<td>-----</td>
<td>--------</td>
</tr>
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<td>Removed with Eye</td>
<td>3/4</td>
<td>with long</td>
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<td></td>
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<td>Original Wound</td>
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<td></td>
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<td></td>
</tr>
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<td></td>
</tr>
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<td>Cornea</td>
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<td>0.56 gr</td>
<td></td>
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</tbody>
</table>

Some Cases of Steel in the Vitreous

1. Frank Brambell, Blacksmith
Admitted: October 1st, 1898.

History: On the morning of admission, he was struck on the right eye by a piece of metal, whilst hammering a shoe.

Condition on Admission: There is a punctured wound of the Cornea situated in its upper, outer quadrant. There is a wound in the Iris, in a corresponding position, extending...
from its pupillary margin, half way to its ciliary attachment.

On examination by oblique illumination, a wound can be seen in the anterior and posterior capsules of the lens, which shows commencing opacity. Situated anteriorly in the vitreous, is a split which suggests the presence of a small metal fragment.

Treatment: With the eye anaesthetised with cocaine, and the pupil dilated with atropine, as much of the lens as possible was removed. Through a lower canthal incision, all the lens matter could not be removed, owing to escape of vitreous.

The electric magnet found was then introduced, and after careful exploration of the lens chamber, with a negative result, was pushed into the vitreous. On withdrawal, a small metal fragment was found adhering to it; the fragment weighed 0.18 grain.

On October 31, the patient was discharged, and was then able to count fingers of a
On January 3rd 1899, he was readmitted, and the lens capsule needed for opacity.
On February 25th, his vision was as follows:
\[ V + 13 \sigma = \frac{6}{36} + 15 \sigma \text{ reads Jaeger 1.} \]

J. James Walkinson: Metal Labourer.
Admitted: September 20th, 1899.

History: While hammering a steel bar, a few hours before admission, he was struck in the eye by a piece of steel. He does not know whether it has penetrated.

Condition on Admission: There is a wound on the sclerotic, commencing at the upper and inner margins of the Right Corneal Sclerotic Junction and running downwards and upwards for \( \frac{3}{8} \) in. inwards. The Auditory Chamber is full of blood, and the lens structures are apparently disorganized. No fundus reflex can be obtained. Visceras is escaping from the wound, and the
Tension of the eye is much diminished.
No Stab can be seen.

Treatment: The vitreous was searched with the electric magnet, introduced through the wound (17 entry) in the sclerotic. After a few plunges a small piece of steel was caught, and removed. The edges of the wound were then approximated by the insertion of a few hand conjunctival stitches.

On October 17th he was discharged, with the eye healed, but quite blind, and commencing to shrink.

The following two cases are of interest, owing to the very large size of the metal fragments; — a long way the biggest, removed from the eye, in this Infirmary, which I can find amongst the records of cases. — Strangely enough, they were consecutive cases —

1. Matthew Middleton: Bailer Maker
Admitted: November 20th, 1898.

History: A few hours before admission, he was hammering in a rivet; when a
piece of metal flew off his hammer, and struck him, in his right eye.
Condition on Admission: The patient complains of very little pain, nor a sense of unsteadiness, and dimness of vision in the injured eye.

There is a large wound running across the upper half of the cornea. The iris is much torn and prolapsed.
The lens is broken up, and vitreous is escaping from the wound. Nothing can be seen of the interior of the eye, owing to opacities in the media.

Treatment: Under Scawie, the electric magnet was introduced, through the corneal wound, and a piece of metal was removed from the vitreous.
The fragment weighed 10.6 grams.

On January 6th, 1899: The condition of the eye was as follows: The corneal wound has healed, the iris is adherent.
to the corneal scar, and the pupil much occluded. Tension is normal, and there is faint light perception. The other eye is unaffected.

(2) John Barton: Metal Striker
Admitted: December 10th, 1878.

History: On the morning of admission, he was chipping a metal plate. Then a piece flew off it, and struck him on his left eye.

Condition on Admission: There is intense pain in the eye. There is a wound of the Cornea, commencing about the middle of its inner half and running outwards through the Cornea Sclerotic Junction for about 1/8 in. on each side into the Sclerotic. The Iris is much damaged, and prolapsed. The lens is destroyed, and Viscous is escaping from the wound.

Treatment: Under Coaxine, the electric magnet
was introduced into the original wound, and thrust into the vitreous. A large piece of steel at once jumped to the magnet, carrying the thin coat of the eye with it. There was much difficulty experienced in removing the fragment, and eventually the wound had to be enlarged for this purpose. a good deal of vitreous being lost during the operation.

The fragment weighed 11.56 grains.

= Sign, and broke 17 the fragment.

On January 23rd, the eye, which was shrunk, and useless, was removed.

The following case, which I have just admitted, will illustrate the rule, viz. that all suspicious cases should be examined with the electric magnet.

Thomas Berry Steel Turner ("Chippier"

Admitted: March 25th, 1879.

History: A few hours before admission, he was passing some men, who were in chipping an armour plate, when a piece of steel flew up and struck him
in the right eye. He has no idea as to the size of the fragment, nor does he know whether it has penetrated. This is a very typical history; the man's statements being more often misleading than otherwise.

**Condition on Admission:**

Patient complained of very little pain. There is a small punctured wound of the Cornea, situated in the outer half of its lower segment. The iris is juxtaposed and is apparently sound.

There is a good deal of blood in the Anterior Chamber. The lens is apparently unjured, but very little can be made out with the ophthalmoscope, on account of the opacity of the media.

**Treatment:** It was decided to search for a possible foreign body. A pair of magnetically was accordingly gently inserted into the corneal wound, and then along an evident track, passing apparently to the side of the lens, was pushed into
the Vibeena. On withdrawal of the
peel, a small piece of steel was
found adhering to it. A small
bit of the iris prolapsed after
removal of the fragment, and was
removed. The weight of the fragment
was 4 grams.
In this case, unfortunately the Cornea,
had evidently been infected at the
time of the accident, as a serpilic
conical ulcer, formed round the wound
in entrance, and the corneal scar was also
in a few days, some irritis, and a
great deal of conjunctivitis.
The Corneal Ulcer was cauterised, and the
strictest antisepic treatment adopted.
At the present time, April 14th, the
condition of the eye is much improved,
the inflammation having to a large
extent subsided, and the Corneal Ulcer
healed. The lens however is now
opaque, and vision only: Light Perception.
The next case is of interest, from the fact that the foreign body in the vitreous was successfully demonstrated by the X rays.

James M.
Admitted May 7th, 1898.

History: Child chipping a piece of crucible steel fifteen weeks before admission, a bit flies up, and entered his left eye. He cannot tell whether the piece was from his chisel or the crucible steel, but he thinks it was from the latter.

On admission to the Infirmary a month later, a fine linear scar was noticed in the Cornea, opposite the upper pupillary margin; corresponding to this the edge of this scar was fixed to the capsule, and from this a broad lamina of opacity was traced backwards through the upper part of the lens. The vitreous was turbid, and therefore a foreign body was diagnosed as most likely to be in the eyeball.
Its precise situation in the Vitreous chamber was not located.
The patient had only slight perception, and the surface of the eye ball was much inflamed together with Iris.

TREATMENT: The patient was kept under observation, and with the use of Antitoxin, the Iris subsided. The surface of the globe whitened, and the Vitreous cleaned. In about three weeks after seeing him, the situation of the piece of steel, surrounded by lymph, was made out in the upper part of the Vitreous lying behind the spar of the lens.

The patient consented to an attempt being made of removal, but hearing of the use of the X Rays, he journeyed to London for Mr. Mackenzie Davidson to take a print.

MR. MACKENZIE DAVISON'S REPORT:

I got two excellent shadows, and localized a fragment of steel, apparently needled shaped in the Vitreous, …
It is about 7 or 8 mm. in length, and is situated obliquely. It is evidently embedded in the white mass of vitreous, visible upwards in the vitreous.

Fig. 7. Mr. Davidson's Skigram.

A wire is seen attached to the lower eyelid A. B is the piece of steel.

Treatment: On May 9th, 4 per cent. cocaine was instilled, the conjunctiva was freely separated over the globe at the lower and inner part, and after all bleeding had stopped, the sclerotic was incised with a Graefe knife. The direction of the wound was median, and it was joined at the base.
extremity by a cross cut. The point
of the electric magnet was introduced
into the vitreous of the globe, and
passed up to the situation of the
vitreous, where the foreign body had
been diagnosed as located. The
fragment of metal, at one became
attached to the magnet, but on
withdrawing the point, it was peeled
off at the wound, but on a
re-entering of the magnet it became
totally attached, and was at once
extracted. It was as the diagram
indicated, needle shaped, about the
thickness of a seagull's needle. It
weighed 0.36 grains, and measured 9 mm. in
length. The conjunctiva was irritated by
these hair sutures.

This Case was reported by Mr. Snell
in Vol. XVIII. of the Ophthalmological
Transactions.
Possibilities of Ophthalmia.

Considering the numbers of cases of metal on the Vitreus, seen every year in Sheffield, it is evident, that a great many eyes must be lost from the effects of this kind of accident, amongst men employed in the Metal Industry. The Workman's Compensation Act has undoubtedly caused wounds, and injuries of all descriptions, to be of far more interest to employers and employed, than was the case formerly. Claims for Compensation for the loss of an eye have already become a common cause of litigation, and although some of the cases have been fraudulent, e.g., men with old afflictions attributing the condition to a recent accident, so as to increase the amount of Compensation, the majority have been made bona fide.

It must remain for the employer to try to minimize the risk of these accidents. As I have previously
remarked. It is amongst Rivellers, Metal Chipper, and Hammerers or Stikers, that metal in the eye is most frequently met with, more than half the cases seen on Sheffield, occurring amongst such workmen. Rivelling, or the welding together of two metal plates, is by means of glowing metal rivets, hammerred through holes previously bored for the purpose; in course a very common occupation in all large steel works. Accidents due to rivelling are perhaps most often seen amongst tool makers.

Metal Stikers (a Hammerer), and Chipper, are employed in chipping irregularities of metal plates, after they have been cast. previois to more finish work being done on them, such as planing, filing, etc.

In dealing with plates of large size, such as Admiralty Armour Plates, the metal strikers and chipper work together. The chipper holds a "double handed chisel"
an instrument, looking like a very large chisel, against the metal projection to be removed, whilst the 'Sticher', or 'Hammer', gives a series of blows on the chisel with a heavy hammer, till the projection is levelled down. In smaller work, only one man does both chipping and striking.

The Chipping of Metal, or any force I consider to be by far the most dangerous kind of employment in the Sheffield Workshops. It is a long way the commonest cause of metal fragments penetrating into the eye, accounting for more than half, nearly two thirds of the cases, which I have enumerated. Not only, in this kind of work, great danger to the men actually employed in it, but it is also a common source of injury to other men, who may be working near by, or simply walking through the shops. The last can of steel in the Vickers, which I have described
is a good example of this.
The average workman has a great
desire to wear glass, but I
think on view of the recent Compensation
Act, the employers will find it
necessary to enforce some precautionary
measures: Careful isolation of chippers
from other parts of the works, and
the wearing of full coat or gauge
spectacles by those engaged on this work.
and the measures that suggest
themselves.
I hear that experiments are now being
made with a mechanical chipper,
worked either by air, a hydraulic pressure,
Should this prove a success, no doubt
it will be the last solution of this
'Chip' difficulty.

Metal Fragments in The Retina

The lodging of a piece of metal in the
Retina, is a rare accident. Of the 70
cases of metal in the eye, which have
been treated at this Institution, during
the last five or six grams, only
or 7 or so, the retina, the 5th or 7th retention of the foreign body.
In all cases, in which the foreign body can be distinctly located, an attempt should be made to remove it, preferably through an incision made in the sclerotic. In many cases, the results obtained after removal are most encouraging. Mr. Smith recently showed a case at the Sheffield Medical Society, in a man, who, after removal of a small piece of steel from the retina, had normal vision in the injured eye. The prognosis in such cases must largely depend on the condition already referred to. When speaking of the vitreous and metal fragments:
the nature of the penetrated body as regards Sphæron, its size, the ability to locate it, and the amount of injury inflicted on the eye structures, at the time of the accident.
Some Cases of Metal in the Eye

William Allford: Metal Turner

History: About three months ago, whilst turning, a small piece of metal fell off and struck him on the left eye.

Condition on Admission: There is a small wound (healed) on the sclera, about a line in length, situated just to the inner side of the middle of the canoes sclerotic junction. The iris is uninjured, and reacts to light, and accommodation.

Since the accident, the patient has complained of seeing flashes of light before the injured eye, often in the dark.

The Ophthalmoscopic Appearance is Indistinct.

Method: As follows.

Situated a little way above and to the inner side of the disc, is a black glittering body, as large as the disc, surrounded by a white ring of effusion. There are also some signs of recent retinal haemorrhage, and some
first which struck, apparently due to

Examination of the Field of Vision shows a scotoma, corresponding in position to

\[ V + 1.25 \theta = \frac{6}{9} \]  

(Patient is Hypermetropic).

No attempt was made at removal.

Three months later, the patient was again examined. The following report was made then. With the funduscope,

no foreign body can be seen, either in situ or in the vitreous. There is an atrophied patch, surrounded by some segmentation, at the site where the supposed foreign body was seen, in the former examination. —

The patient was then warned of the risks of his condition, and told to come up at once, should the eye become

inflamed or painful.

Three months later, he came up,

complaining of great pain in the eye, which was a good deal inflamed, the

iris being discoloured, and sluggish. His

condition of the Fundus was the same, as
when last examined. \[ V = \frac{6}{24} \]

Inflammation of the conjunctiva was continued for several days, but the pain, and

itch increased, and the vitreous began to become cloudy; vision also was

worse, equaling \( \frac{6}{60} \).

No foreign body could be seen in the vitreous, but on bending the head

between the knees, and quickly raising it, a dark shadow could be seen

indistinctly in its lower part.

Four days later, an incision was made in the sclerotic, between the inferior,

and external recti, and the electro-

magnet introduced; after some searching,

a small fragment of steel, coated with exudation, was brought into the

wound, and secured from a membrane

to which it was attached; after its

removal, the conjunctiva over the

wound was united by horse hair

stitches. On examination of the

removed fragment, one surface was

seen to be dark and almost

unaltered metal, whilst the other
was cooled over, giving it a yellowish white appearance.


History: Six weeks ago, whilst chipping steel castings, a piece of metal flew up, cutting through his upper eye lid and wounding the sclerotic under-mesh. It caused little pain, and the wound soon healed. He now complains of a black spot before his injured eye.

Condition on Admission:
There is no inflammation of the eye, and there is none any scar to be seen on the sclerotic.

**Diagram of Retina**

Ophthalmoscopic Appearance: Indistinct.

Method: -
- No media are clear.
- A bluish gray glistening body, A, rather square in shape (probably a foreign body), is visible situated above, and
...side of the door, and no inflammatory
exudation, and patches of pigmentation.
Below the door, is an oval shaped
white mark, and a little internal
to it, can be seen the scar of
the wound of entrance.
The Field of Vision shows a Sustina,
corresponding to the position of the
object seen in the Retina.

\[ \text{Vision} = \frac{6}{30} \text{ and reads Jaeger 1.} \]

No attempt was made of removal, but the
man was kept under constant
observation.

Nine months later, the vision in
the eye began to fail, and on
careful examination at this time, no
foreign body could be seen, but
there were several floating specks in
the Vitreous. The eye gradually
became worse, from increasing
commencing Jaeger's, so it was decided
to search the Vitreous.

Accordingly a puncture was made in
the Sclerotic, between the Spernum.
and Inferior Recti, and the eye, in the muscle, formed oblongs, and back walks in the Vitreous. On withdrawal of the point, a piece of steel was found attached to it. The removed fragment was somewhat square shaped, and weighed 0.122 grams. One side of it was coated over with exudation, and the other was black, natural metal.

These two cases just described present points of interest:

In both of them, the Foreign Body, after having been seen, or the Retina, was impossible to find; on examination several months later and the injured eyes, after remaining healthy for a long period, w 7 months, and 7 months respectively, became acutely painful and inflamed.

The condition of the piece of steel removed was noticeable in both the cases, the steel being coated on one side, with a greyish exudation, and
the other side presenting a smooth metallic surface. In the first case, the fragment was adherent to a membranous structure, from which it was detached before removal. These appearances seem to suggest that in each case the foreign body was retained in the Rehia for a long period, without setting up inflammatory reaction, and that becoming covered with exudation, it was rendered indistinguishable from the other exudation on the Rehia. Hence possibly its apparent disappearance. Possibly this inflammatory condition, which eventually followed, was due to dislodgement of the foreign bodies from their original situations.

Case 3: Walter G., aged 38

History: In January 12th, 1899, whilst engaged at his work, he was sticking a steel found tool, and a small splinter flew from it, and struck the right eye.
On admission to the Infirmary four days later, it was observed that the fragment had penetrated the cornea at the sclera-corneal junction on the inner side of about the median line. Beneath this corneal scar, a small hole was noticed in the iris at the periphery and with the pupil well dilated with Atropine, the track of the foreign body was made out, at the edge of the lens. By the speculum, it had occurred. Examination with the ophthalmoscope disclosed the fragment of metal fixed in the retina, in the lower and outer quadrant. The glistening of the steel was distinct, but it was surrounded and partially covered with whitish exudation. The vitreous humour was but little disturbed and vision equalled about Finger.

Treatment: On January 28th, under Cocain, the conjunctiva was separated with scissors, and the Sclerotic laid bare at the lower and inner side of the globe. All bleeding was allowed to
short, and then the Sclerotic was
incised (meridional section) between the
internal, and inferior recti, and the
electric magnet oriented across the upper
area of the Vitreous to the situation
of the foreign body. Just as introduced, a click heard, but
nothing removed on withdrawing it. On
the third attempt, a piece of metal
was successfully removed.
The exact position of the fragment on
the Retina had been ascertained, but
the splinter was clearly too firmly
fixed either on the Retina, or glued
by adhering of lymph to be detached
at the first two times, it was brought
into contact with the electric magnet.
On January 25th, only a vestige of the
whitish effusion at the site where the
foreign body was fixed, remained.
On February 1st, all the effusion had
disappeared, but a large area remained
covered with fragmentary dots.
February 25th: \[ RV = \frac{5}{24}, \quad LV = \frac{6}{7} \]
This peculiar on the lens remained unaltered.
This case was reported by Dr. Snell in the Physiological Transactions Vol xviii.

The following case is an instance of a metal fragment penetrating the optic nerve. The loss of this eye was due to "Chipping".

Lew Coopin
Steel Molder

History: While standing near a man who was chipping a piece of metal flew up, and entered his left eye. He says that immediately after the accident, he could see nothing, but that soon after he could see shadows. In the course of another day, he says that he became blind again in the injured eye.

On admission a week after the accident, there was a scab on the inner canthus region, and a yellowish spot visible in the Vitreus, suggesting a jaeger body. The eye was painless, but nearly blind. The Vitreus was then searched with the electric magnet, but nothing was found.
In the course of the next few weeks, the eye became inflamed and very painful, so it was decided to remove it. After removal, a piece of steel was found firmly embedded in the optic nerve.

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I have now, so far as is possible, in this length, endeavoured to give some idea of the practical treatment of Eye injuries due to Foreign Bodies, together with statistics and observations, which my position as Ophthalmic House Surgeon at the Sheffield Infirmary has enabled me to make. I can only hope that my efforts have not been wholly unsuccessful, and that this Thesis may have thrown some light upon this important branch of Ophthalmic practice.