**On wounds and injuries of the eye / by William White Cooper.**




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# WOUNDS AND INJURIES

OF

# THE EYE.

ON

# WOUNDS AND INJURIES

OF

# THE EYE.

BY

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TO THE

FELLOWS AND MEMBERS

OF THE

ROYAL COLLEGE OF SURGEONS OF ENGLAND,

This Volume

IS, WITH MUCH RESPECT, INSCRIBED

BY

THE AUTHOR.

# PREFACE.

The subject of Injuries of the Eye forms part of the systematic treatises on diseases of this organ, but I am not aware that any English work has been specially devoted to the subject; when in charge of difficult and anxious cases I have often felt the want of such a book of reference as that I have now endeavoured to supply.

The members of the medical profession, especially those of matured experience, must be conscious of the progressive character of knowledge; and on surveying the various theories and changes of opinion they have witnessed, will feel that the information they possess is but a drop in the great ocean of truth.

Deeply sensible of this, the present volume is put forth by me with the consciousness of many shortcomings and imperfections; nevertheless, it is hoped that it may prove useful: to render it practical no pains have been spared.

Believing that cases are not only illustrative but impress facts upon the memory, they have been freely introduced in a concise form, and limited as far as possible to the leading points.

Though unavoidably enhancing the cost of the volume thereby, I have availed myself of the skill of Mr. Sherwin, to insure fidelity in the colouring of the plates, which, with the woodcuts, are from my own drawings. The cuts have been executed by Mr. William Bagg and Mr. Orrin Smith.

My grateful acknowledgments are due to the following gentlemen, who have courteously afforded me information—Mr. W. Wale Tayler, St. Austell; Mr. Edward Robathan, Risca; Mr. David Hughes, sen., Llangollen; Mr. John Williams, Mold; Mr. Peter Squire, and Mr. Lloyd Bullock.

W. W. C.

19, Berkeley Square;
*February*, 1859.

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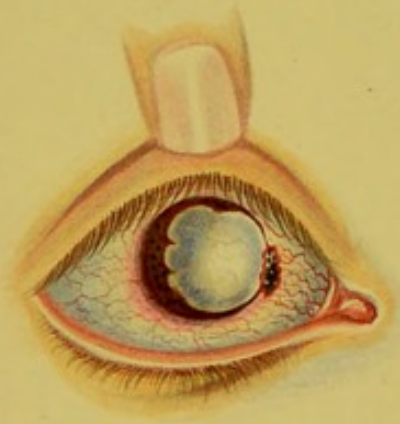

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Cooper ad. nat. del. W. Bagg lith.

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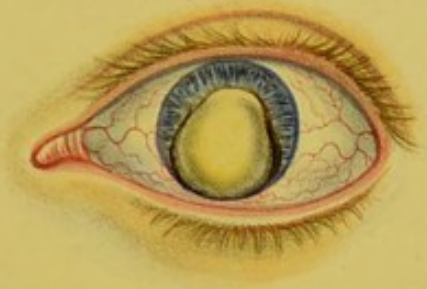

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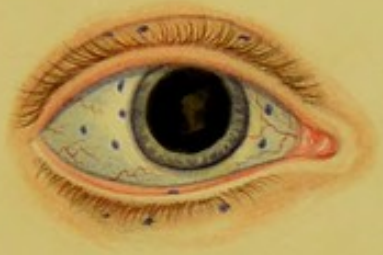

Fig. 2.

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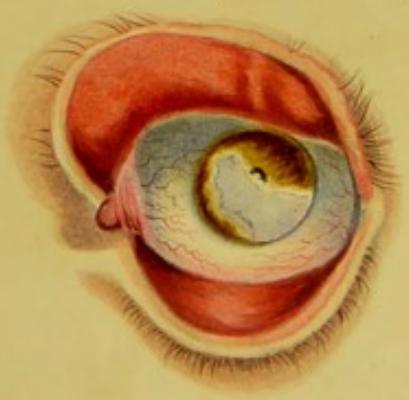

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# WOUNDS AND INJURIES

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## CHAPTER I.

THERE is no organ in which the reparative powers of nature are more remarkable, and the processes by which she works better displayed, than in the eye; whilst the delicacy and complexity of its structure, render important every injury to which it is liable.

Wounds of the eye are less painful than might be imagined from its high organization and the exquisite sensibility displayed when there is a particle of grit between the surface of the eye and the eyelid; this usual standard of comparison is deceptive; the organ has been endowed with such sensibility for its preservation, and acting in sympathy with it are the lids and the lachrymal apparatus, the effect of the whole being to keep the surface of the cornea clear by incessantly wiping away mucus and fine particles of dust, invisible to the sight, but not unfelt by the guardian nerve-fibrils of the eye. The cleansing of the eye by the act of winking is unconsciously performed, and is irresistible; the effort of the *will* can only restrain it for a short time. The eyelashes also play an important part in the protection of the eye; not only

do they assist in modifying the glare of light, but set as *chevaux de frize* before the eye and seated at the extremities of sensitive nerves, they give alarm if approached, and swift as thought they cause a movement of the eyes and eyelids before the offending body can touch the surface of the globe.

A remarkable example of this combined movement was afforded by a case of a penknife-wound, hereafter to be related, where the punctures in the lid and the eye corresponded so little, that had I not seen the case immediately after the accident I should have doubted the possibility of their having been inflicted by the same stroke; at the moment of the accident, the instinct of preservation caused the cornea to be thrown so powerfully upwards, that the lower part of the sclerotic was pierced by the knife which passed through the upper lid.

If, however, a particle sufficiently large or sharp to make itself felt eludes these safeguards and enters the eye, the tears are instantly poured out and deluge its surface, whilst a series of rapid spasmodic movements of the lids combine to hurry the intruder away. If, under such circumstances, the sufferer will only have resolution to abstain from rubbing the eye and will keep the lid quietly closed, the efforts of nature will most probably remove the particle, which might create an amount of discomfort out of all proportion to its dimensions.

Under certain conditions of paralysis the eye is deprived of the safeguard of its sensitive nerves. Soot and dust rest upon it, and lodge under the lids; the dulled sensibility of the conjunctiva fails to rouse the torpid lachrymal gland; the tears no longer flow, an accumulation of dirt excites inflammation; the vitality of the part being lowered, ulceration and destruction of the cornea follow, and thus the eye is lost.

The amount of suffering caused by a foreign body in the eye depends less on its size than on the character of its surface, whether smooth or rough, and on its situation. When near the margin of the upper lid it is carried over the eye at every movement, but if it should be higher up near the angle of reflection or in the fold itself, the irritation will be much less.

I was summoned one evening last winter to a lady who had met with an accident. On entering her apartment I saw the patient seated in her chair, her face turned towards me but her eyes fixed in another direction. I learned that in the course of the afternoon when driving in an open carriage a fragment of straw from a waggon had blown into her eye, and notwithstanding every attempt at removal it had obstinately remained, causing exquisite suffering at each movement of the eye or lid, the eye being only easy in one constrained position. Everting the lid with some difficulty from the strong spasm which existed, the sharp particle of straw was seen just within the margin of the upper lid near its centre, so that it partook freely of its movements. The relief afforded by removal of the straw was immediate.

In strong contrast to the above stands the following.

A farmer residing near Rutland, consulted me, March 19th, 1857. He stated that in the previous October, whilst thrashing barley, some husk was blown into his left eye, and had there remained, causing discomfort, but little pain. He washed and poulticed the eye, which was always inflamed and discharging matter. The upper eyelid was swollen, thickened, and red; the conjunctiva of the eye vascular, and the cornea hazy. On everting the lid, its lining membrane was found to be deep crimson, and highly granular; towards the upper fold the papillæ resembled in shape small mushrooms. Everting the lid to the utmost, and

then drawing it from the eye with a flat probe, there was seen buried at the highest point a white substance; this was drawn out with some difficulty from its being firmly attached at one end, and proved to be a beard of barley, three fourths of an inch in length, and having serrated edges; it had been in the eye five months.

Mr. Guthrie[1] mentions that he removed from the eye of a medical student a piece of the husk of a grass-seed, which had lodged there sixteen months; it had merely given rise to a little occasional irritation, which was augmented on his taking cold, and three or four red vessels running from the spot were then increased in size. It had caused a small depression in which it was lodged, but whence it was easily removed, and all inconvenience immediately subsided.

Dr. Mackenzie[2] refers to three cases in which particles of seed-husks adhering to the cornea in children were mistaken for specks or pustules, and treated accordingly, until the real nature of the case was discovered by that gentleman.

Bird-fanciers frequently suffer from the husks of seeds flying into their eyes when engaged in cleaning cages. I have known severe neuralgia produced by the unsuspected presence of one of these foreign bodies; and M. Magne communicated to the Society of Practical Medicine in Paris a case, in which distressing neuralgia was excited by a particle of millet-seed fixed in the cornea.[3]

There are various occupations which are injurious to the eyes, either by causing direct mechanical injury, or by setting up inflammation as a consequence of irritation. I may specially mention drug and pepper grinders, lime burners, cinder sifters, dustmen, chimney sweeps, millers,

[1] 'On the Operative Surgery of the Eye,' p. 135.
[2] 'A Practical Treatise on the Diseases of the Eye,' 321.
[3] 'Ann. d'Oculistique,' March, 1857.

wool and feather cleaners, besides those exposed to more serious accidents, as miners, quarrymen, workers in metal, engine-drivers, &c.

Chimney-sweeps suffer from the stimulating effect of ammonia contained in soot, in addition to the irritation of the soot itself. There appears to be an affection common in North America, which is injurious to the eyes. The ashes remaining from the various kinds of wood used as fuel are sold to boys, and their eyes become diseased from the light powdery dust containing large quantities of salts of potash, lodging within the eyelids, which become thickened, very red, and deprived of eyelashes.[1]

In certain villages in Alicante, in Spain, the manufacture of *Esteras*, a tissue made with the *Stirpa tenacissima* of Linnæus, causes a disease of the eyes among the workmen.

The Euphorbium is the plant most dreaded by drug grinders. It causes such great irritation, that it is necessary to protect their faces and eyes with masks, having glass apertures to see through; not only will the dust cause violent ophthalmia, but if inhaled, it sometimes produces insanity. Pereira was informed at one drug-mill of an Irish labourer, who, under its influence, insisted on saying his prayers at the tail of the mill-horse.

Cantharides, too, is very injurious to the eyes of workmen, and even the vapour of cantharidin will produce powerful effects. A pupil of Roubiquet was watching the crystallization of cantharidin, when he was seized with acute pain in the eye, followed by inflammation of the conjunctiva, attended with small vesicles, and loss of sight for several days.

I am informed by Mr. Squire, that the preparation of the following articles is injurious to the eyes. Oil of mustard,

[1] Dr. Gibb, in 'Journal of Society of Arts,' vol. iii, p. 124.

infusion of black mustard, made at a temperature of 160°, powder of hellebore, gamboge, squills, and veratria. The vapours of iodine, bromine, and chlorine, are very irritating, as are the fumes of ammonia and strong acetic acid.

The antennæ and elytra of beetles occasionally lodge in the eye, and are somewhat difficult of removal.

A clergyman called on me in May, 1856, and stated that three evenings previously, whilst walking in his garden, a small beetle flew into his eye with some force. It caused considerable pain, and though he wiped out the body of the insect, he saw and felt a portion remaining attached to the cornea. A surgeon endeavoured to remove it, but after many painful and fruitless attempts, advised his patient to come to town. The eye was now painful and inflamed, and the brown shining wing-case of the beetle was very apparent, adhering to the cornea near its upper and outer margin: the point of Hey's needle lifted it off with facility.

In Australia the flies are a dreadful pest, depositing their eggs wherever there is the slightest breach of surface. A gentleman working at the diggings hurt his eye with the handle of a windlass: the next morning, feeling a strange creeping sensation in it, he got up, and to his horror saw it actually alive with maggots.[1]

Larrey[2] mentions emphatically the horrible pest the flies were to the wounded during the Egyptian campaign; lotions of a strong decoction of rue and sage were found the most efficacious means of destroying the eggs and larvæ when deposited in the wounds.

If a particle adheres to the conjunctiva covering the sclerotica, very little irritation may follow, and even when a

[1] Howitt, 'Two Years in Victoria,' p. 180.

[2] 'Mém. de Chir. Militaire,' vol. i, p. 311.

smooth substance attaches itself to the cornea but trifling annoyance may arise. Some years ago I received a letter asking my advice, and stating that a lady was suffering from a singular affection of one of her eyes, apparently prolapse of the iris just at the margin of the cornea, attended with but slight pain and inconvenience. This was so contrary to all experience that I felt satisfied there must be some mistake, and requested an interview with the lady. The supposed prolapse proved to be the brown, smooth, convex wing-case of a small beetle, which some weeks before had flown into her eye, and left the wing-cover sticking to the cornea.

The opposite condition is shown by the following case:

An officer was walking in the streets of Portsmouth in February, 1858, when a particle was blown into his left eye, and for a fortnight became the source of the greatest possible distress; when I saw him at the end of that time there was considerable conjunctivitis and some chemosis, photophobia of both eyes, and the lids of the left eye were spasmodically closed. With some difficulty I obtained a view of the cornea, and saw the foreign body near its centre; it was detached with Hey's needle, and proved to be a minute fragment of glass; the removal was attended with much pain, but the relief was so great that in four days the eye recovered its natural condition.

Sparks from lucifer matches cause much irritation. A gentleman was lighting a match, when an ignited particle flew into his right eye, from which he in vain endeavoured to remove it. When seen by me three days afterwards the eye was acutely inflamed, and a brown speck, the size of a small pin's head, was visible, adhering to the inner margin of the cornea. The foreign body being removed, a deep dimple appeared in the cornea, burnt by the flaming composition.

Among the most irritating substances that can enter the eye, are the rough, sharply angular, gritty particles of cinder, thrown out by railway engines, which prove a fertile source of annoyance to travellers.[1]

Their peculiar roughness causes them to adhere to the cornea with great tenacity, and in some instances, being in a state of ignition they become firmly imbedded. An accident common in iron-works and blacksmiths' forges is for a spark of ignited metal to bury itself in the cornea; these are technically termed "fires," and are usually removed by the workmen themselves with a bit of quill, or even with their pocket-knives; some display much dexterity, but the eye too often suffers from the absence of this qualification.

The Sheffield grinders are frequent sufferers from the same cause. In shaping razor-blades, &c., on the dry stone, an immense number of red-hot particles of steel fly in all directions; from these "motes," as they are called in Sheffield, the eyes of the grinders were constantly injured. The danger is now obviated by wearing large spectacles of ordinary window glass: the protection they afford is very evident; for, on examination after they have been a short time in use, the glasses are found spotted all over with the marks made by the particles of heated steel. The occasional breaking of the stones is an additional source of danger to the eyes, from their

[1] Notwithstanding the frequency with which particles of grit become entangled in the eyes of railway-engine men, they do not sustain material injury either from this cause or from the weather. The following is the reply to a letter of inquiry addressed by me to Captain Huish, secretary to the London and North Western Company, who politely inquired of the locomotive superintendent as to the frequency of blindness:

"In reference to Mr. Cooper's letter, I have not known a single instance of an engine-driver or stoker becoming partially or totally blind from injury by grit, nor indeed from any cause. The eyesight of our oldest drivers does not appear to be at all impaired by the exposure to which the men are subjected in their calling.

J. E. McConnell."

being now fitted with plates and screws. The saw-grinders at one time were often very seriously injured from the stones breaking whilst they were at work.[1]

I never remember to have met with an instance in which the sparks or "fires" were on the sclerotica; their seat is always in the cornea. When they are examined under the microscope they appear smooth and round. Dr. Mackenzie justly points out that other metallic particles which strike the eye are minute unignited splinters thrown off with great force as in turning or filing iron; these are sharp and angular, and are firmly wedged in the epithelium of the cornea; such particles are not attracted by the magnet until after they have been dried, and being firmly impacted in the cornea, the proposition which has been often made of removing them by aid of a magnet is of little practical use.

The spot on the cornea which has been injured by ignited metal, may long afterwards become the seat of morbid action.

A delicate, pallid lad, aged 14, apprenticed to a blacksmith, came under my care at St. Mary's, in August last. He was suffering from photophobia and some congestion of the left eye, and the cornea presented a deep excavation, at the bottom of which was a dark stain. My first impression was that this had been a recent injury, but I was informed that twelve months had elapsed since a "fire" had struck the cornea, in which it was imbedded for two days, and that a fortnight elapsed before the eye had recovered. The present symptoms had appeared a week previously to my seeing him, and several weeks elapsed before the ulcer healed under the influence of tonics and local stimulants.

If a foreign body is allowed to remain in the cornea it excites inflammation; the adjacent portion of the cornea

[1] Dr. Hall, 'On the Sheffield Grinders' Disease,' p. 18.

becomes hazy, then opaque, and ulceration follows, the ulceration being often attended with suppuration; the effect, however, of the ulcerative process is to loosen the particle, which can then be easily detached, if it does not come away spontaneously; when it has been removed, a depression in the membrane is left, which is filled up by opaque material. If the gap be large and deep, a permanent leucoma may remain, but if superficial, the transparency of the cornea may ultimately be re-established.

Fig. 1.

Sharp angular particles may become impacted in the conjunctiva covering the sclerotic; from the looseness of the membrane it is difficult to pick these out, and still more to cut down upon them if in the sub-conjunctival tissue, as the incision is constantly displaced by the movements of the eye and yielding of the membrane. It is easier to grasp and draw forward with fine clawed forceps (fig. 1) the small folds of conjunctiva containing the foreign body, and with scissors to snip the whole away; the wound need be but small. Sutures are sometimes advantageous when conjunctival wounds gape widely, but unless the surgeon is accustomed to such delicate procedures, and is provided with proper appliances, he had best not venture upon them.

Miss S., aged 13, was brought to me, July 21st, 1858. On the previous day she was struck on the left eye by a horse-chesnut enclosed in its prickly husk, which was thrown at her with force; the pain was most acute, and the sight for a time extinguished. The severity of the suffering gradually subsided, leaving a sharp pricking when the eye moved. On

examination I found a good deal of extravasated blood on the outer half of the sclerotic, and at a short distance from the cornea was a dark foreign body. This I with difficulty pulled out, as it was deeply imbedded in the sclerotic, and it proved to be one of the spines of the chesnut which had pierced the eye, and broken off.

No inflammation arose, and the eye recovered in a few days.

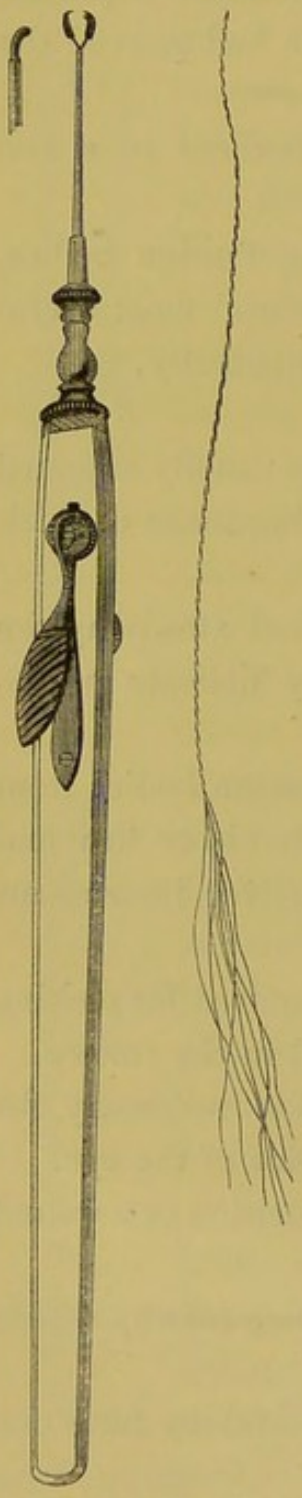
Before describing the method of removing foreign bodies, it will be proper to give a list of instruments[1] most useful for that purpose, and in injuries of the eye generally.

1. An elevator, for raising the lid. Those usually supplied are ill adapted for fitting into cases, being made of thick wire, and unnecessarily clumsy.
2. Forceps, for grasping the conjunctiva and steadying the eye; a necessary proceeding in many delicate operations.
3. A round-pointed needle, for removing foreign bodies from the surface of the eye; the extremity should be firm and not too sharp. Some prefer a blunt silver instrument for this purpose.
4. A sharp-pointed needle, which may be required for picking out splinters of wood, &c., when buried in the cornea.
5. A cornea knife, for making the incision necessary for removing foreign bodies from the interior of the eye.
6. A blunt-pointed knife, for enlarging an incision or a wound of the cornea.
7. A small pair of curved scissors, for snipping off any shreds of iris, or a prolapse of the iris.
8. A probe, for everting the lid. It is useful to have one

[1] Messrs. Weiss, Strand, have prepared sets of the instruments here mentioned.

extremity hollowed like a spoon, for sweeping out loose bodies from the anterior chamber.

Fig. 2. Fig. 3.



These, with fine needles and silk, form a very compact and portable case. The shapes and dimensions will be given in woodcuts.

I have not included canula-spring forceps in the list, as they are expensive, somewhat complicated, and apt to get out of order. Nevertheless they form a valuable addition to a set of ophthalmic instruments. They are represented in fig. 2. By pressure on the trigger the blades are made to close as in the small cut. The closed blades are passed into the eye through an opening previously made; the pressure on the trigger being relaxed, the blades open, and a foreign body or strip of membrane may be siezed by reapplying the pressure, which is maintained whilst the substance is drawn from the eye.

After use this instrument should be taken to pieces, and then wiped out by means of the little silk brush represented in fig. 3. The shaft of the blades should be greased before it is replaced. I find mercurial ointment the best application for preserving fine instruments from rust, but they must be carefully cleansed before being used.

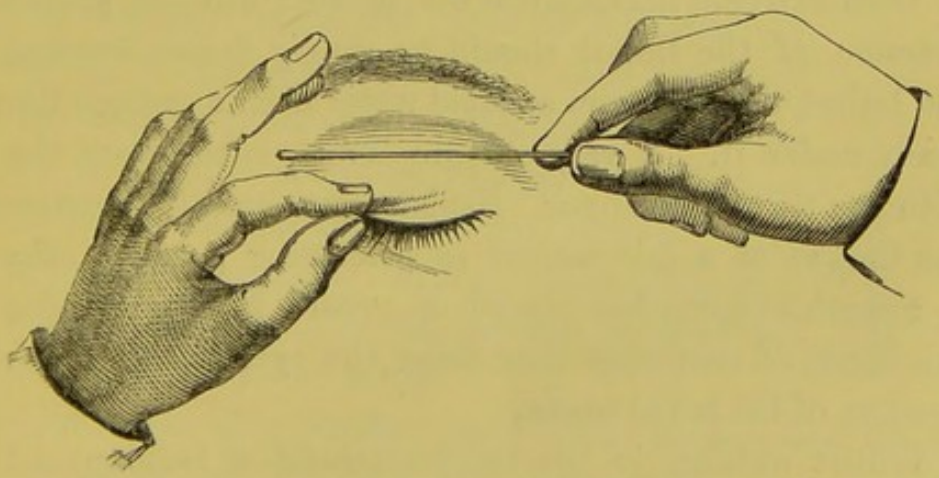
The mode of examining an eye is as follows: The patient

should be placed in a good, but not dazzling light, and the sound eye covered with a handkerchief. The lower lid of the suspected eye should then be gently drawn down by stress on the integument, and its inner surface, especially the fold of reflection, closely examined; the eye, too, should be carefully scanned, the patient being directed to look upwards, then downwards, and to either side, the upper lid being raised as the eye is turned down, so that the surface of the globe may be fully exposed. If the light be oppressive, the eye should be shaded with a hand.

If nothing can be discovered, attention must be directed to the upper lid, and a spot will often be pointed out where discomfort is felt.

The patient should now be seated with his head firmly rested against the back of a chair, or otherwise supported. The surgeon then, desiring the patient to look down, takes firm hold of the eyelashes with the forefinger and thumb of one hand, and with the other lays a probe (fig. 6) transversely across the lid, just below the fold (see fig. 4); then

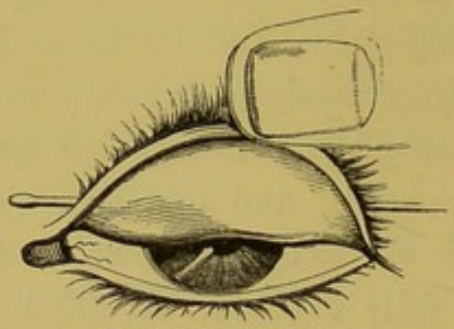
Fig. 4.



pressing the probe down, he lifts the lid by the lashes,

and it is everted by the opposing forces (fig. 5). A practised

Fig. 5.



hand does not need the probe. The lid should be everted neatly and at once, for failures irritate equally the eye and the temper of the sufferer.

The greater part of the mucous surface of the lid will now be exposed, but not the fold of reflection; if the foreign body cannot be seen but is felt higher up, a flat spatula, or a broad probe, should be passed beneath the ridge formed by the eversion of the cartilage, which is to be pushed away from the eyeball; a well cleaned camel's-hair pencil, dipped in cream or oil, should then be passed under the ridge, and the fold swept from without inwards. This seldom fails. If from extreme nervousness the patient will not submit to eversion of the lid, it should be simply drawn forward by the lashes, and a stream of tepid water from a syringe thrown freely under it. A very old proceeding is to sweep the lid with the tip of the tongue. Banister particularly recommends the tongue of a fair damsel as possessing peculiar efficacy. A French surgeon has placed on record his having adopted this mode of removing lime from the eye, to the great discomfort of his labial organ.

Whilst walking in the neighbourhood of London, a lady suddenly felt a sharp pang in her left eye, followed by the sensation of a piece of grit under the upper eyelid, rendering

it almost impossible to open the lids. Fomentations not affording relief, she sought the aid of a surgeon, by whom the eye was carefully examined, but nothing could be discovered. Still the sharp sensation remained, to such a distressing extent as to render her incapable of following any pursuit; for although the lids were spasmodically closed, the eye moved in concert with its fellow, and a sharp pang, with a gush of scalding tears, invariably took place.

Fig. 6.

I found the eye congested and intolerant of light; the mucous surface of the upper lid was very red; but the most careful examination failed to discover any foreign body. The seat of the pain was, however, beyond the ridge of the everted lid, consequently out of sight. I therefore swept it with a brush dipped in castor oil; the first attempt merely moved, the second brought away the foreign body, which was a minute particle of quartz.

If a particle of grit be in the eye, forcible rubbing with the finger should be sedulously avoided, as mischief may be caused by the friction if the body be sharp or angular; relief will often be obtained by drawing the lid forward by the lashes, and retaining it so for a short time—the tears will wash out the particle; or a drop of cream may be placed in the eye, the lids kept closed for some minutes, and the above manœuvre then practised. It is unnecessary to say, that bathing with warm water, without rubbing the lids, is both grateful and useful.

The sensation of a foreign body often remains long after its removal, so that it is difficult to persuade the patient that it is no longer in the eye; relief is best afforded by keeping the lids closed and fomenting them freely.

Until the discovery of the anterior elastic lamina of the cornea, it was difficult to account for the tenacity with which particles of grit or cinder adhered to the surface of the cornea; a tenacity retaining them sometimes for weeks, and often rendering removal difficult. This membrane is, however, firm and resisting, endowed with peculiar elasticity, and holds with a firm grasp the particles in question.

Fig. 7. Fig. 8.

If the foreign body be adherent to the cornea, it will be necessary to pick it away, and for this purpose I give the preference to a round-pointed Hey's needle (fig. 7). A great variety of instruments have been recommended, but that mentioned is well adapted to remove the particle without injuring the cornea. In some cases, as when a splinter of wood, or a thorn, has fixed itself in the cornea, the sharp-pointed needle (fig. 8) is indispensable.

To avoid repetition, I shall here state some general directions which are to be attended to in operations on the eye, and for the removal of foreign bodies.

The sound eye should be covered.

In selecting the position for the patient, a good but not glaring light is of great importance; the patient should not be placed at a window through which the sun is shining, and it is important that the image of the window should not fall on the cornea, or its reflection will certainly cause embarrassment; a north aspect is the best. The patient should recline on a couch, or be seated in a firm chair, with

the head steadily fixed. For the right eye the operator stands or sits behind, in a posture easy to himself, and having his instruments arranged in order within reach; he raises the upper lid with the forefinger of his left hand, and fixes it against the bony margin of the orbit. If he has no assistant, he must draw down the lower lid, and fix it against the lower margin of the orbit with the middle finger. If assisted, the middle finger may be used to steady the eye and prevent its rolling in, by making gentle pressure at the inner canthus.

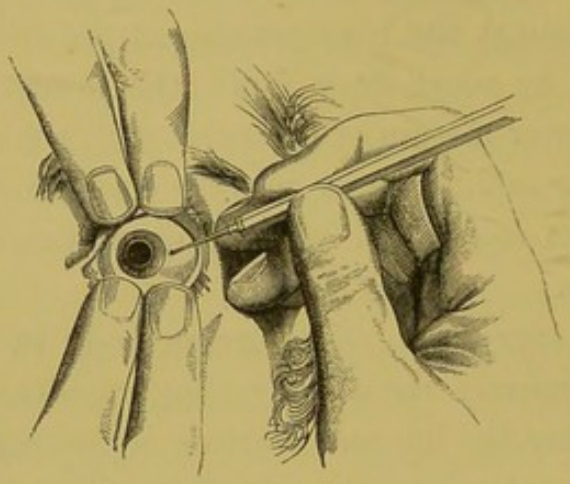
In almost every case of a foreign body in the eye, the organ is excessively irritable, rolling rapidly, turning the cornea up under the lid, and starting away from the contact of the instrument, whilst the tears flow profusely. It is useless to desire the patient to keep the eye steady; with every wish to obey, the will is conquered by the sensitiveness of the eye, which continues restless. By asking a question which requires consideration on the part of the patient, we may often succeed, as the eye is for the moment steadied during the effort of thought. If there be a great flow of tears, the forefinger may be covered with soft rag, to give firmer hold; a piece of old linen or cambric is indispensable to wipe the eye.

If the left eye be the seat of injury, and the surgeon is not ambi-dextrous, he must be seated in front of the patient, whose head should be firmly supported by an assistant against his chest.

The assistant then raises the upper lip and steadies the eye with the tips of his fingers, the lower lid being depressed by the operator, who is before the patient. Holding the needle as he would a pen, and resting his hand on the patient's cheek, as in the woodcut (fig. 9), he seizes a

favorable opportunity, and if there be a foreign body in the cornea lightly picks it from its bed.

Fig. 9.



In some cases the spasm of the lid is so strong that it turns over and conceals the cornea; in that case a wire elevator should be passed under the lid, which it will thoroughly command.

After the removal of "fires" from the cornea a brown stain remains, to remove which by scraping, I have seen much pains taken. It is unnecessary to irritate the eye with this object, as nature will effect it without our aid.

An awkward accident is the penetration and breaking off in the cornea, of a small thorn or splinter of wood. The plan I have adopted with success, in such cases, is to gain room by making a small cut in the cornea on either side of the splinter, then, by pressing the points of fine forceps into the cuts, the splinter can be seized and plucked out.

M. Desmarres recommends, when the foreign body is so deeply imbedded in the cornea as to risk its being pushed into the anterior chamber by the act of picking it out, that the point of a paracentesis needle should be thrust into the

cornea, and made to pass behind the foreign body, so as to afford it support, whilst it is seized in front by forceps, or picked out with the point of a cataract knife. I have never found this proceeding necessary.

We occasionally meet with cases where, either at the time of the accident, or by subsequent gradual pressure, a foreign body has passed through the conjunctiva, and lies impacted between it and the sclerotica. After the first symptoms have subsided, these imbedded substances may give rise to little or no irritation. Mr. Wardrop mentions a case where he found a small fragment of whinstone enclosed in a sac of cellular membrane, lying close to the sclerotica, where it had remained for ten years without the person even suspecting its presence, so little irritation did it excite. I once removed a small particle of granite from beneath the conjunctiva, near the external canthus, where it had remained three months. The patient was a pauper engaged in breaking stones, and, after the first fortnight, during which time the eye was inflamed, he had experienced very little inconvenience. The following case,[1] however, shows the effects that may result from this accident. A woman applied to Mr. Vose Solomon concerning a tumour, the size and shape of a large hemp-seed, situated on the sclerotica of the left eye, half an inch from the external margin of the cornea, and about a quarter of an inch below the equator of the eyeball. It was covered by conjunctiva of rusty brown colour. The patient stated that eighteen months previously, while working at a nail-cutting machine, a piece of iron flew up against the eye in the situation now occupied by the tumour. Some particles of iron were at once extracted by a fellow-workman, and she continued to perform her usual duties up to four days prior

[1] 'Association Journal,' June 2d, 1854.

to her application to Mr. Solomon, when the eye became watery and dim. The tumour was excised, and contained, within a well-defined cyst at its base, a flat piece of iron, of inconsiderable thickness, seven fiftieths of an inch long and three fiftieths of an inch wide.

To show the importance of a full and complete examination before deciding against the presence of a foreign body in the eye, I will relate two cases in which, from absence of this precaution, the patients were subjected not merely to much suffering from the presence of the foreign body, but to very severe and unnecessary treatment.

A tradesman applied at the North London Eye Infirmary, July 8th, 1843. He stated that five weeks previously, whilst walking in the streets, he felt something strike into his right eye, with acute pain. He immediately went to a surgeon in the neighbourhood, who examined the eye, but failed to detect any foreign body. The patient was directed to foment the eye thoroughly with warm water, but no relief was obtained. Inflammation, with severe pain, set in the same evening; leeches were applied, and active purging resorted to, without alleviation of his sufferings. After two days' torture he consulted another surgeon, who was not more successful than the first in detecting the foreign body. The patient was then confined to bed three weeks, and mercury administered so largely as to loosen all his teeth, besides causing severe salivation. When I saw him five weeks after the accident, the acute symptoms had subsided, but motion of the eye still caused great pain. He was much debilitated, and from the condition of his mouth unable to eat. The conjunctiva of the eye was of a purplish hue; upper portion of cornea hazy and traversed by many vessels. Iris dull and slightly discoloured. Vision imperfect.

Finding that the lid had never been everted at the former

examinations, I turned it up, and found a fragment of cinder, as large as a small pin's head, firmly adherent to the palpebral conjunctiva, and imbedded in fungous granulations. It was removed with a cataract needle, and the eye rapidly recovered.

A pallid, sickly looking shoemaker applied July 2d, 1842. Six weeks previously, whilst looking on at a blacksmith hammering at an anvil, a particle of iron struck his right eye and imbedded itself in the cornea, where it had remained. The condition of the eye was formidable; the palpebræ much swollen and congested; the conjunctiva, sclerotica, and cornea acutely inflamed. The foreign body lay imbedded near the centre of the cornea, surrounded by infiltrated pus; and the anterior chamber was half filled with pus. Neither iris nor pupil could be discerned; complaint was made of constant intense pain in the eye and head, depriving the patient of sleep, and preventing his doing any work. He was in a state of great debility, with weak pulse and foul tongue.

I extracted the particle by means of a cataract needle, and ordered two leeches to the neighbourhood of the eye, a warm poultice and frequent fomentations; three grains of calomel immediately, an aperient draught after the expiration of six hours; six grains of Dover's powder every night.

I did not see the patient again till July 9th. The pus had then entirely disappeared, both from the anterior chamber and the cornea; the inflammation had disappeared from the cornea, and the iris and pupil had become distinctly visible; the sclerotica remained considerably injected, but the congestion was of an asthenic character. He was ordered Pulv. Cinchonæ cord. and Soda Bicarb., five grains of each, thrice a day, with nutritious diet; the bowels to be regulated by sulphate of soda. A blister behind the right ear.

July 15th.—The eye is now well, merely a slight film marking the seat of injury to the cornea.

When a foreign body has been long in the eye it gives rise to symptoms varying in intensity according to circumstances. When impacted in the upper fold the symptoms are those of chronic inflammation. The conjunctiva palpebræ becomes thickened and the papillæ hypertrophied, sometimes to an enormous extent; the conjunctiva oculi participates in the thickening, and a thick yellow discharge agglutinates the lashes, accumulates at the canthi, and renders the eye an object of disgust. When this is seen, especially when there is the appearance of fulness about the upper lid some time after a foreign body has entered the eye, a full examination should be insisted on. The subsidence of pain often misleads; the patient feels sure that the body has "worked out," and dislikes the idea of the lid being everted, but that is the proper course to adopt. If, on turning the lid, a fungous-looking mass is exposed, the particle will most probably be found impacted in its centre; if hidden in the fold of reflection the hypertrophy of the papillæ will be strong evidence of its presence. A peculiar warty-looking growth, causing ptosis, was removed by Mr. Bowman from the upper cul-de-sac of the conjunctiva; a pendulous growth in the same situation was excised; it consisted of organized fibrin, &c., and was modelled into shape by the movements of the lid; it was caused by a husk, which on everting the lid was found imbedded in the conjunctiva, where it had been for two months.[1]

A very similar case is recorded by Dr. Borelli.[2] A mass the shape of a cock's-comb, having a large pedicle, had appeared in the interior oculo-palpebral fold of the left eye of a child, three years old. This was found to contain the barb of an ear of barley which had lain there nearly two months.

A child was brought to Dr. Mackenzie with severe inflam-

[1] 'Ophthalmic Hospital Reports,' vol. i, p. 35.
[2] 'Gaz. Med. Ital.,' Jan., 1855.

mation of one of its eyes and puriform secretion from the conjunctiva. From under the edge of the upper lid there projected a black roundish body, which at first view he thought might be a protrusion of part of the iris through an ulcer in the cornea: great was his surprise, when on cautiously raising the upper lid he found this was a case, not of figurative but of real *myocephalon*. A common house-fly was fairly lodged and had been so for eight days between the eyeball and the upper eyelid; its head only projecting in the manner described, and producing an appearance as if the eye were disorganized.

Should the particle be retained near the margin of the lid so as to play over the cornea, it will not only cause much suffering, but opacity, and even suppuration and destructive ulceration of the cornea, may ensue.

A blacksmith's apprentice, whilst paring a horse's hoof, received a piece of horn beneath the left upper eyelid. He applied to a druggist, who gave him a lotion. Seven days after the accident the foreign body was removed. After the further lapse of four weeks he presented himself to Mr. Vose Solomon, with symptoms of disorganizing inflammation of the internal tunics, and although he improved somewhat under treatment, the eye remained incapable of discerning light and somewhat diminished in size.

It was formerly a common practice to blow into the eye powdered sugar as a remedy for opacities of the cornea, and both in this country and on the Continent the lower orders use it for this purpose. Cunier met with the following curious cases: A young woman had had this remedy employed for catarrhal ophthalmia; the sugar had been coarsely pounded, and nearly twenty little crystals remained fixed in each cornea, where they had continued undissolved for more than twenty-four hours; Cunier used lotions, which

cleared away the lymph enveloping them, and they were speedily dissolved. The two corneæ recovered much of their transparency, which had been greatly impaired, but several small opacities remained in the right. Cunier saw another case, where an incrustation of sugar-candy remained eight days in the eye of a young woman who had been subjected to these insufflations.

## CHAPTER II.

The penetration of the eyeball by a foreign body is always attended with risk, and this is increased or diminished by a variety of circumstances. In the eye, as elsewhere, our prognosis is occasionally at fault, for unexpected recoveries under unfavorable circumstances are met with, whilst eyes are lost by trivial accidents. Who would imagine that a touch from the end of a spectacle-branch, so slight as to be scarcely felt, would destroy sight; whilst a fragment of stone-ware, the size of a pea, could remain in the anterior chamber eight days, without producing any severe effects?[1]

A man came to Dr. Mackenzie with a thorn in his eye; the point of it was fixed in the iris, and its thicker extremity in the cornea. The accident had happened three weeks before, and the wound of the cornea, by which the thorn had entered, was healed over; during these three weeks the presence of the thorn had caused no inflammation, and very little irritation.[2]

The toughness and form of the cornea and sclerotica are alike calculated to resist penetration; hence, if they be pierced, the foreign body must either possess considerable momentum, as in the case of a shot, or be of such a form and size as to facilitate its entrance. Perhaps the commonest substances that do pierce the eye are chips of metal, thrown

[1] Rognetta, 'Lancette Française,' 1837.

[2] 'Practical Treatise,' p. 394.

off from turning lathes, fragments of percussion caps, and small pieces of stone driven off by heavy hammers. But very unlikely substances may find their way into the eye. Dr. Bader informed me that dissecting an eye excised at Moorfields, he was greatly surprised to find a piece of *bee's wax* between the sclerotic and choroid. Its presence there greatly puzzled him, till he found that the injury rendering necessary the removal of the eye had been explosion of a cartridge, and that bee's wax is used to close one end of cartridges.

Extraneous substances present themselves under many conditions; the cornea may be pierced through, and the foreign body remain fixed in it, projecting into the anterior chamber, as in the case of the thorn before mentioned; or it may lie loose in the anterior chamber; may be fixed in the iris, or pass through it or the pupil, resting in the posterior chamber behind the iris, or lodging in the capsule of the crystalline, or in the lens itself; or, finally, it may be driven with sufficient force to reach the vitreous cavity, and there remain to the destruction of the eye.

The gravity of the injury will vary with the size and situation of the foreign body. It is singular how tolerant some eyes are of substances which enter the anterior chamber. I have seen a shot rest there for two days without causing pain or inflammation; and Dr. Jacob, in a valuable paper,[1] mentions cases even more striking.

Indeed, the number of recorded instances is great in which bodies have entered the anterior chamber, and there become encysted, without material injury to the eye. On the other hand, I have seen most violent inflammation follow the presence of a small portion of cataract there; and Cunier mentions a case in which an eye was very nearly lost, in

[1] 'Dublin Medical Press,' Dec. 9th, 1846.

consequence of a minute particle broken off from the point of a cataract needle accidentally resting in the anterior chamber.

Escape of the aqueous humour is a common consequence of penetration of the cornea, but a chip of metal may be driven with such force and velocity as to pass through the cornea, the wound closing behind it so instantaneously as to retain the aqueous humour.

The peculiar texture and varying density of the lens seem well adapted for checking the course of a foreign body; that it does so is proved by a case of Mr. Critchett's, hereafter related, in which a chip of metal, driven cleanly through the cornea and iris, was, in its passage through the lens, deprived of so much of its velocity as to fail to rupture the delicate hyaloid membrane.

In turning over the pages of ophthalmic periodicals, especially the foreign journals, it is remarkable how common are accidents from percussion caps; those in use on the Continent are made of inferior metal, and are more brittle than those supplied by English gunmakers; they break in pieces when struck by the hammer of the lock, and the fragments, driven off with force, frequently penetrate the eye. Another source of accidents is exploding caps for amusement, either by striking them or holding them to a candle; the sharp angular fragments cut through the coats of the eye, leaving an exceedingly small wound, bearing no proportion to the magnitude of the foreign body.

Mr. Walton states:[1] "I have seen not less than five eyes destroyed by percussion caps during the last year, and not in a single instance were the caps used in shooting; but two persons received their injury by exploding the caps between

[1] 'Operative Ophthalmic Surgery,' p. 107.

pieces of iron, and three from snapping them for nuts at a fair. The caps of the nut-sellers are highly dangerous, being peculiarly constructed, since the copper is not cleft as in ordinary caps, but entire, to concentrate the force of the ignition; thus they split with violence and fly about, not merely to the injury of those who are using them, but to others."

Mr. Watson mentions two cases of immediate blindness having arisen from concussion of the retina produced by small pieces of percussion cap striking the eye, but without producing any very serious wound; the blindness was permanent, though the eye retained its natural appearance: these cases are exceptional. My experience agrees with that of Mr. Crompton, that the wound made by a penetrating fragment of cap is a clean incised one, and the vision is not destroyed immediately in those cases in which the cap went through the sclerotica and did not injure the transparent parts of the eye.

Lodgment of a foreign body in the crystalline lens is rare, but the following are instances. A little girl, eight years old, was amusing herself by exploding fulminating caps with a hammer, when a fragment struck her right eye, pierced the cornea, and lodged in the crystalline. The accident happened near Mons, and the morning after the injury she was brought thither and placed under the care of Dr. Stievenart. The doctor states that the fragment was fixed near the centre of the crystalline; there was no loss of transparency in the capsule of the lens, and the form of the metal was distinctly visible; it had penetrated the lower portion of the cornea, and the wound was already united; the sight was so little affected that the child could count fingers and guide herself by aid of that eye only; there was very little redness or photophobia. For eighteen days only

mild measures were adopted, for Dr. Stievenart decided not to attempt to extract the lens and the fragment of metal, unless inflammation set in, which it did not; and two years afterwards it still remained "domiciled" in the lens, which had become opaque.

The danger, however, of leaving a foreign body in such a position is forcibly illustrated by a case narrated by Dr. Jacob.

A little boy came under his care, into whose eye a portion of copper cap had passed and lodged in the crystalline lens, where it lay, without producing distress or mischief, for two or three years, neither losing its brilliancy, nor becoming corroded or oxidated. The lens became absorbed, but the copper cap, remaining entangled in the opaque capsule, was not interfered with. About a year afterwards the lad again came under Dr. Jacob's notice, and now the cap had disappeared, and the anterior and posterior chambers were filled with blood, as if from recent injury. The pupil was dilated, but the eye was spoiled, the cap having doubtless fallen to the bottom of the eye.[1]

A novel plan of treatment was adopted with success in the following case.

A scale of metal struck the eye of a man, who ten days afterwards applied to Dr. A. Von Graefe. Close examination discovered a small cicatrix of the cornea, a wound near the centre of the anterior capsule, and finally, the foreign body in the posterior cortical substance of the lens. Dr. V. Graefe passed a cataract-needle in the track of the foreign body and enlarged the opening in the capsule, hoping that with the increase of imbibition the fragment might descend towards the aperture, and so become more accessible. After

[1] Op. cit.

fifteen days it had moved to the middle of the crystalline, and eight days later fell into the anterior chamber, enveloped in cortical substance. A linear incision was made, and as the knife was withdrawn the foreign body escaped. The patient recovered with good vision.[1]

An interesting case has been related[2] by M. Desmarres. A mechanic was struck in the right eye by a chip of metal, which penetrated the crystalline near its external border. Inflammation came on, not very intense, but which could not be subdued. By means of the ophthalmoscope there was discovered in the lens, in a line with the wound in the cornea and of the iris, which remained visible, a black mass, the size of an ordinary pin's head and surrounded by a haze, evidently due to commencing traumatic opacity of the crystalline. This state continued four weeks; then the inflammation disappeared, the haze diminished in extent, and there remained little else than the black mass enveloped in a dull spot about double its size; the sight was good, and continued so when the patient was seen three months later by M. Desmarres.

When the iris is lacerated by a foreign body it usually bleeds, the anterior chamber being sometimes quite distended with blood; when the foreign body lodges in the membrane neither bleeding at the time nor subsequent destructive inflammation necessarily follows; I have several times seen instances of grains of gunpowder and small particles of metal having become fixed in the iris without creating serious irritation; a certain amount of inflammation is excited, but the effect is to throw out lymph, in which the foreign body becomes encysted. Inflammatory symptoms excited by a foreign body in the eye are doubtless efforts on the part of nature

[1] 'Arch. fur Ophth.' T. ii, pt. 1.

[2] 'Traité des Maladies des Yeux,' vol. iii, p. 23.

to expel it; or failing that, so to enclose or imbed it in lymph as to render it harmless. Instances are recorded by Von Ammon, Solomon, Grüllich, Mackenzie, and others, where foreign bodies lying in the anterior chamber were thus encysted, and ceased to be productive of irritation. Two illustrative cases recently presented themselves at Moorfields. A small piece of steel was fixed in the upper part of the iris in one case. It had entered the eye eighteen months previously, when it caused inflammation, which had lasted for a month, and when it subsided vision was unimpaired. A fortnight before the patient applied at the hospital he had had dimness, pain, and other inflammatory symptoms. When he presented himself the cornea was transparent and the pupil active, excepting near a small black point in the substance of the iris, midway between the pupillary and corneal edges. Mr. Dixon made an opening at the margin of the cornea nearest the black point, and seizing it with iris-forceps, extracted a black triangular body, surrounded by organized lymph. After three weeks the inflammatory symptoms had subsided, and the patient had recovered good vision.

In the second case the foreign body had entered the eye the day before, probably through the sclerotic. The pupil was contracted, and a small whitish nodule of lymph was visible near the inner pupillary edge; the irritation and conjunctival redness were considerable. In this case a small opening was made at the outer edge of the cornea, and on extracting the nodule of lymph with canula-forceps, a very small black body fell into the anterior chamber, and was removed with the scoop. In four days the eye was well.[1]

An interesting case, bearing upon this subject, is related

[1] 'Ophthalmic Hospital Reports,' vol. i, p. 139.

by Mr. Middlemore in his valuable work.[1] A man received a blow upon the eye whilst employed in turning metal, and came to Mr. Middlemore a few days after the accident. At this period there was present a smart attack of iritis, a slight degree of hypopium, and a mark at the centre of the cornea indicating the spot at which the metal had struck the eye. A small portion of metal was seen at the bottom of the anterior chamber in contact with the iris. By the aid of bleeding and mercury the symptoms were subdued, and in the course of a few weeks the foreign body was covered with a semi-transparent matter, which eventually became sufficiently clear to permit the foreign body to be plainly seen through its texture. Two years afterwards this person received another blow upon this eye, and Mr. Middlemore ascertained that the cyst was ruptured, and the particle of metal was floating loose in the anterior chamber. Suppuration of the globe threatened, but was averted by the foreign body being extracted through an incision in the cornea.

It sometimes happens that a foreign body is so situated in the iris as not to admit of its extraction. In a case at Moorfields, a foreign body which had pierced the cornea and iris at their lower part could be seen lodged in the iris, and projecting into the anterior chamber. A small corneal incision was made, and the canula-forceps introduced; but immediately the attempt was made to seize it, it disappeared behind the iris, where it was left.[2]

A similar case occurred to myself some years ago, and the result was chronic inflammation and atrophy of the globe.

By what rule should we be guided in the removal of small particles sticking in or adhering to the iris? If seen soon after the accident, it will be proper to endeavour to extract

[1] 'A Treatise on the Diseases of the Eye,' vol. i, p. 604.

[2] 'Ophthalmic Hospital Reports,' vol. i, p. 40.

them. If a particle has become encysted and firmly adherent to the iris, it is best not to interfere, unless it produces irritation; but if the fibrin is absorbed, so that the particle can be readily detached, and its removal is called for by its exciting neuralgia or irritation, we should, if possible, remove it. It must be borne in mind that copper and brass retain their brilliancy unimpaired when in the eye; no solvent action takes place. Iron may be somewhat oxidized, but we must not expect that it will be dissolved.

Nature sometimes succeeds in the expulsion of minute metallic scales long adherent to the iris, of which a remarkable example has been recorded by Mr. Dixon.

A shoemaker applied at Moorfields in 1848,[1] his eye being somewhat inflamed, and the iris displaying on its lower and inner part a small rounded mass the size of a mustard seed, which seemed to be a foreign body thinly coated with fibrin. He stated that *eight years* previously the eye was struck, he supposed, by a shot, as he stood a few yards distance from a man who was shooting sparrows. There was a sharp attack of inflammation, which yielded to mercury; and for three years the eye remained quiet and useful. A second attack then came on, and again yielded to the same remedy. On his application at the hospital for this third attack, he was placed on calomel and opium; and within three days the foreign body was more than half denuded of its fibrinous covering, and proved to be a thin, flat scale, like a fragment of a percussion cap.

The eye, however, was never in a condition to admit of operation, and continued in an unsatisfactory state until the 10th April, when a little white elevation, with a dark dot in the centre, appeared in the middle of a fibrinous patch on

[1] 'Dublin Quarterly Journal,' 1848, p. 210.

the cornea. Three days later a fine black point protruded, and a minute scale of metal was extracted by Mr. Dixon. The ultimate result was, that although the lower half of the pupil was obscured by an opacity, the iris was active and the vision good.

It is by no means easy to seize a minute metallic scale adherent to the iris; the soft, yielding membrane retreats from the instrument, and the particle eludes its grasp. The following I have found the best proceeding: an opening is to be made in the cornea near its margin, in the situation which best commands the foreign body. The operator then introduces the canula-forceps closed, and, gently opening the blades, grasps the particle. Possibly this cannot be done without seizing and lacerating the iris; in that case, I first pick the particle from the iris with a cataract-needle, and, having detached it, remove it with the forceps.

The lymph which encloses the particle often becomes tinged of so dark a tint as to resemble the particle itself, and this may mislead the operator; but he should not be over anxious to pick away every speck that is visible on the iris, or the iris itself will suffer.

If he does not possess canula-forceps, fine iris-forceps must suffice, but they require a much larger opening in the cornea for the expansion of their blades. The incision should not be close to the margin of the cornea, or the iris will bulge through it and obstruct the passage.

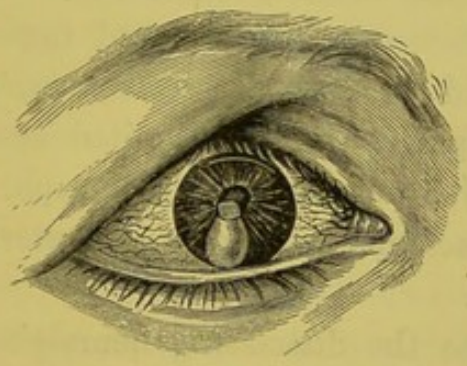
Cases occasionally present themselves, though rarely, in which a foreign body lodges in the posterior chamber, between the iris and capsule of the lens. Violent inflammation and intense neuralgia accompany this accident, and unless the foreign body be removed the probability is that the eye will be lost.

T. T., aged 65, was received into the North London Eye Infirmary November 22d, 1851.

Six days previously, whilst breaking stones on the road, a chip flew up and struck him with great force on the right eye, cutting through the cornea, and burying itself between the iris and crystalline lens.

There was acute inflammation of the conjunctiva, sclerotic, and iris; a vesicle, projecting from the lower third of the cornea near the mesial line, marked the seat of the wound (fig. 10), through which the fragment had passed. The

Fig. 10.



A

iris projected forwards, and was adherent at this point; but it was also bulged by a yellowish body, a portion of which was visible through the pupil, though that was contracted and somewhat distorted. There was hypopyon; and though the lens was opaque, and the sight extinguished, there was distressing intolerance of light.

The old man appeared quite worn down by suffering; the pulse low and irregular, skin cold and pallid, and the nervous system in a state of extreme depression. He had travelled to town by rail in a rough third-class carriage, and had afterwards walked a considerable distance, by which his sufferings were materially aggravated. He was put to bed and the eye freely fomented; an opiate was administered, and

when reaction had been established, four leeches were applied to the temple. By these and similar means, including perfect quiet in a darkened ward, the acute inflammation was subdued, and on the 25th I deemed the eye sufficiently recovered to render justifiable an attempt to remove the foreign body.

The patient was placed in the recumbent posture, and brought under the influence of chloroform by the late Dr. Snow. An incision was then made through the upper and outer margin of the cornea, about the sixth of an inch in extent. Fine iris-forceps were passed through the wound into the pupil, and after one or two failures, arising from the depth of the fragment and the limited space in which to work, the chip (A), enveloped in yellow lymph, was withdrawn. The lids were closed and secured with plaster, and cold-water dressings applied.

From this time the distressing neuralgia ceased, and on examining the eye on the 30th, the cornea was found to be bright and clear, the wound well united, and the eye perfectly free from inflammation. There was perception of light, though the traumatic cataract prevented vision.

The medical journals contain many cases of foreign bodies buried in the eyeball.[1] From these I have selected a few presenting points of special interest.

In a Flemish cabaret, a man placed a fulminating cap on the point of a stick and held it to the flame of a candle. The explosion caused it to fly off, and to strike with great force the right eye of a man who was near, and who instantly fell to the ground in agony. He placed himself under the care of a surgeon, but palliative measures only were adopted

[1] See especially a paper by Mr. Vose Solomon, 'Association Journal,' Sept. 15th, 1854.

until after the expiration of three months, when M. Cunier[1] having discovered in the eye a portion, as he thought, of the cap, proceeded to extract it. M. Laurent secured the upper lid, and Cunier proceeded to make the section as for cataract, but as soon as the point of the knife touched the cornea, the original wound in its centre burst open, and the membrane became flaccid; Cunier therefore determined to make what use he could of this opening, and passing through it the blades of fine forceps, he seized that part of the cap which was visible, but it slipped from the instrument. Eight or nine times was he thus baffled; at length he fairly caught hold of it, but it would not pass through the wound. Both his hands being occupied, Laurent took Scarpa's knife and enlarged the wound upwards and downwards. All this time Cunier held the cap, and then gradually worked it through the wound, when to his great astonishment he found that it was not, as he supposed, a fragment, but the entire cap, which had opened in the form of a V, one portion being in contact with the iris, the other branch being engaged in the corneal aperture; it was not oxidized, but greasy and blackened by the flame of the candle. A little blood and pus accompanied its exit.

Antiphlogistic treatment was adopted, and in about a fortnight the eye had recovered from the effects of this very severe and difficult operation, though the perception of light alone remained.

The toughness of the sclerotic and of the cornea (which operators know to be great) opposes a serious obstacle to that law which seems to prevail—namely, that foreign bodies should, whenever practicable, find their way to the surface and be expelled. Nevertheless, instances occur where this

[1] 'Ann. d'Oculistique,' vol. i, 1839.

takes place. Sharp splinters of metal or of wood are far more likely to work out of the eye than obtuse bodies; and their escape will be favoured by their lying in the antero-posterior diameter of the eye, the gentle pressure of the lids and their action assisting the exit of the body. The efforts of expulsion are not persistent, but take place at irregular intervals; the eye will be quiet for a time, an attack of inflammation will then come on, endure for a period, and pass away, to recur after a longer or shorter interval; and it is usually after one of these expulsive throes, if I may so express it, that the foreign body makes its appearance externally.

On March 11th, 1853, a wheelwright applied to me under the following circumstances. Twelve months previously he had been struck on the left eye by a fragment of iron, which blinded the eye and inflicted a cut on the cornea, but was not supposed to have penetrated; nevertheless, he had been a martyr to neuralgia in the eye and over the side of the head, and the eye was frequently the seat of inflammation.

The reason of his consulting me, was the annoyance caused by a pricking and scratching sensation under the upper lid.

The eye was somewhat atrophied and soft; iris green; pupil nearly closed and filled with lymph; towards the upper and outer portion of the sclerotic, between the insertion of the tendons of the recti, and about a sixth of an inch from the cornea, a dark point projected, which, being touched, proved to be metallic. The man possessed much fortitude, and allowed me to perform the following operation: the lid being raised by a wire speculum and the eye fixed with forceps, I made an incision through the sclerotic with an iris-knife, taking the projecting point as a guide; some blood and fluid vitreous humour escaped; the blades of a pair of fine forceps were then slid along the foreign body until a

firm grasp was obtained, and a splinter of iron the fourth of an inch in length, and of a spindle shape, was extracted. There was a rather free escape of fluid vitreous humour, but the lid was dropped and it ceased.

No irritation followed, and at the expiration of a week the eye had recovered from the operation.

Professor Stœber, of Strasburg, has favoured me with the following interesting communication:

"I have seen a great number of penetrating wounds of the eye by fragments of fulminating caps. Unfortunately, my occupations do not allow of my always writing down my observations. I regret it the more in this instance, for one of these cases would have been interesting to you. It is the case of a boy between eight and ten years old, who, whilst shooting with a little gun, armed with a cap, received a fragment of it in the right eye. The fragment appeared to have traversed the cornea and iris, at least these membranes bore traces of a wound. The eye became violently inflamed, and the pupil was obstructed by false membranes. The foreign body could not be discovered, but I suspected its presence in the bottom of the eye, for during two consecutive years inflammations succeeded each other at short intervals. At the end of this time a little yellow spot became visible at the superior and external part of the iris. I was persuaded that the foreign body was seated in this spot, and I proposed to extract it, to put an end to the inflammations, but the two physicians of the family opposed my advice; they thought that these inflammations were of a strumous nature, and that there was no foreign body in the eye.

"The patient suffered for two or three months longer, when one day he felt a sharp pricking in his eye. I examined it, and found a point which projected from the surface of the cornea; I seized it with forceps, and drew out a

fragment of cap; from that time all trace of inflammation disappeared, but vision was lost."

An old man of the commune of Cannes was cutting a millstone when he was struck with extreme violence by a chip on the left eye. Inflammation immediately followed, and for a year he experienced the severest sufferings. The sight of the eye was lost, but by degrees the pain ceased, and the patient resumed his occupations. Fifteen years afterwards, pain returned in the eye, a perforation appeared in the cornea, and an irregular fragment of stone presented itself at the opening. It was extracted by Docteur Rennes, having been in the eye sixteen years.

A workman employed at a cannon foundry at Liege, was wounded in the right eye by a splinter of iron, July 2d, 1852. No particular effects arising, he waited three days, but then finding a marked change in the sight, he consulted Dr. Ansiaux. At that time there was a linear cicatrix of the cornea, and a traumatic cataract, but not the slightest inflammation, and this being the case, only a belladonna lotion was ordered; the next day the pupil was fully dilated, and it was easy to distinguish a rent in the anterior capsule, and complete opacity of the crystalline. Eight days afterwards the man returned to Dr. Ansiaux, complaining of the eye and of pain around it. The eye was now injected, and symptoms of traumatic iritis displayed themselves.

In spite of energetic treatment, the iritis progressed, and constant pain indicated the presence of the foreign body in the eyeball.

At length, on the 13th September, the patient complained of a pricking sensation every time that the upper lid moved over the globe. The eye was examined, and a small black point was seen projecting on the external surface of the cornea; the iris was pushed forward, and its central portion

was in contact with the posterior surface of the cornea. Seeing then that the fragment was working its way out, Dr. Ansiaux proceeded to extract it, and made an incision through the cornea, where the point was projecting; then grasping the splinter with forceps, he, to his great surprise, drew out a mass eight millimetres in length, and two in breadth at its great extremity, which had thus remained in the eye seventy-seven days.

A workman in the iron foundry of Messrs. Cockrell, at Liege, received a splinter of iron in his eye, where it remained three weeks, causing extreme anguish. Contrary to the opinion of several surgeons, the man insisted that it was still in the eyeball, and when seen by Dr. Ansiaux, the eye presented indications of suppurative keratytis, with central perforation of the cornea, and hernia of the iris. As the patient declared the splinter was in the eye, Dr. Ansiaux passed a probe through the wound, and at once detected a hard substance. This he seized and withdrew with forceps, it proving to be a piece of metal sixteen millimetres in length by five in width. The eye was of course lost, and was subsequently sunk by Dr. Ansiaux.

In doubtful cases, the ophthalmoscope may render us valuable assistance. If a chip of metal, for instance, has lodged in the vitreous humour without traversing or wounding the lens or its capsule, it will be readily discovered by the ophthalmoscope, unless buried in such a position as not to admit of its being brought into view. If the lens has been wounded, it will become opaque, and of course prevent the use of this apparatus. (Should the ophthalmoscope be used in traumatic, or, indeed, in any inflammatory cases, the least amount of light that will suffice for the examination should be employed.) Professor Edouard Jäger has published

a paper[1] with six cases illustrative of this subject, and of the encysting of foreign bodies in the vitreous humour. Of these cases the following may be quoted:

A workman, whilst engaged in engraving on steel, was struck by a chip which passed through the cornea and iris, and lodged in the vitreous humour. Without suspecting the gravity of his wound, he consulted Prof. Jäger at the end of ten days, for a slight affection of his sight. There was only a very slight trace of a wound in the cornea and iris. On examining the transparent media, there was seen a foreign body enveloped in plastic exudation; as a consequence of inflammatory action, the fragment of steel became encysted at the end of a week, and the vitreous humour recovered transparency, but the sight gradually diminished; five weeks after the accident separation of the retina in the neighbourhood of the cyst was discerned. This separation soon extended over a third of the inferior and external portion of the retina, whilst the encysted fragment had moved from its first position, and was gravitating toward the middle of the eye. This displacement was only attended with a slight pricking in the external parts of the eye. A plastic deposit was then formed, which raised the retina and hyaloid in the form of a cone, at the summit of which was the encysted body. At the end of three months this small fragment had reached the centre of the globe. At first horizontal, it had now become vertical, a position which it maintained. The eye retained its form, the lens its transparency, and there remained some amount of oblique vision.

Change of colour in the iris is one of the most distinctive indications of a foreign body being lodged in the eye; a hazel iris will assume a reddish hue, a blue or gray iris will

[1] 'Œsterr-Zeitsch. f. pract. Heilk.,' 1857, No. 2.

become green, sometimes bright, at other times of a dull olive tint. The bright colour depends in some degree on the aqueous humour having become yellow, as I have proved by puncturing the cornea and allowing that fluid to escape. I may here remark that the cornea and aqueous humour influence the colour of the natural iris. Many times, when operating for cataract on a bright blue eye, have I been struck with the dull, leaden-gray tint of the iris, as seen when laid bare.

When a foreign body has lodged in the deep parts of the eye, and cannot be extracted, atrophy of the globe is the common result. The active symptoms—of which neuralgia is one of the most distressing and most persistent—gradually subside; the iris remains permanently discoloured; the pupil either closed by false membrane, or distorted and motionless, is bound by dark adhesions to the capsule of the lens; the lens or its capsule may undergo osseous degeneration, or if the capsule has been opened, the lens may be absorbed. The sclerotic, thinned in structure, permits the hue of the choroid to be seen, imparting to it a dusky tint, whilst the globe, soft and shrunken to the touch, is traversed in front by a few large tortuous purple vessels.

The cornea and iris of these withered eyes sometimes retain in a remarkable degree their relative forms and proportions; the shrinking is not merely by diminution in the contents of the globe, but all parts partake of it. I have seen atrophied eyes in which the cornea and iris were reduced to the size of half a pea; yet the proportions were maintained as they would be in a miniature natural eye.

It occasionally, though rarely, happens that a globe which has been softened again becomes plump; but we must not allow ourselves to hope that this will lead to the restoration of sight. There may be an increase in the perception of

light and of large objects, but useful vision is not to be expected.

Occasionally a globe atrophied from injury will take on acute inflammation. Mr. Watson mentions a case of collapse of the eyeball, resulting from injury seven years previously, in which inflammation came on, and the eye enlarged to a much greater size than the other, with great pain from the rapid effusion of fluid. When the inflammation abated, the eye again became somewhat collapsed.

Some years ago, a similar case occurred in my own practice. A gentleman residing in India received an injury which burst his left eye, and he was in the habit of wearing a false eye. Two years afterwards he returned to England in a bad state of health, and almost immediately on landing, acute ophthalmitis, with enormous distension of the globe, took place. To relieve this, an incision was made by me in the cornea, which gave exit to a quantity of fetid pus. The eye gradually shrank, and, after some weeks, the false eye was again worn.

Ossific deposit in the crystalline lens after injury is common; but this degeneration is by no means confined to the lens. The posterior portions of the globe often exhibit it in a marked degree, as shown in several preparations in the museum at Moorfields. The choroid may adhere to a shell of osseous matter occupying the position of the hyaloid membrane, or there may be a simple ring of bone around the entrance of the optic nerve. An interesting specimen is described,[1] in which a bony tube, continuous posteriorly with the central artery of the retina, and opening in front against the capsule of the lens, ran up the interior of the osseous shell. Between this central pillar and the outer wall were

[1] 'Trans. Pathol. Society,' vol. vi.

numerous spicula of bone, which spicula contained numerous well-formed lacunæ, with their branching canaliculi. The tube and the spaces between the spicula were filled with masses of cholesterine.[1] The presence of cholesterine is not uncommon, and there is also often present in these atrophic eyes brownish or yellowish serum, in which the remains of blood-discs are discernible.

An opportunity seldom occurs of ascertaining the nature of the changes in an eye long the seat of an impacted foreign body.

Dr. Von Ammon examined the eye of a man eighty years of age, which presented indications of marasmus of the cornea and choroid, the pupil being replaced by an elongated fissure, the edges of which were united by a brownish pigment, and which adhered to a mass which occupied the place of the crystalline, and was implanted in the extremity of the optic nerve. At first sight he took this for a calcareous concretion, the more so as there were concretions in various parts of the choroid; but chemical analysis showed the nucleus to consist of a particle of iron, probably detached from a hammer, the man having been long engaged in breaking stones.

Extraction of a foreign body from the interior of the eye is at all times a delicate and often a very difficult proceeding. The difficulty may not be great if the body be loose in the anterior chamber; but it will be increased if there are adhesions, and will be at its maximum if the foreign body has passed out of view into the posterior chamber.

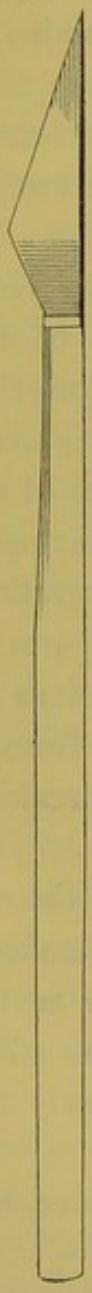
If a chip of metal, grain of shot, or similar substance, has

[1] In the spring of 1852 Mr. Canton exhibited, at the Medical Society of London, a beautiful specimen of complete ossification of the retina and capsule of the lens, removed after death from the eye of a man, which had atrophied in consequence of an accident many years previously.

passed through the cornea and dropped into the anterior chamber, it may thus be extracted:

The patient being properly placed, and the lids secured, an incision through the cornea, corresponding with the position of the foreign body, is to be made with a knife (fig. 11). As the knife is withdrawn, the foreign body will probably follow, washed out by a jet of aqueous humour; if not, the lid should be dropped (if chloroform be not used), and the eye allowed to rest awhile. The operator next, taking a scoop or pair of fine forceps, as may be most convenient, raises the lid, and his assistant should fix the eye by seizing the conjunctiva with forceps, for its steadiness is of the utmost importance.

Fig. 11.



If possible, the foreign body should be gently lifted out of the eye with the scoop (fig. 6); but if forceps are used, the utmost care is necessary that no fibres of the iris be seized, for the iris will now be in direct apposition with the cornea. There may be unexpected adhesions, and traction on the foreign body may risk the separation of the iris from its ciliary attachment. In such a case, I pass a fine probe into the eye, and press back the iris from the foreign body, at the same time that with the other hand the intruder is withdrawn. It may be necessary to snip off with scissors the fibres to which it is attached. In that case the cut should be made towards the pupil, so that the two openings may be thrown into one. In these proceedings the utmost gentleness is necessary, or the iris may be lacerated, will then bleed, and further steps be rendered most difficult.

I may here remark on the great aid afforded by chloroform in these delicate operations; it tranquillises the irritable eye, shortens the operation, and spares the patient pain; for although the eye in its natural state bears operations well, it is far otherwise when inflammation has been excited; and those only who have undertaken its performance can imagine the difficulty of extracting a foreign body from the interior of an eye intolerant of light, streaming with tears, and with lids and ocular muscles in powerful spasm.

Fig. 12.

If there is a sufficient wound in the cornea, and the patient is seen immediately after the accident, the surgeon may possibly succeed in drawing out the foreign body; a slight enlargement of the wound with the blunt-pointed knife (fig. 12), may be advantageous; but if the wound be irregular, or in an unfavorable situation, as the centre of the cornea, it will be best to make a clean incision with the knife (fig. 11), in the most convenient situation, as this will greatly facilitate the extraction of the foreign body.

This may be hidden by a coagulum of blood; if so, the operation should be deferred, for aimless groping with instruments in the eye is greatly to be deprecated.

If the foreign body is behind the iris, but below the pupil, the incision should be towards the upper part of the cornea; the canula-forceps will be here most useful, as they can be passed through an opening of small size, and yet will seize and retain a mass of some dimensions. The main difficulty arises when the shape or polish of the surface prevents

firm hold being taken; I have been baffled many times by the slipping of the toothed blades; in such a case a scoop may succeed when the forceps fail.

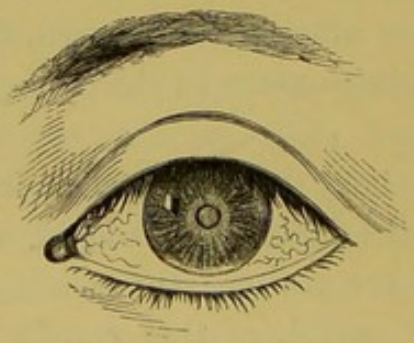
When a chip of metal or a shot is lodged in the lens, opacity of that body certainly follows, causing a traumatic cataract. Sooner or later this will undergo absorption, and the foreign body will drop into the fundus of the eye where it cannot be reached. I believe, therefore, the best practice is to extract the lens and the foreign body together; the plan adopted by A. Von Graefe is of doubtful success, and under no circumstances can the lens be again rendered useful.

R. C., aged 35, an engine-fitter at the Great Western Railway, became a patient of mine at St. Mary's Hospital, December 9th, 1851.

On the previous day, whilst cutting hardened iron with a chisel, a chip struck his left eye, blinding him instantly and causing severe pain. He forthwith applied at St. Mary's, and Mr. Henry Bullock, then resident medical officer, saw that the lens had become opaque in that short interval.

When I saw him, twenty-six hours after the accident, the

Fig. 13.



eye presented the following appearances: there had been a clean incised wound in the cornea, which appeared to have closed immediately after the passage of the chip, for the

anterior chamber was full, and the iris retained its proper position; there was a gap in the iris, midway between the margin of the pupil on the inner side and the ciliary border. This wound was peculiar; a flap of the membrane, about one twelfth of an inch in length, had been cut up, and being attached by its outer border, swung to and fro like a miniature shutter (fig. 13). The lens was opaque, and there was barely perception of light; the conjunctiva and sclerotic were much injected; there was hypopyon, and the patient complained of intense pain.

It being evident that destructive inflammation was commencing, and thinking it possible that the foreign body might be within reach in the posterior chamber, I decided on attempting to extract it.

The patient being chloroformed, an incision was made through the outer margin of the cornea; a fine steel probe was then passed through the pupil into the posterior chamber, and I endeavoured with the utmost gentleness to discover the foreign body; thinking it was felt, a pair of fine iris-forceps were used; but after searching as much as prudence would justify without seizing the chip, and being uncertain as to its precise situation, I considered it proper to desist. The lids were therefore closed with plaister and the patient put to bed, with cold-water dressings to the eye.

For a few days the eye remained quiet; then neuralgia came on, the iris changed colour, and the process of disorganization set in. Calomel and opium, and leeches were used in the first instance, followed by tonics and such local applications as best soothed pain and allayed irritation. Gradually the eye became quiet, and in February the man was able to resume work without inconvenience. The ultimate condition of the eye was this: the globe was soft and diminished about one third in size; iris discoloured; pupil

distorted, contracted, and drawn downwards and inwards; sclerotic of a yellowish brown hue; all perception of light extinct.

Mr. Critchett has published[1] a case which well illustrates the proceedings best calculated to succeed in extracting a foreign body which has buried itself posterior to the iris.

"John A—, aged 20, an engineer, applied at the Royal London Ophthalmic Hospital, October 4th, 1854, under the following circumstances: on the previous day, while engaged in turning, a piece of metal flew off with considerable violence and struck the left eye. He has suffered ever since from severe pain in the globe and dimness of vision. On examining the eye I found, at the upper part of the cornea, and extending downwards towards the centre, a rather irregular incised wound, which was so far closed as to retain the aqueous humour; at the pupillary margin above there was a dark-looking mark, which appeared like a foreign body; the lens was becoming milky. Judging both from the history and appearance that a foreign substance had entered the eye, I proceeded to attempt its removal.

"I first introduced a small probe through the wound in the cornea, towards the dark spot on the pupillary margin, when I ascertained that the appearance depended upon a slit in the pupil, caused by the passage of the foreign body. Having thus far tracked it on its way, and knowing how much mischief was to be feared from leaving it in the globe, I determined to prosecute my search still further. Seeing that the lens was becoming opaque, that a traumatic cataract was already forming, and that it only required time to become complete, I proceeded to remove it. I slightly enlarged the opening in the cornea, and introducing the scoop of the

[1] 'Lancet,' April 1st, 1854.

curette, I gradually spooned away the greater part of the lens. When the lens was thus nearly removed, a dark oblong piece of metal suddenly came into view, lying behind and across the pupil, and resting upon the hyaloid membrane of the vitreous humour, which was evidently not wounded; I now introduced a pair of delicate forceps, and endeavoured to seize and draw it out; but though there was no difficulty in placing the blades of the forceps upon it, they slipped off whenever I made the least traction, which is accounted for by the smooth polished surface of the metal, and by its prismatic form. Finding it quite impossible to remove it in this way, I introduced the spoon of the curette under it and lifted it out; but in doing so the hyaloid membrane was wounded, and a small amount of vitreous humour escaped; the eyelid was closed; the man was put to bed; some slight swelling of the lids came on, together with pain, but these symptoms gradually passed away. A week after the accident the wound in the cornea was healed. The state of the eye ten weeks after was as follows: a faint mark of the wound in the cornea; pupil small, and filled with a thin layer of lymph, and above there was slight adhesion of the iris to the cornea; a good anterior chamber; some perception of objects; the globe firm, and free from pain and inflammation ever since the first week after the accident."

When summoned to a case of laceration of the eye from a foreign body, it is of great importance to make a thorough examination, which is best done under chloroform; the patient often protests that the substance which inflicted the injury cannot be in the eye. Dr. O'Beirne[1] has published a case in which a nail was retained in the eye seventeen days, the girl asserting, that the nail which struck her was afterwards found

[1] 'Dublin Med. Press,' July 7th, 1841.

in the corner of the carpet which she had been shaking; and the following case in my own practice is not less remarkable.

S. K. a deaf and dumb lad, aged 18, was admitted into St. Mary's Hospital, April 13th, 1858. Three weeks previously, whilst engaged at iron works in Derby, a fragment of a screw cut off by a chisel struck his left eye with great force, and instantly blinded it. The same evening it was seen by Mr. J. Wright Baker, who thus by letter described its condition: "The patient was brought to me three weeks ago, having been struck on the eye by a piece of iron whilst at his work. I found a laceration of the cornea, on the side nearest the inner canthus; the aqueous humour freely escaped, and with it, I believe, a little of the vitreous humour; but on that occasion I had the disadvantage of being able to examine it by gaslight only. A portion of the iris corresponding with the corneal wound had also suffered, and slightly protruded. I felt that there was ample room for the iris to retract through the wound by the aid of belladonna, which was accordingly freely applied, and has been continued ever since. At the same time I administered calomel and opium every four hours during thirty-six hours, but with great caution and watchfulness, because of his frail and evidently strumous constitution. So meagre has been the nourishment at home, that he has, in addition to his troubles, suffered from scurvy, the purple spots of ecchymosis being diffused generally over the surface of his body."

I saw him April 14th. The eye was decidedly diminished in volume, and was soft. A large wound extended from the cornea into the sclerotic; this wound had an unhealthy ulcerated aspect, secreting foul pus. The iris was diminished in circumference, and of a dull green colour; pupil was closed, and firmly adherent to the wound. The surface of the sclerotic was dull red. The pulse small and irritable.

The deaf-dumbness of the lad interfered much with my obtaining information, but he gave me to understand that the piece of iron, after striking the eye, had fallen to the ground, and there was no appearance of any foreign body in the eye.

He was ordered five grains of citrate quinine and iron thrice daily, and four grains of extract of conium every night; cold water to the eye and extract of belladonna to the brow; ordinary diet and half a pint of porter daily.

May 8th.—The eye has steadily and progressively improved, the extensive wound has healed, the sclerotic has become nearly free from redness, and the pain has altogether subsided.

Carefully examining the eye to-day, my attention was attracted by a small dark spot in the cicatrix, which had made its appearance since my last visit. The suspicion crossed my mind that this *might* be metallic, which the touch of a probe at once proved it to be. I endeavoured to remove it with forceps, but discovered that it was a portion of a mass concealed behind the iris. The lad was at once taken to the operating theatre, chloroformed, and having made an incision through the iris and cornea, I endeavoured in vain to pull out the foreign body; the wound was therefore freely enlarged, and with some difficulty there was drawn from the posterior part of the eyeball

Fig. 14.

a mass of iron represented in fig. 14, weighing twelve grains, and having sharp and serrated edges.

The lids were closed with plaister, and cold-water dressing reapplied. The effect of this proceeding was most satisfac-

tory; so little inconvenience to the system resulted from this severe operation that, entering the ward unexpectedly three days afterwards, I found the lad seated at a table absorbed in copying a pencil drawing.

He was discharged from the hospital May 31st. The globe had greatly diminished in size, and was becoming puckered; the wounds had firmly cicatrized; the cornea, though much diminished in size, retained considerable transparency; the sclerotic was yellowish, and traversed by a few purple vessels.

Other cases have been recorded of foreign bodies remaining long in the eye, but I know of none in which so large a mass was impacted in the vitreous chamber and caused so little irritation, for not only did the wound heal kindly and all inflammation subside, but neuralgic pain, the usually constant attendant upon such injuries, had also ceased. There was really nothing to indicate the presence in the eye of the piece of iron, and had it not been for the accidental circumstance of the dark point (which was the apex of one of the sharp projections) attracting my attention, the lad would have been discharged without its being suspected that any substance was lodged in the eye.

Professor Simpson, of Edinburgh, has drawn attention to the important general law, that living tissues bear the contact of non-oxidizing metallic bodies for any length of time without being excited to take on inflammatory action, or if such action be excited, it does not usually go beyond the stage of adhesive inflammation. It is doubtless the extension of this law to the eye to which we must refer for an explanation of the tolerance of that organ of metallic substances, often so marvellously displayed. I shall have occasion to mention a case of Dupuytren's, where the knot of a whip-lash lodged in the eye and caused suppuration and evacua-

tion of the humours. It is invariably found that metallic sutures produce little or no irritation, whilst silk sutures excite great irritation; so that if a substance which can absorb inflammatory products becomes buried in the eye-ball, it acts as a focus of decomposition, intense irritation arises, and suppurative ophthalmitis destroys the globe. Soft absorbent substances are therefore more likely to excite violent action of a suppurative character when lodged in the globe than metallic substances, notwithstanding the weight and roughness of the latter.

Among the consequences which may arise from injuries to the eye are epileptiform seizures, of which at least three cases have been recorded. Professor Szokalski, has met with two. The first presents several points of interest.

A countryman, thirty-three years of age, received a blow upon the left eye from a piece of stone; violent inflammation followed, and lasted more than three months. The eye gradually became quiet, and the patient resumed his ordinary occupations, when one day he was attacked with photophobia and violent pain in the forehead, especially over the injured eye; after suffering thus for half an hour, he was attacked with vertigo, pain in the heart, and vomiting; presently he fell to the ground insensible, the head drawn to the left side, and was for some minutes violently convulsed; he shortly recovered consciousness, and it was then found that his tongue was bitten, and that he was much bruised. From this time the man had repeated attacks of the same sort, but without periodicity. Dr. Szokalski thought there was a fragment of stone in the eye, which by its irritation was the cause of these epileptic fits, and recommended either extirpation of the globe, or laying open the eye by a crucial incision and emptying it of its contents, but the man would not submit to either of these operations.

Dr. Szokalski lost sight of him for some time, but meeting him accidentally in the street, was struck by the void in the left orbit; thinking that he had been persuaded to undergo the extirpation of the eye by some other surgeon, he accosted him, but the patient stated that the eye had spontaneously emptied itself during an attack of violent inflammation, which had come on after a fit of more than usual severity. Most probably there was a piece of stone in the eye, which had escaped with the humours when the eye burst; for from that time the epileptic attacks entirely ceased.

In 1839, M. Szokalski saw another case at the Clinique of M. Rostan, in which the *aura epileptica* had its seat in the eye; and M. Cunier met with a case of this description.[1]

Dr. Dunlop mentions the case of a man who, while blasting the roots of trees, had a splinter driven into the eye, which, from its length, must have passed through the foramen opticum into the brain. Long afterwards it was removed by Mr. Liston, and the man recovered. In another case, a man had his eye blown out by the bursting of a gun. The surgeon dressed it, and on the second dressing he perceived something hard among the injured substance of the eye. He found this to be metallic, and getting hold of it with his forceps, pulled it out, when, to his surprise, he found that it was the breech of the gun, which had been forced backwards by the recoil and been jammed into the orbit. Notwithstanding this extensive injury, which annihilated the eye, the man made a perfect recovery.[2]

A difference of opinion is expressed by writers as to the time at which it is proper to attempt the removal of foreign bodies when imbedded in the eyeball: some are advocates

[1] 'Ann. d'Oculistique, t. viii, p. 147.

[2] Beck's 'Med. Jurisprudence,' p. 629.

for waiting until acute symptoms have subsided; others recommend the removal as soon as possible.

When we consider that inflammatory symptoms are the direct consequence of the presence of the foreign body, and that they may be regarded as efforts on the part of nature to expel it, we may fairly conclude, that, by direct removal, we obtain the object for which nature is striving, and that in place of the inflammation being aggravated, it will in reality be diminished by the operation. My experience quite bears out that impression. Again: the longer the inflammatory action is allowed to go on, the greater the risk of disorganization of the eyeball, or of the deposit of inflammatory products within it.

As regards the pain of the operation, that should be no consideration, for chloroform renders us independent of any difficulty from that cause. My own practice, therefore, is to remove, with the least possible delay, a foreign body which is causing irritation in the eye; and I have never found cause to regret this step. I have, however, seen cases where decisive practice would have saved sight, which was lost owing to unwillingness on the part of the surgeon to interfere with an eye which was inflamed.

Mr. Crompton first brought prominently forward[1] the advantage of evacuating the contents of the eye when a piece of percussion cap was buried in it, his communication being a description of the practice of Mr. Barton. The proceeding was as follows: the operator formed, by means of Beer's knife, a large flap of the cornea, which he seized with forceps, and cut away with curved scissors. A dose of laudanum was then administered, and a linseed-meal poultice applied to the eyelids. In all the seven cases mentioned, the frag-

[1] 'Med. Gazette,' 1838, p. 175.

ment of cap was found in the poultice or in the coagulum which closed the opening into the eye. Within a short time after the operation, and in each case, the threatening symptoms of sympathetic inflammation of the other eye disappeared.

The after management of eyes from which foreign bodies have been extracted differs in no respect from that proper for wounds of the eyes in general. I shall, therefore, reserve its consideration for a future chapter.

## CHAPTER III.

GUN-SHOT wounds of the eye, whilst presenting many points in common with injuries from other foreign bodies, possess characteristics entitling them to separate consideration.

A shot striking the eye may cause simple bruising and concussion, or it may glance off, cutting a groove without penetrating; it may pierce through the tunics and lodge in the globe; or, lastly, it may traverse the eye and bury itself in the orbit.

The first accident is usually the effect of a spent shot; in the others the shot retains its velocity. In a large majority of cases it has glanced from a stone or tree, and is flattened, angular, or jagged. It is remarkable how frequently, when *one* shot strikes a person, the eye is the seat of the injury.[1]

The effect of a spent shot is generally to produce concussion of the retina, and subconjunctival ecchymosis. Ecchymosis almost always attends bruising or grazing shot injuries, rendering it difficult to decide at the first glance whether the coats of the eye have been pierced or not; and our judgment

[1] A distressing accident has happened near Salisbury: Mr. W. F— was out partridge shooting with his son, Mr. H. F—, and having fired at a covey of partridges, he hastily turned and discharged the contents of a second barrel at a bird which had separated from the rest. Unfortunately, his son was standing at no great distance, and received a portion of the charge in his chest and face. Singularly enough, there were only two shots which reached his face, and they, after breaking the glasses of the spectacles he wore, entered his two eyes, completely destroying, it is feared, the sight of one, if not both of them.—*Salisbury Journal.*

of the severity of the injury must be formed from actual examination, irrespective of the opinion of the patient; for in some instances the person becomes sick and faint, though the injury may be trifling. Others, whose nervous systems are less impressionable, treat the accident with indifference, though the eye may be seriously damaged.

A surgeon summoned to a gun-shot of the eye may expect to find the patient and those about him in alarm and distress, and may have some difficulty in obtaining a correct account of the accident.

The first thing to be done is to carefully cleanse the eye, if there be either blood or dirt, and then a full and satisfactory examination should be made to ascertain the nature and extent of the injury.

There may be little or nothing visible externally, but the sight may be dimmed. This will indicate concussion, and the actions of the iris are usually either suspended or impaired. More frequently the eye presents such an aspect as is represented in fig. 1, Pl. I, and the ecchymosis should be carefully inspected, lest a wound be concealed by the effused blood.

It is important to ascertain, if possible, the relative position of the injured and injuring parties when the accident occurred, and especially the direction of the patient's face at the moment. A shot crossing obliquely, and striking the inner or nasal side of the eye, will almost certainly penetrate; a shot striking the external side has a better chance of glancing.

In determining the question as to whether or not a shot has pierced the eye, the following points have to be considered: the weight of the shot, the distance from which it was discharged, the position of the eye, and the direction whence the shot came. A heavy pellet will plunge into the

eye at a hundred yards, when a light shot would glance, or fail to enter, at fifty. The more obtuse the angle of incidence, the less the chances of the shot penetrating. The elasticity of the tunics is such, that a round pellet direct from a gun may be thrown off, when an angular or jagged shot, rebounding from a stone, will tear through them; and the laceration within the eye will depend on the size, shape, and force of the shot.

After accidents of this description the surgeon will be anxiously questioned as to the probable result. A guarded answer is at all times proper. A slight graze may, by its concussion, detach the retina and cause hopeless amaurosis, and when a shot has entered the eye the risk is always grave. In two cases within my own knowledge (one in the practice of Mr. G. D. Pollock, the other a patient of my own), the shot simply pierced the cornea and dropped into the anterior chamber, whence it was extracted without difficulty, the eyes receiving no permanent injury; but such escapes are altogether exceptional. When a shot penetrates behind the iris, it either lodges in the interior of the globe, where, unless extracted, it is sure to set up such irritation as to destroy sight, or it tears its way through the eye, generally, but not invariably, blinding it.

If a shot passes through the eye, and lodges in the cellular tissue of the orbit, it may give rise to severe neuralgia. I know a gentleman who was shot through the eye, and in whom there is reason to believe the shot has lodged near the lachrymal gland. He is a martyr to brow-ague, and the pain always commences in the spot above indicated.

The following is an example of the slightest form of injury:

A man, aged 32, was acting as "marker," and had ascended a tree to obtain a good view. A covey of partridges

rose between him and the sportsmen, who were distant about 100 yards, and on their firing at the birds the marker was struck by several shot, one hitting his left eye; the pain was at the moment acute, and the sight greatly impaired. He came under my notice two days afterwards. There was considerable ecchymosis over two thirds of the sclerotic, but no breach of surface. The application of cold and the use of astringent collyria removed the extravasated blood, and the sight, which was not materially impaired, gradually recovered.

I have not myself met with an instance in which complete amaurosis was caused by a glancing shot, but Mr. Lawrence has mentioned a case.[1] The following are examples of the temporary suspension of sight from this cause:

Major M—, aged 42, consulted me in January, 1856. The previous day, while shooting with a party, he was struck by a glancing shot on the left eye. He felt a smart stroke, and the sight was extinguished. No blood flowed, though much became effused under the conjunctiva. Six leeches were applied the same evening, and the eye was frequently bathed; during the journey to town, which occupied four hours, it had been covered with a handkerchief.

Its condition was as follows when examined by me: pupil dilated and motionless; the whole surface of the sclerotica covered with effused blood, but no breach of surface could be discovered; humours of the eye clear.

The treatment was, repose in bed in a darkened room, cold-water dressings to the eye, a brisk purgative, and strict abstinence.

On the third day large objects became visible to the injured eye, and day by day the sight improved; the severity of the

[1] 'Lancet,' vol. ix, p. 531.

discipline was gradually relaxed, and when the major left town at the end of ten days, the eye, though still weak, had nearly recovered its power of vision.

On February 16th, 1854, Mr. M—, aged 60, was rabbit-shooting with a friend in Hampshire, when a shot glanced and struck his right eye, the sensation being similar to that caused by a blow from a twig. The sight was not immediately extinguished, but speedily became so. He went home, and a surgeon happening to be in the house, attended to the eye; he washed it, cleansing away some blood, ordered a poultice, and advised Mr. M— to proceed at once to London. This he did, reaching town at 10 p.m., having suffered severe pain during his long journey. At 11 p.m. I saw him. The upper lid was red, and swollen at the margin; there was little congestion of the eye, but he could only discern light from darkness. As it was undesirable to expose the eye to candle-light, my full examination was deferred till the morrow, cold applications being ordered.

At 9 a.m. on the following day the condition of the eye was ascertained to be as follows: the inner side of the cornea presented an abrasion, extending from an ecchymosed spot on the sclerotic just beyond the junction; except this there was no wound; there was little redness, and the pain had gradually subsided. The pupil was dilated and motionless—no sight. This gentleman was of spare frame, and very temperate. He was desired to keep perfectly quiet in a darkened room, on low diet, and to continue cold applications to the eye.

On the 20th, perception of large objects returned, and the eye was progressing very favorably. On the 22d, finding an increase of congestion, six ounces of blood were taken by cupping from the right temple, with marked benefit. By the 25th the eye was clear from inflammatory action, and the

strict regimen which had hitherto been enforced was relaxed; the sight was greatly improved.

Mr. M— returned home on the 28th. The eye bore no trace of the accident, and the only difference between the sight of the two eyes was a slight haziness in that of the right.

Shots which cut a furrow in the sclerotic retain great velocity; the part struck presents a considerable sub-conjunctival extravasation of blood, and careful examination will detect a breach of surface as if a small groove had been cut with a gouge. This is more frequently seen on the outer side of the sclerotic than in any other position. Patients usually describe the sensation as resembling a sharp cut with a whip or rebounding twig, and these wounds sometimes bleed freely.

A party were beating a wood for pheasants, and in the excitement of several birds rising, a gentleman fired without observing that another sportsman was in the line of fire; three shot struck his face, one his left eye. As the eye bled and the sight was nearly extinguished, great alarm was excited, and medical assistance was promptly obtained. The impression was that the shot had lodged in the globe. I saw the eye some days afterwards, and the groove, which marked the course of the shot and proved it to be but glancing, was clearly discernible: the eye had been struck on the outside, about a line from the margin of the cornea, and there was the appearance under a lens of a piece having been chipped out. There was rather a sharp attack of inflammation, but eventually the case did well.

One of the narrowest escapes I have ever seen was the following: Lord C— was cover-shooting with a party, December 29th, 1856. Two shots struck him; one just grazed the upper lid of the right eye; the second passed through the

lower lid close to the outer canthus, and impinged upon the eye half a line below the cornea. There was free bleeding from the lid, and much ecchymosis of the eye; the sight was confused, but not seriously impaired. I saw him the following day. The whole lower half of the eye was covered with extravasated blood, and an abrasion of the conjunctiva distinctly indicated the stroke of the shot. The sight was still confused, and there were many muscæ volitantes. The pupil was sluggish. Leeches, purging, abstinence, and cold applications to the eye speedily restored it, and at the expiration of a week Lord C. left town with merely a little weakness of the eye remaining.

A remarkable instance of a shot striking the exterior of the eye, and running under the conjunctiva to the internal canthus, is narrated by Dr. Ansiaux.[1] It shows by how small a resistance a shot can be deflected from its course.

Josephine Riga, aged 15, was struck by a shot, which penetrated the left eye near the external angle, and running under the conjunctiva, leaving a grayish mark on the sclerotica, it had become fixed at the inner angle close to the caruncle, where it was very visible under the transparent conjunctiva. Dr. Ansiaux seized it with forceps, drew it well forward, divided the conjunctiva, and it instantly escaped. Cold applications only were used, and in three days the eye was well.

If a shot has passed through the cornea, the eye will present the following appearances, if seen soon after the accident.

There will be a visible breach of surface in the cornea, and the iris will lie in contact with it; this obliteration of the anterior chamber is positive proof of that cavity having been opened. If the shot has wounded the iris, there will pro-

[1] 'Ann. d'Oculistique,' t. viii, p. 19.

bably be some blood in the anterior chamber, and the laceration in the iris will be visible unless concealed by blood. If the shot has passed through the pupil and lacerated the lens, the pulpy fragments of that body will most probably be visible; in the course of a few hours their opacity will decidedly render them so. When a heavy shot passes through the crystalline lens it ploughs it up; fragments may be thrown into the anterior chamber, and the whole body may be displaced, tilted against the iris, or choking up the pupil.

If a small foreign body be driven with great force through the crystalline, it will make a minute opening in the anterior capsule, and a larger at its point of exit through the posterior. The first may be instantly closed by the elasticity of the membrane, in which case opacity will commence in the posterior layers of the lens, and gradually progress from behind forwards. The puncture, if in the pupil, may be recognised by a faint cloudiness in one spot; the rapidity with which the crystalline opacifies depends on the rent in the anterior capsule; if large, so that the aqueous humour is freely admitted, the lens soon becomes infiltrated and opaque. I have seen this occur one hour after injury.

It often happens that shots enter just at the junction of the cornea and sclerotica; the aperture will be very apparent, and in it the dark choroid will be seen. Ecchymosis may be expected to surround the wound, from which a little blood will ooze. An eye may present two wounds, marking the entrance and exit of a shot: the exit wound will be largest, the edges most ragged and everted, and will almost certainly be on the inner side of the eye; if the exit wound be behind the reflection of the conjunctiva, it will not be visible.

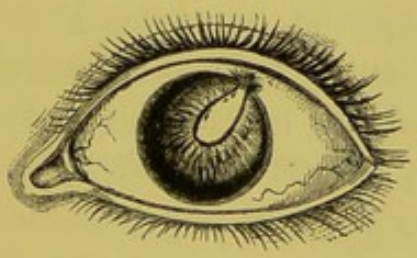
When a shot passes completely through the eye there is far less suffering than when it lodges; vision is generally destroyed by the injury inflicted on the retina, and the intra-

ocular effusion of blood, but, as in the following case, recovery from the wound may be rapid.

In January, 1856, Mr. V. S., aged 52, was woodcock-shooting in Ireland. He happened to be in a ravine when a shot from the gun of the keeper, who was above him on the opposite bank, struck his left eye, instantly extinguishing the sight. The following morning Mr. S. proceeded to Dublin, and placed himself under the care of Sir Philip Crampton. Singular to say, scarcely any inflammation arose, and though the eye was blinded, this gentleman speedily recovered from the wound.

He consulted me in November, 1857, and the condition of the eye was then as follows:—Globe natural in size and consistence; iris natural in colour, but bulged forward by the lens, so that the black uvea at the margin of the pupil is strongly marked; the pupil is drawn upwards and slightly

Fig. 15.



outwards to a cicatrix at the margin of the cornea (fig. 15); the lens densely opaque, and the capsule slightly spotted with pigment, the conjunctiva somewhat vascular. With the exception of loss of sight, and some uneasiness at changes of weather, this gentleman suffers no inconvenience from his eye.

Though the rapid recovery of an eye from a penetrating gun-shot wound may be considered fair evidence that the shot has not lodged in the globe, the converse does not obtain. Dr. Mackenzie has related a case, and another has

occurred in the practice of Mr. Wordsworth, in which it was found necessary to remove the eye on account of the intense suffering; yet in neither instance was the shot discovered in the globe.

A shot may just open the anterior chamber sufficiently to allow of escape of the aqueous humour, or it may lodge in that cavity. In these accidents there will be risk of subsequent distortion of the pupil, for the immediate consequence of loss of aqueous humour is falling forward of the iris, and the tendency always is for that membrane to become adherent to the wound, acting as a plug to prevent the aqueous humour draining away. When the chamber fills, the pupil will be necessarily dragged towards the adherent part, as the iris is prevented recovering its normal plane; the action of belladonna will be a material aid in preventing this disfigurement.

The following is an example of a shot lodging in the anterior chamber—a circumstance which can only arise when the velocity of the projectile has been greatly diminished, it retaining just sufficient to carry it through the cornea.

H. I., Esq., aged 30, consulted me February 2d, 1853. Two days previously, whilst cover-shooting, a shot fired from a gun at a distance of about one hundred yards struck his right eye. The aqueous humour was discharged, but no blood flowed. The sight was very indistinct, but after the first smart there had been little or no pain; a feeling of discomfort when he lay on his back, and intolerance of light, but no positive suffering.

He was an exceedingly temperate man, and always enjoyed good health.

At the first glance the nature of the case was apparent. A shot lay at the bottom of the anterior chamber. A little below the centre of the cornea was the mark of a wound;

but this appeared to have closed sufficiently to seal the anterior chamber. The shot had kept the iris back, so that it was not entangled. There was a slight pink tint around the lower portion of the cornea, but the eye was singularly free from inflammation.

The patient being recumbent, an incision was made through the cornea, and the shot was lifted out, by means of a small scoop, with facility. No inflammation followed, and the eye was well in a week.

The extreme temperance of this gentleman was doubtless the main cause of such slight irritation being excited by his accident.

A shot or fragment of copper cap (for the observation is applicable to both) may lacerate the sclerotic, and yet by its elasticity be thrown off. The late Marquis of Anglesea had a fortunate escape of this sort. He was shooting from his pony, in company with his private medical attendant, when, after a shot fired by the marquis, blood was seen on his eyelid and cheek. On examination the surgeon found that a piece of copper cap had cleanly cut through the outer side of the sclerotic of the right eye, the choroid projecting through the wound, resembling the head of a fly. Gentle pressure was made on this with a probe; it slipped back, and did not reappear. Simple treatment only was used to the eye, and no ill effects followed.

A singular case has been recorded by Desmours. A wine-merchant was shot in the eye, and applied to Desmours, who saw a pellet fixed in the conjunctiva, near the external border of the cornea. This he seized with forceps, but, to his surprise, was unable to move it, though it appeared isolated. After several attempts, a brisk movement of the eye released the shot, which was found to be double (most probably two pellets united). One half was in the eye, the other half

external, the sclerotic grasping the middle. The sight was preserved, though weakened.

A shot may penetrate the lid and lodge in its under surface, retained by the conjunctiva; if the patient feels the sensation of a foreign body, the lid should be everted, and the shot will be seen just bursting through the conjunctiva; such at least was the case in an instance which fell under my notice, where this condition existed. The membrane was divided and the pellet escaped.

In the majority of cases where the sclerotica has been pierced, a distinct hole filled by dark choroid will be seen; but in one instance where the shot was flattened, and entered edgeways, I found merely a slit in the sclerotic.

Mackenzie mentions a similar case. A grain of shot had passed through the lower lid into the eyeball; the wound in the sclerotic presented the appearance of a slit, through which oozed the vitreous humour. The pupil was rather contracted and muddy from effused lymph. Vision with the wounded eye was dim, yet the patient saw everything with it. The conjunctiva became chemosed; gradually the pupil cleared, but opacity of the lens ensued. The interior of the eye suppurated, and matter was discharged through the wound in the sclerotica.

This latter condition is very exceptional; the suppurative action is rarely taken on under these circumstances. I have seen pus in the anterior chamber, but there is a wide distinction between that and suppuration of the eyeball, and I cannot recall an instance where ophthalmitis—general acute inflammation and suppuration of the globe—followed an accident of this description; nevertheless, if the patient be in a gross state of body, it may arise.

On the 3d of January, 1852, I was requested by Mr. Ancell to visit one of the park-keepers, who had received a

formidable injury to the left eye a few days previously. He was standing on the brink of the Serpentine, when a gun loaded with partridge-shot was discharged at one of the water-fowl, at the distance of about thirty yards from him, and a pellet glancing upwards from the surface of the water struck his eye, instantly extinguishing the sight. He was a tall, plethoric man; his eyes prominent, irides grey with a yellowish pupillary margin.

There was acute inflammation of the conjunctiva, sclerotic, and iris; immediately after the injury the anterior chamber had filled with blood, in consequence of a wound just beneath the circumference of the cornea, nearly in the mesial line. The iris was retained in its place by the blood, but as this became absorbed, the iris prolapsed through the wound, dragging down the pupil; the edges of the wound were ragged, and the surface had a peculiar whitish appearance, as if it had been scorched. The colour of the iris was olive green, streaked with red lines; pupil absolutely immoveable; and although the lens was not yet opaque, there was no perception of light. There was severe pain in the eye, aggravated at night, and when the globe turned briskly outwards there was a sharp pang and flash of light.

The patient insisted that the shot could not have entered the eye, but we arrived at the opposite conclusion.

The treatment agreed upon was absolute quietude, leeching, mercury, opiate fomentations and belladonna to the brow. The symptoms slowly yielded, and when seen by me on the 22d of February the eye had undergone the following changes.

Globe perceptibly diminished and flaccid to the touch; sclerotic a dingy yellowish-brown hue; iris dull green; pupil fixed by a fringe of dark-red adhesions partly to the wound and partly to the capsule of the lens. The seat of the wound was indicated by a small red spot.

It is seldom that a blue iris takes on a decided brown hue, and the change of colour, though usually early, may not take place till long after the infliction of the injury.

On December 31st, 1849, Lord S. was shooting in the North, when a friend fired at a rabbit, and two of the shots glancing struck Lord S.; one lodged in his right ear, the other struck the left upper eyelid, passed through it, and injured the globe, though at the time it was thought doubtful whether it had penetrated. For a week the eye was tolerably quiet, but then violent inflammation came on, and was not subdued till after some weeks. Perception of light gradually passed away, the eye remaining irritable, and inflaming on slight occasions.

I was consulted June 7th, 1856. The iris, naturally blue, was now of an olive brown, and the fibres indistinct. The pupil was drawn down and adherent to a yellow mass of lymph, and the lens was opaque. The globe was not diminished in size, but tender on pressure; sclerotic yellowish, and traversed by dark tortuous vessels.

The opacity in the lens did not take place till some months after the accident, and was, I have no doubt, secondary. The iris had only assumed its present unnatural tint within the last twelve months, and was due to morbid action going on in the eye. As to the shot having penetrated, no doubt existed in my mind.

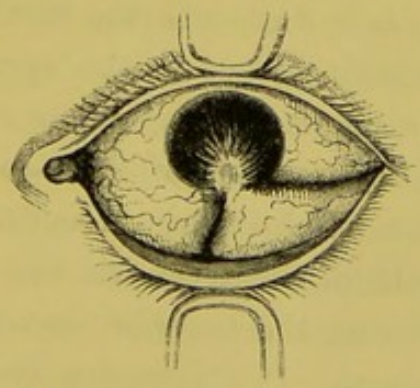
If the wound is at the margin of the cornea, and the lens thrown forward into the anterior chamber, the iris is generally entangled in the wound; this condition is represented in fig. 3, Plate I; the effect is to cause a portion of the membrane to disappear, the other portion being stretched by the displaced lens; as absorption of the lens progresses, more and more of the iris will appear, until there is either a pear-shaped pupil, as in fig. 15, or the pupil may entirely close

(fig. 16), especially if the eye atrophies. I have seen cases in which the aqueous humour drained for some time through the marginal wound, the iris lying in contact with the cornea, but not filling the ragged aperture; gradually the aperture closes, the anterior chamber refills, and the iris falls back to a greater or less extent, according to the adhesions which have formed.

In every case that I have seen in which the iris was entangled in the marginal wound, the membrane has so continued. The fibres are kept upon the stretch, all tending towards the wound, and just at that point they are wanting, having been involved in the cicatrix.

When a shot lodges in the posterior portion of the eye, it gives rise to a series of changes, the result of long-continued inflammation. The iris undergoes marked change of colour —a change uninfluenced by mercury, which is so powerful an agent in restoring the tint to the membrane when suffering from ordinary inflammation. The globe gradually loses its consistence, and becomes soft; the only exception, I believe, being when there has been considerable bleeding into the eyeball; as the softening progresses a peculiar

Fig. 16.



puckering of the sclerotic takes place, the puckers running from the cicatrix (fig. 16); then the outline of the cornea

and iris diminishes in size and loses its roundness, becoming somewhat angular, and frequently there remains a sensitive spot, often towards the upper part of the sclerotic; the eye will bear gentle pressure elsewhere, but the patient shrinks the moment this is touched; general atrophy of the globe usually reduces its size from one third to nearly one half; the diminution is most marked after the first four or five months, and, I think, reaches its maximum within twelve months.

In the more fortunate cases the shot probably becomes encysted, and the eye ceases to be troublesome; but in others it is again and again attacked with inflammation, and is ever irritable at changes of weather. In such cases the sclerotica is discoloured, and its surface traversed by many dull-red vessels.

In one case which I remember, but of which I unfortunately did not preserve notes, an eye which had been pierced by a snipe-shot went on so well for three weeks that speedy recovery was anticipated; then, without any assignable cause, violent pain, inflammation, chemosis, and opacity of the cornea occurred; this, I may mention, was the nearest approach to ophthalmitis which I have seen in accidents of this description.

In the following case there was the peculiarity of a yellow ochre-like deposit taking place in the eye. I have recently met with another example, and entertain no doubt that it is a peculiar form of degeneration of blood-corpuscles. A case is mentioned in the 'Ophthalmic Hospital Reports,' under the care of Mr. Poland, where the iris was hidden by a deep-yellow substance filling the anterior chamber, the eye otherwise appearing normal. It followed a blow inflicted fifteen years previously, and was thought to be fluid, but on opening the anterior chamber a very little fluid which consisted of

decomposed blood, escaped. The yellow covering of the iris could not be removed. In the cases which I have seen, the presence of this yellow deposit was preceded by hæmorrhage into the eye, and followed by intense neuralgia.

In May, 1857, I was consulted by a gentleman under the following circumstances. In January, 1854, he was one of a party woodcock-shooting, when a glancing shot entered his left eye, and immediately extinguished sight. There was some bleeding from the eye, and considerable extravasation of blood under the conjunctiva. His eye was bound up with a handkerchief steeped in cold water, and on reaching home he was placed in bed, feeling sick and faint with pain in the eye and brow; a cold poultice was applied to the eye, and active antiphlogistic treatment employed; nevertheless the eye remained in a state of inflammation for nine weeks, despite of an active mercurial course. The redness and intolerance of light gradually passed away, leaving the globe hard, tender, and subject to neuralgia, which has been a source of torment to him ever since.

The condition of the eye when I saw it was as follows:— The globe perfectly hard and tense, and traversed by dark vessels. The iris bulged forward so as to encroach considerably on the anterior chamber, and of a dark olive green; pupil contracted, and occupied by lymph; in the lower part of the anterior chamber a dark stain and small coagulum of blood. Around the inner circle of the cornea was a singular yellow line, as if the iris had been encircled with a frame; on the inner surface of the cornea there were towards the lower part several small spots of a similar colour; the cornea itself was very tense. The chief complaint made was of neuralgia, and of occasional sharp dartings, like needles being thrust into the eye.

The sight of the right eye was as yet unaffected, neverthe-

less I thought it proper to suggest excision of the damaged eye, as that alone would relieve the neuralgia. My proposition was not acceded to, and I did not see the patient till early in August, 1857; he then stated that his eye had remained in much the same state, except that two or three times after violent neuralgia, and a sense of bursting, blood had appeared in the eye, and it had of late become much more yellow. Such indeed was the case; the whole of the posterior surface of the cornea was covered with this yellow deposit; the circle was still visible, but little of the iris itself could be seen, and that little appeared to be marked with deposit also: it was irregularly scattered over the inner surface of the cornea, in some parts in distinct patches, in others as if lightly smeared, or as if the colour had run. (Fig. 5, Plate I.)

The following case presents in a marked manner the characteristic effects of a penetrating gun-shot wound.

On November 20th, 1857, a gentleman was cover-shooting with a party, and was struck on the right eye by a pheasant-shot, the shock causing him to drop on one knee. He was looking outwards at the moment, and the shot came obliquely across his face, striking the inner edge of the cornea; the eye bled considerably, and there was much ecchymosis. Leeches were applied, and he was brought under the influence of mercury. I saw him for the first time on December 15th. There was then a lacerated wound, filled with iris at the inner edge of the cornea. The iris itself was so widely dilated that comparatively little was seen, that little, naturally hazel, being of a reddish brown, the pupillary edge serrated by adhesions. (Fig. 3, Plate I.) The pupil was filled by opaque lens, which projected into the anterior chamber, and on close inspection it had a broken appearance. It was stated that, after the injury, loose fragments of lens

had for a time been visible in the anterior chamber, but had become absorbed; there was less injection of the conjunctiva and sclerotic than might have been expected, nor was pain great.

Circumstances prevented my seeing this gentleman again until the end of the month, by which time the lens had become greatly reduced in bulk, and there was more iris visible; the vascularity was less, and there was not much pain, that being in the temple.

The treatment pursued had been absolute quiet, three applications of leeches, and low diet.

By the 3d of January the wound had so far healed that the prolapse of the iris had disappeared, and the anterior chamber had again filled. From this time to January 20th, when the patient returned to Cornwall, to be under the care of Mr. Michel, of Redruth, there was steady and gradual improvement. The anterior chamber became well filled, and the iris reappeared, its colour and brilliancy being in a great degree restored; there was still a portion of lens in the anterior chamber. After the patient's return home, a smart attack of inflammation rendered further depletion and mercurials necessary. By slow degrees the eye became quiet, except one point towards the upper and outer portion of the sclerotic, which remained exquisitely tender.

Seven months elapsed before I again saw this gentleman. The condition of the eye was then as follows:—Globe atrophied; circumference of cornea and iris considerably diminished; the fibres of the iris all converged towards the wound, the pupil a mere streak—it is open, but there is not the least perception of light. From the cicatrix a pucker extends inwards and upwards to above the caruncle. There is slight opacity of the inner third of the cornea, and exquisite tenderness of the before-mentioned spot, rendering it impossible to insert an artificial eye.

For many weeks after his return home, this gentleman had been unable to use his sound eye, and found great imperfection in his sight, especially when riding; he more than once narrowly escaped accidents from not seeing ditches and holes when riding across country.

I saw my patient again in the following December. His vision had greatly improved; he could ride and shoot well. His left eye had become so strong, that he had read for two hours by lamplight in the railway carriage coming to town, without fatigue. The tender spot no longer existed, and though atrophied, the eye seemed to have become perfectly quiet and free from inflammatory action.

The amount and duration of suffering caused by a shot lodged in the eyeball will much depend on its position. If it lodges in the firmer tunics, so as to be motionless from the first, the amount of pain, after the first few weeks, may not be very considerable; but if lodged in the optic nerve, or rolling about in the vitreous humour, the torture will be great and protracted. Yet in time even this subsides, for nature does her best to relieve the irritation by fixing the shot in one spot. Dr. Butter, of Plymouth, however, had a patient whose life, during six years and a half, was rendered miserable by a shot lodged in his eye; the pain would at times flash so suddenly and intensely through the wounded eye and head, and so seriously disturb the functions of the sound eye, as to lead him to undergo two severe but fruitless operations. Everything else failing, he submitted to exterpation of the eye (before anæsthetics were used), and Dr. Butter removed the eyeball and lachrymal gland. A duck-shot was found so firmly impacted in the optic nerve just at its junction with the retina, that considerable effort was required to detach it. The result of the case appears to have been satisfactory. Dr. Mackenzie mentions a case in

which a gentleman submitted to extirpation of the eye on account of pain from a gun-shot wound.

Sir Charles Bell relates[1] a circumstance which I confess taxes my credulity. Speaking of the influence elastic tissues exert in arresting the progress of a ball, he says that a soldier received a musket-ball in the globe of the eye, where it remained—not from any surgical difficulty, but because in that situation it was too *valuable* for the man to consent to have it extracted!

The suffering which torments patients with shots in their eyes is of a distressing character; sudden flashes of pain dart back, like electric shocks, into the brain, and are often attended with luminous coruscations; this is especially the pain attending lodgement in or near the optic nerve. When the iris, ciliary processes, or sclerotic are more decidedly implicated, there is the dull, wearying, aching torture implicating the branches of the fifth pair.

For the following notes of a highly interesting case, occurring in the practice of Mr. Wordsworth, I am indebted to Mr. Streatfeild.

John Keefe, aged 43, was passing through a hedge on the 22d December, 1857, when a poacher, concealed in the ditch, fired at him from a distance of about twenty yards. He felt pain in the left eye, and immediately found that he had lost its vision. Twenty or more shots were removed from his face, arms, and upper part of his body, and he was then brought to the London Hospital. The eyelids and ocular conjunctiva were enormously swollen, and there was a wound visible in the cornea. Mercurials and fomentations were ordered.

On the 26th December the anterior chamber was filled

[1] 'System of Operative Surgery,' vol. ii, p. 452.

with yellow deposit, and the pain had increased. The chemosis was scarified repeatedly, and blisters, with general treatment, were prescribed. By January 21st the swelling of the lids and ocular conjunctiva had subsided, the eye was bloodshot and watered, and at intervals there was great pain. He could read a few letters with the wounded eye, but it caused more pain.

About this time the right eye became affected; there was no external redness or pain, but with it vision was dim and uncertain; he could not read a whole line of writing, or look fixedly at anything for a minute.

Under these circumstances excision of the left eye was performed, with marked relief to the right, so that by the 31st January he was able to read pages of small print, though lengthened effort made the eye ache.

The following is the result of the examination made by Dr. Bader of the excised eye.—The globe was of normal consistence, conjunctiva red, cornea transparent, the pupil blocked up with yellow lymph.

*Section of the Globe.*—Connexion of sclerotic, choroid, and retina normal. Lens opaque. Vitreous humour membranous. Many old effusions of blood along the membranes, as streaks in the vitreous, arranged as the radii of a circle. No shots in the eye; three had passed out through the retina, choroid, and sclerotic, close to the entrance of the optic nerve. Retina amorphous. Choroid firmly adherent to the inner edge of the wounds of the sclerotic, the holes in which are of bluish appearance, and not healed; externally they are covered by firmly adherent cellular tissue, so as not to be detected on a careful examination.

*Dried Sections.*—An enormous development of ciliary processes, projecting from the ciliary body like varicose loops. Numerous masses of black pigment round the edge of the

iris and beyond them, forming the boundary of the pigment towards the anterior chamber, a well-defined membrane (like lens-capsule), on the outside of the pigment.

Upon this membrane, and filling the space between cornea and iris, and iris and posterior chamber, an amorphous, translucent, yellowish mass, thickly dotted with pigment, is deposited.

Dr. Playne, of Maidenhead, has communicated to the 'Ophthalmic Hospital Reports'[1] an interesting case.

A lad, eleven years of age, received a gunshot wound of the face, on June 28th, 1858. The gun was loaded with very small shot, and was discharged at a distance of twenty yards from him.

One of the shot penetrated the upper eyelid, in its fold immediately below the margin of the orbit, and perpendicularly above the upper puncture. A probe passed into the wound, penetrated directly backward for three quarters of an inch, but the shot could not be detected, and no attempt was then made to remove it. The eye itself was uninjured. In consequence of the great ecchymosis of the lids no observation of the movements of the eyeball were made till the fourth day, when it appeared that the parallelism of the axis was destroyed, the injured eye having a very marked external squint, and the patient being unable to move it inwards beyond the centre of the orbit; in fact, the eye presented just the appearance produced by division of the internal rectus muscle. When the swelling of the lid had subsided there still remained a considerable amount of ptosis, and the pupil was more dilated than the other.

Double vision was very well marked, the two images of an object at six feet distance appearing as much as two feet apart.

[1] Vol. i, p. 216.

Dr. Playne recommended the free use of the eye, particularly on near objects, and an improvement was soon apparent; the two images of an object came gradually nearer together till August 1st, when the parallelism was completely restored, and the lid had regained its proper position.

It is suggested by that gentleman that inflammatory exudation, or blood effused in the orbit, caused pressure for a time on the third nerve or its branches, whence the paralytic symptoms described.

Carron du Villards has mentioned a singular case of gunshot wound, whereby the patient was unexpectedly cured of an old-standing cast of the eye. A sportsman received in the face, at twenty-five yards distance, a charge of partridge-shot. One of these penetrated deeply into the orbit near the tendon of the superior oblique; he instantly fell, and was supposed, by the unlucky sportsman who shot him, to be dead. He thereupon ran for assistance, but the wounded man presently came to himself, and took a little brandy; perceiving that the eye was protruding, though not deprived of sight, he applied to it his handkerchief wetted with brandy. Six hours afterwards he was seen by M. Carron du Villards; the eye was then very prominent, and surrounded by a bloody swelling, which increased at every attempt to push the eye back into the orbit; there was not much pain, but a sensation as if the eye would start out of the socket. A deep incision was made into the swelling, which gave exit to several ounces of coagulated blood. Cold applications only were used, and the patient gradually recovered; but there was this curious circumstance, that a bad convergent squint, which had existed from infancy, entirely disappeared. M. Carron du Villards attributes this happy circumstance to the contracted fibres of the oblique muscle having been severed by the shot.[1]

[1] 'Gaz. Med. de Paris,' tome vi, c. ii.

I am only acquainted with one instance in which a shot worked out of the eye; it occurred in the practice of Professor Stœber, to whom I am already indebted for the particulars of a case of nearly equal interest.

J. Mech, aged 7 years, in 1831 entered a garden to steal fruit, when the owner fired at him and wounded him in the right eye. The face swelled to such an extent that he could not open his eyes. When, however, the wounded eye was examined its whole surface appeared inflamed, and the boy could not see. By degrees the inflammation subsided, and there remained a white spot, which concealed half the iris and pupil. Damages being sought in a court of justice, the Judge directed two "experts" to examine the eye. The defendant contended that the gun was only loaded with salt, and the "experts" affirmed that the wound of the eye bore the appearance of having been inflicted by salt rather than shot. Twenty-five francs damages were awarded.

Nearly a year after the accident something was perceived under the lower lid, always moving with the globe: on drawing down the lid a round black body was discovered. The patient was now brought to Professor Stœber, who found that the body in question was between the conjunctiva and sclerotica, at the inferior and external part of the eye. It was evidently a grain of shot, and was moveable. The conjunctiva and sclerotic were in the natural state; the cornea presented an elongated opacity, half a line in length, directed obliquely from without inwards and from above downwards; before the lower and outer part of the pupil, at the lower and external margin of the cornea, a second opacity was seen, which appeared to proceed from a cicatrix; the rest of the cornea was clear; but the mother declared that the whole space between the two opacities had been perfectly white, as well as the cicatrices, which had already lost that tint; the

iris presented, at its lower and external part, near the second opacity in the cornea, a round fringed aperture, as if made by a foreign body.

Part of the iris adhered to the cornea, the pupil was fixed, and vision reduced to a faint perception of light. There were occasional attacks of pain and inflammation, but Professor Stœber could not persuade the boy to submit to the removal of the shot.

In May, 1835, he saw the lad again; the foreign body remained in the same place, but the opacities in the cornea had diminished. The interesting point was, that for the last year he had been able, first to see a little, and afterwards the sight had improved so much that he could discern small objects, though less perfectly than with the other eye.

It is remarkable in this case that almost complete amaurosis of more than two years' duration should have disappeared by the unaided efforts of nature.

Military surgery presents cases of wounds of the eye peculiar to itself; the globe may be torn out of the socket, or may be utterly smashed by a bullet; one or both optic nerves may be cut across by the passage of a ball behind them. Sometimes a ball enters straight forward, destroys the organization of the eye, and lodges in the brain, the orbit, or some unexpected part. During the present Indian war a private of the 8th Foot was struck in the right eye by a ball, which was cut out between the spine and the posterior edge of the right scapula; he died in hospital at Umballa some weeks after his arrival there. It was ascertained that the ball had entered the lower part of the right eye, passed through the floor of the orbit, then ploughed along the base of the skull, carrying away the styloid process until abreast of the foramen magnum, when it

quitted the bone and passed down the neck into the back.[1]

M. Menière, in his account of the Hotel Dieu, at Paris, during "the three days," tells us of a ball which entered at the inner angle of the left eye, passed downwards and backwards and to the right side, under the base of the cranium, and was cut out from above the right shoulder. The patient recovered rapidly without a bad symptom.

Sometimes the course of the ball cannot be ascertained. A French soldier was wounded at Waterloo. The ball entered the right eye; the left, though not in the slightest degree injured in appearance, was completely blind. The patient was quite convinced that the ball had entered his brain, but its seat never could be discovered by Dr. Hennen. He returned to France convalescent. Occasionally the eye is torn from the socket, the surrounding parts being little injured. Dr. F. Isenschnied has recorded[2] a case of a soldier who was struck by a ball on the right eye, which was driven almost entirely out of the orbit, the cornea and sclerotica being ruptured and vitreous humour lost; nevertheless neither the lids nor the orbit were implicated in the wound.

A good example of the terrible effects resulting from a gun-shot wound is related by Dr. Fenin, the Chief Surgeon of the Military Hospital at Cambrai.

A soldier in Algeria was shot in the face; the bullet passing from left to right destroyed the cornea and the upper portion of the sclerotic of the left eye, the bones of the nose, and lodged in the external and posterior angle of the right orbit. On the following day he was admitted into the hospital at Blidah.

The right eye thrust outwards, was enormously swollen,

[1] 'Edinburgh Med. Journal,' No. XL.

[2] 'Ann. d'Oculistique,' t. xxx, p. 107.

cold to the touch, and dull in colour; the eyelids equally swollen, were of a violet hue. There was violent pain in the head and febrile disturbance.

Dr. Fenin found a tendency to gangrene, and decided on immediate extirpation of the eye, which he executed with facility. On passing the finger into the orbit, the ball was discovered, flattened and misshapen. Considerable difficulty was experienced in extracting it. The patient made a good recovery, though of course totally blind.[1]

The battle of Waterloo gave rise to numerous examples of lamentable injuries to the eyes produced by musket-balls. In cases where the balls had passed near the eyes, the vision was destroyed; in some without any apparent injury of the eyeball, and in others with the occurrence of every degree of inflammation. In a case where the ball passed behind the eyes from temple to temple, one eye was destroyed by inflammation, and the other affected by amaurosis. In another, where the ball had taken precisely the same direction, both eyes were affected with amaurosis, but without inflammation. In a third, where the bullet entered the face on the upper and left side of the nose, and passed out anterior to the right ear, the patient was affected with amaurosis of the right eye. The left eye was similarly affected in a case where the ball had entered the right side of the nose, and had come out before the left ear. From eight to ten instances were seen, in which musket-balls passed through behind the eyes from temple to temple. Cases of this kind are recorded, in which the blindness is supposed to have been produced by the balls passing through the inferior part of the anterior lobes of the brain, but Dr. Thompson, from his observations, doubts this. In some of the patients at-

[1] 'Ann. d'Oculistique,' t. xx, p. 105.

tacked with amaurosis, there was reason to believe that the optic nerves had been divided; but in a considerable proportion it was obvious that the balls had not come into contact with these nerves.

In one soldier the ball had passed through below and behind the eyes, and he was affected at the end of some weeks with painful spasms in the face, resembling tic douloureux.

The number of cases was considerable in which bullets passed directly through the substance of one or both eyeballs. In several instances the bullet had penetrated through both eyeballs, passing behind the bridge of the nose, which it left unbroken. In one, the ball entered the right eye, and passed out midway between the left eye and ear; the left eye was rendered amaurotic.

In the wounds described, besides the blindness, tedious and painful exfoliations followed the injuries to the bones.[1]

A case is mentioned by Dr. Macleod,[2] showing how little injury and inconvenience may be caused by the immediate vicinity of a bullet to the eye. A soldier was struck at the battle of the Alma by a round ball, which entered close to and immediately below the inner canthus of the eye. The wound healed, and the patient had almost forgotten the circumstance, when after suffering slightly from dryness in one nostril some months afterwards, the ball fell from his nose, to his great alarm and astonishment.

During the retreat towards Corunna, a soldier of the 36th regiment, who was left to cook his comrades' dinners whilst they were skirmishing with the enemy, was seen to suddenly fall backwards, and Dr. Burton, who chanced at the moment

[1] 'Report of Observations made in the British Military Hospitals in Belgium,' p. 67.

[2] 'Surgery of the Crimean War,' p. 223.

to be near, ran to him, and found that he had received a wound under the left eye, as if made with a rough cutting instrument; very considerable ecchymosis took place, which was got rid of by pressure. Dr. Burton extracted from the socket a musket-ball, flattened so much as to resemble a piece of money, from its having first struck against the wall in front of the man. The eye did not suffer in the least, although the soldier underwent a very distressing march that night.

At the Siege of Badajoz, a soldier of the 52d was struck by a bullet, which passed in at the inner canthus of the eye, fracturing the bone; blindness was the instant consequence, though the globe of the eye was not destroyed.

In Dr. M'Crae's 'Medical Report of the Campaign in the Punjaub,' 1848-49, it is stated that a European was struck by a musket-ball, which entered at the side of the nose, passed into the orbit, and lodged just behind the eye. Vision was lost, but the eye was unaltered in appearance. The man never felt inconvenience from the ball, nor were any bad symptoms produced by it.

So far as I have been able to learn, the injuries to the eye during the Crimean war were less numerous than might have been expected. In one case a comrade's double tooth was found imbedded in a soldier's eye; in another, a portion of a man's skull was removed from between the eyelids. The following cases are reported as having occurred in the Naval Brigade; and it is mentioned in reference to the many severe and fatal wounds about the head, that they were mainly attributable to the fearless manner in which the seamen continued to raise their heads above the parapets, contrary to the express injunctions of their officers. But there is not perhaps any class of men so regardless of their lives as the thoroughbred seamen of her Majesty's Navy;

and it is difficult to make them believe that there is not something discreditable in crouching behind stone walls or parapets in presence of an enemy.[1]

George Ellis, aged 22, of the "Queen," had been struck apparently by a piece of stone, broken from the parapet of the battery, below the left eye; the anterior wall of the superior maxillary bone was fractured, and the antrum opened. Another piece appears to have struck the cornea and laid it open, giving exit to the contents of the eyeball. His face and eyelids were covered with small wounds caused by gravel striking forcibly against them. A probe could be passed deep into the wound under the eye, but it did not detect any foreign body. The wounds were cleaned and dressed with lint. This man recovered with the loss of the left eye.

On the 24th of August, 1855, a seaman was struck by a musket-ball below the left eye; there was an elongated wound on the lower eyelid, and the eye itself was hidden by the swelling; the ball had lodged, but its position was uncertain. On the 28th, a hard, imperfectly circumscribed spot was discovered anterior to the ear, and opened; when the supposed foreign body was discovered to be part of the malar bone, which was loose in front, but connected posteriorly. The patient was sent to Cossack Bay, where the ball was extracted from the antrum, but the sight of the eye was lost.

There is a distressing effect said by Dr. Hennen to result from gun-shot wounds of the eye, namely, fungous growths, of a most irritable nature, and attaining a large size, which sprout from the wounded eye. "I have seen (says Dr. H.)

[1] Medical Statistical Returns. An admirable report on the surgery of the war in the Crimea has been privately printed by the War Office. It is to be regretted that it has not been published, as I know it to contain much curious and valuable information.

many gallant men driven almost to desperation by the agony they suffered, which nothing but large and repeated doses of laudanum could subdue."[1]

Among the consequences of gun-shot injuries in military service, the same writer mentions, disorganization of the iris, tremulous iris, detachment from the ciliary attachment. He also states that the pigmentum nigrum is sometimes forced off in small masses, which are lodged in the anterior chamber, where their presence gives rise to muscæ volitantes. In time they are absorbed, and the muscæ disappear. Cataract is not an unfrequent result of this class of injuries.

Profuse hæmorrhage may follow gun-shot wounds of the eye. During the Belfast riots, in July, 1857, a girl was brought into the hospital, deadly pale, cold, nearly pulseless, and throwing herself about in that restless, distressed manner, that great exhaustion from loss of blood usually produces, and she soon vomited a large quantity of coagulated blood. On examination by Dr. Browne, it was found that the right eye had been shot through, the cornea hanging outside the lids, which were greatly swollen. No trace of the foreign body could be found in any direction, but as the bleeding evidently proceeded from the posterior nares, it was surmised that the bullet had lodged in some part of the spongy bone. The girl was discharged, with loss of the eye, on the 20th August, never having had a serious symptom after the first twelve hours.[2]

At Waterloo, one of the Brunswick Hussars was struck by a musket-ball, which penetrated by the left temple into the orbit, and tore the eye from its cavity. He came under the care of Dr. Pockels, staff-surgeon of the corps, by whom the ball could not be found. The eye hung from the eyelid,

[1] 'Military Surgery,' p. 346.

[2] 'Trans. Belfast Med. Society,' Sept., 1857.

and was easily separated from the surrounding parts. The patient was insensible for the first few days, but recovered on being copiously bled. The wounds were cured in three months, but the patient remained in a state of mental derangement.

In a French prisoner, taken in the same battle, a ball passed through the right eye, in a direction straight inwards, and lodged, site unknown. A total paralysis of the pupil and the muscles of the *left* eye ensued.[1]

The late Mr. Guthrie, whose large experience entitles his opinion to much respect, lays down the following rules :— "When a ball lodges behind the eye, it usually causes protrusion, inflammation, and suppuration of that organ. If it be not discovered by the usual means, its lodgment may be suspected from the gradual protrusion and inflammation of the eye itself. If it be discovered, it should be removed, together with the eye, if such proceeding be necessary for its exposure. If suppuration have commenced in the eye, a deep incision into the organ will arrest, if not prevent, the horrible sufferings about to take place, and allow of the removal of the offending cause. If the eye remain in a state of chronic disease and suffering, a similar incision will give the desired relief. If the chronic state of irritation affect

[1] In the Memoir of Sergeant Thomas Morris, 73d Highlanders, the following singular circumstance is mentioned :—At Waterloo, the regiment was in square, defending itself from the Cuirassiers, when the sergeant's left-hand man received a ball in his left eye ; the blood gushed out, and he fell forwards. There being no doubt of his death, he was thrown out in front of the square. Greatly to the surprise of his comrades, the "dead" man reappeared at Paris ; the ball was still in his head, and could not be extracted. The man was sent to England, where he was again reported to have died some months afterwards. Thirty-five years subsequent to this event, this person, who had been twice officially reported dead, presented himself to his old comrade, the sergeant, the ball being still in his head. Nevertheless he had contrived to bring up a large family, and to attain a highly respectable position in Carlisle.

the other eye, the incision and sinking of the ball of the one first affected or injured is urgently demanded, and should not be delayed. I have several times seen both eyes destroyed and sunk by one ball, with little other inconvenience to the patient; one eye sunk, the other amaurotic, and both even amaurotic, almost without a sign of injury, by balls which had passed from side to side through both orbits, but behind the eyes. When the eye becomes amaurotic from a lesion of the first branch of the fifth pair of nerves, the pupil does not become dilated; the iris retains its usual action, although the retina may be insensible, and vision destroyed. This was well shown in the case of the late Major-General Sir A. Leith, who was wounded by a sword in the forehead, this nerve being divided."[1]

Fig. 17.

If an eye be greatly lacerated by a bullet, or splinter of shell, especially if there be reason to suppose that the missile is lodged in the socket, the upper lid may be fixed with the elevator (fig. 17), and a free incision made to evacuate the contents of the globe. If the eye be nearly detached by the missile, it will be best to remove it at once; in each case the surgeon will be enabled to extract with greater facility the bullet, and the after treatment will be simplified. It is seldom that during a campaign a soldier can be placed under favorable circumstances as to subdued light, careful dressing, &c., which are essential to the restoration of a wounded eye; and though, if there be a prospect of preserving the sight, the chance should be given

[1] 'Commentaries on the Surgery of the War,' p. 523.

to the patient, it will save him much suffering if the contents of the globe be evacuated, when the injury is irreparable, and when particles of stone are driven into it. The mere stroke from a bullet is not the worst injury which can befall an eye; a shower of gravel driven up by a cannon-ball or the explosion of a shell,[1] may mutilate it fearfully, and leave within it and in the orbit fragments which may be a source of the greatest suffering.

After an injury of this description the eye should be carefully examined, and every particle of foreign body removed; and then, if the case be a simple rupture or lacerated wound,

[1] It is well known that the great Lord Nelson lost the sight of one eye at the Siege of Calvi, and never having seen an accurate account of the particulars, I have taken pains to ascertain them.

In a letter to his wife (August 18th, 1794), Nelson states,—"A shot having hit our battery, the splinters and stones from it struck me with great violence in the face and breast. Although the blow was so severe as to occasion a great flow of blood from my head, yet I most fortunately escaped, having only my right eye nearly deprived of sight; it was cut down, but is so far recovered as for me to be able to distinguish light from darkness. As to all purposes of use, it is gone; however, the blemish is nothing—not to be perceived unless told. The pupil is nearly the size of the blue part—I don't know the name." The immediate effect of the injury was only to confine Nelson from duty one day, but he appears to have suffered a good deal subsequently.

Sir John Liddell was so polite as to cause search to be made among the records at the Admiralty, but he informs me there are no documents whatever relating to the injury that Lord Nelson received at the Siege of Calvi.

Having consulted every work that I could find bearing upon the subject, and well weighed the various statements, I am of opinion that the primary injury was concussion of the retina, which would account for the loss of sight and great dilatation of the pupil. I have been puzzled by the expression that the eye was "cut down"—a nautical phrase, signifying diminished in size—and at first thought that rupture of the globe had taken place; but if so, Nelson would surely have been confined more than one day, and the medical officers would have reported the injury, which they appear not to have done. It is most probable that secondary inflammation took place, which would account for the annoyance caused afterwards; atrophy of the globe may have been the ultimate result. The constant use of a patch to conceal the eye would imply disfigurement.

cold-water dressings, and the lightest possible applications, should be adopted.

The following case, which occurred in St. Mary's Hospital, illustrates this form of injury; for although fired from a pistol, the effects were similar to those produced by gravel driven by a heavy shot or shell.

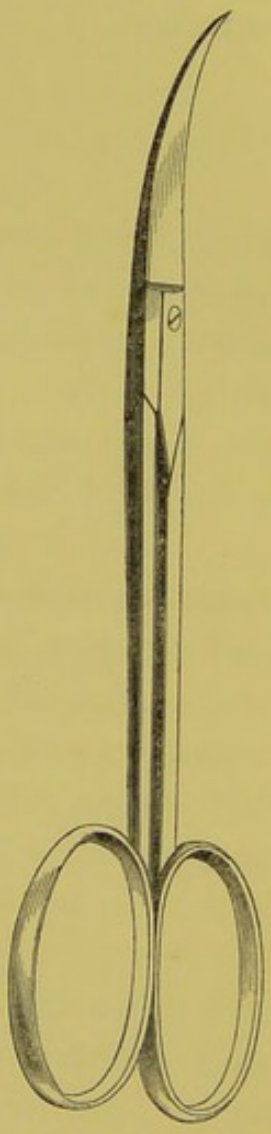
Emily L., aged 23, was brought to St. Mary's on the 7th July, 1856, having been shot in the face half an hour previously with a horse-pistol loaded with pebbles. Immediately after the pistol was fired, she fell to the ground stunned by the blow. When admitted, there was an irregular contused and lacerated wound over the right orbit, and the upper eyelid was torn through at the outer canthus. On raising the eyelid, which was much swollen, the eye was found quite destroyed, with the iris protruding. The left upper eyelid was swollen and red, ecchymosed in patches, and incapable of being opened.

During the next three days she suffered agonizing pain in the right eyeball, the swollen lid of which was exquisitely tender to the touch; and this pain continued, more or less, until the 14th. The right eye was utterly destroyed, and when an examination could be made of the left eye, it was ascertained that the cornea was ulcerated in one or two points, and there was considerable surrounding inflammation, evidently caused by grains of powder impacted in the sclerotic conjunctiva. The judicious treatment employed by Mr. Ure gradually subdued the inflammation, and when the patient left the hospital, she was able to use the left eye, although there remained several grains of gunpowder impacted in its surface. The deformity caused by the bursting and complete sinking of the right eye was materially diminished by the introduction of an artificial eye.

Two remarkable cases of recovery from gun-shot wounds

are mentioned by Dr. Dunlop. In a duel in the West Indies, one gentleman hit another in the eye, which was completely demolished, and the ball passing in through the orbit came out in front of the ear; notwithstanding which the officer recovered with rapidity.

Fig. 18.



Lieutenant Gray, a brother officer of Dr. Dunlop, received a buck-shot in the left cheek; the ball lodged behind the right eye, which was instantly deprived of sight, and remained much inflamed for some days; these symptoms subsided, and no further inconvenience was felt than a want of power in moving that eye (which remained blind) in concert with the other.[1]

After wounds from bullets, sabre-cuts, or extensive lacerations of the eye received in action, the strictest antiphlogistic treatment must be enforced. The injured eye should in the first instance have cold-water dressings; if suppuration takes place fomentations must be substituted; heavy dressings to be avoided, as calculated to heat the parts; if there be much discharge, the dressings should be changed frequently, as it is highly objectionable for them to become foul and offensive. The diet should be low, and the usual means adopted to prevent inflammation.

[1] Beck's 'Med. Jurisprudence,' p. 629.

If the painful fungous growths described by Dr. Hennen arise, they should be carefully sliced off with scissors (fig. 18) level with the eye; the use of nitrate of silver drops, four grains to the ounce, applied to the wound, will check their recurrence.

## CHAPTER IV.

The class of wounds which last engaged our attention are simply destructive to vision; the class now to be considered are made instrumental to the restoration of sight, because operations for cataract and artificial pupil come under the denomination of incised and punctured wounds; it is not, however, with that division of the subject that I propose to deal.

To avoid needless repetition I shall consider punctured and incised wounds together, as for practical purposes they are merely modifications of one description of injury.

To Mr. Bowman we are indebted for an accurate account[1] of the changes manifested in the cornea when pierced with a knife or a needle, and a right understanding of these changes is necessary to enable us to follow the process of reparation.

If we puncture or incise the cornea, the first effect is a change wrought in the natural actions of nutrition then existing in the wounded part—a change which can only be described as a mechanical interruption to those actions. This is speedily followed by the presence of an increased quantity of blood in the vessels that are nearest to the wounded part, and thus the materials from which the breach is to be made good are brought in greater abundance to the part that

[1] 'Lectures on the parts concerned in the Operations on the Eye,' p. 28.

requires them. We cannot doubt that as these vessels, comparatively so remote, are thus affected, so the part of the corneal tissue intervening between them and the exact seat of injury, is pervaded by a corresponding change of which the general expression is, that it is one of exalted nutritive vigour; the play of forces and the interchange of material which mark the nutritive function being more energetic and more rapid than before. And whatever phenomena of this kind occur in the intermediate tissue are concentrated in an especial manner about the wound itself. In a short time the vicinity of the injured part begins to contain in abundance nuclei or cytoblasts, which exist sparingly in the corneal lamellæ, and the relative quantity of which may be regarded in most tissues as an index of the intensity of the nutritive function. These particles are speedily found choking the interstices of the tissues in the lips of the wound, and covering its surface so as to occupy whatever space was left between its opposite sides, and bringing them into temporary union.

From the presence of these embryo materials of new tissue, intermingled among the elements of the old, is derived that slight milky opacity which envelopes and marks the seat of wound; and which, if the injury be extensive, may engage a considerable extent of the cornea in the direction of the neighbouring blood-vessels. The breach being filled, the new material is gradually transformed into products resembling those tissues among which it has been poured; the blood-vessels at the border of the cornea resume their size, and at length, in the most favorable instances, all vestige of the wonderful process which has taken place vanishes away.

Wounds of the cornea present themselves of every size, from the minute puncture of the surgeon's cataract-needle, which does not even cause escape of the aqueous humour, to

cuts and lacerations the most extensive; but there is no puncture or scratch, however slight, which is devoid of risk; and no wound, within certain limits, from which the eye may not recover under favorable circumstances. The earlier the age the greater are the restorative powers, and if the patient is healthy, the less disposed is the eye to take on inflammation; even in advanced age the recovery from operations is often surprising.

If there is actual destruction of substance of the cornea an opacity will follow, and an opaque line usually marks the cicatrix of a wound. The mode in which this arises has been thus explained by Mr. Bowman. The mechanical arrangement of the elementary lamellæ of the cornea, on which its transparency depends, is so artificial, that when once removed the loss cannot be supplied with tissue of an equally elaborate organization. The new material is fibrous instead of lamellated, and opaque instead of translucent. It contains a considerable quantity of yellow tissue intimately mixed with white, and both most irregularly interwoven and ill developed; but though this may be the ultimate blemish, its dimensions are for a time increased thus: during the progress of the reparative process there exists in the part and its immediate vicinity an excess of fresh material, which not being required is in due course absorbed. This augments the opacity whilst its lasts, but ultimately disappearing, there only remains the ill-developed, opaque new structure above described.

If a wound of the cornea does not heal kindly, the edges swell and pus is secreted; this pus is yellow and tenacious, and separates the edges of the wound. The process of healing is now tedious, but as it proceeds the quantity of pus diminishes and the edges of the wound approximate, until at length they are cemented together in a dense cicatrix, which

leads to a permanent blemish; for, although it may lessen in time, the white cicatrix tissue never becomes transparent.

A little boy, aged 9, was brought to St. Mary's Hospital, August 3d, 1858. Three days previously, whilst playing with a chisel in his father's workshop, he wounded his right eye. No treatment beyond occasional bathing with warm water had been adopted. There was a clean transverse cut through the whole lower third of the cornea; the edges were swollen and slightly everted, and the aqueous humour drained through the wound; the fibres of the iris were entangled, and the pupil was much drawn to it. There was but little inflammatory action. A tonic plan of treatment, with occlusion of the eye and the use of belladonna, was adopted, but nearly three weeks elapsed before the wound united; a flake of thick pus kept the edges apart, but the local application of a weak solution of nitrate of silver excited healthy action, and they gradually drew together; union had taken place at the end of five weeks, and when ten weeks had elapsed, there was a dense white cicatrix with an irregular outline; attached to this was the iris, and the pupil was reduced to a small opening (which, however, sufficed for vision) just above the margin of the cicatrix.

Alfred Walden, aged 11, was brought to the North London Eye Infirmary, May 10th, 1845. On the 7th inst. he was struck on the left eye by a sharp piece of slate, which inflicted a severe wound on the cornea. Nothing was done to the eye that day, but on the following, a surgeon was consulted, who ordered a mixture to be taken every three hours, and a lotion for the eye; in the evening three leeches were applied to the temple.

On the 9th he suffered much pain, and on examining the eye on the 10th I found, extending from above downwards through two thirds of the cornea, a wound, opening into the

anterior chamber; the iris had become involved between the edges of the wound, and was in a state of acute inflammation; a mass of glutinous pus projected from the wound, and more pus was in the anterior chamber. There was considerable chemosis, and the conjunctiva and sclerotica were acutely inflamed.

The condition of the eye requiring energetic treatment, he was ordered to be kept in bed in a dark room, and to take a grain of calomel and a sixth of a grain of opium every six hours; the eye to be frequently fomented, extract of belladonna to be applied freely to the brow.

12th.—The mouth decidedly affected; there is little change as yet in the condition of the eye, there being considerable hypopyon, the glutinous pus hanging out of the wound, from which the iris has retracted. As he seemed low, I omitted the mercurials, and ordered one grain of quinine thrice daily, and meat diet.

16th.—Great amendment has taken place: the general inflammation is much diminished, the pus has disappeared, the wound in the cornea is healing, the iris is much brighter, and the general power is greater. As the pus disappeared, the pupil became visible, and a traumatic cataract displayed itself.

From this time the eye continued to improve. The lad was supported by good diet and tonics, and on June 10th he was discharged, the cicatrix in the cornea and the traumatic cataract alone indicating the serious injury.

When an extensive wound is inflicted on the cornea of a person of feeble powers, a certain amount of constitutional vigour is necessary for union to take place. This failing, there will be seen about the third day puffiness at the inner angle of the eyelid, and complaint will be made of pain, or only of uneasiness. This, however, is deceptive, as a large

amount of mischief may be accompanied with very little pain. If the eye be then examined, the edges of the wound will be found gaping widely asunder, the space being occupied either by iris or tenacious pus. The cornea will, sooner or later, be infiltrated with pus in the cases which I have specially in view; and if much violence has been inflicted on the eye, the whole membrane may be permeated by it. The conjunctiva will be dull red, and raised by effusion into the condition termed *chemosis*. The termination of such cases is unsatisfactory; the cornea may retain its transparency here and there near the margin, but the eye is rendered useless for visual purposes. The projecting edge of the wound ulcerates, and the pus in the cornea works out by the ulcerative process. New material, into which a few vessels run, fills up the vacant space. The chemosis subsides, and by slow degrees the sclerotic reappears as the vascular veil which has concealed it is removed. After the lapse of some weeks the eye may recover with merely a dense leucoma on the cornea; I say merely a dense leucoma, for worse may happen. Slow, disorganizing inflammation of the deep tunics may weary the sufferer with neuralgic pain, and cause first, softening, then wasting of the globe; or the ulcerative process may so destroy the cornea, that the new tissue is but a weak and imperfect covering to the iris, and a staphylomatous projection may result. These are the worst cases. A portion of the cornea may retain transparency, and sight may be restored by an artificial pupil in more favorable instances.

Scratches of the cornea so slight as to be scarcely perceptible are very painful, and occasionally cause formidable inflammation. Last year I attended with Dr. Fuller a gentleman who, turning over the 'Times,' scratched with the edge of the paper the right cornea. He thought nothing of it at the moment; but the eye became more and more painful,

and when I saw him the following day it was in a state of acute inflammation, which speedily assumed a gouty character, and did not yield till after the employment of active treatment.

I have seen several instances of scratches of the cornea from the nails of children in arms, and in each some days elapsed before the eye recovered. But the worst accidents of this description are from the eye being scratched by the beards of barley. Walther[1] mentions that in the Isar district of Bavaria from fifty to sixty eyes are annually lost in this way. The sufferers are the reapers, robust, full-blooded men, living high and working under a hot sun. They receive a scratch in the eye from the rough and serrated beard of corn, neglect it, or irritate the eye by some popular nostrum; then an abscess forms in the cornea; pus shows itself in the anterior chamber, and ultimately the cornea is destroyed by suppuration, and the sight is lost. Mackenzie states that his experience agrees with that of Walther, but in Scotland the sufferers are generally women, and much of the bad effects is no doubt attributable to neglect. The internal structures of the eye inflame, the cornea becomes infiltrated with pus, and bursting, gives rise to staphyloma.

Unusual forms of opacity of the cornea occasionally present themselves in traumatic cases, of which the following is an example, the patient being under the charge of Mr. Bowman, at Moorfields.[2] She was a poor woman, reduced in health and spirits from repeated ill-usage on the part of her husband, and she received a blow on the left eye from a tea-cup, which he threw at her in a fit of drunkenness ten days before she applied at the Ophthalmic Hospital. At that time, August 3d, 1846, there was a penetrating wound half

[1] 'Merkwürdige Heilung eines Eiterauges,' p. 25.
[2] 'Lectures,' p. 121.

an inch long through the sclerotica and choroid, on the outer side, and a clot of blood behind the lens, which remained transparent. The iris was adherent to the lens on the side of the wound, and she was totally without sight in that eye. The wound healed, and the lens gradually became opaque. On October 15th, the right eye was complained of as having been getting dim a fortnight, and its cornea appeared covered in the central region with minute circular specks. The pupil was bordered with a black rim of uvea, and the contiguous part of the capsule was muddy. The pupil dilated under atropine, leaving on the front of the lens a circular line of dirty-looking lymph. On the 22d the right lens was clear, but the specks on the cornea remained the same, and the left cornea presented large spots of opacity like mould spots. On November 12th the left cornea was almost entirely obscured by opaque deposit; the right cornea was still studded with a dense cluster of very minute, distinct round spots. Under the influence of tonics the opaque deposit disappeared from the left cornea, but many months afterwards the minute, dark circular spots continued in the right cornea. She had fair vision, however, though she could not see small type or thread a needle.

Penetrating wounds of the cornea almost invariably involve loss of the aqueous humour; in many, prolapse, or at least adhesion of the iris to the cornea, is a consequence; the nearer the wound to the margin of the cornea the greater is the risk of prolapse. It is well remarked by Mackenzie, that very extensive divisions of the cornea are less liable to be attended with prolapse of the iris than those which are limited; thus, the section of the cornea in extraction of cataract is rarely followed by immediate prolapse, while a small section, such as is made for artificial pupil, generally gives rise to it. The prolapse results partly from the iris

losing the support of the aqueous humour which has been evacuated, and partly from the rush made by the rest of that fluid to escape.

In performing extraction, if the aqueous humour escapes when the knife has only partially traversed the anterior chamber, the iris will be seen not merely to fall before its edge, but to lap itself over it.

In proportion as the prolapse is great will the displacement of the pupil be serious; serious as a deformity and from its effects upon vision, for as perfect vision depends upon the image being correctly formed upon the retina, any interference with this detracts from its accuracy. In many cases the pupil disappears altogether, and if the prolapse should be at the upper edge of the cornea, it may, though not obliterated, be practically useless from its being covered by the eyelid.

The tendency to contraction of the pupil is in some cases irresistible; it often becomes a mere chink, or is entirely closed by lymph. Another morbid condition is fading of the colour of the iris; the fibres may remain distinct, but the colour undergoes considerable alteration; a hazel iris, for example, has assumed in two thirds of its extent a pale grayish hue, affording a striking contrast to the opposite eye. In these cases I have observed a tendency to softening of the globe, though not in a marked degree, and under irritation or excitement the sclerotic assumes that pale pinky hue characteristic of long inflammatory action; the pink tint is generally diffused, as if the membrane had been dipped in a weak solution of carmine, and is distinct from the redness caused by separate and visible blood-vessels.

Harriet Turner, aged 8, became a patient at St. Mary's, February 2d, 1858. Three days previously, whilst undoing a knot with scissors, they slipped, and one of the blades

entered the right eye close to the margin of the cornea. The eye was merely washed with milk and water for two days, when it became painful and intolerant of light, and on presenting herself at the hospital it was found in a state of acute inflammation. At the upper and outer margin of the cornea was an incised wound, somewhat irregular in outline; in this the iris was involved. There was a marked white opacity of the capsule where it had been wounded, which terminated abruptly (fig. 19), and beyond this the

Fig. 19.

gray haze of the opacifying lens was visible. There was perception of light, but the child complained of pain.

The usual treatment was adopted, and the acute inflammation gradually subsided, but the diminution in the pupil became more and more marked. She ceased attending at the hospital, but in the following December I saw her again, and this was the condition of the eye. The pupil was closed to a mere transverse line, and was adherent to the opaque capsule behind; the iris, naturally brilliant hazel, had faded, being of a grayish tint through two thirds of its extent; the upper third retained somewhat of its normal hue; the fibres were strongly marked, as was the brilliant reflection from the surface of the iris; the globe was somewhat softer than that of the other eye. She could just perceive the light of a candle, but had no further vision.

Replacement of a hernia of the iris, after a wound inflicted on the eye, is stated by Larrey to have been suggested to him by an accident to his own daughter. This child, seven years of age, was cutting bread with a knife, when a crumb flew into her right eye. Startled by the pain, she threw up her hand to her eye, forgetting that she held the knife in it, the consequence being, that the sharp point was plunged into the cornea, cutting it obliquely through the whole of its external half, and making a wound three or four lines in length.

A portion of aqueous membrane and of iris protruded, forming a hernia the size of a pea. Larrey came in at that moment, and, he says, preserved the courage and *sang froid* to render help: with a gold probe he gently replaced the protrusion, and found it was retained. The lid was then closed, and the eye fixed by means of compresses and a bandage. By strict diet, cooling drinks, and quiet in a dark room, a rapid recovery took place, and so perfect was it that no trace of the accident remained, nor was the sight at all impaired.

A similar accident came under my notice in 1856. I was one day fishing in Scotland, when I was accosted by a miner, and asked by him to go to his little child, who had "cut out one of his een." Knowing the tendency of the lower orders to exaggerate, I thought it possible that the accident was trifling; however, I put up my rod, and at once accompanied him to his cottage. Here I found a crowd of neighbours recommending a variety of remedies; however, I cleared the apartment, and proceeded to examine the eye; I found the cornea completely divided transversely through its centre, the iris cut, and protruding. The accident had thus arisen: the child was trying to disentangle a knot in one of his boot-ties with a sharp-pointed table-knife, when the knife

slipping was jerked up, and inflicted the wound on the eye.

He seemed to suffer little or no pain, and allowed me to do what I thought necessary. With a probe I replaced the iris, and closing the lids, secured them by strips of plaster; a compress and bandage were then applied, and ordered to be constantly moistened with cold water.

The progress of the child was satisfactory, and the wound in the cornea healed, but there was a deformed pupil and a traumatic cataract.

Traumatic cataract is indeed the usual effect of these severe wounds of the eye; but hairbreadth escapes occur, as in the case of Mlle. Larrey, and the following, related by Von Graefe.

A lady received an incised wound in the eye, by which the cornea and iris were in great part divided. She recovered without any impairment of vision; the capsule of the crystalline had not been touched, consequently there was no cataract. This escape was remarkable when the proximity of the parts is considered.[1]

Mackenzie mentions a still more remarkable case. The crystalline capsule was actually scratched by a sharp body, without being penetrated, and a permanent white mark remained in evidence of the narrow escape.

A curious case of injury from the bite of a dog fell under my notice in 1857. When Lord Granville returned from his embassy to Russia, 1856, he brought with him some wolf-hounds, large and ferocious animals. The daughter of his coachman laid her cheek caressingly on one of them, and the brute seized her by the face, but happily her long hair getting into his throat caused him to release his hold immediately.

[1] 'Ann. d'Oculistique,' 1855, p. 180.

Mr. James E. Mathew was immediately sent for, and has favoured me with the particulars of her condition on his arrival.

The canine tooth had passed through the left upper eyelid at the angle nearest the nose, the integument was much torn from within outwards, exposing the deep cellular tissue and the parts adjacent; the levator palpebræ was completely but irregularly divided, the upper division very much injured, the lower portion hanging from the eyelid, which was everted, its inner surface therefore exposed and covered with clotted blood. The parts were placed in proper apposition, and three stitches applied. The eyeball was so covered with extravasated blood that the injury which it had sustained was not perceived, nor could it be readily detected till after the lapse of some days, when it became apparent that the tooth had penetrated the eyeball, and produced prolapse of the iris.

On January 9th, 1857, the case was seen by me in consultation with Mr. Mathew; ptosis was complete, there being no power of raising the lid; when drawn up, as in

Fig. 20.

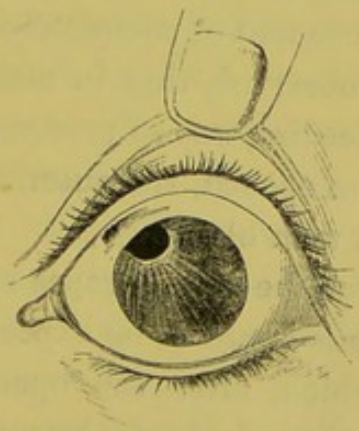


fig. 20, the upper and inner portion of the iris was found to have disappeared; the pupil was dragged towards the margin

of the cornea, and there was a dark mark in the sclerotic near that spot indicating the seat of the wound.

We applied strong nitric acid to the external surface of the lid, which was productive of great advantage, as in two months the cornea was half uncovered when the lids were opened, still the displacement of the pupil entirely prevented sight.

To obviate this, on the 23d April, the patient being chloroformed, I made an incision through the cornea, below the mesial line, and with Tyrrell's blunt hook drew down the margin of the pupil and fixed it in the wound. No inflammation followed, and the appearance of the eye on its recovery from the operation was as represented in fig. 4, Plate I. The pupil being well below the margin of the lid perfectly good vision was restored.

From the skilful manner in which the external wound had been treated immediately after the accident, the deformity was much less than might have been expected.

Punctured and small incised wounds of the iris are followed by comparatively little effusion of blood; but lacerations of the membrane near the ciliary margin, and above all, detachments of the membrane, are accompanied by profuse bleeding, often to the extent of completely filling the anterior chamber. Fischer[1] observed, that in making artificial pupil by separation, the bleeding was so profuse, that on the fourth day, when the eye was opened, the anterior chamber was still more than half-filled with blood.

When the iris is cut the wound gapes and does not unite; healing of such wounds is not to be expected, though I have seen instances in which, after the operation for artificial pupil by incision, a clot of blood obstructed the passage of

[1] 'Klin. Unterricht in der Augenheilkunde,' p. 328.

light through the wound, and the fibrin remaining after absorption of the colouring particles, contraction took place, and the edges of the cut were drawn together; nevertheless, though in apposition, they did not unite. I had in St. Mary's a curious instance of a boy, on whose eye the late Mr. Guthrie had operated for artificial pupil, and the wound had thus closed defeating his object; I repeated the operation, making a free incision in the iris, and was surprised to find subsequently that again a coagulum blocked up the new pupil, which was again reduced to a mere line. I believe, however, that when this happens, the iris has lost somewhat of its contractility from previous inflammation; for after a healthy iris has been cut, as a general rule the gap remains open.

The iris does not readily inflame after clean incisions, but punctured wounds and bruising of the membrane excite inflammatory action. There is no operation undertaken with more confidence of speedy recovery than that for artificial pupil by incision; and even when forceps are used, and a strip of fibres torn away, the membrane seldom inflames; but iritis is very likely to follow bruising, by rubbing the iris, or pressing it to make it contract if it falls before a knife in extraction; and though the deformity may be greater, the risk of inflammation is less, if a portion of the edge of the pupil is cleanly shaved off, instead of much friction being used to make it retreat from before the edge of the knife.

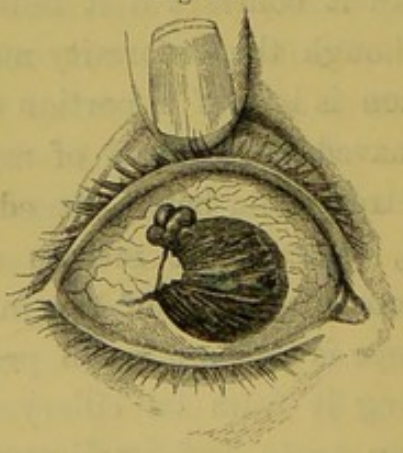
Nor is the iris, at least the margin of the pupil, very sensitive to incisions; but one of the most painful of the operations on the eye is that not much practised at the present day, of tearing it from its ciliary attachment; then, indeed, is the pang acute, and implicates the supra-orbital and other branches of the fifth pair.

A prolapse of the iris after a wound is a serious complica-

tion; it greatly retards the recovery of the eye, and adds to the sufferings of the patient. It has, too, a tendency to increase, and that which at first was a small protrusion, slightly dragging the pupil, may after a time cause most serious distortion; I recall to mind cases in which it even led to complete obliteration; its presence is usually indicated by a sensation as of a foreign body under the lid, and this usually continues long after the wound has healed; until, indeed, the projection has disappeared. The following case is a remarkable exception.

A young gentleman was brought to me, August 31st, 1858. Two years previously, whilst at school, he was running along a dark passage, when he came with great force against the latch of a door, which struck his right eye, laying open the globe without cutting the lid; at the time it was not thought that the eye was injured, but it became swollen and painful the next day, and he was sent home. A surgeon was at once consulted, who recognised the character of the injury, and took all proper measures. He was under treatment two months, during which he suffered scarcely any pain.

Fig. 21.



The condition of the eye when I saw him is represented in fig. 21. There was the mark of a wound at the outer edge

of the cornea extending into the sclerotica, upwards and also outwards, about two lines in length. At the upper portion was a considerable projection, of a dark hue, apparently partly iris and partly choroid. The iris was dragged to the wound, and was obliterated on the outer side; the pupil was also involved in the cicatrix, and was filled with opaque capsule; there was bare perception of light.

The singular point is, that not only was he free from pain whilst this serious wound, involving such delicate and highly organized structures, was healing, but that he was unconscious of any sensation of a foreign body under the lid though the projection was so marked.

If the patient be seen soon after the injury, and prolapse of the iris has taken place, we should direct his face to the light and close and open the lids several times, allowing a pause between each; the sudden exposure to light powerfully stimulates the contractility of the pupil, and thus the iris may be drawn back; this failing, we may with the utmost gentleness endeavour to replace the protruded portion with the rounded extremity of a probe, but if the aperture be small and the portion of iris tightly girded like a strangulated hernia, such attempts will seldom succeed, and it is better to snip off the protruded portion with scissors (fig. 18). This may be done without much difficulty when the wound is quite recent, but after the lapse of some hours the eye will become irritable, intolerant of light, and unable to bear the necessary exposure; the iris, too, will then more easily resent any pressure. According to my experience prolapses are very seldom overcome by Belladonna, and I believe that the simplest, and on the whole the best mode of proceeding, is to bring the patient under chloroform, and to remove with scissors the extruded portion; the wound

will then unite, and a tedious confinement and much neuralgic suffering be averted.

Should this not be adopted, the next best course will be to close the eyelids and to keep them perfectly quiet for ten days or a fortnight; opening them causes a spasm of the muscles of the eye, which compressing the globe, has a tendency to force out more of the iris; the brow should be freely painted with Extract of Belladonna reduced to the consistence of cream (the pure extract is generally far too thick to be readily absorbed), and this may be covered with oiled silk or gutta percha sheeting to prevent its drying, and also for the sake of cleanliness.

Where there is a small prolapse with a tendency to increase, it will be important to cause speedy adhesion of the iris to the wound; this is best accomplished by touching the prolapse with a finely pointed stick of nitrate of silver; it is proper to place a drop of oil upon it immediately afterwards, which materially lessens the pain and irritation. The eye should then be closed, and treated as already directed.

I am quite sure that it is not safe to use too great endeavours to return a prolapsed iris into the eye; it may be pushed back, but again and again will it protrude, and the unavoidable bruising with the probe will be very likely to excite iritis and all its attendant evils; it is far safer in such a case to snip off the prolapse as close to the wound as possible. The power of contraction of the pupil is greatly diminished when it has lost the support of the aqueous humour, but at the moment of its escape the iris contracts vigorously. Unless the iris be completely paralysed by use of a strong solution of atropine prior to extraction, the pupil will, however dilated, contract briskly the moment the

aqueous humour jets out, and the curette has to be used in a very diminished space.

The following case, related by Professor Quadri,[1] is interesting.

A young lady was struck with scissors in the left eye and completely lost the sight. Quadri discovered a cataract and slight hernia of the iris, with displacement of the pupil towards the wound. The pupil having been dilated, the lens was found completely divided into two portions. Some days after, the protrusion of the iris increasing, Quadri excised it with scissors, and there immediately issued from the wound portions of soft crystalline which had been pushing the iris from behind; light pressure being made, the whole of the softened and opaque lens was squeezed out, the eye closed, and the patient speedily recovered with restored sight.

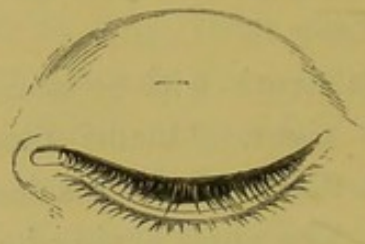
The most frequent mode in which an eye is wounded is either by the accidental slipping of some sharp instrument, whereby it is jerked up into the eye, or from glass, as by the bursting of a soda-water bottle, of which I have seen many instances, or by mischievous throwing of stones, &c. The lid may be wounded, but it by no means follows that its wound should correspond with that in the eye; the instinct of preservation causes the muscles of the globe to carry the cornea far under the upper lid, and thus the eye may receive a wound in a very unexpected position.

J. S., a policeman, from the Great Western Railway, was admitted into St. Mary's, December 6th, 1855. About half an hour previously, whilst cutting a piece of wood with a penknife, with his head bent forward, the knife slipped, flew up, and passed through the upper lid into the eyeball. The upper lid presented a clean incised wound nearly in its

[1] 'Ann. d'Oculistique,' t. xxxviii, p. 178.

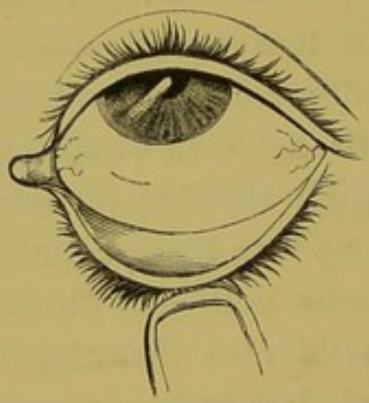
centre, full a quarter of an inch from its margin (fig. 22).

Fig. 22.



The wound in the eyeball was considerably *below* the cornea, and somewhat to its inner side (fig. 23). The sight

Fig. 23.



was extinguished. There was a free discharge of vitreous humour through the aperture in the sclerotica, the eye was injected with blood, and much pain was complained of. The vitreous humour continued to ooze through the wound for three days, then gradually ceased, and the wound united, but three weeks elapsed before the cicatrix was firm. The lens was uninjured, but nearly three weeks elapsed before the sight began to return, and then very gradually. The treatment was simple, and mercury was not used. He was discharged on January 1st, and the sight was then sufficient to enable him to discern large objects. He continued as an out-patient for three weeks longer, at the end of which time

the sight was nearly equal to that of the other eye, and he was able to perform his duties as a policeman. The wound in the sclerotica appeared to have cicatrized with a dense tissue, apparently as firm as the surrounding membrane.

When the sclerotica is cut through but the choroid not divided, that dark membrane will be seen, either as a line marking the incision, or swelling into it. If the incision be clean through both membranes, the hyaloid and vitreous will project through it, for the delicate retina offers no appreciable resistance, though it may bulge into the wound; it is of tenextremely difficult to reduce protrusions of these membranes, they being kept up by the spasm of the muscles which compress the globe; but if the lids be closed and the eye left perfectly quiet, they will often retreat of themselves.

It has been somewhat loosely asserted that wounds of the sclerotica do not unite; on this point Mr. Dixon's remarks are so just, that I shall quote them. "If the term 'union' be arbitrarily restricted to mean 'repair of a wounded part by new-formed substance absolutely similar in structure to the original tissue,' there is, perhaps, no such process as *union* to be met with in the human body; for the composition of every cicatrix differs from that of the once severed parts which it brings again into apposition; but if the word be taken in its ordinary acceptation, then most assuredly wounds of the sclerotic *do* unite, and very closely too."[1]

Generally speaking, indeed, wounds of the sclerotica heal readily, but exceptions occur. Desmarres has seen suppuration and loss of the eye take place after such an accident. Hasner, also, has noticed a case in which the edges of a wound of the sclerotica swelled, became everted and infiltrated

[1] 'Practical Study of Diseases of the Eye,' p. 110.

with pus. In the case of a child who had pierced the eye with a fork, suppuration of the sclerotica was propagated to the entire eye, and led to wasting of the globe.

One of the effects most to be dreaded from punctured wounds of the eye is cataract; this almost certainly follows the admission to the lens of the aqueous humour, and the opacity is rapid in proportion as the rent in the capsule is large and the patient young. In advanced life the effect is neither so rapid nor so marked; the increased density of the lens materially retards the change, so much so, that I have seen little effect produced on a lens where the capsule was purposely opened to establish absorption.

Höering performed a great number of experiments on wounds of the capsule of the lens, and arrived at the following conclusions:

That wounds of the anterior capsule have a great analogy to those of the cornea, and that like it, they tend promptly to cicatrization by simple adhesion, and that this union is only prevented when the substance of the crystalline places itself between the edges of the wound; every time that the wound was linear and made with a sharp cutting instrument, and there was no disturbance of the crystalline, complete cicatrization took place.

In cases where the lesion has been extensive and symptoms of inflammation have happened, thickening of the capsule and plastic exudations have been found. Beger, on one occasion, found vascular injections in this membrane.

F. M., aged 8, was brought to St. Mary's, July 19th, 1858. On the previous day he was looking into the muzzle of a toy-gun which he had charged with a piece of wood having a needle stuck in it, when the gun accidentally went off, and the needle entered the right cornea near its centre, where it remained until pulled out. When I saw the eye

there was a general sclerotic blush, and the iris, naturally gray, had a greenish tinge; a hazy point on the cornea indicated the seat of the wound, and corresponding therewith was a hazy point in the capsule of the crystalline lens, close to the margin of the contracted pupil. Simple treatment was adopted, and on July 26th the eye was quite free from inflammation, the iris of a natural colour, but adherent to an opaque spot in the capsule; the lens was perfectly clear, and I thought the case would be one of those exceptional instances in which the lens escapes opacity, but I was mistaken; after the lapse of a month the sight became impaired, and an unmistakeable gray film occupied the pupil. This I watched, and saw it gradually increase in opacity, but very slowly, so that three months elapsed before traumatic cataract was fully developed; the opaque spot in the capsule remained unaltered; the pupil was disengaged by atropine.

The following case, which happened nearly at the same time as that just related, assumed a much more formidable character, and resulted in loss of the eye.

T. W., aged 8½, was brought to St. Mary's, July 31st, 1858. A fortnight previously he was looking through a keyhole, when a boy on the other side thrust a pin through and wounded his right eye. There was much pain, and the eye was poulticed with a mess in which bruised snails formed an ingredient. The cornea now presented a wound near its centre, still open, and surrounded by a considerable haze; the iris, naturally hazel, was dark reddish brown, and in contact with the cornea; the capsule of the lens was opaque, and the pupil, reduced in size, and of a narrow crescentic form, was adherent to it. There was much venous congestion of the conjunctiva and sclerotica, and a purple zone surrounded the cornea.

The child was feeble, and not in a condition to bear

powerful treatment; two leeches were applied, and gray powder, with sesquioxide of iron, administered twice daily; the eye to be frequently fomented with a belladonna lotion, and the brow to be rubbed with extract of belladonna and opium. At the expiration of a week great amendment was visible; the vascularity had diminished, and the iris had to a considerable extent recovered its natural hue; the mercurial was after a time suspended, and quinine with iron substituted; the eye gradually lost the inflammatory condition, but the pupil remained closed.

When then, the aqueous humour has been admitted to the lens, the effect will be marked in proportion to the size of the aperture in the capsule; if that is sufficiently large, the whole body of the lens shows its influence; at first a faint cloudiness pervades it, then a gray tint is assumed, and within from five to sixteen days the whole lens has lost its normal character, and been converted into a semi-opaque mass. As for the capsule, a white spot indicates the seat of the rent at an early period. This white mark may remain defined, or the whole anterior capsule may gradually take on a dense white hue, distinct from the grayish white of the lens, which has been compared not inaptly to milk and water.

If the puncture in the capsule be very small, as a prick with a needle, there may be no escape of the substance of the lens; if it is somewhat larger the elasticity of the membrane draws asunder the edges of the wound, and a small flake of lens-substance is squeezed out; this, at first small, may increase in size, sometimes breaking off, at other times pushing forward in the form of a mushroom; whatever be the size of these extruded portions they are always semi-transparent, as nearly as possible resembling a broken grain of boiled rice. If the opening in the capsule be large, more

and more lens-material may be forced out until the anterior chamber is half filled.

When a traumatic cataract has formed there is a strong tendency in the lens to assume fatty degeneration; I have repeatedly examined portions of lenses which have opacified from injury, and invariably found this characteristic.

The changes which take place in traumatic cataract of old-standing are illustrated by two cases in the practice of Professor Von Roosbroëck. A young man had for many years been the subject of traumatic cataract with synechia posterior. Von Roosbroëck made an artificial pupil and extracted what remained of the crystalline. Under the microscope, the principal change was found to consist in the confused aggregation of large transparent granules of a yellowish tint, resembling fat in appearance, but not soluble either in ether or in caustic potash, but quickly dissolved without effervescence in acids. Hence they were supposed to be amorphous phosphate of lime.

The other case was that of a young woman affected with traumatic cataract and synechia posterior ten years. The cataract was extracted entire; it was remarked that on cutting through it, the nucleus presented an elastic resistance like caoutchouc. When divided into two portions the cortical layers presented a grayish tint and nearly normal consistence; one half of the nucleus was deep yellow, the other half quite black; this black portion, after being macerated several days in water, lost a portion of its colouring matter; examined with the microscope when fresh, it is found that instead of fibres, of which no traces were discovered, there were large amorphous cells, some filled with light yellow liquid, others with blackish red granular matter, or of a bright red resembling the colouring matter of blood.

Neither ether, caustic potash, nor hydrochloric acid produced any appreciable effect.[1]

I have never known an instance in which a lens, rendered opaque from infiltration of the aqueous humour, has become clear. The following case related by M. Robert[2] is very remarkable. In 1835 a countryman, whilst gathering chestnuts, was wounded in the left eye by one of the prickles of the outer husk. This sharp body had traversed the cornea, and implanted itself in the crystalline. Some days elapsed before M. Robert saw the case, and when he did so, the crystalline apparatus presented a uniform milky whiteness, of which it was impossible to determine the precise seat. M. Robert extracted the spine entire through an incision in the cornea, bled the man largely, and covered the eye with cold water dressings. The following day the opacity had greatly diminished, and forty-eight hours after, had completely disappeared. The whiteness spoken of must have been either in the lens or the capsule, and in either case its rapid disappearance is marvellous.

A very favorable, but unusual circumstance, after puncture of the capsule of the crystalline, is for the lens to undergo absorption, and to disappear without any opacity of the capsule remaining, leaving the eye in the condition of an organ on which the operation for cataract had been performed with the happiest result.

On the 2d of April, 1856, I was consulted respecting Miss H., aged 8, under the following circumstances. In November, 1854, whilst threading beads with her little sister, a fine needle with which she was taking up the beads was suddenly jerked up by her sister, entered the centre of the right cornea and doubtless pierced the lens. The following day her

[1] 'Ann. d'Oculistique,' p. 127, 1856.

[2] 'Gaz, des. Hopitaux,' No. 150, 1851.

mother told me the pupil looked grey, and the sight was obscured. In a few days the lens became quite opaque, and the surgeon in attendance announced that cataract had formed. About six months later sight began to return, and the opacity was perceptibly diminished. After this (to use the mother's expression), the veil gradually lifted, till the pupil became black and clear. On examination the eye presented the following appearances. There was a minute speck discernible with a lens in the centre of the cornea, indicating the seat of the puncture. The anterior chamber was very large, the iris being somewhat concave; the pupil acted freely. There was no visible opacity of capsule. The sight was confused, but with a six-inch cataract lens she had excellent perception of distant objects, and with a four-inch could make out small objects. She had not been taught to read well in consequence of the accident to her eye. The other eye, being perfectly normal, afforded a good opportunity for comparing the difference in appearance caused by the absence of the crystalline lens.

A case which occurred at Moorfields is highly interesting, showing the changes consequent on a punctured wound of the eye by a piece of metal.

A lad, aged 17, was admitted, July 17th, 1858, at the Royal Ophthalmic Hospital, Moorfields, under the care of Mr. Dixon. He stated that sixteen weeks previously he had been struck in the right eye by a chip of brass, which entered in the front, and remained sticking there until a fellow-workman drew it out. Inflammation, attended by much pain in the globe, followed. There was still great irritability and some aching, and the sclerotic presented that peculiar diffused pink colouring commonly seen after long congestion. The globe was now somewhat softened; there was a scar in the cornea, a small anterior chamber, a traumatic cataract, and

adhesions of the pupillary margin. The lad continued under observation for about a month, when, as the pain continued, as the sight was totally lost, and as sympathetic irritability of the other eye was beginning to show itself, extirpation was decided upon. The existenceof cataract made ophthal moscopic inspection impracticable ; but from the soft, boggy condition of the globe, its diminished size, and the history of the injury and subsequent continued pain, &c., a tolerably confident diagnosis of detached retina had been arrived at. On August 10th the eye was removed ; no portion of metal was found in the globe. The retina was completely detached from the choroid, and formed a folded band of opaque white tissue, extending from the ciliary processes to the entrance of the optic nerve. The whole of the vitreous humour had been absorbed, its areolar framework being enclosed in the collapsed retina. Between the retina and choroid was a large quantity of yellow serous fluid ; the lens quite opaque, and its exterior calcified.[1]

The following is in many respects remarkable.

On May 3d, 1856, Captain C., an officer in the East India Company's army, was brought to me for consultation by Mr. Heward. Two years before, whilst at an outpost in India, he was struck on the left eye by the fragment of a glass bottle, which burst, and inflicted a formidable wound on his left eye. Far away from medical aid, and being a man of uncommon resolution, he determined to ascertain for himself if a piece of the glass had remained in the eye, and passing a probe into the globe, he moved it about in various directions. Nothing could be felt ; but, as might be expected, inflammation set in, and had continued, more or less, ever since. The condition of the eye when seen by me was

[1] 'Med. Times and Gazette,' No. 429, N. S.

as follows: the globe was softish, as if the vitreous humour was disorganized; the iris discoloured, very concave towards the inner side, but bulged forward towards the outer side by a mass, evidently the dislocated crystalline. There was a large cicatrix, extending from nearly the centre of the cornea to within a short distance of the external canthus. This was firmly united throughout its extent; the pupil was dragged by the iris being involved in the wound, and was filled with lymph (fig. 24). There was constant uneasiness in the eye,

Fig. 24.

and the other sympathised. My own impression was, that nothing short of removing the lens and sinking the globe would afford relief; but I was happy to learn from Mr. Heward subsequently that the object had been attained by simply depressing the lens. The soft condition of the globe led me to fear that this would not have answered.

Fishing-hooks, propelled by unskilled hands, occasionally become fixed in the human eye in place of their natural habitat. Twice have I known this happen, but in each instance the conjunctiva only was caught; the barbed point being snapped off with pliers, the shaft of the hook came away without difficulty. Mackenzie[1] relates a case in which the injury was greater.

[1] 'Practical Treatise,' p. 391.

On the 29th June, 1843, Dr. Mackenzie was raised out of bed at 2 a.m. to extract a fishing-hook from a man's cornea, where it had been fixed since the previous evening about eight o'clock. The point of the hook had penetrated into the anterior chamber, and the barb was covered in the substance of the cornea. By seizing it firmly with a pair of forceps, and drawing it steadily, the Doctor managed to make it retrace its path without enlarging the wound. Next day the eye looked well, but the iris, from the escape of the aqueous humour, was in contact with the cornea. The pupil having been dilated with Belladonna resumed its place, and in two days the eye was perfectly well.

On the 31st March, 1858, I was requested by my colleague, Mr. S. Lane, to see a patient who had been brought to town for his opinion, by Mr. Wethered, of Stroud. Three weeks previously, whilst chopping wood, a splinter flew up and stuck into his left eye. He instantly pulled it out and threw it on the ground. The sight was soon extinguished, and had continued so, notwithstanding the use of depletion, calomel and opium, &c.

The condition of the eye was as follows, when examined by me: conjunctiva injected, but not to any great extent; iritic zone slightly marked; iris slightly discoloured. The cornea presented a cicatrix towards its upper and inner third, and several vessels extended to it. The pupil was contracted and bound by adhesions to the opaque capsule of the lens. Through a rent in this capsule a soft piece of lens projected, like the paint from an artist's colour-bladder. I could not discern any splinter left in the eye. The splinter had pierced through the cornea, and plunged through the pupil into the lens, which became opaque, causing blindness. The man had perception of light.

M. A. Cartwright, aged 20, was admitted into St. Mary's

Hospital, May 5th, 1852. On Thursday, April 29th, a soda-water bottle burst whilst she was uncorking it, and a fragment of the glass struck her right eye, extinguishing sight, and inflicting a wound which caused much bleeding and acute pain.

When admitted, the whole face was slightly swollen, the right eyelids particularly so. The conjunctiva and sclerotica were acutely inflamed. On the inner side of the right eyeball was a wound of the sclerotica, half an inch in length, and implicating the margin of the cornea; the anterior chamber contained blood; the iris was discoloured, the pupil drawn upwards and inwards to the wound; there was not much pain, but she could not discern light with that eye.

She was ordered Hydr. Chl., gr. ij; Opii, gr. ¼; 4tis horis, and an active aperient.

May 8th.—The pain, which had increased, has now greatly diminished; the mouth is rather sore; no vision. (Omit the mercurials.)

13th.—Can now distinguish light from darkness. (Simple treatment.)

15th.—Can count fingers when held up before the eye; has no pain, and the blood in the anterior chamber is disappearing rapidly.

On the 22d, she had sufficient vision to distinguish the largest type, and the inflammatory symptoms had subsided. (Collyr. Plumbi, bis die; Mistur. Quinæ, ℥ss, bis die.)

She was discharged on the 27th, the eye being in the following condition:—Pupil drawn upwards and inwards, and adherent to the cicatrix at the margin of the cornea (fig. 6, Plate I); the wound in the sclerotica well united, but indicated by a dark line derived from the choroid. Sight still very imperfect, large characters only being discerned.

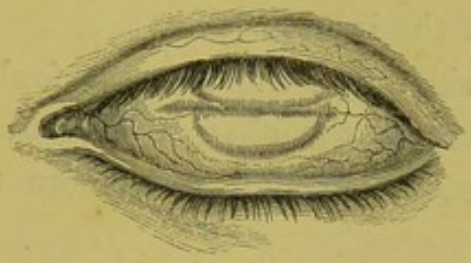
In June, 1856, I was calling at the North London Eye Infirmary to make an inquiry, when at that moment a little girl, five years old, was hurriedly brought thither, with a severe wound in the left eye, inflicted a few minutes previously. She had been seated on a step, when a boy mischievously threw at her a piece of broken window-glass, which struck her eye. There was a wound through the cornea and sclerotica, nearly half an inch in length; the vitreous humour was escaping freely, the iris wounded, and the lens came away in the handkerchief which had been tied over the eye. I gently examined the eye, and finding that no fragment of glass was left in the wound, closed the lids, and secured them with plaister, ordered her to be kept perfectly quiet, and simple cold-water dressings to be applied. No pain of any consequence followed, and the eye recovered rapidly from the immediate effects of the injury, though the sight was lost.

Very formidable are the injuries inflicted by arrows. I have seen several instances, and in almost all the eye was destroyed. The missile is sharp, heavy, and propelled with force, so that the eye is not merely wounded, but there is violent concussion.

In June, 1855, I was consulted on the following case:— A young gentleman, aged 10, was struck on the left eye by an arrow discharged from a distance of about ten yards. The eye was completely laid open, so that the lens and much of the vitreous humour were found upon his cheek. Medical assistance was immediately obtained, and the treatment adopted was so judicious that very little inflammation followed. The accident had occurred four months before I saw him. A large cicatrix, extending completely across the cornea into the sclerotica on either side (fig. 25), marked the seat of the wound; the pupil was obliterated; globe

diminished to half its size, and soft; no perception of light. The sclerotica was rather discoloured, but there was no

Fig. 25.



morbid action in progress, nor was the other eye sympathetically affected. The point on which my opinion was asked was the advisability of inserting a false eye, which I recommended to be delayed for a time.

Instances have come under my notice in which severe injury has been inflicted on the eye by a silly practice boys have of holding a pen near the side of the head of another boy, and causing him to turn sharply round. Steel pens inflict severe wounds.

A youth, aged 10, was brought to me May 2d, 1856. The previous afternoon a schoolfellow had accidentally struck an inky steel pen into his eye, inflicting a wound in the sclerotica, about a line beneath the cornea. The sight was nearly extinguished, and considerable pain attended the injury. The wound was indicated by a bluish stain, a line in length, derived from the ink; it had just the tint imparted by gunpowder. There was a small projection of choroid.

A hand held up before the eye was indistinctly seen; there was pain in the eye, but the inflammation was trifling. Absolute quiet, cold-water dressings, a purgative, and low diet were ordered.

May 6th.—The eye has progressed so favorably, that all pain has subsided, and very little inflammation presented

itself. It has not been necessary to use active treatment.

14th.—The eye has quite recovered, with perfect restoration of sight; the stain on the sclerotica yet remains, indicating the seat of the injury.

When we consider that the pen was foul, and penetrated through the sclerotica, the absence of acute symptoms, and the complete recovery of sight, was more than might have been expected.

The following case shows the development of strumous ophthalmia after a wound.

Thomas Campbell, aged 10, was brought to me, May 8th, 1856. On the 6th he was endeavouring to disentangle a knot in the string of one of his boots with a carving fork, when the fork slipped, and one prong with much force struck his right eye. He made little complaint of his eye until the morning of the day on which I saw him, when it became painful and intolerant of light. The lids were swollen, and any attempt to open the eye caused a profuse flow of tears. The conjunctiva and sclerotica were much injected, iris dull and discoloured, and aqueous membrane dull. The cornea presented near its centre a wound indicating the seat of the injury, but it had closed sufficiently to retain the aqueous humour, for the anterior chamber was filled. He complained of much pain in the eye, extending back into the head.

Four leeches were ordered, fomentations to the eye, belladonna to the brow, and a grain of calomel with opium every six hours.

The symptoms not yielding, and intolerance of light increasing, with indications of general debility, I ordered him, on the 14th, three grains of the citrate quinine and iron thrice daily, and discontinued the mercurials. He had had

nutritious diet from the commencement, being of a feeble habit.

On the 16th a marked improvement was visible, and from this time a steady amendment took place. The tonic treatment was continued, and on the 25th the eye was sufficiently recovered for him to leave town. On the 17th July I saw him again, and the corneal cicatrix was the only trace of injury. The capsule of the lens was not ruptured, nor was there traumatic cataract. The sight was perfect.

## CHAPTER V.

The opposite condition to atrophy of the globe may result from a punctured wound, especially when there has been detachment of the iris. I have seen many instances of staphylomatous enlargement originating in this accident. In such cases opacity of the lens and capsule will usually be seen if the cornea be clear, and around the seat of injury the sclerotic will be thin, irregular, and discoloured, partaking of the tint of the choroid.

Joseph Lovell, aged 23, was admitted into St. Mary's Hospital, March, 1858, as a patient of Dr. Sibson, from whom he was transferred to me. Eleven years previously, whilst behind a boy who was spinning a top, he was accidentally struck in the right eye with the sharp peg of the top. Acute inflammation followed, and both eyes were closed three weeks, when the symptoms gradually subsided. Twelve months prior to his admission the eye again became irritable and gradually increased in size, there being much pain, especially in the evening. The other eye was so weak and the sight so affected that he was unable to read large type.

The eye presented the characteristics of marked staphyloma. The upper half of the sclerotica was thinned and irregular from dark bulging projections. The cornea was enlarged, and near its centre was a cicatrix to which the iris and capsule of the lens were adherent. The whole globe was

enlarged and projected, giving an unsightly aspect to an otherwise good-looking face.

I removed the eyeball on the 31st March, and the patient made so rapid a recovery that the orbit appeared healed on the third day. An artificial eye was inserted on the seventh day.

I am indebted to Dr. Bader for the following accurate description of the extirpated eye, which had been unfortunately burst in placing it in a bottle for examination: "On separating it in lateral halves I found the retina detached, probably on account of the vitreous humour having escaped (detaching it in doing so). The portion from the ora serrata to the entrance of the optic nerve appears natural, the sclerotica of proportionate thickness, the choroid and hexagonal layers normal; the elements of the retina, rods, bulbs, and capillaries perceptible; not so the nerve-cells or optic nerve-fibres. The hyaloid is thickly sprinkled with pigment, and what remained of vitreous humour contained many transparent shreds and a great quantity of transparent globules (oil?)

"From the ora serrata forwards the globe is staphylomatous; the ciliary processes and iris flattened out on the staphyloma; portions of the iris adhere to a corneal cicatrix; the suspensory ligament was torn through, especially at the lower periphery of the lens, and the staphyloma appears to have been under pressure of the vitreous humour. A ring of hard transparent lens-substance and some phosphate of lime, enclosed by transparent capsule, was in contact with the corneal portion of the staphyloma, and fixed by firm adhesions of the anterior and posterior capsule to a transverse corneal cicatrix."

The retina is said not to suffer from small punctures, as those made with a cataract-needle. Majendie pushed the

opaque lens against the optic nerve in the operation of depression, and repeatedly touched and even punctured it with the cataract-needle, without producing either pain or even sensation to the patient; nor is it said these injuries were followed by inflammation or any amaurotic symptoms.

Nevertheless, amaurosis does follow the small puncture made with the cataract-needle; I have seen cases where the operation of solution was performed by puncture through the sclerotic, made rather far back to avoid the ciliary processes, in which no inflammation followed, absorption progressed, and the pupil became clear; but about six months after the first operation, and one month after the disappearance of the cataract, muscæ volitantes and scintillations appeared, the sight began to deteriorate, and despite of every treatment, permanent amaurosis from chronic retinal inflammation resulted.

A similar effect follows depression of the lens when it is made to rest on the retina, and that is one reason why extraction is so generally preferred by London operators. A case of immediate extinction of sight by depression of the lens, has been recorded by Bonavita, a pupil of Vacca.[1]

A lens in an eye presenting a favorable cataract, and having, as usual, perception of shadows of objects, at the moment that the cataract was pressed down to the bottom of the eye the pupil widely dilated, there was at once extinction of sight, and the eye remained amaurotic.

It is important therefore not to think lightly of retinal wounds, however trifling, and if operating for cataract by reclination or depression, to take the utmost care to prevent the lens pressing on the retina.

[1] 'Thèse Inaugurale,' 1820.

When the system is in a bad state, a trifling wound of the eye will bring on violent general inflammation and suppuration of the globe; I have principally observed this in persons who had led irregular lives and whose powers were low; soon after the injury violent pain attacks the eye, shooting back to the brain; the lids rapidly swell and assume a crimson hue; the eyeball itself enlarges, tightly girded by the lids; and in a short time all natural appearance of the organ is lost, the cornea becoming first yellowish, then brown, the conjunctiva enormously chemosed and more or less dry. This constitutes an important point of distinction between ophthalmitis from injury, and gonorrheal ophthalmia, with which I have known it confounded. To a superficial observer there is a general resemblance in the swelled and crimson lids, the chemosed conjunctiva projecting like a fleshy mass between them and burying the cornea; but in the specific inflammation the conjunctiva secretes pus which agglutinates the lids, or passes over the cheek; whilst in the traumatic ophthalmitis, there is little or no pus till the eye gives way, and then the pus flows from a small aperture, which gradually enlarges as the slough separates.

The relief from pain is marked when the eye has given way.

John Pierce, an Irishman, aged 37, whilst engaged in shaking carpets on March 20th, 1857, was struck on the left eye by a nail which flew up from the carpet with considerable force; the eye became painful and swelled, and on the 22d he was admitted into the accident ward of St. Mary's Hospital under Mr. Coulson; eight leeches were immediately applied; five grains of calomel administered, and saline mixture ordered thrice daily.

23d.—Eye worse; lids enormously swollen, and eyeball projecting between them in a state of intense inflammation.

Four grains of calomel immediately, to be followed by two ounces of senna mixture after four hours; six leeches to left temple.

I first saw this man on Wednesday, March 24th. The lids were livid and greatly swollen; the upper lid presented a free incision, which had been made the previous day; between the lids and tightly girded by them, a dark brown mass projected, from which a little thin pus oozed; towards the inner canthus the conjunctiva was seen thickened and chemosed; with some difficulty the limits of the cornea were discerned in the centre of the slough which formed the front of the eye. The globe was greatly enlarged from general ophthalmitis, and it was remarkable to see the rapidity with which the vitality of the tissues had been destroyed. The pulse was low and numbered sixty—skin cold and clammy—complaint of intense pain in eye and head. I ordered poultices to the eye, with frequent fomentations, 40 drops of tincture of opium in camphor mixture immediately, and 12 drops to be given every four or six hours. Beef tea every two hours.

25th.—There is distinct discharge of pus from the eyeball, and the pain is lessened; the appearances much the same. To have two grains of quinine thrice daily.

27th.—There is complete cessation of pain, though the lids are still livid and swelled and the slough has not separated. To have a mutton chop daily.

30th.—The slough is separating kindly, including the whole cornea and a portion of the sclerotica; there is a copious discharge of healthy pus; the lids remain unaltered, the man insisted on being discharged, as he was free from pain.

This man occasionally presents himself at the hospital; the eyelids have fallen in as if the eye had been extirpated, and are adherent to the remains of the globe.

Instances occasionally present themselves in which the conjunctiva is ripped away from the sclerotica, and the muscles of the eye may be exposed or even lacerated. A case has been already mentioned in which a shot ran along under the conjunctiva and lodged near the inner canthus; so a blunt instrument or a fall on a projecting stump may tear the conjunctiva from its attachment. The mere separation is not of great importance; it is sometimes made to a large extent without ill consequence in the operation for strabismus; the most troublesome result is the formation of a vascular granulation, like a little fungus, which sprouts up from the wound. It may be snipped off with scissors.

On January 20th, 1855, James Strong, aged 30, a gamekeeper, fell whilst plunging through a hedge after a wounded bird, and struck his right eye with great force against an irregular broken stump of a tree; a projecting splinter ran into his eye, causing agonising pain and a considerable effusion of blood. He was sent to town, under the impression that the eyeball had been burst.

I saw him the following day. A large flap of conjunctiva had been detached from the inner segment of the sclerotic, extending from within a line of the margin of the cornea to the caruncle; it was of a semilunar form, adhering slightly by its upper border. The inner rectus was lacerated but not torn through, and there was much blood extravasated.

As the flap of conjunctiva had a tendency to become displaced, it was secured by a fine suture to the conjunctiva below the wound, the lid was closed with plaister, and cold-water dressings ordered.

Union took place kindly; from a point near the caruncle a granulation rose, was snipped off, and the man returned home convalescent at the end of a fortnight.

Dr. Albert Von Graefe has narrated a somewhat similar

case. A boy received in the eye a violent thrust from the point of an umbrella, by which the conjunctiva was separated from the sclerotica in the form of a flap, with an almost complete rupture of the rectus internus; the mobility of the eye was considerably impaired; the point of the umbrella had penetrated deeply into the subconjunctival tissue, and many bits of dirt were removed with a curette; no particular treatment was adopted; a portion of the detached conjunctiva sloughed, and for eight days there was slight divergence of the eye, but this also disappeared at the end of three weeks, by which time the eye had quite recovered.

Though sutures are often used to bring together the cut edges of the conjunctiva, they are seldom employed in wounds implicating the deep tunics. Dr. Albertetti has related a case in which they were adopted with advantage by Dr. Borelli.[1]

A wound was inflicted on an eye by a piece of glass, which cut through all the tunics and extended from the outer corner of the eye very nearly to the cornea; the edges were brought together by three points of suture, and when the patient was discharged from the hospital after the lapse of fifteen days the eye had perfectly recovered, a dark line only marking the seat of the wound.

When the sclerotica has been extensively wounded, escape of vitreous humour is one of the results; the loss of one third of this humour is not serious in a healthy eye, as it will be reproduced, and even one half may escape and the globe refill; there is a point, however, beyond which the globe cannot be emptied with impunity; there is decided peril attending the escape of half of the humour.

There is considerable difference between the re-secretion of vitreous humour in a healthy eye which has been wounded,

[1] 'Gaz. Med. Italiana,' Jan., 1855.

and the refilling of a globe which has atrophied from inflammation of the deep tissues. In the one, the hyaloid membrane remains unaltered; in the other, it has partaken of the disorganization of the retina and choroid; the vitreous humour therefore loses its tenacity, and assumes nearly the condition of water.

If, then, no inflammation of the deep tunics follows the escape of a portion of vitreous humour, it will be re-secreted, and the globe assume its former plumpness; but if inflammation comes on, the re-secretion may be prevented, and atrophy of the globe will take place. Under these circumstances it is very rare to find the globe refill; still rarer is it when the atrophy is the result of chronic internal inflammation. Yet exceptions to each of these conditions occasionally present themselves. The following is a case in point:

A lady, aged 72, underwent extraction of cataract in her right eye in December, 1855. The wound united, but subacute choroido-retinitis destroyed the sight, and the globe atrophied.

In August, 1857, calling to see this lady, I was surprised to find that the eye had again become plump, having nearly recovered its natural volume and consistence. The pupil was closed, but from having a bare perception of light the sensibility of the retina had so far improved that the shadow of a hand was distinctly perceived.

The following case related by Larrey is extremely interesting:

Dreux, chasseur à cheval de l'ex-garde, received in single combat a sabre-cut, which perforated the right eye; there resulted a transverse wound of the cornea, some lines in diameter, with loss of a small portion of this membrane. This wound, according to the patient, was immediately followed by the escape of a thick limpid fluid, and collapse of

the globe. He lost the perception of light, was attacked with violent pains and vomiting. This man had abandoned all hope of recovering the use of his eye, but to Larrey's great surprise the globe gradually recovered its form and natural size. The edges of the wound united and formed so close an adhesion that the cicatrix was scarcely opaque. The iris which had been wounded recovered its movements, but the pupil remained deformed. Some months afterwards the man could distinguish colours and large objects.

A. Von Graefe mentions[1] the case of a student who received a cut which divided the border of the upper eyelid and inflicted a wound in the corresponding segment of the eye, from which issued a quantity of vitreous humour. The iris presented itself in the sclerotic wound. The anterior chamber contained little blood, but vision being almost completely extinguished, it was supposed that the deep membranes were injured, or that intra-ocular hæmorrhage had taken place.

After strict antiphlogistic treatment, which prevented inflammation, the patient began to distinguish large objects, and the globe partially recovered its volume and consistence, at first lost. The ophthalmoscope showed that the crystalline and vitreous humour remained transparent; the inferior half of the retina had been detached in the form of a fluctuating sac as far as its junction with the optic nerve. There was also rupture of the inner membranes, commencing at the point of perforation, but extending beyond it; the fluid in the retinal pouch became absorbed, and there followed a *rapprochement* of the retina and choroid; nevertheless the retina remained completely insensible, and the patient lost the power of sight in the upper half of the visual field.

The same writer has related another case of interest.

[1] 'Ann. d'Oculistique,' 1855, p. 180.

The eye of an infant was wounded by two fragments of glass, of which one penetrated through the sclerotic and the other membranes to the bottom of the eye. A great quantity of vitreous humour escaped, and the anterior chamber was half filled with blood. The pieces of glass were extracted, the lids were closed, and ice applied. Antiphlogistic treatment and the position of the child on its back favoured the rapid healing of this wound, which was happily followed by no imperfection of sight.

Though injuries may give rise to detachment of the iris and the formation of a supplementary pupil, it does not necessarily follow that confusion of vision results. A striking illustration of this, quoted from Graefe and Walther's Journal, is recorded in the 'Medical Gazette' for 1828.[1] A young man received a severe wound in the eye with a pointed instrument. When the supervening inflammation was subdued, it was discovered that the margin of the iris was torn in three places, and that a portion was lost. There were now three openings through the iris; the pupil in the centre, and an aperture on each side. Nevertheless the patient afterwards saw objects in their true position, had no multiplication of images, and saw distinctly with the injured eye when the other was closed.

The following is one of those unlooked-for instances of restoration of sight which occasionally present themselves. A person became the subject of cataract in each eye; the right eye was accidentally wounded by a splinter of wood, which divided the sclerotic close to the cornea on the inner side. There resulted an artificial pupil, which was as useful for vision as if made by art; the cataract still existed, so that the vision was by the side of the lens.[2]

[1] P. 453.

[2] A. Von Graefe, op. cit.

Instances present themselves where the very laceration of the iris is the means by which the sight is preserved. Fig. 6, plate xvi, in Dalrymple's 'Pathology of the Eye,' exhibits a case of leucoma and adhesion of the iris to a dense opacity occupying nearly two fifths of the cornea, which had been the effect of ulceration consequent on a wound inflicted by a percussion cap. The injury to the cornea was accompanied by laceration of the iris, and the subsequent prolapsus and adhesion of that membrane to the cicatrix gave rise to great contraction of the pupil, which was indeed nearly obliterated; it was divided into two apertures by the adhesion of a torn strip of iris, and this being cut across and contracting, gave a sufficiently large and well-directed opening for all purposes of distinct sight.

A remarkable instance of restoration of sight, after long suspension of its function in consequence of a wound, is related by Dalrymple in the same work.

A. B., aged 60, when a child, had lost the sight of his left eye in consequence of a punctured wound of the cornea; prolapsus iridis followed, and closure of the pupil by a dense and organized deposit of fibrin. The right eye had remained good, and he had pursued his occupation as a barrister's clerk up to the year 1846, when he was unfortunately knocked down by a carriage and received a severe concussion of the brain, that for some weeks endangered his life. On his recovery from this accident, it was found that he had also received concussion of the right eye, and had become amaurotic; from this latter condition he never recovered. Finding him thus hopelessly blind of his right eye, Mr. Dalrymple thought it fair to give him a chance of regaining some degree of vision in the left eye, and after a series of operations and absorption of an opaque lens, an artificial pupil was effected with but little improvement. By slow

degrees, however, it strengthened, and at the end of a year he was able to read with cataract-glasses bold type.

Though rare, instances have been known of tetanus following wounds of the eye, of which an interesting example has been recorded by Mr. George Pollock.[1]

J. S., aged 33, was admitted into St. George's Hospital, January 10th, 1847. He had that morning received a cut from a gig-whip on the left eye, which lacerated the cornea, dividing it through its entire thickness, and extending obliquely across from one margin nearly to the other. The aqueous humour had escaped, but there was no prolapsus iridis, and but little pain or chemosis. Goulard's lotion was applied, and an antimonial and aperient saline ordered every six hours. On the following day the lids were distended and tense, and there was great chemosis, the conjunctiva almost hiding the cornea; the pain also was great in the globe and forehead. Six leeches were ordered to the left temple, and warm fomentation. The above symptoms were still further aggravated on the following day, when several punctures were made in the upper lid, which afforded immediate relief. On the third day the leeches were repeated, and three grains of calomel and half a grain of opium was ordered twice in the day. On the sixth day the visible portion of the cornea was cloudy; and on the seventh there was purulent discharge from the tense and projecting globe. On the evening of the same day the muscles of the face on the right side appeared contracted, and the patient complained of stiffness about the jaws. On the ninth day trismus was fully established, which was followed by general tetanic symptoms, and the patient died on the following morning.

A case of tetanus is also reported as having followed a

[1] 'Medical Gazette,' 1847, p. 1006.

wound of the eye in the Crimean war; the particulars are not known to me.

Treatment.—We have now to consider an important subject, namely, the treatment, general and local, proper after the removal of foreign bodies from the interior of the eye, and after wounds of the globe.

It might at first sight appear that this could be comprised in a few words—repose, darkness, depletion, mercury, and low diet—but such is far from the fact. There is no class of cases which call for more discrimination than these, or which by their result show more accurately the skill and judgment displayed in their management.

It may be laid down as an axiom, that if the eye receives an injury, the speedy recovery will depend far more on the state of the system of the patient than on the extent of the wound. A mere scratch will light up a flame that will destroy one eye, whilst another eye will bear with impunity the most severe laceration or incision. Nothing can be ruder or better calculated to destroy an eye than the operation for cataract as performed by the natives of India; yet so little is thought of it, that immediately after its conclusion the patient goes about his ordinary business as if nothing had happened—yet inflammation is most rare. So, in this country, patients who have been brought into a fitting state, recover from an extraction of cataract (which involves an extensive wound and serious disturbance of the eye) in from ten days to a fortnight.

It is undoubtedly true, as laid down by Dr. Jacob,[1] that so far from the inflammation which follows injury of an eye being of a simple or uniform character, it is specially the

[1] 'On the Inflammations of the Eyeball,' p. 293.

inflammation which affords examples of peculiar and specific modification.

It will be intense in its nature and rapid in its effects, or languid in its action; it will assume the rheumatic, the arthritic, the scrofulous, or neuralgic character, and may even display the syphilitic taint.

One patient will require support and stimulants to urge the sluggish powers to the reparation of the injury; whilst another will need the most rigid discipline and active depletion to keep the inflammatory action within reasonable bounds.

Again, there is no class of cases in which the directions of the surgeon should be more rigidly enforced; to errors of judgment we are all liable, and perchance the view taken of a case may not be strictly correct; but it is far worse for ill-judging friends or captious patients to endeavour to escape from the thraldom of the surgeon as soon as his back is turned, and to think only how the pleasure or the whims of the sufferer can be most agreeably consulted. I say this advisedly, for though the patient is the real sufferer if the eye be lost, ill-deserved blame is too often attached to his medical attendant. In many affections a false step can be retraced, but with the eye we cannot afford to have our orders disobeyed. I can never reflect without indignation on a case which fell within my own knowledge. I had performed extraction on an old gentleman, and nothing could be better than his progress during the first three days; on the evening of the fourth day his wife declared that he would be suffocated if he remained in his bedroom, and insisted on taking the poor man into the drawing-room, in which there was a blazing gas chandelier. Need I say that acute inflammation followed and destroyed the eye?

It appears to me, that the undoubted value of mercury as

a remedial agent in iritis and some other inflammations of the eye, has led to an exaggerated idea of its necessity in cases of injury of that organ. It is too much the custom among young practitioners to begin with calomel and opium as soon as they undertake the management of a wound of the eye—a simple cut for instance—and their reason is doubtless a not very defined notion, that as mercury cures iritis, so it ought to be given to counteract the effects of an injury; but a little consideration would convince them that their conclusion is premature. In a healthy subject a simple wound of the eye will heal with so little redness, pain, or disturbance of the organ, as not to deserve the name of inflammation—there is merely such an amount of vascular action as is necessary for the carrying out the process of union: let me refer once more to operations on the eye —what are these but wounds? What are extraction of cataract, and artificial pupil operations but severe wounds? Yet we never give mercury to enable these to heal! and the speedy and happy recoveries which take place under simple treatment should lead a reflecting mind to hesitate before deciding on a mercurial course for an injury, less severe probably than either of the operations referred to.

I wish it to be understood that mercury should not be considered essential to the treatment of simple incised wounds of the eye when the patient is in a state of health. It will be sufficient to employ it when symptoms indicate inflammation of the iris or deeper tunics, those symptoms being pain and redness of the eye, a vascular zone around the cornea, aching in the brow, intolerance of light and flow of scalding tears. The iris will be dull, discoloured, and the sight will be affected. If in addition there is deposit of lymph in the pupil, mercury is imperatively called for, no other remedy exerting so powerful an influence.

When the condition of an eye in children demands the administration of mercury, its effects should be carefully watched. The ordinary sponginess and tenderness of gums do not display themselves in young children nor are they salivated; but formidable sloughing of the inside of the mouth may be caused. To subdue this the hydrochlorate of potass or of ammonia is invaluable.

An excellent formula for delicate children is two grains of Hydrargyrum c. Creta, with four or five grains of sesquioxide or potassio-tartrate of iron; this may be given twice daily, and the beneficial influence of the mercury will be displayed without the constitutional depression which often arises from its uncombined use.

It has been pointed out by Mr. Wilde,[1] that a low but generally diffused inflammation of all the tissues of the eye is a frequent result of the cornea being struck smartly by a piece of stone or brick; that the usual practice is to deplete largely, apply stimulating collyria, and put the patient upon mercury.

The cornea may be infiltrated with pus, there may be serous chemosis, redness, and violent pain, but there will also be small pulse, cold clammy skin, paleness and anxiety of countenance, and all the powers generally below par; with such symptoms, I believe, with Mr. Wilde, that mercury will increase the mischief, whilst the liberal use of bark, nutritious diet, and pure air, with moderate local depletion and soothing applications, will afford the greatest relief.

At St. Mary's Hospital we have the advantage of a garden for the recreation of the patients; and when I find my operation or accident cases at a stand-still without any defined cause, I permit them to take the air (the eye being

[1] 'Report on the Progress of Ophthalmic Surgery,' for 1847.

properly protected), and almost invariably find the best results follow. I believe it to be an error to confine ophthalmic patients too long to their chambers; their spirits flag and convalescence is retarded, whilst no tonic is so powerful or so marked in its effects as pure air.

It was formerly the practice to deplete largely, and to confine to the most limited liquid diet, old persons who had undergone operations on the eye, or who were suffering from wounds of that organ; the phantom of inflammation seems to have been ever present before our predecessors. This much is certain, that the opposite plan of treatment is generally adopted at the present day with the happiest results, and of those cases which take an unfavorable turn, for one patient who is attacked with acute inflammation after extraction, six or more suffer from non-union of the section from deficiency of power.

I am convinced that harm arises from keeping old people on broths and fluids; the digestion is deranged, flatulence excited, and the process of reparation flags from want of support; light nutritious food, and if the powers are feeble, wine or malt liquor in moderation, are far more congenial to their systems. It is best not to give food requiring mastication for the first day or two after a serious injury of the eye, but chicken panada, or finely minced meat, is admissible in old or feeble persons from the commencement. Robust or plethoric persons will of course be subjected to a rigorous diet.

The treatment of cases of simple wounds of the eye must be regulated by the same principles which guide us in the management of injuries from foreign bodies. Absolute repose of the eye is most important; the less frequently it is disturbed the better; a slight injury may require very simple treatment, but much will depend on the subjects we have to

treat. The spirit-drinking, tobacco-smoking, ill-nourished artisan, who so frequently falls under our notice in this metropolis, is a bad subject for any injury of the eye; but it is less frequently acute inflammation which attacks him than a low but scarcely less destructive form; there is great tendency in the cornea to take on suppurative action after wounds in such people, and the management requires much nicety; depletion they will not bear, and local irritants do more harm than good: it is very important to correct the secretions in the first instance, the tongue being generally foul and liver deranged. Three grains of blue pill and one of extract of henbane at night, followed by a warm aperient, should be first prescribed; after this, great benefit will result from effervescent salines; if the powers are low, ammonia may be added to the draught with advantage. When the tongue has become clean, and the secretions healthy, tonics will be indicated; in rheumatic constitutions five grains of the Pulvis Cinchonæ Cordifoliæ, with five of bicarbonate of soda, will render essential service; quinine, or quinine and iron, will be proper in many cases, and I have seen the greatest advantage from the ammoniated tincture of iron; this, and the pyro-phosphate of iron and soda are valuable preparations.

Whereas ordinary preparations of iron are all more or less precipitated or transformed into oxide of iron in the stomach, the pyro-phosphate of iron and soda is an exception, being entirely soluble and rapidly absorbed.

If it is necessary to give mercury to such patients, the grey powder with iron will be most suitable.

I repeat that in many cases of wounds of the eye, in clean incisions implicating the cornea only or the sclerotic only, mercury is really very seldom required if the patient is in fair health and the case not mismanaged; a certain amount of

inflammation may be expected, but this will yield to soothing local applications, moderate depletion and repose; but if there be one thing more than another calculated to light up the flame of deep-seated inflammation, it is daily opening and examining the eye. I cannot too often or too strongly deprecate such meddlesome proceedings. No possible good can arise from frequently looking at an eye which is evidently going on well, but infinite harm may follow. Another thing which often leads to mischief is carelessness or reckless exposure on the part of the patient; feeling no particular pain in the eye he presumes too much; reads, exposes himself to light and to cold draughts; a relapse is the consequence, and a heavy penalty is paid for the neglect.

The first thing to be done when called to a gun-shot wound or other injury of the eye, is to carefully and gently cleanse the organ, removing any coagula of blood which may be clinging to the globe or hanging about the eyelashes. Then a full and complete examination should be made to ascertain the precise nature and extent of the injury, and to obviate, as far as possible, the necessity for subsequent disturbance of the eye, for as each day will increase the irritability of the organ and the intolerance of light, frequent elaborate examinations are most pernicious.

Should there be a wound with fibres of the iris hanging out, they should be snipped off with fine scissors (fig. 18), and if there be a sensation of a foreign body under the upper or under lid, it will be proper to ascertain whether anything has lodged there. Some years ago I was assisting Mr. Dalrymple at an extraction, when a smart gush of vitreous humour attended the completion of the section; the lens could not be found. We looked on the floor, in the folds of the patient's dress, in vain. At last Mr. Dalrymple arrived

at the painful conclusion that the cataract had sunk, for we could neither see it in the eye nor find it elsewhere. Rather dissatisfied, he was about to apply the bandages, when the patient complained of something being under the upper lid. Carefully lifting the lid, he looked—and there was the cataract fixed between the lid and the eye.

If an operation has been performed, care should be taken that the edges of the wound are properly adjusted, and no eyelashes turned in.

The lids should then be closed. If plaister be not used, the patient should be warned on no account to open them; but I think it safer not to trust to this; between sleeping and waking a patient may unconsciously open the lids. It is safest therefore, to secure them with a strip of soft plaister; that spread on kid leather being best. As perfect quietude of the eye is of paramount importance it is best to cover both eyes.

Wounds of the eye are generally followed by a burning sensation, to allay which, cold is soothing and grateful; one or two folds of soft rag, dipped in cold water, should be laid upon the injured eye. Thick compresses are very objectionable from their weight and tendency to heat the eye; the dressings should therefore be light. A bandage covering both eyes should be carried round the head, pinned on one side, and then carried over the crown of the head from ear to ear, where it is to be again pinned; this cross turn prevents the bandage slipping down the face. The nurse should be shown how to wet with rag from time to time, the bandage covering the wounded eye; the coolness and moisture is communicated to the linen beneath, and thus does away with the necessity of frequently disturbing the bandage. Above all, warn the nurse and the patient on no account to *strike* the eye—every touch should be light as a feather.

The room should now be darkened, and if there be a fire, a screen should be placed before it. When in bed, the shoulders of the patient should be well raised, and he should be warned not to lie on the side of the injured eye. If the pillow be soft, its corners should be stitched to the bolster, lest the eye be struck by the projection, and at night a tape should be slipped round the wrist, and attached to the bed, allowing the hand to reach the mouth but not the eye; the discomfort leads to an inclination to rub it during semi-consciousness.

The surgeon will exercise his discretion as to the duration of these precautions.

It is to be understood that the instructions given have reference to severe injuries; slight accidents require less severe discipline.

Twelve hours may be permitted to elapse before the bandage is removed; if the eye be comfortable, twenty-four hours will not be too long. The linen rag should then be changed, and the bandage re-arranged.

The sensations of the patient should always be consulted as to the length of time during which the cold applications are to be continued; generally, about the third or fourth day warm fomentations are most grateful. Then soft dry rag should be substituted for wet dressings, and the eye carefully and gently bathed three or four times a day with warm water; the plaisters may be removed after the second day, as the eyelashes will be agglutinated sufficiently to prevent parting of the lids.

If a foreign body be in the eye, neuralgic pains will arise about the third day. At first confined to the eye and the brow but gradually increasing in severity, they extend down the side of the nose, around the orbit, and sometimes over the whole side of the head, so that the pulling of a hair, or

touch with a finger, is intolerable. When confined to the brow or face, great relief is afforded by frequently painting the parts with a solution of two grains of nitrate of silver in one ounce of nitric ether. The hemicrania is best alleviated thus:—a layer of cotton wool should be placed over the painful scalp, the outer surface of the cotton sprinkled with chloroform, and oiled silk immediately applied over it; the vapour is thus confined, and permeating the cotton allays the irritation of the nerves. Another application, useful though less cleanly, is the following:—One drachm of extract of opium, one drachm of extract of belladonna, and three drachms of strong mercurial ointment, are to be well triturated together, a little glycerine being added to soften it sufficiently to allow of its being rubbed into the brow. This may be used at bedtime, and repeated if necessary, as the sufferings of the patient are aggravated during the night. He may fall into a tranquil sleep, but about two in the morning will be awoke by pain in the brow which increases in severity to a certain point, then gradually diminishes, leaving the skin sore and tender, and the patient worn and unrefreshed.

Sedatives are powerful auxiliaries in the treatment of injuries of the eye. By encouraging sleep, allaying pain, and diminishing constitutional irritation, they materially assist in promoting the union of wounds. Two or three days after a wound of the eye, the patient often complains of an attack of pain and increased discomfort in the eye; at the first glance leeches might appear to be indicated, but it will be found that the skin is cold, the pulse feeble and irritable, and the patient sighs frequently; a full dose of tincture of henbane in camphor mixture will be the remedy. I prefer henbane as less likely to disturb the stomach and liver than opium.

If the wound be extensive, it is best not to disturb the eye by examination before the fifth or sixth day; we may conclude that it is progressing favorably if the pain diminishes, the eye becomes less and less tender, and the lids are neither swollen nor discoloured. If on examination (which should be executed cautiously, shading the eye with the hand) the condition of the eye is satisfactory, the bandages may be discontinued, and a shade assumed.

Clean cuts of the iris are seldom followed by iritis; but if a foreign body has lodged in that membrane, or if it has been lacerated or bruised, there is great fear of traumatic iritis.

Traumatic iritis sets in about the fourth day; the patient may progress favorably during the previous days, but will then complain of dull aching in the eyeball and brow, and a flow of scalding tears. A puffiness will be visible at the inner canthus, implicating the upper lid; the pulse will be raised, skin hot, and system feverish, differing in this respect from the condition previously mentioned as accompanying simple neuralgia.

The eye will present the unmistakeable vascular zone, discoloration of iris, and rigid pupil speedily becoming fringed with effused lymph binding it to the capsule of the lens.

In such a case, mercury will be necessary, and should be administered in such form as will most rapidly affect the system.

It will be proper also to apply leeches to the neighbourhood of the eye, and at night a full dose of Dover's powder may be administered; there are few medicines more valuable under such circumstances.

Iritis arising from injury is less manageable than the simple form, and yields less readily to treatment. This will be especially the case when a foreign body is in the eye.

It will not be proper to continue the mercury too long; if the powers are depressed and the inflammation does not yield, iodide of potassium may be substituted, but this too, must not be pushed too far; it is often advantageous to combine the iodide with infusion of gentian or calumba. I have seen instances where eyes continued inflamed under mercury; where the iodide of potassium seemed to aggavate the neuralgia, but where liberal diet, with tonics, acted like a charm. Such patients have usually been strumous pallid subjects, to whom mercury and the iodide were poisons. The combinations of gentian and ammonia, quinine and iron, and cinchona with soda, are indicated in such cases.

Allusion has been made to iodide of potassium aggravating neuralgia; this I have repeatedly observed, and in prescribing it two points should be borne in mind—to have it largely diluted, and to order it not to be taken when the stomach is empty.

If a delicate child be the subject of injury to the eye (and it is among children that serious wounds from forks and other pointed instruments are most frequent), the tendency to a strumous diathesis must be steadily borne in mind. The lowering, starving, and depleting system would here entirely defeat its object; moderate intolerance of light would resolve itself into intense photophobia, and the eye would take on the condition so familiar to us as strumous ophthalmia. I have many times seen such cases; I have many times seen the wounded and bloodshot eye, which could not be cured under blisters and leeches, take on healthy action and heal kindly under cod-liver oil, steel, and quinine, and as the pinched and pallid face acquired colour, the power of vision was restored to the light-abhorring eye.

Gouty complication when arising in a wounded eye is

always serious. There is severe pain in and about the eye, the organ itself has a brick-dust redness, not general but most marked towards the lower half of the sclerotic, and this often comes on quite suddenly. The tongue is usually foul, the urine loaded with lithates, and other evidences of general derangement exist.

In such a case the bowels should be unloaded by a pill at night, a good formula being three grains of blue pill, four of compound colocynth pill, one of acetous extract of colchicum, and one of extract of henbane.

This may be followed in the morning by a warm draught, as an ounce of compound decoction of aloes, three drachms of tincture of senna, and two drachms of sulphate of magnesia.

In addition to this there may be given every four or six hours eight or ten drops of wine of seeds of colchicum with an alkali, in aromatic water.

To relieve the eye, blood may be taken by cupping from the temple or mastoid process, or leeches may be applied. I may here remark, that in cases of acute inflammation from whatever cause, the application every day or every other day of one or two leeches affords great relief.

Counter-irritation by blisters does no good in the early stages of treatment of injuries of the eye, but they are of service when irritation and chronic inflammation linger about the organ.

Stimulating drops should never be used in traumatic cases during the acute stage of inflammation; indeed, discrimination is at all times needed in employing them. They are chiefly indicated when the general powers are low, and the wound bearing a sluggish aspect, does not heal.

If the iris be entangled in the wound belladonna will be useful as a means of extricating it; it may be rubbed upon

the brow, or the eye may be bathed with a weak solution of the extract; subsequently a solution of atropine will be useful as exerting a more powerful influence. Daturin, the principle of the stramonium (which is much used in America), has the same effect as atropine, but the dilatation is more evanescent; so much so, that for merely examining an eye I give the preference to daturin.

It has been said, that an eye in which a foreign body is lodged is liable to attacks of inflammation. These attacks are variable. Years may intervene between, or they may recur at intervals of weeks. When very frequent, rendering miserable the life of the patient, and preventing use of the other eye, excision of the diseased eye will be the proper course to recommend.

The patient may decline, and it will then be proper to adopt palliative measures, leeching, mild mercurials, and perfect repose in a darkened room. An issue in the temple may be of much service.

As in other diseases, so in injuries of the eye, the most judicious practitioner is at times baffled. The system does not respond to the extent expected, and the inflammation does not yield. In such a case close investigation will generally reveal a clue, and change of treatment will crown our efforts with success.

## CHAPTER VI.

Extravasation of blood under the conjunctiva consequent on rupture of a small vessel, is the most familiar and least serious effect of a blow upon the eye. The swollen and bruised condition of the lids denominated a "black eye," is usually accompanied with extravasation on the surface of the sclerotica; this effusion of blood however, may arise from a variety of causes besides direct injury, as coughing, sneezing, vomiting, &c. It also accompanies concussion of the brain.

When a small vessel is ruptured under the conjunctiva, the blood is in the first instance confined to one spot, forming a purple elevation or thrombus, which subsides as the blood diffuses itself in the loose surrounding tissue; the extravasated blood may be limited to one patch, or it may be spread over the sclerotica, ceasing abruptly at the margin of the cornea, which remains bright and clear amidst the discoloured mass. The lower two thirds of the sclerotica are more liable to be covered by the extravasated blood than the upper third, which is comparatively seldom involved. Carron de Villard, however, mentions an instance in which the whole conjunctiva was detached from the sclerotic a in an old man; the cornea and iris of natural aspect, lay in the midst of a bloody elevation, projecting considerably beyond them, and presenting a singular appearance.

Ecchymosis, as it is termed, may be recognised by its generally diffused blood-like appearance, its defined margin,

and the absence of vessels running into it (fig. 1, Plate I). The blood is unequally diffused, the coagulum being thicker in some spots than in others.

The swelling disappears first, from absorption of the serous portion of the blood; and the purple coagulum disappears gradually, its edges being shaded off into a yellow or yellow-green tint. As absorption progresses the hue changes, and when the blood is nearly removed, a yellow tint succeeds the red and continues for some time. Ecchymosis is common amongst elderly people, a small vessel giving way in a fit of coughing; sometimes it bursts without assignable cause.

This blood-shot eye being unsightly, patients are anxious to be relieved from it speedily. The frequent application of ice or iced-water powerfully stimulates the absorbents. The application in favour with pugilists is bryony root finely scraped; but it is too irritating to be used alone; it should be mixed with equal parts of ground rice prepared rather more thinly than for table, or with soaked bread-crumbs. A poultice being thus made, should be wrapped in soft linen and worn during the night, cold being applied during the day.

Absorption may be further hastened by Vinum Opii, or a solution of nitrate of silver, two to four grains to the ounce, being dropped into the eye once a day.

If seen soon after the vessel has given way, before the blood has diffused itself, the thrombus should be punctured, allowing the blood to escape in place of being pent up under the conjunctiva.

The effect upon the sight is by no means necessarily in direct ratio to the violence of the contusion; inasmuch as vision may be extinguished or seriously impaired by such slight accidents as the rebound of a twig, the stroke from the lash of a whip, &c.; whilst, though severely bruised, the

eye is seldom blinded by heavy blows from the fist. A sudden, sharp, though comparatively light blow, is often attended with formidable effects. A case which much interested me as a remarkable example of blindness from a slight cause, fell under my notice four years since.

On June 15th, 1854, Mr. K. was sent to me by Mr. Ceeley, of Aylesbury, who stated by letter the following particulars: "About five or six weeks ago he struck the sclerotic of the left eye with the broken end of a pair of spectacles, which he was trying on. The blow caused no pain at the time, nor did he fancy he had sustained any harm. On returning home, however, he found he could not see, except very imperfectly, in a downward direction. Inspection of the eye soon after enabled me to see that he had penetrated through the sclerotica on the outer margin of the ciliary ligament, and that the pupil was much dilated, and the iris immovable.

"As he felt no pain, and there was no inflammation then or at any subsequent period, I thought gentle aperients, mild diet, and rest of the organ from light and use, were all that could be useful; but there is no improvement in vision."

On examining the eye I found the pupil widely dilated and insensible to light. In reply to my inquiries, he declared that he had good vision with the eye before the injury, which was so slight—merely striking the outer side of the globe with the spectacle frame—that he took no notice of it; shadows of objects between the eye and the light could alone be distinguished. The only abnormal conditions discernible besides the fixed and dilated pupil was a slight haziness of the lens.

The total absence of inflammatory or other symptoms indicating effusion into the eyeball after the accident was remarkable, and the real cause of the loss of sight is by no

means clear to my mind; the ophthalmoscope was not then in general use, or it might have elucidated this obscure case.

I am disposed to refer some of the cases in which sight has been destroyed by slight strokes upon the eye, to powerful muscular spasm and compression of the retina analogous to that which has been known to cause death, after slight blows upon the epigastrium.[1] It is scarcely conceivable that the mere touch can be sufficient to extinguish sensibility in the whole retina, unless some further powerful influence was exerted. In some cases sight is suspended for a time, and gradually returns; in others it is hopelessly extinguished.

A young female was brought to Mr. Middlemore on account of complete amaurosis after a blow on the right eye with a whip; no wound could be discovered; the conjunctiva was slightly ecchymosed, pupil dilated and insensible, and vision completely destroyed. The humours of the eye were perfectly transparent. She was bled and had leeches applied to the temples, but without any immediate benefit. On the third day, however, she began to distinguish light, and after a few days more, vision was almost completely restored.

Mr. Tyrrell states,[2] "I have seen two cases of amaurosis from blows inflicted by the end of a whip-lash. In one instance the sufferer was seated at the back part of a stage-coach, outside; in the other case the patient was driving in a gig, and passing a stage-coach at the time he received the injury. In neither case was there lesion of the membrane, but slight ecchymosis and subsequent ophthalmia. One remained amaurotic, and the other recovered completely."

In May, 1853, I saw a lad who had been accidentally

[1] In my younger days, a sad instance fell under my own knowledge. A schoolfellow was playfully struck on the stomach by another lad—he screamed, fell back, and soon after died.

[2] 'Practical Treatise,' vol. ii, p. 103.

struck on the right eye by the end of a whip. He stated that there was an immense flash of light, and from that moment utter darkness of the eye. The accident had occurred five weeks prior to my seeing him; the pupil was dilated and motionless, the humours of the eye clear, and there was nothing abnormal visible; but he was unconscious either of daylight or strong light thrown into the eye by a lens.

It is well known with what force muscles act when stimulated by the instinct of self-preservation—how the patella and the tendo-Achilles are ruptured in the effort to save ourselves from falling; and I believe that powerful compression of the retina by the action of the muscles is in some cases, especially those in which the suspension of sight is temporary, the cause of the amaurotic blindness.

Though in the first instance the amaurosis may be the simple effect of the compression, it has a tendency to assume the congestive form, and is relieved by depletion and the use of mercury. Many cases illustrative of this are recorded. The following possess points of interest.

A woman received a blow from a whip on the right eye, and sight was completely extinguished; she applied at the Hotel Dieu, and was seen by Dupuytren. Slight ecchymosis appeared at one point of the conjunctiva, but with this exception and dilated immovable pupil, there was no abnormal appearance. The patient was bled, and leeches were applied without benefit; but on the third day the menses appeared, and from this time the patient was able to discern light from darkness. Her recovery was so rapid that in a few days she left the hospital perfectly cured.

A woman, aged 40, presented herself at St. Mary's Hospital, February 23d, 1858. On the previous day her right eye was struck by a piece of slate which had flown out of the

fire: from that time she had been unable to see with the eye, and suffered considerable pain. Neither bruise nor indication of the seat of injury existed; there was slight congestion of the eye, the pupil was contracted and motionless, and light was distressing.

The ophthalmoscope discovered considerable retinal congestion and some serous effusion. (Six leeches; active aperients; fomentation to eye.)

27th.—States that there is pain in and behind the eye and tenderness of the bones; there is decided loss of power of raising the lid and inverting the eye. Can still only discern light. (To be cupped ʒiv from right temple; Pil. Hydr., gr. iij, Ext. Opii, gr. ss, twice daily.)

March 6th.—Mercurial influence established; pain nearly gone; can raise the lid and invert the eye, and can distinguish large objects.

From this time the improvement was rapid; the mercurials were continued a few days longer, and by March 30th the eye was well.

Dupuytren was the first to call attention to a circumstance connected with blows upon the eye with a whip, which, though rare, should not be overlooked; namely, the imbedding of a portion of the lash in the eye. A man playing with a child gave it a cut with a whip which struck its eye. No wound was observed, but great ecchymosis followed, and violent inflammation took place which resisted all treatment, and produced disorganization of the eye and evacuation of the humours, in which were found one of the knots of the lash of the whip.[1]

There is a case often quoted as an instance of amaurosis from simple pressure on the retina. Beer was called to a man

[1] 'Med. Gazette,' p. 574, 1830.

who being with others, a stranger stepped behind him and clapped his hands on his eyes, desiring him to say who stood there. He struggled and endeavoured to remove the hands, but this only caused them to be pressed more firmly on the eyes. At length they were withdrawn—the unfortunate man was blind! and so continued ever after, without any apparent lesion of the eyes. Had the ophthalmoscope then been known, there is little doubt that the loss of sight would have been satisfactorily explained, and there would have been found either deep-seated rupture, hæmorrhage, or displacement, the result of violent compression continued under the struggles of the sufferer.

A strong man, while engaged in a drunken row, had an attempt made upon him by a person with whom he was quarrelling, to force out his right eye by thrusting the thumb between the inferior part of the globe and the orbit. The sight was at once extinguished, and a fortnight afterwards he applied to Mr. Vose Solomon. At this time the whole front interior of the eye appeared of a dark bluish black colour; no vestige of iris could be anywhere traced; there was one vast pupil bounded by the margin of the cornea; the outer tunics were natural. On looking obliquely into the cavity of the eyeball the choroid was seen of a metallic lustre, abruptly terminated in front by a very narrow ring, in the position of the corpus ciliare.

Detachments of the retina to a greater or less extent may result from blows upon the eye: when partially detached it hangs as a pouch towards the cavity of the globe; when the detachment is greater it assumes a funnel or trumpet shape, its apex adhering to the entrance of the optic nerve, its base spreading out at the ora serrata. The museum of Moorfields Hospital contains a remarkable specimen; the eye had been subjected at different times to severe blows; it became neces-

sary to excise the globe, and on opening it the retina was seen of a funnel shape, the apex not at the entrance of the optic nerve, but considerably to one side of it, clearly the result of an adhesion which had there taken place. Another preparation in the same collection, shows partial detachment of the retina, which is lifted as a fold into the vitreous humour, the fold extending to the entrance of the optic nerve. The anterior portion corresponds to a perforating wound of the cornea.

Mr. Lawrence mentions a remarkable change of colour of the iris following a blow upon the eye.

A gentleman received a severe blow on the left eye from a piece of wood projected forcibly by the sudden explosion of a firework; the following day the sight was impaired, and a globe of red appeared before the eye. Four days after the accident he consulted Mr. Lawrence; there was then ecchymosis of the conjunctiva scleroticæ in its whole extent; the iris, naturally blue, was of a bright yellow or yellowish-green; the pupil just like the other, and moving with it. No pain in the eye or head; no increased vascularity of the conjunctiva; no inflammation of sclerotica, cornea, or iris. He could recognise persons, but could not read ordinary print.

He was twice cupped, actively purged, and put upon calomel and opium.

The discoloration of the iris gradually disappeared although the mouth had not been affected in the slightest degree, and the patient recovered the power of reading the smallest print.

Mr. Lawrence discussed this case with Mr. Wardrop, who suggested that the cause of the phenomenon lay in the aqueous humour. Mr. Lawrence remarks, that the circumstance which rendered this explanation doubtful is, that the chamber

cleared first at the centre, and then gradually towards the circumference.

My own impression is, that the aqueous humour was involved, but I think it possible that in addition to this there may have been some deposit on the iris; had it not been for the peculiarity mentioned by Mr. Lawrence, I should unhesitatingly have ascribed the change of hue of the iris to coloration of the aqueous humour, having repeatedly punctured the anterior chamber in cases of bright green tinting of the iris, and in every case found the aqueous humour yellow.

It has been recently ascertained by Dr. Bader,[1] that neuroma of one of the ciliary nerves may result from an injury of the eye, and be the cause of intense neuralgia; it is possible that many of the obscure cases of extreme suffering may be attributable to this cause.

Charles Carpenter, aged 22 (a patient of Mr. Bowman), had the left eye injured by a stone a year ago. The patient says that "the sight lay on his cheek," and this was followed by immediate loss of vision. No swelling followed the injury, and the eye gradually became smaller. The patient has had frequent attacks of pain in this eye; the right eye felt weak for three months after the injury to the left, and then it recovered.

The left eye was excised, on account of the severe pains he had in it.

A cicatrix ran through the cornea and the sclerotica; the choroid was formerly adherent to the cicatrix; after removing the choroid, a hard, yellowish, white, pin's-head-sized nodule was found attached to one of the ciliary nerves. The tissue surrounding the nerve-tubes was thickened; the nerve-tubes

[1] 'Ophthalmic Hospital Reports,' vol. i, p. 216.

lost themselves in the nodule, which microscopically consisted of brown and yellow pigment, masses of cellular tissue, and of nerve-tubes. This nodule was supposed to be a neuroma, and to have caused the repeated attacks of pain.

An opportunity having presented itself by the death of a patient in the Brompton Hospital, to examine an eye which sixteen years previously had suffered from traumatic inflammation the result of a severe blow, it was submitted to Mr. G. D. Pollock, who ascertained the following particulars :[1] "The diameter of the cornea was much diminished, its surface flattened, and its structure opaque and thin. The choroid was much less dark than usual, and less vascular than in health. Vessels were seen in its structure mixed with pigment-cells. In its structure, but chiefly on its inner surface, were numerous spots and little masses of calcareous matter, consisting chiefly of carbonate of lime. In one or two places they were prominent on the inner surface. From the entrance of the optic nerve to the posterior surface of the lens, there was stretched the remains of the retina, now a delicate, folded, but opaque membrane. The retina, therefore, was not in contact with the inner surface of the choroid, but in this collapsed condition placed in the axis of the globe, which was flaccid, and contained a small quantity of pinkish fluid. Portions of the retina examined microscopically gave evidence of its fibrous lamina, but no other trace of the natural structure of the retina. The lens was flattened, opaque, and much diminished in size. Its anterior surface was in close contact and intimately adherent with the posterior surface of the cornea; and between them there was no trace of any portion of the iris. The posterior

[1] 'Proceedings Pathol. Society,' vol. iii, p. 181.

surface of the lens was adherent to an opaque membrane, which beyond its circumference adhered to the wall of the eye. To the posterior surface of this membrane was attached the anterior extremity of the collapsed retina. It may be supposed, from the history of the case, that some laceration of the cornea was produced by the blow, which allowing the escape of the aqueous humour, enabled the lens to come in contact with the cornea, and at a subsequent period adhesion of the adjacent structures taking place, explained the manner in which the iris had become degenerated and absorbed. The condition of the retina might be accounted for by effusion of fluid taking place between the choroid and retina."

Separation of the iris from its ciliary attachment is one of the effects of blows upon the eye; and is as frequently produced by small smart strokes as by heavy contusions. The separation presents every variety, from a mere chink to total detachment of the membrane, as in a case related by Mr. Dixon.[1] It is a painful accident, and always attended with effusion of blood, so that the exact nature and extent of the injury may not be readily ascertained in the first instance.

When the detachment is small, a gap will be seen like a supplementary pupil near the margin of the iris, which usually presents a visible fold from loss of support at that point. The drooping of the membrane also alters the form of the pupil, which is reduced to a mere slit when the separation is great, and the iris is generally tremulous. The sight is impaired, the more so as in many of these cases the injury is not confined to the mere separation of the iris. The lens is sometimes forced through a rupture of the

[1] 'Practical Study,' p. 374.

sclerotica, the retina may be detached, and other serious mischief inflicted on the deep textures of the eye.

The action of belladonna is to enlarge the false pupil as well as the natural pupil. The stress upon the fibres which retain their points of support draws the detached portion still further from the ciliary ligament, hence neither belladonna nor atropine should be used in such cases; the accident is indeed irremediable so far as the reparation of the injury is concerned. Mr. Middlemore remarks that great confusion of vision may arise from this supplementary aperture, and that it may be desirable to make the two pupils into one by dividing the intervening portions of iris. In the cases of small detachment, which have fallen under my notice, the confusion was less than might have been expected, and not sufficient to call for operative interference. When the detachment of iris is large, the artificial pupil supersedes the natural pupil.

The following cases present marked examples of this form of injury. Some have already been published; but as I have met with no better illustrations of the various forms of separation, I reproduce them.

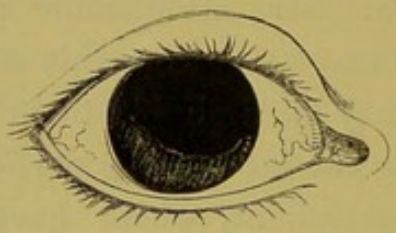
On July 18th, 1851, I was sent for to a physician who had met with an accident the previous day. Whilst playing at cricket with his sons, a pebble flew up and struck his right eye on the inner side, at the junction of the cornea with the sclerotica; the shock was so great and the pain so acute, that his first impression was that he had been shot. When I saw him the eye was ecchymosed and inflamed, the pupil widely dilated, iris tremulous and detached at the point corresponding with that struck by the pebble. The pupil was also somewhat displaced downwards and outwards, and was slightly oval in form.

He could barely discern fingers when held before the eye.

Leeches were used, and he was brought under the influence of mercury. The inflammation gradually subsided, and the power of vision slowly returned, though when I saw my patient twelve months afterwards, the sight was not equal to its condition before the accident.

Fig. 26 represents the eye of an Irishwoman who was a

Fig. 26.



patient in St. Mary's Hospital for an affection of the chest. Four years previously she had received a violent blow on the right eye from an oyster-shell thrown at her; the eye was blinded, and had continued useless. It will be seen that the iris had been detached to full one half of its extent, and hung loosely in the eye, vibrating at every movement. The humours were clear, but the eye was perfectly amaurotic.

Mydriasis will occasionally follow blows upon the eye. I have seen more than one instance in which it came on a week or two after the accident, apparently from paralysis of the iris; it does not yield very readily, and gives rise to unpleasant confusion of vision. The use of a stimulating embrocation to the brow, and bichloride of mercury with tincture of nux vomica internally, seemed to exert the greatest influence on this troublesome affection.

Cases occasionally present themselves in which the pupillary margin of the iris is the seat of rupture, being split as it were, in consequence of a blow. Three cases of this description came under my notice within a brief space, and I

have seen one since. In the latter case a single fissure was apparent; in the other cases two or more existed. Mydriasis and complete paralysis of the iris is a constant attendant upon this accident, and many months elapse before the pupil recovers its action. As it does so, the fissures in the iris become less visible. In the first instance there is generally considerable effusion of blood into the anterior chamber, and concussion of the retina, seriously impairing the sight. The wide dilatation of the pupil is partly referable to concussion of the retina, but continues after this has passed away. The sight continues imperfect from the flood of light poured through the large pupil, and the consequent confusion caused by the imperfectly refracted rays.

By looking through an opaque diaphragm having a pin-hole aperture, or a pierced card, the sight is greatly improved by the exclusion of those rays.

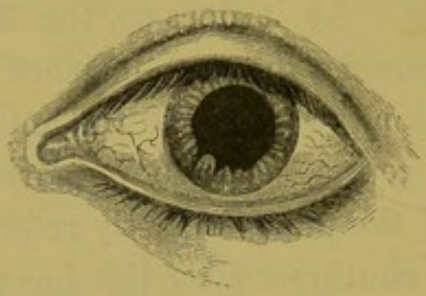
Treatment produces little effect in these cases. The action of the iris returns by almost imperceptible degrees, but I do not think it can be hastened by any remedies. The pupil continues larger and less active than that of the other eye during a very long period—perhaps permanently.

An officer of dragoons in garrison at Dublin in October, 1854, was playing at raquets, when he received a violent blow from the ball on the left eye. He was stunned for the moment, and the sight of the eye was extinguished. He placed himself under the care of an able surgeon, and Mr. Wilde was also consulted, so that he had every advantage.

I saw this gentleman six weeks after the accident. The pupil was then greatly dilated, the iris being reduced to a narrow band, and quite motionless under the strongest light; the lower portion presented distinct laceration, imparting a serrated aspect to the margin of the pupil (fig. 27). The

sight was very imperfect, large objects only being visible; a pierced diaphragm did not assist the sight.

Fig. 27.



Stimulating embrocations to the brow, and the instillation of aconite and of opium into the eye, were tried, but without the least effect upon the iris.

Six weeks afterwards a marked improvement had taken place in the sight, as he saw fairly through a pin-hole aperture; but the size of the pupil continued the same. At the expiration of four months there was a visible diminution in the size of the pupil, but no action under light and shade.

Twelve months afterwards I saw this gentleman, and by that time the pupil had considerably diminished, the iris acting feebly when tested. By aid of a pierced diaphragm large objects were discerned, and he could read and write; but the two eyes were unequal, and he generally closed the left eye when he wished to see distinctly.

Instances occasionally present themselves in which both eyes meet with injury by accidents entirely independent of each other. Such was the case with the two men whose cases will next be related; and other instances have fallen under my notice, though the injuries were less remarkable than those which befell these men.

In February, 1847, a hale countryman was brought to me for advice. In September, 1844, whilst fighting with another

man, he received a heavy blow upon the right eye, attended with violent pain and immediate loss of sight, and the chambers were filled with blood. For three days the pain was very severe, but gradually passed away. After ten days he was free from it, and the blood gradually disappeared from the eye, but the sight did not return.

In January, 1847, whilst felling a tree, a chip flew up and struck his left eye with great force. The agony was intense, and he was led home totally blind. For some days his sufferings were great, but had subsided when I saw him on the 9th February.

In the right eye the iris was separated from its attachment along the upper and nasal side, and hung down, vibrating with every movement (fig. 28) ; the pupil was elliptical, and considerably below the natural level ; the eye was insensible to light.

Fig. 28.

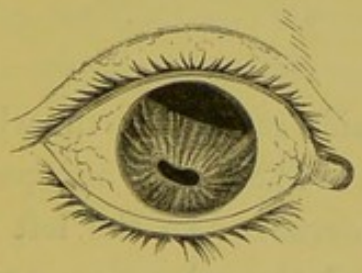


Fig. 29.

In the left eye (fig. 29) the iris had separated from one half of its attachment along the upper and temporal side, and vibrated as in the other eye. The pupil was elongated, elliptical, and below its proper level ; a small dark coagulum of blood lay in the anterior chamber. With this eye he could faintly discern light.

Lewis Lewis, aged 55, a bootmaker at Aberystwith, was admitted into St. Mary's Hospital, November 16th, 1852. Eight

years before he had received a blow from a fist upon his left eye, which instantly deprived it of sight. The eye continued blind for a fortnight, at the expiration of which perception of light returned, and then some sight, but never beyond the extent of enabling him to discern large objects faintly.

Three months prior to his admission he was unlucky enough, whilst endeavouring to separate two men who were fighting, to receive a blow upon the right eye, which completely blinded him. The case appears to have been regarded as beyond relief, but he came to town in the faint hope that something might be done for him. The condition of the eyes is represented in figs. 30 and 31. In the right a semi-

Fig. 30.

Fig. 31.

circular strip of iris to the external side remained; the whole of the remainder had disappeared. There was an opaque cicatrix at the inner margin of the cornea. In the left eye there had evidently been rupture of the sclerotica, and a portion of the iris had become entangled in the wound, a large opening remaining as represented. The iris was tremulous, but immovable under light.

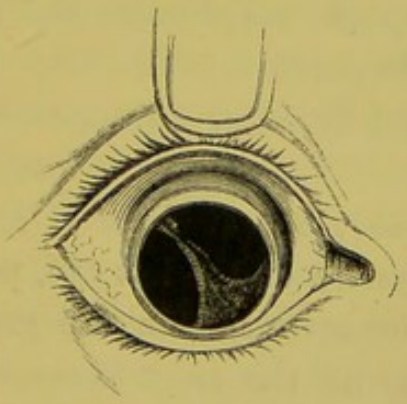
From the assistance rendered by cataract-glasses, it was evident that each eye had been burst, and that the lens had escaped through the fissure; he could faintly distinguish the outline of a hand when held up, and could just make out that there was a difference in tint between the type and paper on

a printed page. Sight was greatly improved by a lens combined with an opaque diaphragm and central slit.

William Stoker, aged 46, was admitted into St. Mary's Hospital, September 2d, 1854. He stated that on the 21st of the previous July, whilst seated on a bench in an inn, a man struck him a straightforward blow directly on the eye. He felt the eye burst, and immediately afterwards picked up the crystalline lens, which had fallen on the sleeve of his coat. The wounded eye bled a good deal, and sight was completely extinguished. Half an hour after the accident six leeches were applied. I was from town when he was admitted into the hospital; he was bled by leeches four times, and the last time, whilst the blood flowed, he suddenly recovered sufficient sight to distinguish the flame of a candle and the fire in the ward. Leeches were again applied with benefit; nevertheless he perceived that the left eye became weak and painful.

I saw him for the first time on the 25th September. The iris of the right eye had been largely detached from the ciliary ligament, and hung down from one point as a mere strip, which traversed the eye obliquely from above down-

Fig. 32.



wards, and from without inwards, spreading out at the latter point (fig. 32). This strip was grey at the upper part and

olive-grey below; all fibrous structure had disappeared. A prominent deep-brown cicatrix, nearly half an inch in length, marked the seat of the rupture through which the lens had escaped. The vessels of the conjunctiva were still injected. He could distinguish large objects with this eye, and the sight was assisted by a pin-hole aperture. The left eye was intolerant of light and tender to the touch. Leeching and a mild mercurial course were of much benefit to this patient.

James Packer, aged 27, received in a fight, in March, 1853, a blow on the left eye which instantly blinded it; he felt the eye give way, and the crystalline fell on his cheek. There was a profuse flow of blood, which ceased after a time; the treatment appears to have been cold applications, low diet, purgatives, and repose.

I saw him in April, 1854; the iris had been detached from the ciliary body in two thirds of its extent, the remainder hanging loosely down. There was a very large gap, through which objects were indistinctly seen. A cicatrix in the sclerotic, near the upper and inner border of the cornea, indicated the seat of injury.

Sight was much assisted by means of a five-inch glass, mounted with an opaque diaphragm and slit to counteract the magnitude of the pupil.

Double vision from irregular refraction may follow a blow on the eye.

In September, 1857, a gentleman at Andover received a blow from a stick, partly on the left eye, partly on the inner side of the nose, the severity being so great that the nose bled nine times during the next twenty-four hours. The sight of the eye was greatly affected during the following two days, but gradually improved: still with that eye objects were seen double, which continued to the 30th November, when I

was consulted. There was some dulness of vision and sluggishness of pupil, and the ophthalmoscope discovered a fine opaque line on the posterior surface of the capsule, to which the irregular refraction was referable.

A blow upon the eye may prove fatal by giving rise to intra-arachnoid hæmorrhage. A case is related by Mr. St. John Edwards, in the 'Medical Times and Gazette,' June 10, 1854. An unfortunate girl received a blow on the left eye which blackened it; eleven days afterwards she died, and on post-mortem examination from five to six ounces of blood were found in the left arachnoid cavity, partly fluid, partly coagulated; the latter portion contained in its centre a fibrinous clot about the size of a small nut. The fluid portion of the blood was found to extend downwards to the base of the brain. The membranes were deeply stained with blood, as also the substance of the convolutions. The small wing of the sphenoid bone on the left side was found disarticulated and displaced backwards and upwards, exactly in a position to have wounded the middle cerebral artery in the fissure of Sylvius. Mr. Edwards was of opinion that the blow on the eye displaced the bone, which in its turn gave rise to the hæmorrhage by rupturing some vessel, but that it temporarily plugged the vessel, and ultimately failing to do this, rapid extravasation of blood and death ensued.

In the cases hitherto considered, the injury to the sight has arisen from violence applied directly to the eye; there is a class of cases of great importance in which the eye is mediately affected, that is by the effect of shocks imparted to it either as a part of the general frame, or from its vicinity to the seat of injury. We are familiar with the effects of concussion, on the brain, spinal cord, &c., and the eye in like manner experiences its influence. It cannot be doubted, for instance, that a violent blow inflicted on the brow will cause

considerable concussion of the eye. A sailor, says Wardrop, got a blow on the edge of the orbit from a ramrod during an engagement, at the place where the frontal nerve passes on the brow; the vision of that eye was instantly destroyed, and when seen by Mr. Wardrop, several years after the accident, the eye remained amaurotic, with a dilated and immoveable pupil. A cataract had formed in the other eye. This case is adduced by Mr. Wardrop as an instance of amaurosis from injury of the frontal nerve; but the suddenness and completeness of the extinction of sight point rather, in my opinion, to concussion of the retina, with possibly detachment or laceration of that membrane.

We can imagine that a violent concussion of the eye may cause disturbance of the relations of its tunics and humours, affecting their cohesion, and giving rise to rupture of vessels and internal hæmorrhage.

A countryman, aged 26, received accidentally a violent blow over the right eyebrow from a flail used in thrashing corn. He fell stunned and was unconscious for some minutes. He then became sick, and discovered that he had lost the sight of his right eye. He was sent to town a week after the injury, and was seen by me, May 14th, 1856. The brow still bore marks of the blow, the pupil of the eye was dilated and motionless, and the only sight was perception of shadows of objects, when the image was thrown on the outer portion of the retina.

This, like Wardrop's case, might fairly have been quoted as an example of amaurosis from injury of the branches of the frontal nerve, but the ophthalmoscope revealed the true nature of the case. The retina was detached from the choroid over a space about two lines in diameter each way; behind it was a coagulum of blood, of a deep reddish brown, the red predominating in parts. The retina was slightly opaque

where detached, and had a generally congested and unhealthy aspect.

Whilst attending the practice at Moorfields, in 1841, a case presented itself of which I made a note. Benjamin Baker, aged 26, applied for advice, June 28th. On the night of the previous 17th November, whilst poaching, he became engaged in a conflict with gamekeepers, from one of whom he received a blow from a gun-barrel on the left temple, which laid him prostrate and rendered him insensible for twenty-four hours. From that moment he utterly lost all perception of light in the left eye.

The pupil was dilated and motionless; iris unchanged in colour or brilliancy; no perceptible abnormal condition in the size or consistence of the globe.

Mr. Dalrymple pronounced the case hopeless, regarding it as a well-marked example of retinal paralysis from concussion.

At the battle of Aboukir, M. Magny, chef de brigade, was grazed by a bullet on the outer side of the right orbit, which, without breaking the skin, caused complete extinction of sight in the right eye. Acute pain was felt at the back of the orbit, followed by weight in the head, effusion of blood into the cavities of the eye, and ecchymosis of the conjunctiva. During the first fortnight he was attended by the surgeon-major of his brigade; he then fell under the care of Larrey. At this time the ecchymosis had disappeared, but the anterior chamber was three fourths full of fluid blood; the eye was perceptibly larger than the other, and there was sleeplessness, darting pains, and Larrey feared the development of a carcinomatous affection, adding, that his fears were not without reason, for a similar injury had befallen an officer of the 75th demi-brigade, and the eye was attacked with all the symptoms of cancer, which were only dissipated by the loss of the organ and long treatment.

"I think (says Larrey) that blood, effused from its proper vessels, cannot long remain in the sensitive parts of organs without determining more or less irritation, accompanied with distressing accidents, such as I have described in other articles."

After having employed, in the case of M. Magny, local bleeding, and cooling local applications, Larrey decided on letting out the effused blood, which he did by a free incision in the cornea. On the escape of the blood light was immediately discerned, the wound healed kindly, and the patient gradually recovered. A similar accident befel one of the aides-de-camp of General Robin, was attended with precisely similar phenomena, and the same treatment was pursued with success.

The following cases, selected from a large number which have been recorded, illustrate the injury inflicted on the eye by general concussion.

R. W., aged 48, a mail-cart driver, applied to Mr. Bowman for impaired sight of both eyes; six years previously he had been thrown out of his cart and had concussion of the brain; the left eye was worst. Under the ophthalmoscope the entrance of the optic nerve was seen to be abnormal; the choroid was of a deeper red colour in some parts than in others, and there were irregular black spots, some in front of and some behind the retina.

Dr. Williams has related the following:[1]

James F., aged 45, of robust constitution, enjoyed good sight until about four months ago, when in running violently he fell and received a severe shock. About three weeks afterwards, accidentally covering the right eye with his hand, he perceived to his astonishment that he could not see with

[1] 'Med. Times and Gazette,' July 8th, 1854.

his left. He has never experienced the slightest pain or uneasiness in this eye—of objects placed before or to the right side of him he has not the faintest perception; but he recognises very imperfectly large bodies situated towards his left side. The pupil is more dilated than the other and immoveable.

Examined with the ophthalmoscope the refracting media appear perfectly transparent, the retina presents no abnormal vascularity, but it is easy to recognise that this membrane, to a large extent and all around the entrance of the optic nerve, is elevated by a liquid, and it has a trembling movement during the oscillations of the eye. What is curious in this case is, that during these movements we do not see those deep folds which the membrane ordinarily forms in dropsy of the retina. Here the folds are superficial and the undulations quite limited; these phenomena, taken in connexion with the pearly colour which the elevated membrane presents, can only be explained by supposing that the retina is raised up by a turbid liquid as often observed in pericarditis and other serous inflammations.

A sentinel, whilst on duty on the ramparts of Nimeguen, one very dark night, fell from a bastion a height of six metres. The noise called up the main guard, and he was found apparently lifeless on the ground. He was taken to the hospital, and placed in charge of Dr. Van Dommelen, surgeon to the regiment.

The man had concussion of the brain and was wounded in the face; some hours afterwards he opened his eyes, which presented such an effusion of blood that their surfaces were almost black.

The immediate effects of the accident soon passed away, but the sight of the left eye was lost. The ophthalmoscope showed that the contour of the optic nerve had disappeared,

and was replaced by a reddish disc, differing but slightly in colour from the rest of the fundus of the eye. The veins were alternately raised and depressed, whilst the arteries were very small and pale. The loss of sight probably arose from the rupture of some vessel in connexion with the cerebral concussion.[1]

Cases occasionally present themselves which create considerable perplexity: an eye has received a blow or violent concussion, and much or the whole of the iris vanishes; conflicting opinions exist respecting this disappearance of the iris, but a case related by Von Ammon[2] throws light on this singular condition.

A young soldier, wishing to commit suicide, adopted the strange expedient of loading his musket with powder, and then pouring a quantity of water into the barrel, placed the muzzle in his mouth, discharged the piece, and fell dead. The eyes presented no external marks of injury, but the unusual condition of the pupils attracted the attention of Von Ammon, who examined them four hours after death. In the right eye the only visible portion of iris was a crescentic fragment towards the external side, it being completely wanting along the inner border; no trace of ciliary processes could be discovered. The point where the visible portion of iris disappeared was neither torn nor abruptly folded inwards, but disappeared in this direction without its being possible to discern what had become of it; but dissection showed that the inner, upper, and lower borders of the iris were thrust back. The vitreous body was displaced, the lens, with its capsule entire, touched with its upper border the middle of the superior ciliary processes, whilst the inferior border was found near the centre of the unnaturally large

[1] 'Ann. d'Oculistique,' t. xl, p. 203.

[2] 'Arch. für Ophthalmologie,' Bd. i, p. 119.

pupil, the whole indicating a partial retroversion of the lens and vitreous body which were displacing the iris. When the lens and vitreous body were removed under water, the iris slowly returned to its position, the displaced parts, however, continuing somewhat depressed.

The left eye presented an elongated pupil, large above, conical below. The iris formed a sort of swelling against the posterior surface of the cornea; the vitreous body was displaced above, but in a less degree than in the right eye. At the line of junction of the iris with the ciliary ligament there were three small ruptures, and at these points the iris projected forwards.

Thus it seemed that in the right eye the concussion had displaced the lens and vitreous body, and they had dragged the iris from its position, fixing it by their weight, but, singular enough, without any detachment of this membrane from the ciliary ligament. The left eye, on the other hand, showed several points of detachment of the iris from the ciliary ligament.

In both eyes the vitreous body had been luxated carrying with it the crystalline, which retained its natural relations to it. In the right eye the choroid presented a considerable rent, but no rupture of the retina or sclerotica; effusions of blood were found in both eyes.

It would seem, then, that without actual blow a violent concussion of the eye may cause great internal mischief, and that such a displacement of the humours may arise as may drag the iris from its position, and by their pressure retain it in its new situation.

Our prognosis in cases of contusion and concussion of the eye must be guarded. If all perception of light is lost immediately after the injury, there is reason to expect permanent amaurosis; but if perception of light be not extinguished,

hope need not be abandoned. The extinction of sight which follows concussion of the brain depends in some cases on injury to the cerebral portion of the optic apparatus; and such cases are always grave. If there is detachment of the retina, vision must necessarily be extinguished in that portion; but a portion may remain uninjured, giving rise to partial vision—vision useless, if not embarrassing, in connexion with the other eye, but valuable, if that be deprived of sight.

Rupture of the sclerotica adds materially to the gravity of the case. Such a condition involves serious injury to the contents of the eye, for a blow which can burst that tough membrane must be weighty. In the process of healing, too, serious complication often arises from the sclerotica taking on inflammatory action difficult to subdue, productive of much suffering, and not infrequently the forerunner of chronic inflammation and atrophy of the globe.

If vision begins to improve within a few days—a week possibly—after the accident, further amendment may be anticipated. Even if some time elapses before improvement is recognised, we need not despair; but the prospects are most unfavorable when, after the lapse of months and the use of proper treatment, there remains but bare perception of light. Patients are often misled by the appearance of a luminous glare, which they mistake for improving sight, whereas it is indicative of retinal excitement of an unfavorable character.

In the management of amaurosis from contusion, it must be remembered, that on judicious treatment whilst the accident is recent will success mainly depend. It will be proper to prevent the access of inflammation by low diet, purging, repose in a darkened apartment, and cold applications to the eye. If inflammation arise, evidenced by pain in the eye,

flashes, tenderness, and intolerance of light, no time should be lost in taking blood by cupping or leeching, and in commencing the administration of mercury. When the inflammation is passing away, counter-irritation by blisters behind the ears will be of service. When the retina has been actually detached, remedies are powerless in restoring sight to the portion which has been separated; yet it is important to preserve so much as remains uninjured. There will certainly be tendency to chronic inflammation, and in the majority of cases more or less effusion attends or follows the accident.

An eye which has suffered from concussion is liable to become the seat of an insidious form of inflammation after the immediate symptoms have passed away. It may not display itself till after the lapse of weeks; but overwork of the eye, undue excitement of the organ or imprudence in living, may then develop it. Muscæ volitantes, scintillations, and the appearance of a network with obscuration of vision, attend it; and if these present themselves, aid should at once be sought.

The proper treatment in all cases of low retinal inflammation will be, repose of the eye, mild mercurials, and counter-irritation, with strict attention to diet and to the digestive organs. If the inflammation be manifestly of the asthenic type, tonics may accompany the mercurials. Electricity, strychnine, and other nerve-stimulants have obtained the credit of materially aiding the restoration of sight after concussion of the retina. Without denying *in toto* their efficacy, I cannot accord them the merit which has been awarded by some writers. I have repeatedly tried them without satisfactory results.

There is one element which ought to be taken into consideration in these cases, and that is—*time*. If sufficient time be allowed, the powers of nature will of themselves do

much to restore power to the weakened organ, and it is our duty to impress this on the patient. There is a natural desire in all sufferers to recover quickly, and it too often happens that the real skill of the medical attendant is undervalued because he does not endeavour by art to supersede the unseen power, which he knows to be working for good. Then some plan of treatment—fashionable possibly—is tried, the patient gets well, and the treatment which happens to be in use obtains that credit which in reality belongs in the first instance to nature, in the second to the sound judgment and wise discretion of the medical practitioner.

Cysts.—The formation of a cyst in the eye is the occasional result of a blow or other injury of the organ; Mackenzie, Dixon, Walton, Stoeber, Richard, and others, have recorded examples. I have seen several instances of cysts arising without any well-ascertained cause, but will relate three which fell under my notice, and were clearly traceable to injury. These cysts, as they ordinarily present themselves, appear to consist in the morbid formation of fluids between the iris and the uvea; but in some cases the seat of origin seems to be rather the ciliary margin than the posterior surface of the iris. In one of the cases I shall relate, the growth took place behind the iris, and gradually pushed its way through the pupil. The irritation caused by these cysts is great, and is mainly the result of their being enclosed within the unyielding tunics of the eye; as they increase and require more space, painful tension is excited.

In October, 1849, a man servant was sent to town from Devonshire to be under the care of Mr. Dalrymple, but he being ill, the case was placed in my hands. Ten years previously his eye had been injured by a fragment of a copper cap. It gradually became quiet, and although there was but little vision, no annoyance was experienced until seven months

prior to the above date, when the eye became irritable, inflamed, and intolerant of light. The man was twice brought under the influence of mercury, but without benefit, and he therefore came to town.

On examination, some congestion of the conjunctiva and sclerotica was visible; the surface of the cornea was irregular, and marked with an opaque scar in the centre, from which posteriorly there extended back to the iris a peculiar substance, the nature of which was doubtful. It was not possible to obtain a distinct view of the pupil, but it appeared to be contracted, irregular, and was not amenable to atropine. The substance mentioned resembled a white thread, to which a filmy cyst was attached. A broad needle was passed through the lower part of the cornea into the cyst, from which clear fluid escaped, and it instantly collapsed; after a few days it refilled, and was again punctured. The irritation in the eye continued, and Mr. Dalrymple agreed with me in thinking that there might possibly be a fragment of the percussion cap in the eye, and as the other eye was suffering sympathetically, it was proposed to evacuate part of the contents of the injured organ and allow it to sink. The patient, however, declined, and returned into the country.

On February 16th, 1849, a young gentleman, eleven years of age, of strumous diathesis and excitable temperament, was in a garden pulling out a piece of wire from an old box, when the wire suddenly gave way, and his hand struck his right eye with great force. The pain overpowered him for a time; he went into the house and laid down sick and stupified as if stunned. As he was going home from school the next day, he said nothing about the accident. The drive home was about three miles, during which he felt sick and poorly, and wore a handkerchief tied over the eye. Inflammation came on, and on the 20th, a surgeon was called in, who

discovered a wound across the cornea, apparently made by the thumb-nail. Leeches and other treatment were adopted, but five weeks elapsed before his eye became quiet. By April he was able to use his eye again, but there remained a seam, like a hair, marking the seat of the wound. With the exception of some dimness of sight, no further inconvenience was experienced till shortly before April, 1851, when a minute speck, like a small seed pearl, was first perceived. Mr. Morgan, of Lichfield, was, I am informed, consulted, and as the young gentleman was soon to be placed at Westminster School, he advised that a London opinion should be taken. Mr. Guthrie was consulted in June, and advised, that as the speck did not obstruct the sight it was best to let it alone. In September the eye became inflamed and irritable, and as the speck had slightly enlarged by November, a consultation was held, and it was decided that it was a cyst containing fluid, an opinion in which Mr. Dalrymple subsequently concurred. Slowly but steadily did the cyst increase, and in the following April it completely obstructed the pupil in bright light. In the beginning of May the patient got wet through, and from that time had much pain and inflammation in the eye. On the 15th, he went to Torquay, and was seen by Mr. B. Toogood, who considered that the inflammation was caused by the growth of the tumour, and advised that no time should be lost in its removal. On May 31st, I saw this youth. There was difficulty in obtaining a view of the eye from the excessive photophobia, but I could see projecting into the anterior chamber a tumour or cyst about the size of a pea, lustrous and iridescent like mother-of-pearl (Plate III, fig. 4). It covered the pupil, and pressed on the iris, from which it appeared to have its origin. The eye was intensely inflamed, and was evidently suffering from the irritation caused by

the tumour, which I decided on removing the following day.

The patient being then chloroformed, an incision was made near the outer margin of the cornea. I attempted to grasp the base of the tumour with canula-forceps, but so hard and tough was it, that the instrument slid off without making any impression; the wound in the cornea was therefore enlarged, and with strong iris-forceps I succeeded in breaking up a portion of the cyst, which was as tough as cartilage. An endeavour was then made to cut the remainder away with scissors, but on the iris separating from its ciliary attachment it became apparent that the real attachment of the tumour was to the ciliary ligament, whence originating it had pushed between the lens and iris, and had finally made its appearance through the pupil.

Though I succeeded in detaching the mass from its base, it had contracted such firm adhesions to the iris that I found it impossible to remove the whole without seriously detaching the iris, and perhaps destroying the eye; I therefore contented myself with removing piecemeal as much of the growth as possible, trusting to absorption to get rid of the remainder. The prolapsed iris was then carefully replaced, and the eyelids secured with plaister.

The effect of the operation was to subdue the inflammation and diminish the distress; and although the eye was not rendered useful, it was relieved of the morbid growth, of which there has been no return.

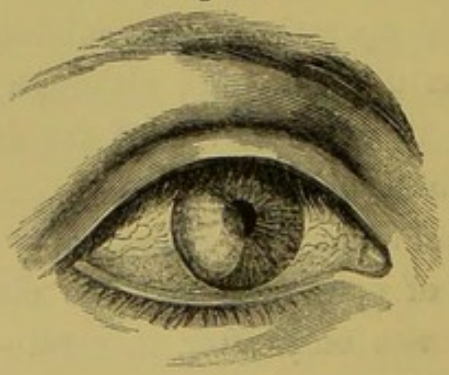
When examined under the microscope, the cyst appeared to be made up of epithelial cells, so closely agglutinated together that it was only after maceration they could be separated.

The nearest approach to this case is one recorded by Mr. Tyrrell, in which a tumour connected with the iris was

attributed to the eye having been struck by a bearded head of barley. The patient was a fair and beautiful girl, and the tumour, which was the size of a small pea, was attached near the margin of the iris, and had the characteristic of glistening like tendon. Never before or since have I seen a growth in the eye which possessed the iridescent property manifested in the case which I have described. It more nearly resembled an opal than any other substance to which I can compare it.

E. M., aged 32, struck her right eye against the sharp corner of a chest, in October, 1850. The eyelids were blackened by the blow, and a rather considerable effusion of blood took place beneath the conjunctiva. In the following February the eye became irritable and intolerant of light, with increased lachrymation. There was a red patch at the outer margin of the cornea, which was at times blended in a general inflammation. In April, a substance appeared in the anterior chamber, for which she underwent a course of mercury; it was in fact a cyst, which steadily increased in size. I saw the patient in September, 1851. At this time the outer half of the anterior chamber was nearly filled by a deli-

Fig. 33.



cate semi-transparent cyst, which pushed back the iris and encroached upon the pupil (fig. 33). It appeared to originate

from the junction of the iris with the ciliary ligament, and to have bulged forward from thence into the anterior chamber. There was still redness around the cornea, and a feeling of distension and aching increased by exposure to light.

I first contented myself with puncturing the cyst, but it refilled; at the end of three weeks I again used the needle, but more freely, cutting and tearing the cyst in various directions. The relief afforded was permanent, the shreds of the cyst gradually shrank and disappeared, and the eye perfectly recovered.

There is a tendency on the part of these cysts to refill if they are merely punctured, and therefore I prefer lacerating the membrane with a broad needle; when punctured, the fluid jets out, and the delicate membrane, which has been kept on the stretch, collapses. If this treatment does not succeed, and the pouch is large, it may be drawn out of the eye with canula-forceps and a portion snipped off. This will effectually cure it.

## CHAPTER VII.

One of the most formidable accidents which can befall the eye is rupture of its tunics by a sudden and violent blow. The concussion may be destructive to the retina; there is always some escape of the humours, frequently of the lens, and effusion of blood within the eye, besides external hæmorrhage.

The usual seat of rupture is in the sclerotica, immediately anterior to the insertion of the recti, most frequently above the cornea. It is very rare to find the cornea itself burst. Mackenzie, however, mentions a curious case of a gentleman who accidentally struck his right eye with his thumb and ruptured the cornea at its upper edge, giving rise to a large prolapse of the iris. There was a strongly marked arcus senilis in the cornea, and a small clear space between it and the sclerotica; it was at this point that the rupture took place.

A singular case is recorded of rupture of the cornea, occurring during the extraction of a molar tooth. It is said that at the moment both sight and hearing were lost; and as the maxillary bone was fractured, we may suppose the shock was very great. The cornea of the eye immediately presented a peculiar livid appearance, and hernia of the iris suddenly took place through the rent. Violent inflammation followed, and was succeeded by a large staphyloma. This was removed by Dr. Duval on the eighth day after the

accident, by which means the pain and inflammation were greatly lessened.

An extensive wound of the eye is likely to be attended with prolapse of vitreous humour; when, through the cornea, it is generally preceded by the lens, which is forced out by accidental violence or by spasm of the muscles of the globe. Prolapse of the vitreous humour will be recognised by the wound being filled with a clear, transparent albuminous mass, which holds apart its edges, and is forced out more and more as the eye is irritated by exposure. The sooner, therefore, that the lids are closed, the better. The remains of the prolapse of the vitreous humour may be recognised as a mass resembling white of egg, which clings to the edges of the wound.

Rupture of the eyeball is attended with excruciating pain and considerable flow of blood. The crystalline lens (vulgarly known as the "sight") and vitreous humour may be found either on the cheek or the patient's dress; and I have had the lens brought to me carefully preserved, in the vague hope that it might be replaced in the eye. An eye may be emptied and recover its shape from being filled with blood. Mackenzie has seen the sclerotica and conjunctiva rent behind the cornea, the humours evacuated, the eye flat, and cornea sunk back into a cavity. Next day the eye was plump and cornea natural, the globe being distended by blood. It is needless to say the eye was blind.

In 1856 my opinion was asked respecting an eye which had been ruptured under singular circumstances. Some years before the patient had received a blow on the left eye from a piece of copper cap, which had deprived it of sight, but in nowise altered its appearance.

Two years afterwards, when travelling by rail, he and his wife were placed in a coupé, which was provided with a small

flap table. This had been opened, and they were congratulating themselves on the convenience, when the patient, happening to be stooping down, was requested to close the window. Forgetting the table, he started up to do this, and struck the left eye with great force against its corner. He fell back with a sensation as if he had been shot through the head. The eye was completely burst open, and the flow of blood profuse. When he reached his destination the lids were greatly swollen, and his sufferings most acute. Violent inflammation followed, and the globe ultimately atrophied. When seen by me there was an extensive cicatrix of the sclerotic, indicating the seat of the wound, and the eye was still irritable.

When an eye has been burst and emptied of its contents it usually remains collapsed, puckered, and in size a mere button. I have before remarked on the manner in which the iris and cornea adapt themselves to the diminished proportions of the globe. Most marked is this when the eye collapses from rent in the sclerotica, the iris and cornea remaining intact. These ultimately assume so small a size that they might be easily overlooked; yet the proportions of the convex cornea, the anterior chamber, and the diminutive iris, remain distinct, as in the following case, though the pupil is always obliterated.

In August, 1857, I was consulted by Captain E., aged 26, who brought with him from a regimental surgeon a report of his case, of which the following is an abstract.

"March 2d, 1857.—Captain E., a healthy, spare, full-blooded young man, in playing racquets, was struck by his opponent's ball on the right cheek; he was stunned for a short time. I examined him, and found a small triangular cut below the right eye. The humours of the eye were partly on the cheek, partly protruding from the eye. The cornea

seemed entire; the conjunctiva and other coats were broken through just below the cornea and the inner canthus, and the eye was filled with blood.

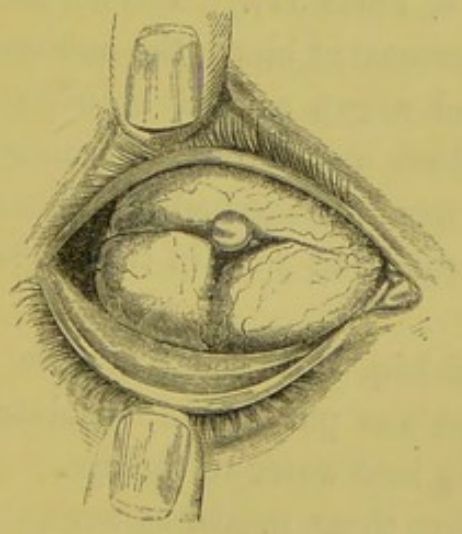
(The treatment adopted was, the lowest diet, active aperients, and darkness. Warm fomentations afforded great relief.)

"March 16th.—The eye opened itself, and it is in the following state: cornea clear and entire; conjunctiva highly inflamed and congested; a wound about three fourths of an inch long is situated at the inner canthus, partly covered by the lower lid; discharge small in quantity. Allowed small quantities of toast.

"March 31st.—The patient has gradually progressed toward recovery, and the eye is as follows: conjunctiva clear, cornea glistens, healthy and transparent; cicatrix formed part under the cornea, and covered by the lower lid; the eye considerably sunk in the head."

When I saw Captain E. in August, the condition of the eye was as follows: globe softened and much diminished in

Fig. 34.



size; cornea retaining its form, but singularly diminished, so that it was not a tenth of the natural size (fig. 34); more like

the cornea of a small bird—still there was a distinct anterior chamber. There was an iris and pupil filled with opaque material; the cicatrix spoken of had contracted and drawn the eye into puckers. A dusky, reddish hue pervaded the sclerotica. He was to have an artificial eye, and I saw him again December 4th. The shrinking had continued, so that the eye was a mere stump; it was gathered into three regular divisions by puckers. There had been no pain, though at changes of weather the eye was tender.

On the 11th June, 1852, I was summoned to a gentleman, aged 18, to whom a serious accident had just occurred, when playing at racquets. The ball, impelled with the full force of a powerful man, struck his right eye, and he fell as if shot, and remained insensible full two minutes. Blood flowed freely from his eye, and on his cheek the crystalline lens was found. He had been laid upon a bed, and was vomiting when I arrived. He was pale, faint, and almost pulseless, so great was the shock to the system. On gently raising the upper lid a considerable rent was visible in the conjunctiva and sclerotica, through which there was a slight projection of choroid (fig. 4, Plate II). The surface of the eye was covered with extravasated blood, the anterior chamber nearly full of blood, and a gap existed between the iris and the ciliary body. Blood and vitreous humour still oozed from the wound; the hæmorrhage had been considerable.

There was excruciating pain in the eyeball, the brow, and the head.

Forty drops of Liq. Opii sedativ. were at once administered, the patient was put to bed, absolute quiet enjoined; weak broth diet; iced water to the eye.

Notwithstanding these measures severe inflammation followed, rendering depletion, mercury, and active general treatment necessary; but it gradually yielded, and at the

expiration of five weeks the eye was in the following condition.

The wound in the sclerotica has united, its cicatrix retaining the dark tint imparted by the choroid which was involved in it. The natural pupil has disappeared, but there is a gap between the iris at its upper part and the margin of the ciliary body: the iris remains of a dull green hue, is tremulous and insensible to light; the patient has bare perception of light with that eye, and the other remains weak and incapable of exertion. The blood disappeared from the anterior chamber on the sixteenth day after the accident.

Rupture of the eye posteriorly, that is behind the point of reflexion of the conjunctiva, is a rare accident; and as the true character of the injury can only be ascertained by excision of the eye, doubtless cases in which it has taken place have escaped observation in the absence of the performance of that operation. It is the result of a sudden and violent blow inflicted full on the eye, and is attended with the sensation of the globe bursting; the eye fills with blood, and pain of the most distressing character racks the patient for many weeks, not a gleam of light being bearable; for though the injured eye is absolutely blind, the other is exquisitely sensitive to light. The symptoms subside by slow degrees, and atrophy of the eye takes place, varying in degree according to the extent to which the coagulum within the eye is absorbed; for it must be borne in mind that this coagulum does not always disappear. I have met with a case in which the colouring particles were absorbed, but the fibrin remained in a firm mass.

In May last I had the opportunity of seeing a highly interesting case in the practice of Mr. Bowman.

The patient, an elderly gentleman, was standing by a brougham when the door was suddenly thrown open and

struck him full on the left eye; the agony was intense, but the sight was not immediately extinguished, though after a few hours it became so. Mr. Bowman was sent for, and found the anterior chamber so full of blood that no part of the iris was visible; there was also chemosis of the conjunctiva. The accident had occurred a month prior to my seeing him, during the whole of which time his sufferings had been intense, and he could not bear a gleam of light. When the right eye was completely covered, the left could be opened, but it was absolutely blind. On examination it appeared as if the pupil were enormously dilated, the iris being reduced to a mere strip, and the colour of the pupil was a dull reddish brown; there did not appear to be blood in the anterior chamber, but we thought the back of the eye was full of it. The conjunctiva and sclerotica were acutely inflamed.

The eye was removed by Mr. Bowman the succeeding day, and I am indebted to him for the following particulars: During the operation it was found that the sclerotic had been ruptured in the posterior part, and that a large coagulum of blood lay partly under the rectus and partly within the eye. The vitreous humour had escaped at the time of the accident. Singular to say, the anterior chamber which appeared to be free from blood, was filled with coagulum, behind which the iris was found with the pupil of natural size; the aspect of the anterior chamber had been deceptive; the apparent film of iris being really the small portion visible beyond the margin of the coagulum.

Rupture of the eyeball must be treated on the same principles which guide us in the management of other wounds of the organ, bearing in mind that the most serious complications exist. The eye presents severe contusion, a lacerated wound of the sclerotic and choroid, entanglement in the

wound of the choroid or iris, and intra-ocular hæmorrhage. If the patient is vigorous or plethoric, full depletion should be employed, with every other means calculated to subdue inflammation, including rigorous diet and confinement to a darkened room.

Cold applications will be proper during the first two or three days, but if suppuration take place, poultices of warm ground rice will be very agreeable; frequent fomentation with warm water will be proper when the cold ceases to be grateful to the eye.

If a large portion of the contents of the eyeball have not been lost, and if perception of light remain, some sight may possibly be recovered, but the most guarded prognosis is at all times proper; if the progress should be most favorable, and the eye recover from the direct effects of the injury, there may be secondary effects which prevent or seriously embarrass sight; traumatic cataract may form and obstruct the pupil; if the lens has been expelled from the eye there will be a pupil either enormously large or much out of the axis of vision. Such at least has been the condition in every case I have seen.

The traumatic cataract may gradually undergo absorption if there be a rent in the capsule of the lens, or operative interference may be called for at some subsequent period; but an operation for the restoration of sight, under such circumstances, should only be undertaken after careful examination of the eye, as the blindness may depend on causes independent of the cataract.

When there is a clear and displaced pupil, the lens being absent, sight may be assisted by a cataract-glass; when the pupil is too large, there should be a plate of metal pierced with a hole or slit added to the glass; this excludes the excess of rays, and adds materially to the perfection of vision.

*Dislocation of the Lens.*—When a blow is inflicted on the eye the globe will be compressed between the impinging force and the hard walls of the orbit; the soft cushion of fat behind tends to diminish materially the force of blows falling directly on the front of the eye, and the brow further protects it. It is from the small hard balls used in racquets and tennis, which from their size easily reach the eye, that terrible injuries result; and I am told that dislocation of the lens is common among those confined in debtors' prisons, where the games in question are much in vogue. In pugilistic combats, on the other hand, where the weightiest blows are aimed at the eyes, it is rare to find the globes burst or the lens displaced;[1] indeed, in the cases which I have seen of serious injury to the eye from blows of the fist, the accident has, with few exceptions, befallen some unlucky peacemaker who was trying to separate the combatants, and who received the blow unexpectedly and sideways; or there has been a cowardly blow suddenly inflicted.

A blow upon the eye may cause rupture of the sclerotica and conjunctiva and loss of the lens, or the lens may be retained by the loose conjunctiva; the sclerotica almost always gives way either at the upper part or towards the inner side, and the rent takes place just beyond the junction with the cornea. Subconjunctival dislocation externally is extremely rare, it being difficult to inflict a blow in such a direction as will cause it; a well-marked instance has, however, been described by Mr. France,[2] the accident arising from the

[1] To obtain authentic information on this point, I made application to Mr. James Ward, formerly champion of England, who replied that in the whole course of his experience he does not recollect blindness to have followed in consequence of blows received in a prize fight. James Belcher, the once celebrated champion, who had preserved his eyes unhurt through numberless terrible battles, lost one of them whilst playing at racquets. The accident proved his ruin.

[2] 'Guy's Hospital Reports,' 1850.

woman, when stooping, striking her eye violently against the corner of a clothes-horse.

A good example of subconjunctival dislocation presented itself to me in 1856, and a careful drawing was made at the time, from which the annexed figure has been copied.

J. G., aged 17, was brought to my house May 28th, 1856. The day previous, whilst "larking" with other lads, he received a severe blow on the right eye from a clod of hard earth; the sight was at once extinguished, and intense pain, continuing for some hours, attended the accident. The eye had been fomented and covered with a bread and water poultice. When I saw him he still complained much, not merely of pain, but of the sensation of something in the eye, aggravated by movement of the lids, and it was with some difficulty that I made a satisfactory examination. The condition of the eye was as follows. There was general ecchymosis; the iris was nearly invisible from the anterior chamber being partially filled with blood; on the inner side just beyond the junction of the sclerotica and cornea, a dark line, evidently a rent in the sclerotica, was visible, and between this and the inner canthus was a yellowish swelling, the size of half a pea; this was recognised as the lens which lay under the conjunctiva; the conjunctiva had evidently yielded, and the lens had been driven rather beyond its point of exit from the sclerotic (fig. 5, Plate II).

Observing this, I decided on removing it at once, making the external wound not corresponding with the rent in the sclerotica and choroid: standing behind the patient, I slit the conjunctiva to the inner side of the lens; then making slight pressure, that body started out, together with extravasated blood. The eyelids were then closed and secured with a strip of plaister; cold-water dressing ordered to be constantly applied. The patient to remain in bed, on low diet.

It is unnecessary to give the particulars of the progress of the case, as they presented nothing remarkable; the patient was brought mildly under the influence of mercury, and strict antiphlogistic treatment enforced. On the fourth day I examined the eye, and ascertained that the iris had been detached at the point corresponding with the wound; the effused blood had been in a great degree absorbed, and the wound in the sclerotica appeared to be healed. At the expiration of a month the eye had partially recovered from the injury, though the traces remained in the disfigured iris and the dark seam which marked the exit of the lens.

When luxated, as in this case, the lens occasionally retains its form, but the force of the blow and the passage through the tough sclerotica, may so far destroy its texture as to reduce it to a mere jelly. It may retain both its form and its transparency but little impaired, as in a case in the practice of M. Roux, at the Hotel Dieu, in which, after thirteen days displacement, the lens was removed, little altered in form, and merely tinted yellowish amber.

The tumour formed by the lens has been seen to present very much the appearance of a collection of thick yellow pus.

Expulsion of the lens from the eye is, however, far more rare than simple luxation of that body, of which examples are familiar to ophthalmic surgeons. The extent of the displacement and the position of the lens varies: it may be thrown upwards, downwards, backwards, forwards, or to either side; much more frequently to the inner than to the outer side; it may be tilted on its axis, or may be forced partially through the pupil, as in fig. 2, Plate II; a condition invariably attended with serious symptoms. A remarkable case is mentioned by Dr. Mackenzie, in which the lens, broken in pieces and apparently swollen, lay in contact with the iris and cornea, whilst immediately below the cornea, the

sclerotica presented a concave depression where it had been struck by the stone which caused the injury. I never saw such a condition as permanent flattening given to the sclerotica by the momentary pressure of the stroke; that the eye should be bent for an instant from its natural shape is comprehensible; the persistence of the depression is not easily explained.

Partial or complete displacement of the crystalline lens may be produced by a trifling blow upon the eye. The slightest form is that in which the suspensory ligament, being partially detached, retains the lens *in situ*, but permits of its swaying to and fro, creating great confusion of vision; in such cases the iris is tremulous, and there is usually (as remarked by Mr. Dixon) a faint haziness of the lens, just sufficient to distinguish it from the deep blackness of the space between it and the edge of the pupil.

The lens may be separated from its attachments and fall into the anterior chamber, retaining its transparency, a condition depending on the integrity of the capsule; when there it produces a most unpleasant puzzling of the sight, so that the patient is constantly disposed to wipe something away which prevents his seeing clearly. A gentleman whose eye was in this condition, when describing his sensations to me, compared his sight to the sight of a person when his eyes are opened under water.

The presence of the lens in the anterior chamber usually causes neuralgia, but not necessarily inflammation; its appearance is peculiar, and when once seen is unmistakable. The light being reflected by its edge presents a prismatic or glistening circle within the eye, the iris is pressed back, rendering the anterior chamber larger than natural, and in the cases seen by me the pupil was dilated and motionless. It is important to recognise the true character of the case. Mr.

Dalrymple mentions a little patient, in whom dislocation of the lens was produced by a blow from a ball. The nature of the accident was not recognised, and the eye was destroyed by long-continued inflammation of the globe, ending in staphyloma sclerotic æ. Two years after, dislocation of the lens in the other eye took place, also the result of a very trivial accident, and the eye perished in the same way.

The detachment of the lens may not immediately follow a blow on the eye; weeks or even months may elapse before the ligament completely gives way, and then the separation may be caused by rubbing the eye, or some shock, as jumping from a height. The cases in which dislocation of the transparent lens takes place without violence in a healthy eye are, I believe, very rare; it is generally possible to trace symptoms indicating a departure from a perfectly sound condition, which have preceded the detachment of the lens, and these may be traceable to irritation sympathetic with a diseased condition of the other eye, or to morbid action excited in the organ itself.

If the lens be small enough to rest in the anterior chamber without materially stretching the iris, the eye may be tolerant of its presence in this unnatural position; but if it be jammed in the pupil or tightly fixed between the iris and the cornea, great irritation will be excited; this applies equally to those cases, and they are most numerous, in which the dislocated lens has become opaque.

The length of time during which the lens may retain transparency in its new situation varies. Kammerer observed an instance in which it remained clear two years. Chelius, Von Ammon, and others, have mentioned cases in which opacity was long delayed. It might be imagined that being cut off from its sources of nutrition, loss of transparency would speedily ensue; but whilst the lens is re-

tained within a perfect unbroken capsule, it is for a lengthened period independent of such influences.[1]

A striking instance was afforded of the small annoyance caused by a dislocated lens, in the patient whose eye is delineated in fig. 1, Plate II. She was an Irishwoman, who presented herself among the out-patients at St. Mary's in 1855, and the first glance discovered an opaque lens lying in the anterior chamber. Not doubting that her application bore reference to this, I told her that an operation would be necessary for its removal. Rather to my surprise, she intimated that it was by no means her wish to have the lens interfered with, as it had been in its present position two years (having been displaced during a little difference with her husband), but that there was a bladder on her eye which was painful, and for that she sought advice.

The anterior chamber was more than half filled with an opaque lens, which concealed the pupil, and rendered the iris concave; the iris itself was slightly altered in colour, but gave no indication of having been the seat of acute inflammation; the sclerotic was natural; the cornea presented a transparent vesicle the size of half a pea, which was exquisitely sensitive. On being punctured, this collapsed, and the eye became easy. The patient was directed to use a solution of nitrate of silver, and when I saw her at the expiration of a week the vesicle was well. The woman assured me that all pain ceased in the eye a few days after the blow which blinded it, and even the prospect of regaining sight would not tempt her to submit to the removal of the lens.

When we reflect on the extreme irritation often caused by the presence of a small fragment of cataract thrown by the

[1] Valuable information on luxation of the crystalline is to be found in the '*Etudes Ophthalmiques*' of Dr. Revaud-Landrau, Paris, 1852.

needle into the anterior chamber, it is surprising that so bulky a mass as the entire lens should remain in this novel position without lighting up acute inflammation. Such cases are, however, exceptional. The ordinary characteristics of a dislocated lens are presented by the following.

Jane Webb, a servant, applied at St. Mary's, February 10th, 1857. Two days previously, while coughing violently, she felt something give way in her left eye, and at once lost the sight. As she entered the out-patient's room my notice was attracted by her peculiar gait. Her head was thrown far back, and her eyes were nearly closed. On examination of the affected eye a large, densely opaque, yellowish white lens lay in the anterior chamber, completely shutting up the pupil. The iris was slightly discoloured, and the iritic zone was becoming marked. The girl complained of intense frontal pain, extending over the side of the head, depriving her of rest at night. Light could not be borne, nor could she carry her head in any other position than that mentioned without increase of pain.

The patient refused chloroform, and great difficulty was experienced in making a section of the cornea, from the powerful spasmodic action of the eye and lids; the lens being in the anterior chamber was unavoidably divided, and one portion retreated through the pupil as the other was extracted. So little irritation followed the operation that she left the hospital convalescent on the third day.

James Housego, was admitted into St. Mary's Hospital, March 23d, 1855. Twelve weeks prior to his admission some dirt dropped into his eye; he rubbed it violently, and the sight at once became very indistinct without actual pain; it remained in the same state for fourteen days, when inflammation set in and became rapidly worse. On the 24th, I found the eye presenting every indication of long-continued

acute inflammation; the conjunctiva chemosed; sclerotica intensely inflamed; iris discoloured; the pupil widely distended by the opaque lens, which was impacted in it, and partly filled the anterior chamber.

The patient being chloroformed, I made the lower section of the cornea, and with a scoop easily removed the lens. The extraction of the lens at once relieved the suffering, and the patient rapidly recovered from the operation; the iris, however, did not recover its contractility, nor had the pupil regained its normal size or its activity, two months after the patient had left the hospital.

Impacting of the lens in the pupil is a source of great irritation, but when there is in addition a serious wound of the cornea the sufferings are intense indeed; the case just related is an example of the first of these conditions; the following is an illustration of the second.

John May, aged 38, was admitted into the North London Eye Infirmary, July 7th, 1849. On the 22d June a child threw a toy tin trumpet at him, the sharp jagged edge of which struck full on the cornea of his right eye, producing such intense pain that he felt stunned. The cornea was cut through transversely to one half of its extent, the lens was dislocated, and partially forced through the pupil in which it became fixed; palliative measures and salivation were resorted to, but from the time of the accident to the day I saw him he never ceased to suffer intense pain, so bad at night as to prevent his lying down or obtaining sleep; that which he had was by snatches in the daytime.

When seen by me the aspect of the eye was remarkable. The iris was stretched to the utmost (fig. 2, Plate II), so as to present a cone, the apex of which was formed by the greyish lens involved in the wound of the cornea, giving the appearance of a small staphyloma in front of the eye. The

iris was acutely inflamed and surrounded by the characteristic zone.

When proceeding to extract the lens an incision was made through the cornea, in the direction of the original wound, and the iris divided on each side of the pupil; nevertheless, great difficulty was experienced in removing the impacted lens, as extensive adhesions had formed, and it became necessary to take it away piecemeal. The operation was protracted, nevertheless so great was the relief afforded to the eye, that six days afterwards the wound had healed, the iris had recovered its place, pain had ceased, and the man was able to return home.

A singular case of occasional amaurosis, caused by a displaced lens, has been related by Mr. Middlemore; the crystalline lens was slightly cloudy, and when in its natural position, indicated by a grey tint of the pupil, the patient could find his way about; but the lens often sank, its posterior convex surface resting on the retina, at which time the pupil was perfectly clear, and the patient was quite blind. He could replace the lens at will by holding his head down, which was his usual position when walking.[1]

If the lens be partially displaced, its margin will be seen, and the clear black space between it and the edge of the pupil explains at once the nature of the case; whilst the lens is clear, as it may be for some days after the accident, it may not be easy to decide upon its luxation; especially, as the accident causing it may give rise to effusion of blood into the chambers of the eye; but as this disappears by absorption, the lens, more or less opaque, may almost invariably be recognised; and if there has been intra-ocular hæmorrhage in the vitreous humour, it will be very distinctly seen, as in the

[1] 'Treatise on the Diseases of the Eye,' vol. ii, p. 328.

following case, for the opportunity of seeing which I am indebted to Mr. T. Spencer Heward.

A tradesman was attacked by a gang of ruffians on the evening of December 9th, 1855, and garotted; besides the strangulation, which nearly cost him his life, a dreadful blow was inflicted on his left eye, which completely destroyed it. For a long time it was the seat of inflammation, but that had subsided when I examined the eye in June, 1856. Its condition was then as follows. The globe was greatly diminished in size, soft, and tender to the touch. The sclerotic was of a peculiar dingy yellow hue; the pupil widely dilated, the iris being reduced to a mere strip, and of a leaden colour. The lens, of a dark amber tint and opaque, had been driven upwards and outwards (fig. 35), so that its inner and lower

Fig. 35.

margins were visible at the upper and outer portion of the pupil; behind the lens a coagulum of dark blood was distinctly seen, the remains doubtless of hæmorrhage into the eye at the time of the injury. Sight completely extinguished.

An extremely rare accident is the partial expulsion of the lens from the eye; I have never met with an instance, but such a case is figured and described by M. Sichel.[1]

A female, 60 years of age, when sneezing, struck her right

[1] 'Iconographie Ophthalmologique,' p. 198.

eye violently against the corner of a table, and inflicted on it serious injury. Seven days afterwards she consulted M. Sichel. The cornea had been separated from the sclerotic along its upper and inner border, and the condition of the lens is thus described: "The crystalline is opaque, large, of a greyish tint, and covered superficially with small flakes of coagulated blood, which on its inner border extend in folds into the neighbouring region; it is fixed in a direction obliquely from behind forwards between the edges of the gaping wound existing at the junction of the cornea and sclerotic, so that the two inferior external thirds are seen in the anterior chamber, whilst the upper third appears without, covered only by the conjunctiva."

There was a good deal of inflammation; but this being somewhat subdued by the 17th of May, M. Sichel proceeded to remove the lens. With a cataract-knife he made an incision, which gave exit to the soft portion of the crystalline. This body itself, its surface marked with coagulated blood, followed, with a portion of vitreous humour, when the incision was completed; the nucleus was yellow. As many fragments of the lens and capsule remained adherent to the posterior surface of the cornea, they were removed with forceps. The lips of the wound were then drawn together. Strict antiphlogistic treatment was adopted, and the case did extremely well, a fair amount of vision being restored to the eye.

Those luxations in which the lens is somewhat turned upon its axis, and its edge tilted against the iris, are attended with much neuralgia; there is intolerance of light, and the muscles of the eye are in an irritable state, compressing the globe and propelling the lens against the iris, so that when motion excites vibration of the lens, the sufferings and irritation are excessive.

A displaced lens may create so much irritation as to excite sympathetic disturbance in the other eye, rendering its removal necessary. In the course of the last autumn Mr. Dixon excised an eye, at the Royal Ophthalmic Hospital, under the following circumstances.[1]

The patient, a man of 40, had sought advice for muscæ and failing vision in the right eye, and stated that for twelve months back he had been quite blind of the left. On carefully looking into the left, Mr. Dixon found that the lens had been depressed and was visible below the pupil. On inquiry, it turned out that the man had received a blow on the eye twelve years ago, prior to which his sight had been good, and within a few weeks of which it had been wholly lost. The eye having been excised, the lens in its capsule was found lying on the retina, just behind the ciliary processes, and attached by some thin films of membrane both anteriorly and behind. The vitreous humour was fluid as water; the retina was not detached, but had almost wholly lost its normal structure.

A sad case fell under my own notice in 1857, in which it became necessary to remove the eye.

R. W. Apps, a very respectable man, an umbrella-maker, was struck intentionally on the left eye with a shoemaker's hammer, in December, 1856. His assailant stealthily approached him, and as the blow was struck his face was rather turned, so that its force fell partly on the eye and partly on the lower edge of the orbit, near the nose, where a severe wound was inflicted. Such was the force of the blow and such its effects, that the poor fellow remained nearly unconscious for a week, and was said to have lost a considerable quantity of blood at the time of the injury. He was laid up, unable

[1] 'Med. Times and Gazette,' Sept. 4, 1858.

to work, for eight months, suffering great pain over the brow and head.

His condition on the 8th November, 1857, was as follows: the globe tense and somewhat conoidal; the upper and outer third of the sclerotic discoloured, inclined to be staphylomatous, and there is the mark of a cicatrix just at the margin of the cornea. The cornea is somewhat projecting; of the iris, merely a narrow strip remains, and this is wanting at the upper and the outer part; the lens is luxated, and is tilted downwards and forwards, the lower edge pressing the iris against the inferior border of the cornea.

The lens is somewhat flattened, doubtless by absorption; the margin semi-transparent, nucleus opaque. Sight is entirely extinct in the eye, and it is impaired in the right eye to such an extent as to prevent his following his work.

The eye was excised by me at St. Mary's Hospital, on the 9th December. Fifteen minutes after removal the globe was examined by my colleagues, Dr. Sieveking, Dr. Handfield Jones, and myself. The outline was altered, there being a staphylomatous fulness at the upper portion. The tint generally was dark brown, from thinning of the sclerotic; there was indication of a cicatrix near the upper and outer margin of the cornea, and some old extravasated blood still lay under the conjunctiva.

Our attention was attracted by a remarkably brilliant reflection from the fundus of the eye.

On cutting through the globe transversely, the vitreous humour was found to be perfectly fluid, the retina as nearly as possible transparent, no yellow spot discernible; choroid very pale, and total absence of pigment; under the microscope the bacillæ and vessels of the retina were well seen, and scattered about were peculiar globules or particles like blood-corpuscles.

The lens lay between the iris and the ciliary processes, which completely encircled it posteriorly. At the upper part, corresponding with the cicatrix, was a pouch-like appearance of these processes, doubtless from rupture.

Professor Tyndall was so obliging as to institute a series of experiments to determine the cause of the peculiar brilliant reflection from the fundus of this eye, and sent me the following explanation.

"I examined the coating of the eye by lamplight, and observed the reddish glare of which you spoke; at certain incidences of the light it was very strong.

"I placed a cold plate of glass over the flame of a candle, so as to get a uniform layer of soot deposited upon it. Where the layer was not too thick to exclude the light wholly, the soot showed the same colour as the coating of the eye. I think both are due to one and the same cause. The redness of the eye-coating depends upon a slight transparency for the red rays possessed by the brown pigment; both the soot and the pigment are more hostile to the blue than to the red, and the latter rays remain after the former have been wholly quenched.

"The effect is observed during a smoky day in London; the sun's disc appears *red*. This is not the case with a mere foggy day; it is the finely divided carbon suspended in the atmosphere which produces the effect."

Mr. William Martin kindly communicated to me the following singular case of cysticercus in the lens.

Ramchurn, aged 56, was admitted an out-patient of the Calcutta Eye Infirmary, June 21st, 1856.

About four months previously he received a blow on the temple, since which his sight has been lost.

The pupil is large and inactive, and is pressed upon by a lens evidently partially detached from its suspensory ligament.

It is opaque, and can be seen through a transparent capsule to be composed of two distinct parts; one of dense consistence, which lies amidst a lighter mass, and moves freely as the eye is moved. Near the outer margin is a small body, which, by examination with a powerful lens, has the shape of a cysticercus, such as are occasionally seen in the interior of the globe. It moves independently of the motions of the eye, seeming to dip down its head, and occasionally moves entirely out of the field of vision.

The object was seen at every examination till the 14th of July, when it disappeared, and no opportunity presented itself of further verifying its existence.

The crystalline lens may be displaced by succussion, as in the following case related by Mr. Brodhurst.

"A complete virago, a Hungarian of stalwart form, had occasion to correct her little son for some real or imaginary misdemeanour. Not wishing, however, to execute the full vigour of her law, she preferred the milder punishment of shaking to any better established mode of administering correction. Having seized him by the collar of his dress and his coarse shirt, she used her formidable powers to the best of her ability, and seemed not disinclined to repeat the lesson when desired to explain the how and the wherefore. The child was a puny boy and delicate, but not in bad health. The shaking having been administered, was forgotten (except by the boy, perhaps), and only recalled to the mother's memory by cross-examination, and the suggestion of falls, blows, &c., in explanation of the case. Then it flashed upon her mind, and she made a ready confession.

"It appeared that about ten days had elapsed before anything extraordinary was observed in the eye. At the end of that time a scale was seen in the eye; but she thought it might disappear, and consulted with a neighbour as to the

probable cause. Failing to suggest a remedy, and the opacity growing more confirmed, she at last sought advice. It was on the eighteenth day, as near as may be, that I had an opportunity of seeing the lad. The cataract was whitish, capsulo-lenticular, yet incomplete, without adhesions to the iris, without lymph-spots or irregularities of opacity. The iris was healthy in appearance, and the pupil dilated. There had not been pain in the eye, nor was there evidence of any unhealthy action." [1]

A case is related by Dr. Lorch in the fifth volume of Ammon's 'Zeitschrift,' in which dislocation of the lens occurred in both eyes after a fall on the back of the head.

It may be a question whether the lens is in the eye or not; and in determining this point, we derive considerable aid from the catoptric test, which was brought forward some years ago as invaluable in the detection of cataract, but which has been superseded by the ophthalmoscope for that purpose.

The pupil being dilated, the patient should be placed in the dark, and the surgeon, being seated in front of him, passes a lighted taper slowly backwards and forwards across the eye. The image of the flame will be clearly reflected from the anterior surface of the cornea. If the lens be *in situ*, two other images will be seen: one, inverted and very small, from the concave inner surface of the posterior capsule; the other behind it, less distinct, but erect, from the anterior convex surface of the lens. The reversal of the position of these images is referable to one surface being concave, the other convex. The existence of these three images is conclusive as to the presence of the lens. If there be but one image seen—that from the cornea—it may be concluded, the humours being clear, that the lens is wanting.

[1] 'Of the Crystalline Lens and Cataract,' p. 141.

We have seen two forms in which the displaced lens presents itself, namely, with its transparency retained, and as an opaque cataract; there is yet a third condition in which it is found—where osseous degeneration has been superadded to the simple opacity. When the lens continues clear, we may conclude, not only that its capsule retains its integrity, but that the conditions of nutritive supply are not seriously impaired. In the second class of cases, the attachments may be severed, or the supply may be so far interrupted as to give rise to the death and opacity of the lens. The third form, the ossified lens, always represents a long-standing condition of disease. The ossific change is slow; but for it to take place, it is necessary that the sources of supply should not be arrested, otherwise the interchange of particles cannot take place. As in those beautiful specimens of fossilized wood from Antigua, where the ligneous molecules are slowly disintegrated and as slowly replaced by silex, so here, though in a less regular and perfect manner, the ossific material is laid down in place of the normal lens-structure. That this may closely resemble the structure of true bone is proved by a specimen described by Dr. Kirkes, and figured in the sixth volume of the 'Transactions of the Pathological Society.'

We are indebted to Mr. France for the narration of an interesting case of true ossification of the lens, which presented itself under the form of dislocation.[1] A groom, aged 44, had received a blow on his right eye twenty years before, and the sight was completely extinguished by the severe subsequent inflammation. He met with no fresh violence; but on rising one morning, three or four months before his admission into Guy's Hospital, he observed for the first time a white substance in the eye, which continuing permanently,

[1] 'Guy's Hospital Reports,' 1845.

excited constant pain and inflammation of variable severity. On his admission there was visible at the bottom of the anterior chamber, occupying about three fourths of the cavity, an oblong light straw-coloured opaque body, separated by a space from the cornea, but in contact with the iris.

Mr. Morgan extracted this on the 10th of May, 1847. The case did well; the wound healed, and the patient was speedily convalescent, though the eye was amaurotic.

On examination, the lens proved to be in chief part hard and calcareous, resisting compression between the finger and thumb, or puncture with a knife, and tinkling when shaken in a phial. On chemical examination, it was found to be composed of carbonate and phosphate of lime, three proportions, cemented by two proportions of animal matter.

This agrees with an analysis made by Dr. Hoffman of an ossified lens removed by me.

The irritation caused by such a hard and heavy mass shaking in the anterior chamber may well be imagined.

An interesting case of osseous dislocated lens has been recorded by Dr. Stoeber, of Strasburg. A stone-cutter, aged 49, had lost the sight of his left eye in infancy, from some unknown cause; but in 1832 he accidentally received a blow upon that eye from a clod of earth. This was followed by violent inflammation, which never disappeared, the eye remaining irritable, and especially susceptible to atmospheric influences.

In May, 1838, he consulted Dr. Stoeber, who saw the opaque lens lying in the anterior chamber, and proceeded to remove it. This he found no easy matter; for in making the section, the knife grated as it touched the lens, showing that it was ossified. A hook was then introduced, which slipped without seizing the body, which was adherent to the iris. With some further difficulty, the lens was detached by

means of a needle, and removed. It was found to be hard, and to give the sound of a piece of flint when dropped on a slab of marble; it was, in fact, thoroughly calcareous. The patient recovered in eight days.

A not less interesting case has been published by Dr. Robert Taylor, and a third occurred in the practice of Dr. Warlomont, of Brussels. There are others noted, but these possess especial interest.

A few words now remain to be said as to the treatment proper for cases of dislocated lens.

When an opaque lens lies in the anterior chamber, it can only be regarded in the light of a foreign body, and the safest course will be to extract it. Instances have been mentioned where little irritation has been caused, but these are exceptional, and it must be borne in mind that inflammation may be lighted up at any moment—the vibration of a railway, the shaking of horse-exercise, or a multitude of other circumstances, may give rise to it. According to my experience, the operation of extraction in such cases is attended with little risk, and by its performance the eye is relieved from a great and constantly impending peril. Undoubtedly the consent of the patient may be withheld, and then we can only adopt palliative measures if inflammation exists, or precautionary measures if the patient has the good fortune to escape it.

In proportion as the patient is advanced in years is the chance of a dislocated lens being removed by absorption, diminished. In early youth, when the lens is soft, easily infiltrated by the aqueous humour, and thus brought into a condition for the action of the absorbents, there may be reasonable expectation of its disappearance through their agency, and extraction need not be insisted on; but after the age of forty, when the lens has acquired greater consist-

ence, its removal by absorption must be very slow under the most favorable circumstances, and the probabilities of its exciting inflammation will be great.

Should inflammation arise, the patient must keep absolutely quiet, in order that the lens may not undergo vibration or displacement, as that would increase the irritation. Blood may be abstracted, and antiphlogistic measures employed. Mercury may be administered, but should not be pushed to a great extent; more advantage will be derived from keeping the system mildly under its influence for some time than by exciting profuse salivation.

Belladonna should be applied freely around the eye to maintain dilatation of the pupil, and frequent fomentations with a weak solution of the extract of belladonna will soothe the pain. When the neuralgia is severe, the brow should be frequently painted with the solution of nitrate of silver in nitric ether.

Dupuytren advised that a needle should be passed behind the margin of the cornea into the anterior chamber, and fixed firmly in the dislocated lens, which should then be lifted behind the iris; but if any operation be performed, it will be far better to remove the lens from the eye than to replace it thus ingeniously.

In proceeding to extract opaque lenses, I give the preference to the lower section; this enables the lens to escape at once if free, or if adherent to the iris, the connexion can be separated with facility. We should remember, when dealing with a spontaneously displaced lens (especially if the lens be osseous), that the vitreous humour is almost certainly fluid, and that, therefore, the gentlest handling will be necessary. If the hard lens is behind the iris and attached to it, the pupil will probably be so rigid as to make it exceedingly difficult for the lens to pass through; under

these circumstances it is far better to slit the margin of the pupil with a pair of scissors, and so to enlarge it, than to endeavour to force the lens out; for the vitreous humour will escape, though the lens will not, and thus the globe may be emptied to a serious extent.

Though not an advocate for the use of chloroform in ordinary extractions, I consider it of the greatest value when dislocated and osseous lenses have to be removed. Adhesions may exist; the operation is then necessarily prolonged, and requires extreme care and delicacy in its performance. Without chloroform the eye becomes restless and irritable, retreating from every touch, while the lids spasmodically close. The anæsthetic then, is a great boon to the operator, and a still greater to the patient, sparing much suffering, warding off secondary neuralgic pain and irritation, and thereby hastening convalescence.

Dislocation of the Eyeball.—The eyeball may be dislocated, that is, extruded beyond the fibrous layer of the eyelids, as the result of accident.

The aspect of a person with dislocation of the eye is very ghastly; the globe is protruded beyond the lids, fixed and staring, and apparently all but detached; yet in the majority of cases, notwithstanding the violent stretching of the optic nerve, vision has not materially suffered when the globe has been promptly replaced.

The accident is generally the result of a stick or tobacco-pipe being thrust violently into the orbit; such is not always the case. Mr. Tyrrell mentions having seen two cases of dislocation of the globe from imprudent forcible examination of the eye—the tarsi being pressed into the orbit behind the anterior hemisphere of the organ; the mischief was readily repaired, and the globe reduced without any injury to it or

to the optic nerve. Vision was not materially affected by the dislocation.

Cases where, by a comparatively slight cause, the eyeball has been dislocated from the socket, are of rare occurrence. Nor can they arise without a concurrence of circumstances; a large eye, a shallow orbit, and the force applied in such a direction as to act between the margin of the orbit and the posterior hemisphere of the globe, would be required to jerk the eye beyond the lids; by them it is prevented returning to its place.

There are persons whose eyes naturally protrude so much, that a very slight amount of violence would be sufficient to push them from their sockets. I had occasion to extirpate an eye of this description last year, and after a few strokes of the scissors the globe was detached with singular facility, as it could be almost drawn from its place by the fingers, so shallow was the orbit. It was probably owing to a similar conformation that an eye was displaced by a blow from a racquet-ball, as described by Covillard in his 'Observationes Iatro-Chirurgicæ.' A man received so terrible a stroke on the eye from a racquet-ball, that the globe was completely forced out of the socket, and when Covillard entered, the father of the patient stood ready with scissors to sever the remaining attachments. The eyeball was carefully replaced, and the patient recovered without injury to sight.

A smart controversy arose regarding this case. Maitre-Jan denied the possibility of such a cure, and declared the statement grossly exaggerated. Similar cases had, however, occurred to Lampzwerde of Cologne, and Spigelius, and modern experience has fully established the possibility of such accidents, and of sight being recovered on replacement of the eye.

Two cases of genuine dislocation of the eyeball have fallen

under my own notice. In one, a young man in a fit of insanity endeavoured to pluck out his eye, and succeeded so far as to drag it beyond the lids.

In the other, two lads were fencing with sticks, and one making a lunge struck the blunt end of the stick into the outer corner of the left orbit of his opponent, whereby the globe was dislocated.

In neither case were the attachments of the eyeball seriously injured, and in each it returned into its place with a jerk when the lids were held sufficiently apart.

The sight was uninjured in both instances.

Mr. Stuart, of Kelso, mentioned to me an instance in which the globe was dislocated by the patient stumbling and falling with his eye against the ring of a key in the door; the eyeball was thrust completely out of the socket, but the attachments were not severed. It was ascertained before returning the eye to its place that vision was retained; this is exceptional, for vision is generally lost whilst the optic nerve is on full stretch. The patient made a good recovery, with complete power of vision.

Dr. Jameson, of Dublin, has recorded a highly interesting case.[1]

Peter Nowlan, aged 30, a powerful and muscular man, a corn-porter, was admitted into Mercer's Hospital, November 3d, 1852, at half-past twelve at night. His wife stated that he came home that evening at ten o'clock in a most intoxicated condition, and while staggering about his room struck his right eye against a small hook or nail that was in a dresser, which entered at the outer angle of the upper eyelid of that side, and when she went to his assistance discovered his eye protruded from the socket. She was most anxious

[1] 'Dublin Med. Press,' 1853.

to remove him at once to the hospital, but could not succeed in prevailing on him to go until half-past twelve at night. He was on admission very boisterous and unruly, and held a large check apron close up to his eye, constantly rubbing and pressing against it. On its being removed, he presented a most peculiar and frightful appearance. There was the right eye protruded from the orbit, firmly fixed and immoveable, staring, elastic to the touch, and devoid of all power of vision. The cornea was dry and rather opaque, pupil moderately contracted and uninfluenced by the light of a candle. The margin of the upper lid was not visible, being behind the globe and spasmodically contracted.

Restraining the patient with difficulty, Dr. Jameson, with two fingers of his left hand, elevated the upper lid, pressing at the same time with the fingers and thumb of his right on the ball of the eye, which was immediately drawn back with a snap, the lids closing over it.

The patient recovered in a few days with complete vision.

Excessive protrusion of the eye, almost amounting to exophthalmos, has been known to follow rupture of the ophthalmic artery. Dr. Bennati, a promising young physician, was thrown from his horse in the Boulevard des Italiens, at Paris, and his head struck the pavement. Dr. Carron du Villards saw him immediately after the accident, and found the right eye so much thrust out, that it could scarcely be pushed back into the orbit. Death took place, and the autopsy showed a fracture of the orbit, involving the optic foramen. The ophthalmic artery and vein were ruptured, and behind the eye was an enormous coagulum of blood, which thrust it forwards.[1]

Professor Flarer, of Pavia, has published a case,[2] in which

[1] 'Gaz. Médicale,' t. vi, p. 612.

[2] 'Ann. d'Oculistique,' t. xix, p. 141.

traumautic exophthalmos was followed by sloughing and exfoliation of the anterior hemisphere of the globe.

A swineherd, aged 17, was knocked down and gored by a pig, the tusk striking the inner angle of the left eye.

Three hours afterwards he was seen by Dr. Flarer; the eyelid was ripped open, and the eyeball lay on the cheek, turned on its axis, so that the torn insertions of the rectus internus, rectus superior, and obliquus superior, were visible. The sclerotic was bluish and dry, but not wounded. There was constant trembling of the globe. No perception of light. It was doubtful whether the eye ought to be at once excised, but the chance of recovery was decided on, and the globe was carefully replaced in the orbit, retained by bandages, and ice was applied.

Swelling of the cheek and lid took place the following day, and there was febrile disturbance, but it yielded to free abstraction of blood. The day after, the eyeball increased in size, and the conjunctiva became chemosed, so that the lids no longer closed. The third day after the accident there was free discharge of bloody pus from the wound, and the cornea had become opaque. On July 21st the cornea and portion of conjunctiva formed a dry eschar, and a line of separation appeared. Some days later, Professor Flarer removed the slough, which was found to comprise, not merely the cornea, but the iris and anterior portion of the sclerotic.

The extensive wound gradually healed, and the eye recovered, with less diminution in size than might have been anticipated.

If an eye has been dislocated by a substance being thrust into the orbit, it is important to ascertain in the first instance whether a portion might have been broken off and left behind. M. Nelaton removed from an orbit the ivory handle of an umbrella, which had remained there unsuspected

twelve months![1] Beer was summoned to a student whose eye had been thrust out of the socket by a tobacco-pipe. He found, and extracted from the orbit, a piece of the pipe nearly an inch long, when the globe returned of itself into the cavity.

The action of the muscles is sufficient to replace the eyeball when freed from the constriction of the eyelids, which gird it tightly behind.

If the end of a narrow smooth spatula or probe, oiled, be gently slid under the margin of the upper lid, and the lid pressed upwards and forwards at the same time that with the fingers of the other hand, the eyeball is gently pressed backwards, reduction may generally be accomplished, the globe returning into its place with a sudden snap. The lids should then be closed, a light compress and bandage applied; proper measures must be taken to prevent inflammation.

If the muscles have been lacerated, and the palpebral aperture torn open, there may be some difficulty in retaining the globe in its place. This can be done by applying a little collodion to the eyelashes; it will immediately glue them together, and effectually prevent further extrusion. Cold-water dressings should then be applied, and strict antiphlogistic measures adopted. Should the collodion not be used, a compress and bandage will be required, but it will be objectionable to load the eye with dressings as tending to heat it and excite inflammation.

The eye may be completely torn out of the socket, as in a case mentioned to me by the late Dr. Ross, of Madeira. A peasant, heavily laden with wood, going down one of its steep mountain sides, fell with great violence on a fir log, a projecting fragment of which, striking the corner of his right

[1] 'Gaz. des Hopitaux,' No. 114, 1854.

eye, completely tore it out of the socket. The man did well, but was so unlucky as to lose the other eye some time after by a blow in a drunken squabble.

It is, however, by musket-balls that this injury is most frequently caused. During one of the sanguinary convulsions in Paris, a man, passing through the Rue de Cléry, was struck by a bullet fired from a window. The ball grazed the right superciliary region, passed before the bridge of the nose, entered the left orbit, and turned the eye out as cleanly as if done with a curette. The globe was not quite detached, but hung suspended by some strips of muscle and nerve. The man came under the care of M. Jobert, at the Hotel Dieu; and the eye having been replaced, ultimately shrank sufficiently to admit of an artificial eye being worn.

A case is related in the first volume of Gräfe and Walther's Journal, in which a cart-wheel went over the side of a man's head, and tore out the eyeball, with seven lines' length of the optic nerve, the muscles of the eye being left behind, and the orbit uninjured. The patient, though seventy-five, recovered without a bad symptom.

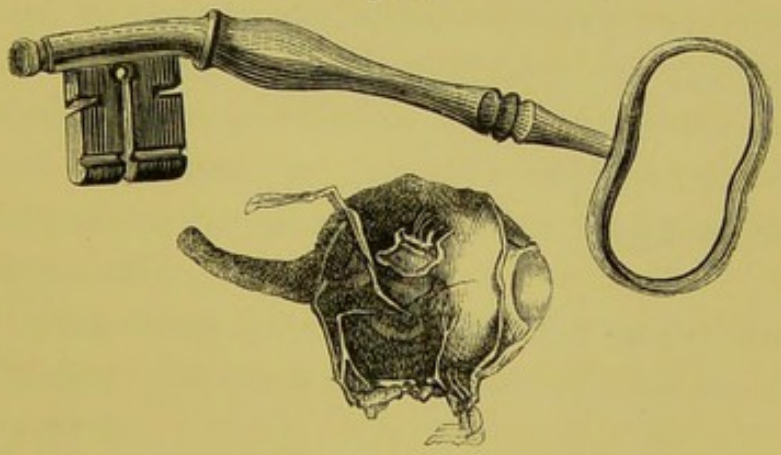
A drunken fisherman at Ostend, named Degruyter, coming home one evening very far gone, stumbled in the act of undressing himself, and fell with all his weight against the room door. In the fall the right orbitary region struck against the ring of the key which was in the lock of the door; and as the key was worn thin by long use, it divided vertically the upper lid, entered the orbit, and acting as a kind of lever, tore out the eye, so that it rolled upon the floor. It might have been supposed that such an accident would have sobered the man; but he went to bed and fell asleep, quite unconscious of the injury he had sustained. His wife, on rising in the morning, was astonished at the quantity of blood which her husband had lost from an appa-

rently slight wound of the lid; but her astonishment changed to fear when she found an eye on the floor.

Dr. Verhaeghe, who was sent for, found the man in bed, his clothes saturated with blood, the orbit filled with coagula, and portions of some of the muscles of the eye hanging out between the lids. The bleeding had ceased.

The eye and the key, reduced one third, are represented in the accompanying wood-cut (fig. 36).

Fig. 36.



The eye was entire; its muscles had been torn across at different distances from their insertions into the sclerotic. The optic nerve was divided at about an inch from the globe. The key was bent into an obtuse angle from the fall against it of so heavy a weight. The patient speedily recovered.[1]

If the eye be torn out, little can be done beyond removing any ragged strips that may be hanging from between the lids and applying cold wetted rags. In neither of the cases related was the hæmorrhage formidable, nor is it likely to proceed beyond the control of cold and pressure.

[1] 'Ann. d'Oculistique,' t. xxvi, p. 99.

If the orbit be in a fit state, an artificial eye may be introduced after about a week. How far it may partake of the movements of the other eye will depend on the quantity of the muscles of the globe and soft parts remaining to form a stump on which the eye can be placed.

## CHAPTER VIII.

Traumatic effusions of blood into the eyeball may be caused by violence acting directly upon the globe, or by blows inflicted in its vicinity, and acting indirectly by concussion. The shock produced by a powerful blow on the chest has even been known to give rise to it, and I have seen it follow a heavy fall on the occiput. Larrey remarked upon the frequency of intra-ocular hæmorrhage from bullets striking the margin of the orbit.

Blood may be effused into the anterior chambers (hypoæma), into the vitreous chamber (hæmophthalmos), or, in extreme cases, into both.

Effusion of blood into the anterior chambers of the eye is far from uncommon after smart strokes, as those from a whip, small branches of a tree, &c. This, though it may, by occlusion of the pupil, temporarily extinguish the sight, is not usually serious, unless attended with other injury. Far otherwise is it when the blood is effused into the chamber posterior to the lens—an accident always serious, often destructive to vision.

The appearance presented by effusion of blood in the anterior chamber is represented in fig. 2, Plate I. The drawing was taken from the eye of a lad who had been accidentally struck by a whip, the end of the lash falling just at the outer margin of the cornea. There was slight congestion of the conjunctiva, the anterior chamber half filled with

florid blood, and for a time the sight was extinguished as an effect of the concussion. Cold water only was applied, and at the expiration of thirty-six hours the blood had entirely disappeared. The sight was restored in a few days.

If the anterior chamber be filled with blood, the patient will have a red glare before the sight, but no vision; if only partially filled, objects may be seen through the portion of the pupil that is not covered. Even then there may be a reddish tinge imparted to the vision from the aqueous humour holding colouring matter of the blood in solution.

The anterior chamber sometimes fills with blood during the operation for cataract by puncture through the sclerotica. Von Ammon[1] has represented this in one of his plates. The blood would here flow from the choroidal or ciliary vessels; when it is confined to the anterior chamber, it is probably effused from the ciliary margin of the iris; in some cases slight detachment of that membrane exists. Free bleeding, it may be remarked, always accompanies separation of the iris from its attachment. In cases in which there is considerable effusion of blood into the anterior chambers,[2] although there is no trace of injury to the iris, we are justified in supposing that it is the ciliary vessels whence the blood has been poured.

When hæmorrhage into the anterior chamber has followed a blow, a recurrence may take place. In 1852, a man was admitted into St. Mary's who had received a blow upon his right eye with a small stick; there was some ecchymosis, and the anterior chamber was nearly filled with blood; this disappeared after three days, under the application of cold, but on the fourth day the eye felt full and uncomfortable, and

[1] 'Klin. Darstell,' Bd. I, Tab. xiii, fig. 1.

[2] The expression, anterior chambers, here includes the entire cavity in front of the lens.

the anterior chamber again filled with blood. Leeches were applied, and strict antiphlogistic treatment enforced; again the chamber became clear; but after incautious exposure to the heat and glare of the fire in the ward on the sixth day after the blood had disappeared, another, but slight effusion took place. Blood was again abstracted by cupping, and the patient confined to bed for a week on the lightest diet, the eye being constantly covered with cold wet rags. There was no recurrence of the bleeding, and the patient was discharged, at the expiration of a fortnight, with the eye recovered from the effects of the injury.

After each effusion the blood was rapidly absorbed. Clemens[1] saw a peasant lad who had been caned by a soldier, and wounded in the supraorbital region; a considerable detachment of the iris and effusion of blood had taken place, but three days afterwards not the least trace of extravasated blood remained.

Blood effused into the anterior chamber speedily undergoes absorption if it mingles with the aqueous humour; if, however, it coagulates into a clot the process is somewhat slower. The explanation offered by Mr. Bowman, of the rapid disappearance of the first of these conditions, is this: he imagines that the blood in such cases mixes with, and its red particles swell in and give their colouring matter up to the aqueous humour, hence their speedy absorption; Dr. Meyr, without denying this, has pointed out[2] that in wounds of the eye, in which the aqueous humour is totally evacuated, and its place instantly occupied by blood, the blood will sometimes be absorbed in twenty-four hours, provided proper means are taken to prevent inflammation.

Much depends, however, on the healthy condition of the

[1] 'Script. Ophthal. Minores,' t. i, p. 144.

[2] 'Beiträge zur Augenheilkunde,' p. 17.

eye; when blood is effused, as a consequence of inflammation or of disease, its disappearance is much slower. A clot will remain almost unchanged for weeks and even months, assuming a dark chocolate tint. In some cases, as mentioned elsewhere, the blood undergoes a species of decomposition, and assumes the yellow-ochre aspect delineated in fig. 5, Plate I.

When the anterior chamber remains filled with coagulum, a chocolate reflection may be seen which is very deceptive; in a case elsewhere mentioned, Mr. Bowman and myself were under the impression that a reflection of this description was posterior to the iris, whereas it was in front of it.

When the extravasation has been considerable, there may remain discoloration of the iris for a considerable time after the anterior chamber has been emptied of the effused blood. A curious instance of the deceptive appearance caused by these patches occurred to Von Ammon, who was completely deceived by a patch upon the iris, so dark as to lead him to suppose that the pupil was greatly distorted; careful examination with a lens proved that this supposed distortion was merely a black deposit on the iris.

When blood is effused from, or upon the retina, sudden loss of sight results; this may be complete, or if only a portion of the retina is involved the remainder may still perform its functions; there is usually also a strong red glare before the eye, and often deep-seated pain; the iris is rigid and motionless, and from the fundus of the eye a reddish reflection is visible; the ophthalmoscope reveals the situation and extent of the effusion very precisely.

I have seen cases in which after a time, the clot in the vitreous humour assumed a greenish tint: these clots, though loose, have always a tendency to gravitate to the bottom of the eye, and it is far from uncommon to find, in connexion

with a single clot, brownish flakes or particles moving freely in the vitreous humour.

In September, 1850, a gentleman was struck on the left eye by a cricket ball; the sight was at once rendered imperfect, and became extinct within a few hours; he had submitted to a variety of treatment without advantage. In June, 1858, the patient was seen by me. Beyond a motionless and slightly dilated pupil there was nothing in the condition of the eye to attract attention; there was, however, visible, on close examination, a deep-seated greenish reflection. The ophthalmoscope revealed a multitude of brownish flakes floating on the vitreous humour, and effusion varying in parts from pink to a chocolate hue, pervaded the retina, covering the entrance of the optic nerve. A distinct dark clot of blood was discernible near the lower and outer portion of the retina.

An illustration of the value of the ophthalmoscope, in detecting obscure injuries of the eye, is afforded by the following case; without the aid of that instrument Mr. Dixon and myself could only have hazarded an opinion as to the probable nature of the injury, whereas we were enabled to speak with confidence and precision.

Two officers, returning from Epsom races, were amusing themselves with throwing various missiles at the passers by; one of these missiles, a hollow wooden pear, struck with great force the right eye of a farmer; the sight was immediately extinguished, and the eye much bruised. Ten days afterwards Mr. Dixon was consulted, and on examination with the ophthalmoscope discovered a rent in the retina and a considerable coagulum of blood, which lay against that membrane.

Legal proceedings were taken against the officers, but it was agreed that an amount of compensation should be settled

by two arbitrators, founded on a medical report to be sent in by Mr. Dixon and myself, together with Mr. Simms of Staines, who had special charge of the case.

We met therefore, on the 6th October, and made a careful examination of the injured eye. The pupil was slightly dilated and motionless; nothing abnormal visible beyond this; objects were seen by the patient indistinctly, and a black patch obscured the central portion; pica type was read with difficulty, each word requiring to be separately made out.

The ophthalmoscope showed the seat of the rent in the retina as an opaque, irregular line, nearly in the axis of vision, and there were many small spots around this, evidently the remains of the coagulum of blood which had not been entirely absorbed.

In our report we were enabled to state with confidence that though Mr. J. might retain a certain amount of sight in the injured organ, we were of opinion that it would never be restored to its former perfection.

An interesting case is mentioned by Langenbeck, which he describes as traumatic apoplexy of the retina.[1] A young man was kicked by a foal on the right eye and eyebrow, and was brought to the hospital. He there stated that at the moment when he was struck, flames appeared before the eye, after which all sensation of light in the eye was extinguished, but that it appeared to him as if a purple glare were before his eye.[2] The pupil was dilated and almost immovable. There was blood at the bottom of the anterior chamber. Towards the end of next day this was increased, but the patient joyfully declared that his power of vision was enlarged. On the third and fourth days the visual power

[1] 'De Retina,' p. 154.

[2] "Sed purpureum splendorum sibi ante oculum effusum videri."

returned, but only partially, so that only half of objects were seen. This hemiopia continued, and was considered to indicate that the lower half of the retina was covered by the effused blood.

When a vessel has given way between the retina and choroid, there will be seen a deep-red projection in the fundus of the eye, formed by the coagulum over which the retina is stretched. In some instances the retinal vessels are distinctly visible coursing over the surface; after a time the retina may give way, and the blood then comes into contact with the vitreous humour, in which it may remain as a coagulum, or diffuse itself in the form of flakes.

In December last, a gentleman consulted me respecting the sight of his left eye. Four months previously he had struck it against the corner of a chair; a red glare appeared, and in a few minutes he lost the sight, which had never been regained; there was the appearance of a dark mass before the eye. I examined it carefully, but with the exception of a greyish tint, evidently posterior to the lens, and a motionless pupil, could detect nothing abnormal. The first glance with the ophthalmoscope however, revealed the nature of the case. A greenish-grey mass at the posterior part of the vitreous humour completely obscured the retina, and as the eye moved, this was distinctly seen to be jerked up and then to settle slowly down, although it was too large to admit of the rays of light reaching the retina; it was evidently a coagulum of blood which had been effused at the time of the accident.

In this case the coagulum could not be detected without the ophthalmoscope, but I have seen others in which there was a yellowish, red, or buff reflection from the fundus of the eye, arising from extravasated blood containing more or less of the colouring particles. In some instances the bright red

continues for a long time, as in the patient whose case has been narrated as partial dislocation of the lens the result of garotting.

In another case, where the eye had been struck by a stone, the retina was almost entirely covered with extravasated blood, varying in colour from bright red to a deep chocolate, whilst a quantity of small flakes were floating in the vitreous humour.

The coagulum may be limited to a portion of the retina, and in place of a projection there may be seen at the lower part of the eye a concave mass, which remains fixed during the movements of the globe; or a patch may appear at one spot. The more recent the effusion, the more marked will be the colour, form, and size of the coagulum: if the effusion be considerable it may at once tear through the retina, or the retina may be lacerated by the blow, and the effusion result from the rupture of its vessels.

When the effusion into the vitreous humour is of some standing, the ophthalmoscope will detect opaque particles floating in the vitreous humours. This I believe to be specially the case when the blood has been extravasated into that body, and has been somewhat diffused.

The ophthalmoscopic examination often accurately confirms the description of the patient, who complains of a persistent dark spot constantly appearing before the eye, or a large portion of objects being obscured. In such cases a patch will often be seen upon the retina, conveying the impression of blackness by extinguishing its perception of light.

Formidable consequences may result from traumatic intraocular hæmorrhage. It does not follow that sight should be at once extinguished by an injury, but after a brief period the field of vision becomes limited, and diminishes rapidly

until it is altogether lost. This is caused by blood gradually encroaching upon, and at length totally obscuring the retina. I have seen two distinct forms, that in which the whole eyeball becomes filled with blood, and that in which the effusion is limited to the parts behind the crystalline lens. In the first class, the pain is very severe from distension of the globe and pressure on the ciliary nerves. The whole eye may appear enlarged, and inflammation of the conjunctiva and sclerotica takes place. The blood gradually clears away from the anterior chamber, and there is seen a widely dilated pupil, presenting a dull red reflection from the blood in the back of the eye; there is not the least perception of light in that eye, but the photophobia of the other may be extreme.

When the effusion is limited to the true posterior or vitreous chambers, symptoms closely resembling glaucoma may arise. The pupil becomes fixed and oval, the iris discoloured, and the lens gradually assumes the greenish amber-tint characteristic of glaucoma. The patient is usually teased with circumorbital neuralgia, but the symptoms rarely indicate very acute inflammation; it is rather a low form of inflammation set up by pressure upon the tunics distended with blood.

If an eyeball become filled with blood, it may present appearances closely simulating malignant disease.

James Cooper, aged 12, was admitted into St. Mary's Hospital, October 1st, 1852.

He was a pale, emaciated lad, but was said to have enjoyed good health until five and a half years previously, when his left eye was accidentally scratched by a piece of glass. This produced total loss of vision (probably from opacity of the cornea) but not much pain; three months since, the eyeball became painful and began to enlarge; it was treated with

leeches, blisters, &c., for six weeks, when the pain subsided, but the globe remained enlarged. Since that time he had complained occasionally of pain in the eye, and a week previous to his admission it had been struck with much force by a potato thrown at him by another boy.

The eye was burst by the blow, and it was stated that he lost half a pint of blood from the wound, but that was probably an exaggeration.

Its condition when seen by me was as follows. The upper lid was of a livid purplish hue, stretched by the globe, and displayed numerous large vessels. On fully raising it, the eyeball was seen greatly enlarged. In place of the cornea, the front of the eye was occupied by a yellowish brown mass, and there was a deep fissure nearly half an inch in length by two lines in width, occupying the situation of the inner half of the cornea. From this there issued a sanious discharge (fig. 3, Plate II). The general surface of the eye was of a brickdust red, with many vessels coursing over the whole of it. The globe was moderately elastic on pressure; the lad complained of paroxysms of lancinating pain, and almost constantly lay on his bed with the affected eye buried in the pillow.

He was ordered to bathe the eye frequently with a weak solution of Liq. Sodæ Chlorinatæ; and to take thrice daily, Hydrarg. c. Cret., gr. ij; Ferri Potass. Tart., gr. iv; M. fiat pulvis.

12th.—The pain has somewhat diminished, and the discoloration of the lid has disappeared. From the wound there still continues a free sanious discharge mixed with pus. The front of the eye is now occupied by a whitish sloughy mass; the other appearances continue much the same. The case was seen by Mr. Coulson, Mr. Hodgson, and Mr. Lane, and a difference of opinion existed as to whether the disease was

malignant or not. It was decided to cut away the mass occupying the front of the eye, and then either to extirpate the globe or simply sink it, according to circumstances.

13th.—The patient being chloroformed, I passed a long extraction-knife through the base of the mass, just at the margin of the sclerotica, and cut the whole away with one stroke. The globe now appeared filled with a reddish mass into which the sharp end of a curette was passed, but neither lens nor fluid of any sort except blood escaped. The eye was clearly filled with solid substance, the nature of which was doubtful. I therefore cut out some portions of it, and submitted them to the microscope, when they presented a granular appearance, with quantities of crystals of hæmatine but no malignant cells. This point ascertained, it was decided to do no more than smooth the edges of the wound. The lids were then closed, and cold water dressings applied.

The effect of the operation was most satisfactory. The pain, inflammation, and swelling rapidly diminished, and the wound assumed a healthy granulating appearance. Cod-liver oil and the muriated tincture of iron, were prescribed, and in a month the lad left the Hospital with the eye perfectly quiet, and bearing the appearance of a collapsed shrunken globe, well adapted for supporting an artificial eye. His general health was greatly improved, and he had gained considerably in weight.

The following case, published by Von Ammon[1] is highly instructive.

A robust man, aged 40, received a blow on the left eye from a large stone; violent inflammation with destruction of the cornea followed, and caused staphyloma; the inflammation continued in a chronic form with intense neuralgic pain;

[1] 'Ann. d'Oculistique,' t. xxvii, p. 39.

the right eye also became affected. Dr. Von Ammon, supposing that a foreign body was lodged in the eyeball, decided on removing a portion of the staphyloma. This was done about twelve weeks after the accident. The first incision was made, and just as the second was about to be completed, a large red mass escaped from the interior of the eye; the operation was promptly completed, and the patient made a quick recovery and was rid of his pains.

The red mass proved to be, not as supposed, a piece of stone, but the crystalline lens and capsule which were morbidly developed, and had undergone a peculiar metamorphosis. To the naked eye this mass appeared of a deep red, the capsule was torn, and in the aperture the lens, about half its natural size, was seen. Cautiously detaching the lens from the capsule, a small portion was placed under a microscope. In certain points were seen blood-corpuscles of a brownish red colour, agglomerated into small groups. Here and there blackish pigment molecules, without definite form, were distinctly recognised, and were regarded by V. Ammon as the state of transition to the formation of pigment. At other points of the inner surface of the capsule, where the blood was not in masses, blood-globules were visible, some of a vivid red, others dull and broken up. In some instances the globules were united, resembling a string of pearls. They were also attached in the form of rings, and in certain points lateral branches sprang from the rings; these were considered to be the rudiments of a vascular organization.

Under the microscope, the crystalline, which was here and there of a blood colour on its anterior surface, showed fibres of a deep yellow and somewhat opaque; coagulated blood was also seen. Where it was abundant the globules could not be discerned, but where the coagulum was thinner they

were seen as on the inner surface of the capsule; only they were more apparent, fresher, and more plastic.

Dr. Von Ammon adds the following remarks:

"The intense and permanent pains which existed in the staphylomatous eye were due to the sanguineous extravasation, which closely resembling that of a wound of the eye, was the consequence of rupture of the corpus ciliare and laceration of the capsule, the extravasation taking place into the posterior chamber and the cavity of the capsule; the quantity of effused blood was too great to be absorbed, and it acted on the ciliary nerves as a foreign body.

"The blood extravasated into the eye not being absorbed, was doubtless the cause of inflammation of the membranes which had been ruptured, and gave rise, in the space of three months, to two distinct metamorphoses, that is to say, the pigmentary transformation and the vascular transformation. I am not aware whether the same transformation has been observed in other parts of the body; it frequently happens that it gives rise to granulations and false membranes. I had previously once observed the same phenomenon in the anterior chamber of a patient, where there were also developed blood-vessels, which proceeded from an extravasation of blood which passed very slowly to the state of a melanotic patch situated at the lowest part of the iris; this observation was made by means of a strong lens. In the present case I have been able, by the aid of the microscope, to distinguish these morbid phenomena in the different degrees of development. I possess several exact drawings, which represent in the clearest and most perfect manner, this object so interesting in an ophthalmological and physiological point of view.

I think it extremely probable that the quantity of pigment may become by degrees more considerable, and that there

may be formation of new vessels in every eye where the process of pathological formation has commenced in the sanguineous effusion of the capsule and substance of the crystalline. If this process should continue its march without interruption, it will give rise to progressive destruction of the crystalline substance; the final result of a similar transformation may be that which the ancient oculists called „grumous cataract."

Malignant disease may follow effusion of blood into the eye; Larrey specially calls attention to this, and Von Ammon has seen actually in progress the conversion of the products of the effusion into medullary sarcoma. Dr. Surrage of Wincanton, informed me of a case of this description. A fine healthy child received a blow upon the eye, attended with intra-ocular hæmorrhage; a month subsequently, the eyeball began to increase in size, all the indications of malignant disease manifested themselves, and the child died.

Melanosis is far from an uncommon consequence of blows upon, or injuries to, the eye.

In the quarterly report of the Edinburgh Eye Infirmary, September, 1858, a case is related by Mr. B. Bell, showing the rapid development of malignant action after an injury of the eye.

A tall youth of 15 applied in October, 1857, for advice. Some days previously a piece of metal had struck his left eye with great force, wounding extensively the cornea and sclerotica. A cataract had formed, vision was gone, and the organ was inflamed and tender.

He was not again seen till September, 1858, when he returned and gave the following account of what had occurred during the interval. After going home to Inverkeithing, the eye gradually became quiet, so that in about six weeks he

resumed his employment, and experienced no further inconvenience till a month before his present visit. At that time, without any apparent cause, the injured eye became very red and painful, so that his nights were disturbed and sleepless. Leeches were applied, and the more acute symptoms had subsided.

The sclerotic was highly vascular; cornea transparent, excepting at its inner and lower edge the seat of the original wound, where in common with the sclerotica, it bulged slightly, forming a small partial staphyloma. At this spot a dark spot, with thinning of the sclerotica, was observed. Pupil widely dilated; anterior chamber almost obliterated, and occupying the place of the milky cataract but in contact or nearly so with the cornea was an opaque substance of pale brown colour and coarse spongy texture.

The globe was excised, and the patient rapidly recovered.

On making a longitudinal section of the globe after the lapse of a fortnight, the interior was found to be filled with a light reddish-brown substance, of coarse grain, all traces of the vitreous humour and lens having disappeared. The morbid mass seemed to be divided into two unequal portions by a wavy line of separation which crossed the globe, and suggested the idea of the posterior portion having been deposited between the choroid and retina, and the anterior portion in front of the latter membrane. The cornea was unchanged; the sclerotica thinned at one or two points. The optic nerve was quite sound.

In the treatment of intra-ocular effusions we must be guided by those principles which experience teaches us are most appropriate to these cases; at first sight mercury might be regarded as our sheet anchor, and indeed it is very frequently used under that impression, but in a large number of instances it is unnecessary. The power of nature, in

removing that which obstructs the due performance of the functions of an organ, is nowhere more remarkable nor more visible than in cases of this description; a few days suffice to clear from the anterior chamber a considerable effusion of blood, and the active absorbents vigorously grapple even with a firm coagulum; this latter resists them for a while, but sooner or later yields to their untiring and never-ceasing efforts.

It is in the anterior chamber especially that such activity exists. The powers of the absorbents are more feeble and their efforts are more languid, when dealing with blood effused in the posterior cavities of the eye, so that a coagulum remains long in the vitreous humour, and if deposited on the retina may extinguish the sensibility in that spot.

As in starvation every superfluous particle is applied to the support of the body, we may hasten the absorption of deposits in the eye by creating a demand for supply; this is best done by limiting the diet, a powerful means also of preventing inflammation. Low diet then, should be strictly enforced, and this with the application of cold is often sufficient; the eyelids should be kept moistened with cold water or an evaporating lotion, care being taken that it is not of an irritating character; it will be proper, if pain and other symptoms of inflammation arise, to meet them by the local abstraction of blood, by purging, but not by nauseating medicines; the act of vomiting would increase the mischief in the eye.

Should the integrity of the eye be jeopardised by the coagulum pressing upon the iris or other delicate structures, it may be necessary to use mercury; for though this is not to be resorted to as a matter of course nor of routine, it may prove a valuable auxiliary if judiciously employed. The cases, then, in which after effusion in the anterior chamber mercury is admissible, are those in which inflammatory symptoms,

indicated by irregularity of the pupil, change of colour of the iris, and pain, exist. It must be borne in mind, however, that the change of colour may be the result, not of interstitial deposit nor of inflammatory action, but of simple discoloration from the blood which has been effused and perhaps still tinges the aqueous humour; therefore, this of itself is not sufficient to warrant the administration of mercury.

When the effusion of blood is so large as to cause violent pressure on the tunics with which it is in contact, there is considerable risk of inflammation, which, according to my experience, is best averted by puncturing the cornea and permitting the escape of the extravasated blood. Another advantage is derived from this proceeding; there is less risk of inflammatory products combining with the effused blood to cover the capsule of the lens, forming that kind of cataract to which the term *spuria grumosa* has been applied.

When there is effusion of blood into the posterior cavity of the eye, mercury may be employed with advantage; it is of importance to relieve the retina as quickly as possible from the pressure of the extravasated blood, and, as already stated, absorption goes on less rapidly there than in the anterior chambers. We may, therefore, with propriety place the patient under a mild mercurial course, as it undoubtedly facilitates the removal of the coagula. If there be deep-seated pain in the eye, photophobia, and slight redness of the sclerotic, with dulness of the iris, blood should be abstracted, and every measure adopted to subdue undue vascular action.

Very serious intra-ocular hæmorrhage may arise after operations on the eye, especially extraction of cataract: it is one of the rarest and most disastrous complications that can present itself, utterly defeating the object of the operation and entailing much suffering on the patient.

Three cases have occurred in my practice, presenting points in common, characteristic of this accident.

A sudden and most acute pain darts from the eye back into the brain, and is followed by a sensation of tearing, or dragging the eye from the socket. If the vessel gives way during or immediately after extraction, the vitreous humour will escape, and be followed by a flow of blood; but if some resistance is offered by union of the wound, the hyaloid becomes filled with blood, and the vitreous humour is lost sight of. The agonizing pain soon involves the brow and side of the head, and the eyelid is so exquisitely sensitive that it cannot bear the slightest touch; this adds to the suffering, the application of cold wetted rags to the eye being indispensable.

The first burst of pain is followed by faintness and nausea, often amounting to sickness, which nausea may continue many hours. The retching, however, does not prevent the stomach retaining small quantities of sustenance, and is best combated by soda-water, and by effervescing draughts containing dilute hydrocyanic acid; also by swallowing ice, either in lumps or as lemon ice. Cold jelly and cold beef-tea are also grateful.

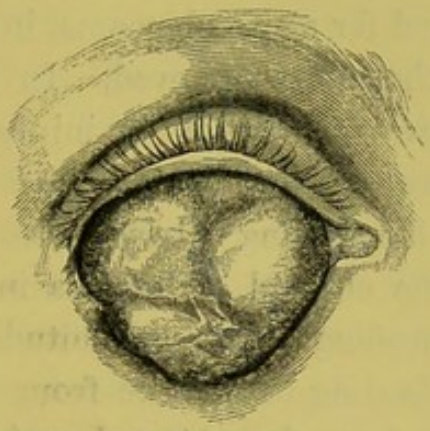
When the wound is sufficiently united to offer resistance to the immediate escape of the contents of the eyeball, the hyaloid becomes filled with blood; and when the wound is burst open, it gradually protrudes through the corneal section, and then between the lids, as a pouch filled with blood, represented in fig. 37. The retention of this increasing the suffering, it should be snipped off.

As the eyeball becomes distended with blood, the flap is widely opened, the upper lid thrust forward, and more or less œdema arises, commencing at the inner corner.

The blood is usually venous, oozing from the eye and

trickling down the cheek; there is every reason to believe that it is caused by disease of the choroidal vessels, and their

Fig. 37.



morbid condition prevents their ready contraction, nor probably does the bleeding cease till they feel the influence of the pressure caused by the coagulated blood within the eye.

It was formerly supposed that rupture of the arteria centralis retinæ was the source of the bleeding, but that idea is now, I believe, generally abandoned. Mr. Walton mentions[1] a case seen by him at Moorfields, in which some time after extraction, the chambers of the eye filled with blood, which did not interfere with the success of the operation; but this was a piece of good fortune entirely exceptional.

Dr. Rivaud-Landrou,[2] of Lyons, who has written upon the subject of intra-ocular hæmorrhage after extraction, is of opinion that it is caused by rupture of the small blood-vessels which pass from the choroid to the hyaloid, and is always a consequence of escape of vitreous humour.

The careful examination of four eyes in the museum at Moorfields is conclusive, to my mind, as to the seat of hæ-

[1] 'Operative Ophthalmic Surgery,' p. 453.

[2] 'Ann. d'Oculistique,' t. xl, p. 129.

morrhage. In one case, the eye was excised for intra-ocular hæmorrhage after extraction, being the second case in which excision was performed there for that occurrence. Two eyes were excised from one individual; in each, Graefe's operation had been performed for acute glaucoma, in each, hæmorrhage took place, and they were removed. In the fourth case a staphylomatous eye was ruptured by injury.

In all these preparations there is most distinctly visible the coagulum of blood lying between the choroid and sclerotica, pushing the choroid and retina inwards, or inwards and forwards, according to the magnitude of the clot. In not one did the bleeding take place from the inner surface, but in all clearly from the *external surface of the choroid*, probably from the vasa vorticosa. A precisely similar condition existed in another eye excised for hæmorrhage after extraction, the description of which is in the ninth volume of the 'Transactions' of the Pathological Society. I am therefore of opinion that intra-ocular hæmorrhage after extraction is due to a diseased condition of the choroidal vessels, that it does not arise from rupture of the central artery of the retina, and that it occurs irrespective of loss of the vitreous humour, though the sudden withdrawal of the support afforded to the weakened vessels by that body may be a powerful predisposing cause.

On June 13th, 1855, I performed extraction at St. Mary's Hospital, on the right eye of a female, aged 70. Some years previously she had suffered from deep-seated pain in the eyeballs, with muscæ, and had long been teased with irregular gout; the globes were hard and pupils nearly immovable, and it was with some reluctance that I performed the operation, as I did not think favorably of the case. The section was completed with facility, the curette used, and with gentle pressure the lens escaped, a small quantity of

rather fluid vitreous humour accompanying it. The flap being replaced, the lid was dropped, and I paused before taking a final look at the eye. After a few seconds the patient clapped her hand to her eye, and complained of sudden intense pain going back into her head. Removing her hand, I looked at the lid, and saw it rapidly becoming distended; raising it, I found the section gaping widely, and a large mass of hyaloid pushing through it. In a second or two a gush of blood issued from the eye, and flowed down the cheek. The bleeding continued for thirteen hours, notwithstanding the constant application of ice, and the free administration of gallic acid.

On the evening of the 17th, the patient being faint and low, a cordial opiate was administered; as the power of the circulation returned the bleeding recurred, but ceased in half an hour under the use of ice.

The application of cold was persevered in for two more days, when it was changed for poultices, as suppuration of the globe was commencing; liberal diet and wine were ordered, the suppuration proceeded favorably, and the eye gradually collapsed.

On December 6th, 1856, I performed extraction on the left eye of Anne Gale, a patient in St. Mary's Hospital. She was a feeble old woman, had been a great sufferer from rheumatism, and was so extremely deaf that it was with difficulty she could be made to comprehend a single sentence addressed to her. This infirmity made her very nervous, and from her restlessness the section was made with great difficulty, the iris being slightly wounded. The lens was extracted with facility and without any escape of vitreous humour. The patient was allowed liberal diet, and the eye not disturbed till the seventh day, when it was examined. The eye was pale, cornea clear, but the section had not

united. The eye was therefore again closed for some days, and wine, with bark and ammonia, ordered. On the tenth day, the section being still open, and some serous chemosis existing, a weak solution of nitrate of silver was applied.

That evening the head nurse was suddenly called to the patient, and found a great protrusion hanging out from the eye, with blood trickling down the cheek. The house-surgeon was summoned, and applied ice and pressure. The hæmorrhage continued actively for an hour, when it gradually ceased and did not return.

The after-treatment was similar to that of the previous case; the eye suppurated and sank.

In the third case, the lady was 85 years of age, but of remarkably sound constitution; she had long been attended by Dr. Jervis, who kindly gave me his assistance in the trying after-treatment which became necessary.

This lady had long been the subject of hard lenticular cataract, and I performed extraction by the upper section, on the right eye, on Tuesday, November 2d, 1858. The operation was performed with facility, the lens escaped gently, and not a drop of vitreous humour followed. No case could progress more favorably; all pain ceased by the third day; there was not the slightest œdema of the lids, and speedy convalescence was anticipated. We were doomed to disappointment. The patient was lying on the sofa quietly conversing with me on the evening of the following Friday, when blowing her nose rather briskly, she instantly exclaimed, "Oh, what a pang in my eye; it gets worse! it goes back into my brain! oh heavens, some one is dragging my eye out! the pain is intolerable!" There was nothing visibly wrong, and at first I attributed the pain to spasms, but as it increased I began to fear that intra-ocular hæmorrhage might be taking place. I bathed the eye with warm water for two or three minutes

without any relief being afforded, and certainly not until the expiration of five minutes from the first exclamation of pain, did blood appear from between the eyelids. This I attribute to the resistance offered by the firmness of the union of the corneal section; very shortly after the blood appeared, a mass projected from the eye, and gradually increased in size until it hung halfway down the cheek; this was the hyaloid, filled with blood and pushed out of the eye; besides this protrusion there was a trickling of venous blood down the face. The moment the nature of the case became apparent I sent for ice, and on obtaining it applied it pounded to the lids. When the hyaloid was fully protruded I cut it off, and found the surface covered with the retina.

The blood continued to ooze from the eye for thirty-six hours notwithstanding the constant application of cold; the patient suffered from severe nausea and retching, and the pain about the brow and head was distressing.

When the eye was examined five days afterwards, the wound was gaping widely open, and a clot of blood occupied it; this gradually came away, the margin of the corneal flap disappeared by ulceration, the wound closed up after the expiration of a month, and the globe atrophied.

There are two courses open to us in cases of intra-ocular hæmorrhage—to excise the eyeball, as has been four times done at Moorfields, or to adopt palliative measures; doubtless excision materially hastens the recovery, but it necessitates administration of chloroform, and may not be readily assented to by the patient; for when a person, after much consideration, submits to an operation with the confident expectation of recovery of sight, the removal of the eyeball, as a finish to the operation, is far from an acceptable proceeding.

Should the eye not be excised the bleeding will gradually cease, and the globe will either suppurate or atrophy. In the latter case the projecting corneal flap long continues a source of irritation, but ultimately disappears, and the wound heals, the globe becoming puckered.

Little can be done in the way of treatment beyond subduing the severity of the suffering and supporting the strength of the patient when there is age and debility to contend against; the most comfortable topical application is a poultice of warm ground rice, which being light, of uniform consistence, and very soft, is superior to bread or linseed; it should be frequently changed, the eye being carefully cleansed each time.

In other respects the treatment must be conducted as described elsewhere.

## CHAPTER IX.

The eyes beyond all other organs are liable to serious injury from the contact of heated substances; and the amount of injury will depend on the nature of the material, its temperature, the part of the eye it comes in contact with, and the length of time that contact lasts. Molten pitch may adhere to the conjunctiva, but becoming semi-fluid at a comparatively low temperature, it may inflict less injury than the momentary contact of boiling water. A hot iron striking the eye, or a fall against a fire-grate, causes terrible damage. In their effects burns and scalds are so analogous that they may be considered together.

If the temperature of the heated substance be not sufficiently high to destroy vitality, it only excites ordinary inflammation, which may subside and leave no ill consequences; but if the heat be beyond a certain point, the effect is the same as in other parts of the body; a slight touch causes a blister to rise; a longer contact kills the tissues, which being thrown off as sloughs, are replaced by cicatrices and adhesions, interfering with sight and disfiguring the countenance.[1] A scorch from an explosion, as gas or fire-damp, produces a somewhat different effect. The transparency of the cornea may at first be but little affected, so little as to disarm suspicion as to the severity of the injury, though on

[1] The frightful disfigurement caused by burns is well represented in 'Teale on Plastic Operations,' p. 27.

close examination it will be seen to display a peculiar roughness and want of brilliancy. In the course of a few days opacity creeps on, and as this depends on loss of vitality of the superficial corneal layers, which are thrown off slowly and replaced by opaque material, the cicatrix almost certainly leads to loss of sight.

The phenomena resulting from the contact of heated metal with the eye are, according to my observation, the following. In the first instance the cornea is either blistered or rendered slightly dull, the boundary of the injury being indicated by a white opaque line; the sclerotica is also blistered and soon becomes reddened. Within twelve hours, inflammation, with chemosis of the whole conjunctiva, takes place, the membrane presenting numerous points of extravasated blood; the lids rapidly swell and assume a purplish tint; the burnt surfaces have now become opaque, and pus begins to be secreted after the lapse of about thirty hours. Inflammation often reaches a high point, the sclerotica and iris being involved, pain severe, and sight nearly or entirely extinguished. The inflammation and chemosis linger in the eye, the burnt surfaces appearing as excavations out of the swollen membrane. If only a portion of the cornea be burned, the other portion becomes turbid from inflammatory deposit; this is at first generally diffused, but in about eight days pus appears here and there in the substance of the membrane, most marked beneath and around the seat of the wound. At this period the conjunctiva has assumed a thickened fleshy aspect, of a deep red. The œdema of the lids having diminished, enables them to be opened more widely, and if the palpebral conjunctiva has participated in the injury, it will now be very apparent.

When the burn is deep, the injury cannot fail to be very serious: the part destroyed is slowly detached, for the vitality

of the tissues on which reparation depends being diminished by the injury, tedious ulceration follows, and it is common to find staphylomatous projections result from the thinning of the cornea.

Melted metal or fluids gravitate to the fold between the lower lid and the eye, and here extensive sloughing and ulceration may take place, giving rise to hopeless symblepharon. Dr. Mackenzie has pointed out an effect of burns of the conjunctiva, which I have occasionally seen. It is effusion of blood into the substance of the cornea near the burned part, and this ecchymosis is very slow of removal. Tendency to conjunctival ecchymosis exists in all burns, whether mechanical or chemical, as seen in fig. 3, Plate III, the blood being effused in patches around the seat of the injury.

A severe burn of the eye came under my notice recently, at St. Mary's Hospital.

Richard Landor, aged 27, hammerman at the Great Western Railway Works, was admitted as an out-patient, January 15th, 1859. About an hour previously, whilst hammering a piece of red-hot iron, it flew from the anvil and struck his left eye with considerable force. He was in great pain, but had I not been aware of the deceptive character of such injuries, I should scarcely have anticipated from what was then visible, the formidable consequences which ensued.

The lower half of the cornea presented a faint haze, and had lost its polish, the limits of the injury being marked by a white line; the sclerotic beneath the cornea was severely burned and raised in a blister. (Sweet oil to be placed in the eye thrice daily; cold to be constantly applied; purgatives; low diet.)

18th.—Lids œdematous, greatly swelled, and of a purple

tint; extensive conjunctival chemosis, many points of blood scattered throughout. There is a deep wound of the cornea, which is discharging pus freely, as is also the wound in the sclerotica. Cornea generally turbid. (Six leeches; fomentations; poultice; saline aperients.)

20th.—The leeches afforded much relief to the pain, nevertheless there is considerable chemosis and inflammation; there is general dulness of the cornea, and a free discharge of pus from the wound.

25th.—The cornea is generally infiltrated with pus, a small portion only being clear; thickened appearance of the conjunctiva, which is of a dull red; free discharge of pus; wound has a sloughy look. The patient is low: pulse 60. (Sol. Arg. Nitr. gr. ij ad ℥j ocul.; Mist. Quinæ, ℥j (gr. ij), bis die.) Improved diet.

28th.—A considerable improvement is manifest, the wound having a more healthy aspect and the pus less in quantity; nevertheless the eye is most seriously damaged; there will doubtless be extensive leucoma, possibly staphyloma corneæ.

Very unexpected escapes of the eye from serious damage are on record, though such cases must be regarded as exceptional. Von Ammon, for instance, quotes the case of a man who, smearing the roof of the entrance to his house with melted pitch, received a drop of that substance directly on the cornea, where it stuck so fast that the surgeons who were called were unable to loosen it, either by instruments or the use of an eye-water. The patient was advised to drop olive oil into the eye and to cover it with a compress steeped in oil, whereby the pitch was happily loosened; I say happily, for it is said to have quitted the eye without leaving any visible injury.

A case singular in its cause and its result is related by

Dr. Vallez.[1] A man in blowing his nose struck the lighted end of his cigar against the cornea of his left eye. Three hours afterwards, when seen by Dr. Vallez, the cornea presented a grey eschar nearly over the whole of its surface, and in the centre was a depression, at the bottom of which was a foreign body. The symptoms seem to have attained great severity, and the detachment of the eschar was followed by staphyloma, and then exit of the crystalline lens and humours of the eye, leaving a mere button, on which an artificial eye was placed.

The bad conducting power of vapour is strikingly shown by the protection it affords the eye when fluid heated metal is suddenly brought into contact with it; the moisture on the surface of the globe is then at once converted into vapour, a stratum of which lies between it and the heated metal; and as the heat travels with great difficulty through the vapour, it forms an efficient protection to the tissues. In no other way can I explain the statement of Mr. Tyrrell, that he had several times taken out from beneath the palpebræ, portions of lead weighing many grains, which had evidently entered the eye in a fluid state, as they were perfectly moulded to the surfaces of the globe and palpebræ; yet the conjunctiva remained free from all injury, except slight inflammatory action.

Mr. Neil, of Liverpool, mentions[2] a remarkable escape of this nature, and attributes it to the same agency. A youth was engaged in making leaden fastenings; there was water at the bottom of the mould, and the molten lead was thrown back into his face and both his eyes. When seen by Mr. Neil the lids were open, and a sheathing of lead lay in front of each eye. On removing this, Mr. Neil was

[1] 'Ann. d'Oculistique,' t. xiv, p. 135.

[2] 'Report of the Liverpool Eye and Ear Infirmary,' 1849.

greatly astonished to find the cornea quite clear and uninjured; the eyelids were badly burned, but the sight was safe, and his recovery was rapid.

A not less fortunate escape is related by M. Ansiaux.[1]

A jeweller's apprentice was pouring into a mould, solder composed of silver and copper; the mould was damp, and the fused metal was thrown up into his face and left eye, to which a drop became fixed. Eight days afterwards, M. Ansiaux saw the patient and proceeded to remove the foreign body. This he easily effected with forceps, the solder coming away in the form of an oval metallic plate, depressed in its centre, and somewhat elevated around its circumference. On examination M. Ansiaux found, to his surprise, that with the exception of some congestion the eye had sustained no damage.

A remarkable case is recorded by Mr. J. Hutchinson, in the 'Ophthalmic Hospital Reports.'[2]

A healthy man, employed at an iron foundry, received in his left eye some molten iron at a white heat. It had struck the globe over the lower edge of the cornea and the adjacent part of the sclerotica. One of his fellow-labourers removed the metal after it had solidified, with some difficulty, on account of its adhering firmly to the charred tissues. It had in cooling been accurately moulded upon the surface of the globe and the edge of the lower eyelid. The affected parts of the cornea and sclerotica, which included the greater part of the thickness of each, but without actual perforation, sloughed off, as also did some of the palpebral mucous membrane. The globe itself did not inflame. In the healing of the scar the pupil was drawn downwards by puckering of

[1] 'Ann. d'Oculistique,' t. viii, p. 91.

[2] Vol. i, p. 217.

the iris at its attached margin, but perfect vision was retained.

The collection at Moorfields contains an eye which had been excised after a burn. It presents on the inner surface of the choroid a mass of whitish firm tissue, of a somewhat laminated arrangement, adhering to the choroid in some parts, in others merely in contact with it; in the centre of this mass was a small quantity of pus.

The changes produced in an eye by the action of fire have been ascertained by Von Ammon,[1] who carefully examined an eyeball of one of the unhappy sufferers in the frightful catastrophe on the Versailles Railway in 1842, when so many persons were burnt to death; one half of the body was almost entirely carbonized; the other less so, so that it was possible to remove the eye from the socket.

The globe had preserved its form and colour. There was a slight wrinkling of the sclerotica, the upper part of the cornea also presented this appearance; this membrane was greasy and semi-transparent. Von Ammon then divided the sclerotic and choroid in the middle of the eye and no fluid escaped. When he proceeded to detach the two segments of the globe one from the other, he found them adhering strongly in the centre to a whitish tumour which stretched across the globe from the bottom of the eye to the crystalline; this was the retina detached from the choroid, there being a vacant space between them. The retina drawn back on itself was thicker than natural, and presented longitudinal folds; it was detached in such a manner that the posterior surface of the crystalline was displayed. The capsule of the lens appeared thickened, dull, and of a clear white.

On opening the retina it was found to have the form of a

[1] 'Ann. d'Oculistique,' t. xxvii, p. 41.

tube, within which was the vitreous humour reduced to a small bulk, and resembling slightly coagulated albumen. The retina was very thick, and the yellow spot had completely disappeared, nor could the foramen centrale or the fold in the membrane be discerned; the pigment of the choroid was very abundant and dark; the vessels had been dried, and yellow striæ marked their anterior track. The crystalline was very white, had totally lost transparency, and was confounded with the capsule; its fibrous structure was, however, recognisable under the microscope in a small portion which remained clear.

It is singular to remark the diminution of the vitreous humour to such small dimensions, and the consequent retraction of the retina from the choroid, even to the form of a cord, though there is always a tendency to assume this form when complete detachment of the membrane has taken place.

Gunpowder inflicts a double injury on the eye, for its explosion scorches the surface, whilst unignited grains of powder are driven into the globe with a force scarcely conceivable. I have seen instances where grains have passed completely through the cornea, and have lodged in the lens and iris. A case is represented in fig. 2, Plate III. The force with which they strike depends much on the size of the grains. The fine powder used for rifles and fowling-pieces seldom penetrates beyond the cornea, whilst the most serious consequences result from mining and cannon powder.

In 1857, during a sham fight, the parties became intermingled, and in the excitement of the melée a musket was fired into the face of one of the combatants, at the distance of perhaps a yard. I saw the injured man immediately afterwards; his eyelashes and brows were singed off, and his

whole face was scorched and blue with powder; he was in great pain, especially complaining of his eyes; on examining them I found six or eight grains of powder sticking in the cornea and conjunctiva of each; these I proceeded to pick out, and succeeded in removing them, after a search tedious and difficult from the irritability of the eyes; they were entirely relieved, but it was impossible to remove all the powder impacted in the skin of the face.

When grains of gunpowder strike the eye they do not all bury themselves beneath the conjunctiva; a portion are partially exposed, conveying to the lids the sensation of foreign bodies, and causing extreme discomfort; moreover, they act as nuclei for deposits of salts of lead, if, as is often the case, goulard water is used as a collyrium.

Gunpowder injuries of the eye are rendered additionally painful by the solution of the nitre in the tears, whereby the irritation is greatly increased.

The following case illustrates the graver form of injuries caused by explosions.

In the spring of 1854 I was consulted respecting a young gentleman, 14 years of age, who nine months previously had been injured by the bursting of a small cannon. The condition of the eyes is represented in figs. 1 and 2, Plate III. The pupil of the right eye was widely dilated and insensible to light; the lens had escaped at the time of the accident through a rent at the upper part of the sclerotic; the retina was detached in a considerable part of its extent, and the eye was perfectly amaurotic.

The left eye presented a less hopeless condition; three grains of powder had passed through the cornea and stuck in the capsule of the lens, and to these the pupil was adherent by three tags of lymph; the lens and capsule were opaque and displaced, but the above adhesions retained it somewhat

*in situ;* towards the nasal side there was a chink by the side of the lens through which there was sight.

Both eyes were spotted with grains of powder.

In the following June I removed the opaque capsule and lens through a small aperture, and the patient recovered useful vision with the left eye.

The 5th of November[1] generally brings with it cases of accidents to the eyes from fireworks, but these are seldom serious as the gunpowder is reduced to "meal," technically called, and being no longer granular it merely scorches; I have seen burns from the explosion of loose powder, but the flash being diffused they have generally been trivial. Far otherwise is it when the "blast" used in mining and quarrying improperly explodes; the coarse powder used for riving rocks is rammed into a long narrow chamber, and the whole force of the explosion, if premature, expends itself in the line of direction of the mouth of the chamber, so that if it strikes

[1] It might scarcely be expected that fireworks are a great source of pleasure to the blind. The following extract from a letter to me from the accomplished author of 'The Land of Silence and the Land of Darkness,' cannot fail to be read with interest:

"July 24th, 1858.

"Dr. Duchesne's statement as to the love of the blind for fireworks is, I think, a well founded one. It entirely agrees with my own experience.

"Seven years ago, when I undertook my present post at the Blind School, I found that the male pupils had been in the habit, for several years, of having a great bonfire on Guy Fawkes' Day, and then letting off fireworks. We tried it for one year, and to my amazement they let off squibs and crackers themselves, and flung them about as calmly and quietly as the most experienced hands could have done. I never saw the blind so thoroughly enjoying themselves—except when listening to music of a high order, executed on a great scale. But though the enjoyment was so great, we were afraid to allow fireworks again, though the bonfire still blazes away every 5th of November. As well as I remember, they spent more than a sovereign in squibs and crackers—from some little fund which we all helped to raise. The difference between a wheel, a cracker, and a serpent, might be easily discerned by a blind boy, but I doubt about any other discrimination."

the face of a man the effect is tremendous—the eye may be completely burst and the face frightfully injured, as in the following case quoted from the work of Mr. Dixon, which, considering the difficulties successfully overcome, may be considered a triumph of skill.

A Cornish miner[1] was severely wounded by an explosion of gunpowder at a copper mine in Cuba, in October, 1847. The following May he came under the care of Mr. Dixon; his forehead and cheeks were seamed with scars, and small fragments of stone might be felt here and there beneath the skin of the face, which was dotted with grains of unexploded powder. On the left side the eyeball had been totally destroyed, and the lids torn in various directions. The right palpebral aperture presented a very singular appearance, both lids being confounded together in one uniform cicatrix, so firm and rigid that the aperture, diminished to about a third of its natural size, never underwent the slightest change of form. It looked like a hole cut in a mask. The margin of this opening was smooth and rounded, and fringed with a few straggling eyelashes. The lachrymal puncta being obliterated, tears were continually trickling over the cheek. No adhesions existed between the lid and the eye, but the cornea was white and opaque, except at its upper and outer part, where a transparent portion, two lines broad, showed the iris adhering by its pupillary margin to the large cicatrix of the cornea.

Mr. Dixon decided to endeavour to make an artificial pupil opposite to this clear corneal space, and as a preliminary step divided the cicatrix which united the tarsi, whereby the palpebral aperture was enlarged to nearly twice its former

[1] 'Guide to Diseases of the Eye,' p. 382.

width, and a considerable portion of the eyeball came into view.

As the next step Mr. Dixon extirpated the lachrymal gland, as the tears instead of being serviceable would only be an embarrassment. Some irritation followed, but subsided in a few days, and Mr. Dixon then made an artificial pupil, by drawing out and removing a small piece of iris; this not being sufficient the pupil was enlarged by a subsequent operation, and the ultimate result was that when the patient left town he could guide himself, so as to be able (as Mr. Dixon subsequently learned) to gain his living by driving a coal cart down to the coast, a distance of ten miles, unattended by any companion.

It has been well remarked by Professor Miller[1] that by burns, so much have the reproducing parts had their powers weakened, that they not only form little new substance and leave the greater part of the closure to contraction of the original textures, but the little new which is produced is imperfectly organized, and like all similar adventitious structures, is prone to diminish by absorption; thus, then, burns heal slowly, and much more by contraction of the old structures than by the formation of new; the new matter is imperfectly organized and liable to absorption, and consequently contraction continues for some considerable time after completion of the cicatrix.

When an eye has received injury from gunpowder the grains adhering to the conjunctiva should be picked out without delay, or the membrane will close over them, rendering subsequent removal very difficult.

An eye into which molten metal, pitch, &c., has flown, should be carefully examined and every particle removed;

[1] 'Principles of Surgery,' p. 691.

inflammation must then be guarded against by absolute repose, cooling applications to the eye, low diet and laxatives; if vascular action increases, blood must be taken by leeches or cupping.

During the suppurative stage warm fomentations will be proper, the preference being given to decoction of poppies.

When the process of granulation is in progress, the utmost attention will be necessary to prevent adhesion of the surfaces of the eyelid and the globe; on this and other points I shall speak when describing the treatment proper for chemical injuries.

Chemical injuries.—There is no class of injuries to which the eye is exposed, more formidable than those caused by the caustic alkalies or the strong acids. Intensely painful at the time, they leave behind, effects which not only destroy sight but mar the aspect of the face; the brilliancy of the eye is superseded by white opacities, and the lids are either glued to the ball by adhesions, or everted, showing their crimson and raw-looking conjunctival surfaces. It is these well-known properties which cause the mineral acids, as vitriol, to be used from motives of malice or revenge as a means of disfigurement.

A wealthy French gentleman married in the country a very pleasing young lady, but becoming unreasonably jealous, he treated her with such violence that a separation was the consequence. The lady took refuge in Paris, whither she was followed by her husband. Under a disguise he watched her, and meeting her on one of the bridges, accompanied by her aunt and mother, he threw into her face a quantity of sulphuric acid mixed with animal charcoal. The result was lamentable; the face, neck, bosom, arms, all were fearfully burned. M. Desmarres saw the patient one hour after the

accident. On parting the closed eyelids, he found that merely a drop of the acid had entered the left eye, over which was noticeable a very slight greyish film insufficient to prevent vision. On the right side, the conjunctiva and sclerotica seemed to have been deeply injured in their lower part, but the cornea had been touched very superficially, and altogether the appearance of the eye was not such as to cause much alarm. M. Desmarres, however, deemed it necessary to be very cautious in his prognosis.

Up to the twelfth day sight was preserved in both eyes; but from that time, the cloud noticed upon the left cornea spread in all directions, and an abscess formed. On the eighteenth day the eschar fell and the crystalline lens escaped, together with the vitreous humour. The conjunctiva became contracted, and the lids were so closely brought together as to admit with difficulty the introduction of a probe. On the right side, matters were not so bad; one of the puncta lachrymalia was obliterated, and became the cause of incurable epiphora, but the eye was saved; and now the unfortunate lady uses it in the occupation of painting, in which she seeks to forget her sorrows and the loss of her formerly prized personal attractions.

The destructive influence of sulphuric acid on animal tissues depends partly on its affinity for water, so that it chars or carbonizes the parts with which it comes in contact; but its other properties, that of coagulating albuminous tissues, of combining with albumen, and of dissolving fibrin, render it especially hurtful to the transparent cornea. This becomes at once whitened by the formation of sulphate of albumen, and if the action of the acid is prolonged the charred membrane assumes a blackish appearance. But the limits between the dead and living parts are not accurately defined; an intermediate space exists on which the acid has

weakened without extinguishing vitality; hence a long period elapses before the dead part sloughs off.

Intense agony attends the presence of sulphuric acid in the eye; I have seen persons of strong nerve quite overcome and lose all self-command.

If the cornea is not touched by the acid, and free washing of the eye is practised, first with water and then with a weak alkaline solution—*bi*-carbonate of potash being the best—no material injury may result. At the great chemical works accidents are not uncommon. There is always abundance of water at hand, and the instant that a workman is hurt by any of the chemicals flying into his eye, he rushes to the lavatory and washes the eye freely with water, after which he bathes it with a weak alkaline solution if an acid has entered the eye; if an alkali, as caustic potash, he first washes the eye, then holding open the lids submits the eye to the vapour of hydrochloric acid, and again washes it. This is found by experience the best mode of neutralizing the alkali; thus no time is allowed for serious mischief to arise, and a smart inflammation is the worst consequence anticipated.

The following are cases illustrative of the minor injury.

On December 4th, 1855, one of our most eminent chemists met with the following accident. He was, with a friend, engaged in experiments, and the friend poured some anhydrous sulphuric acid into a flask which happened to contain a little water. The bottom of the flask was instantly blown out, and a drop of the acid flew into the professor's right eye. He rushed to the water-tank and washed the eye, but finding the pain intolerable he hurried to my house. I thoroughly syringed the eye for some minutes with a weak alkaline solution. Though this neutralized the acid, intense pain continued; a drop of sweet oil was therefore placed in the eye and a full opiate administered. The eyelids were directed to be constantly cooled with iced water.

5th.—Considerable œdema of the lids, but the eye less red than might have been expected; the cold applications afford great relief, the eye feeling hot and scalding tears pouring from it whenever they are omitted. A full aperient was administered and low diet ordered.

6th.—Much easier, though the least exposure to light causes increased suffering. A wound on the sclerotic below the cornea indicates the spot touched by the acid, which happily escaped the cornea.

From this time bathing with warm milk and water was substituted for the cold applications, and a drop of oil was placed in the eye thrice a day, to keep the conjunctival surfaces apart.

At the expiration of eight days a slight mark alone indicated the seat of injury, and the eye gradually and completely recovered.

On the 15th June, 1856, the coachman of a medical friend was adding water to strong vitriol, when several drops of the vitriol flew into his face, each eye receiving a small portion. He came to me in great agony. The eyes were syringed with a solution of bicarbonate of potash for ten minutes, which relieved the burning pain; a drop of olive oil was then placed between the lids, and cold-water dressings were ordered; a full opiate was administered.

As in the former case, considerable œdema of the lids took place, rendering it difficult to examine the eyes, but on the 17th I was enabled to ascertain that the corneæ were safe. The seat of injury was the conjunctiva below the cornea, which was ecchymosed, and the whole lower half of each eye was acutely inflamed, the right being the worst.

He was kept in a darkened room on low diet; oil was placed in the eyes thrice daily, and cold applications continued. These, with smart purging, soon abated the inflammation, and the eyes recovered without blemish.

In cases of more serious injury from sulphuric acid, the conjunctiva swells, and with the cornea assumes a dull white tint, and a pulpy, rotten consistence. This pulpy mass is in time thrown off, but beneath it the cornea becomes opaque by infiltration of pus, and not infrequently sloughs, as in the sad case described by Desmarres. The inside of the lids participating in the cauterization, union may take place between their surfaces and the eyeball, giving rise to intractable symblepharon. Or the opposite condition may arise; the external integuments may be so charred and destroyed, that extensive cicatrices mar the countenance with hideous ectropium (fig. 6, Plate III).

That figure represents the eye of a man whose face was severely burned by the bursting of a carboy containing sulphuric acid. The integuments of the face were extensively destroyed, and great deformity resulted; the upper lid was completely everted, the margin being glued, as it were, to the brow. The lower lid was similarly drawn to the cheek. The greater part of the cornea was opaque, and having been penetrated, the iris had become adherent; a small part only retained its transparency, and as this corresponded with the upper part of the pupil, sight was not altogether lost.

In December, 1858, a youth was sent for my opinion by Mr. Fox, of Weymouth. He had lost his right eye in consequence of its having been bathed by mistake with a turpentine lotion, when he was an infant. This was followed by violent inflammation, and the globe enlarged and became staphylomatous. I concurred with Mr. Fox in the propriety of sinking it by excising a portion of the opaque cornea.

Smart attacks of inflammation of the eyes have been brought on by the too profuse use of stimulating applica-

tions when persons were fainting, drops of aromatic vinegar or spirits of hartshorn being thrown into them; and I lately saw a professional friend who suffered from chloroform being carelessly splashed into his eyes whilst being poured on a handkerchief.

A clergyman now under my care for long-standing iritic inflammation stated that he dated his disorder from his having, thirty-five years before, whilst uncorking a vinaigrette, accidentally jerked some aromatic vinegar into his eye; he fell as if he had been shot, from the intensity of the pang, and violent inflammation set in. From that time, when looking at objects, he had the appearance of bubbles as if from water, rising up and bursting before the eye; and became subject after some years to attacks of deep-seated inflammation, which have nearly closed the pupil.

Desmarres mentions a case of a young lady who, having fainted, had thrown into her face by her over-zealous maid a large quantity of vinegar, part of which entered the left eye. The cornea was at once rendered opaque, violent inflammation followed, and the eye never completely recovered.

Dr. Mackenzie has known very intractable inflammation of the conjunctiva, cornea, and sclerotica, caused by whisky being thrown into the eyes, and a similar result follow the miserable trick of putting snuff into a person's eyes during sleep.

I remember a case in which a splash of melted sulphur flew into a man's eye, causing intense suffering; it was removed with some difficulty, as it adhered rather tenaciously to the conjunctiva, but with the exception of a severe attack of muco-purous ophthalmia and a slight persistant nebula of the cornea, no further ill consequences arose.

A chemist was chipping a piece of phosphorus, when a

fragment lodged in his eye; the spasmodic closure of the lids pressing it firmly against the globe, caused rather a severe burn of both eyeball and eyelid. I did not see it till the following day, when it merely required the ordinary treatment of a burn. In such a case the eye should at once be washed with alkaline water to neutralize the phosphoric acid.

Caustic potash, the well-known *lapis infernalis*, is most formidable if it enters the eye; it is an hydrated oxide of potassium, and operates chemically by its powerful attraction for water and its solvent property over organic tissues, especially albumen, with which it forms a new compound; consequently the transparency of the cornea is speedily destroyed if the potash comes in contact with it.

The eye should be instantly freely washed with water, and if possible, exposed to the fumes of hydrochloric acid; failing this, it should be washed for some time with dilute vinegar and water, and then a drop of oil should be placed between the lids.

In Strasburg a patient was under treatment by having calomel blown into the eye as a remedy for granular lids;[1] one day, by mistake, "Poudre de Vienne" was used to the left eye; violent inflammation followed, leading ultimately to entropium and corneal opacity.

If nitrate of silver in substance enter the eye accidentally, or if it be too freely used surgically, dangerous consequences may follow: a white compound of nitrate of silver with the fibrin and albumen is formed, and the vitality of the textures destroyed.

The proper treatment is to wash the eye with a solution of common salt, after which the raw white of an egg may be dropped into it, which besides assisting in decomposing any

[1] 'Archives d'Ophthalmologie,' t. vi, p. 17.

lingering particles of the nitrate, is very soothing to the eye.

The following case illustrates the effects of this caustic when injudiciously applied.

Nitrate of silver in substance was being applied by a surgeon to ulcerations on the lids of a young woman, on the 9th February, 1858, when unfortunately a fragment of the caustic broke off and became fixed between the eyeball and lower lid, where it remained undiscovered some minutes. It was then washed out, and she was directed to bathe the eye freely.

The following day she applied to me. The conjunctiva of the injured eye was acutely inflamed and somewhat chemosed. A white slough upon the lower and inner segment of the globe, and a corresponding slough on the inner surface of the lid, marked the seat of the escharotic (fig. 3, Plate III). Blood was extravasated at several points along the margin of the wound. She had suffered intense pain during the night. Leeches and fomentations were ordered, and olive oil directed to be dropped into the eye thrice daily.

On the 13th the chemosis had subsided, but there was still much conjunctivitis. Pus was discharged freely from the burned surfaces.

From this time the acute symptoms rapidly subsided, and great care being taken to prevent union of the raw surfaces, by frequently passing a probe between them and dropping oil into the eye, perfect recovery without deformity took place.

It is seldom that corrosive sublimate in a concentrated form comes in contact with the eye; an interesting case presented itself at the Clinique of Professor Jaeger,[1] at Vienna.

[1] 'Arch. d'Ophthalmologie,' t. vi, p. 228.

A young man was carrying corrosive sublimate in a paper bag, when it burst, and a considerable quantity of the sublimate flew into his right eye; to relieve the pain he used an eye-cup filled with water, throwing his head back and opening the lids, but the only effect was to dissolve the sublimate on the lids, which penetrated between them, whence resulted an extensive cauterization of the ocular conjunctiva and of the lids, accompanied with insupportable pain.

It was at the expiration of an hour that the patient presented himself to Professor Jaeger. A mixture of oil, milk, and yolk of egg cooled in ice, was ordered to be dropped into the eye and applied externally. Eighteen hours afterwards, the lids were greatly tumefied and the pain intense. Endeavouring to open the lids, Jaeger found them strongly glued together and to the eyeball by gelatinous exudations. Energetic antiphlogistic treatment greatly diminished the pain, swelling, and inflammatory symptoms, in forty-eight hours. The exudations along the borders of the lids had now a whitish aspect; fearing their organization, Professor Jaeger proceeded to separate them, but was obliged to use a scalpel, with which he severed the adhesions which united the lids together and to the globe. Many vessels were divided; the exudations covered the entire surface of the eye. Twenty-four hours afterwards the adhesions were reproduced, but their separation was easier. Once thoroughly disengaged, the cornea appeared perfectly transparent, and the patient saw distinctly. Instillations and fomentations of oil were continued, and the patient was desired to keep the eye open as much as possible.

It is stated that the patient was perfectly cured at the end of six weeks, the cornea being clear, and the conjunctiva assuming a new epithelial covering without contraction; a result more favorable than might have been anticipated.

Carron du Villards has recorded two authenticated cases where the ejection of the venom of a serpent into the eye caused intense pain, swelling, and inflammation. One of the victims of this accident was Dr. Segond, Physician in Chief of the Marine Hospitals; the other was a naval officer. In each case the suffering, though of short duration, was intense, and the inflammation acute, but in neither did the eye suffer permanent injury.[1]

Croton oil when applied to the eye gives rise to most violent inflammation.[2] A case occurred in the practice of M. Chassaignac of a patient, who suffering from some trifling malady of the eyes, was desired to bathe them with a sedative collyrium, and to rub croton oil behind the ears. Unfortunately he diligently applied the collyrium behind the ears, and dropped the croton oil into his eyes. Violent purulent ophthalmia was the consequence, terminating in opacity of the lower half of the cornea of the left eye; the right eye was restored.

The effects of creasote in the eye are well displayed in a case described by Mr. Vose Solomon. The sensation was that of liquid fire, and vision became at once red and flaming; cold water applications dulled the pain, and it became a dead, aching smart, similar to a burn of the flesh; after the rising of blisters, the eyes felt swollen and too large for the sockets; severe ocular hyperæsthesia followed the primary symptoms, and some months elapsed before the patient fully recovered the use of his eyes. In the same paper[3] another interesting case is related, in which amaurosis was induced by the entrance within the eyelids of a boiling solution of soda and soap. In a third case, severe rheumatic inflammation of the

[1] 'Ann. d'Oculistique,' 1855, p. 253.
[2] 'Archiv. d'Ophthalmologie,' t. vi, p. 157.
[3] 'British Medical Journal,' Jan. 24th, 1857.

eyeball is described as being excited by a boiling solution of gold and cyanide of potassium, which spirted into the eye.

When sulphuric acid, or any other of the powerful acids has entered the eye, not a moment should be lost in neutralising it, by washing the eye with a weak solution of bicarbonate of soda or potash, or if that be not at hand, soap and water should be used. If not too irritating, the fumes of ammonia, a bottle of common smelling salts, for instance, might be useful; but the thorough washing is to be preferred. A drop of oil should then be placed between the lids, which has the effect of interposing a stratum between the conjunctiva of the lid and that of the eye, and thus keeping the injured surfaces apart; the eye should be cooled by iced water, and the patient confined to a darkened chamber. Of the further treatment I shall hereafter speak.

Quicklime, or oxide of calcium is, as is well known, made by burning limestone or chalk in a kiln, whereby the carbonic acid is driven off, leaving a powerful caustic material having a great affinity for water. The combination of this substance with water is accompanied with the evolution of intense heat, so that if quicklime enters the eye there is the double injury produced by the chemical destruction by the caustic, and the influence of the heat set free by the mixing of the lime with the fluid portion of the tears and mucus; this, therefore, is the most formidable of the preparations of lime, for it destroys quickly the vitality of the cornea and the conjunctiva.

Slaked lime, hydrate of calcium, entering largely into the composition of mortar, is destructive to the eye, though less actively so than quicklime; mortar is made by mixing sand with slaked lime, soot being sometimes added. It is from mortar entering the eye that the most frequent injuries arise (at least in towns), and here we have not only the chemical

action of lime, but intense anguish caused by sharp particles of the sand, at every movement of the eye or lids.

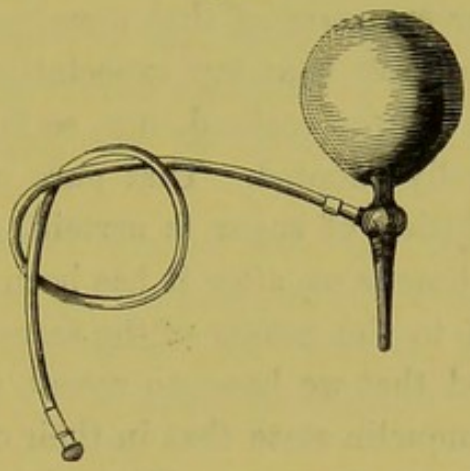
When lime is in the eye the sufferer keeps the eyelids spasmodically closed, the slightest motion aggravating the pain; this is especially the case when lime or mortar has found its way under the upper lid. The material itself has a tendency to become attached to the moist surfaces of the membranes, and especially to accumulate in the folds at the point of reflection; pressure of the lids increases this adhesion, gluing the lime still more firmly to the cornea and conjunctiva; I have several times been unable to remove it except by picking it off with a round-pointed needle; no time therefore should be lost in cleansing the eye, and if the pain of exposing it is insufferable, it may be advantageous to place the patient under chloroform; the lids should be everted, the folds of the conjunctiva searched with a camel's hair pencil dripped in oil, and every particle removed; lime-burners use a slice of the rind of bacon for sweeping out the lids; it is really adapted for the purpose, the fat of the bacon forming a soap with the alkali. The lids being cleared as far as possible, the eye should be well syringed; it is possible that in the first instance a solution of sugar, recommended by M. Gosselin, may possess some efficacy, and treacle mixed with water would be the simplest and readiest form.

Dr. Jacob[1] recommends that the sufferer should be laid on his back, the eyelids held firmly open, and a stream of cold water poured from a tea-kettle into the eye; or failing this, that the eye should be washed by a jet of water thrown from the mouth. An eye-douche, sold by Carpenter and Westley of Regent Street, is well adapted for syringing the eye. It is of vulcanized india rubber, the tube being furnished at

[1] 'Dublin Medical Press,' Sept. 20th, 1858.

its extremity with a rose, pierced with five holes (fig. 38), through which fine jets pass, and a continuous stream can be made to flow.

Fig. 38.



The effect of mortar on the conjunctiva is to render it white and pulpy, and the cornea appears as if it had been parboiled. In a case mentioned by Dr. Mackenzie, the cornea became quite dry when the eye was held open for a few minutes, and when viewed through a lens presented the appearance of cuticle; immediately on being shut it became bedewed with tears, and assumed a less opaque appearance; ultimately it became sufficiently clear to enable the patient to read small type. I may here remark, that whilst after injuries with the strong mineral acids the most cautious prognosis must be given, inasmuch as an eye which at first appears slightly injured may be ultimately lost, the opposite condition exists after injuries from mortar; corneæ, which from their densely opaque appearance seem hopelessly marred, may ultimately clear sufficiently to admit of useful vision; and though we must always be prepared to contend against frænæ and symblepharon, yet we may be hopeful of cases which appear at first unpromising.

Dr. Gosselin introduced, a few years ago, a plan of treat-

ment in cases of injuries from lime; it was the use of *eau sucré*, founded on the theory of a soluble compound of lime and sugar being formed, which compound was removable, leaving the cornea free from the opacities which too generally remain after exposure of that membrane to the action of lime. I cannot say that my expectations of success in this treatment have been realised, nor, so far as I am aware, has it been generally adopted. That pure oxide of calcium is soluble in a solution of sugar is certain, but it is by no means clear that lime is so, after it has been in the eye some time and exposed to the action of the tears and mucus. It is to be regretted that we have no recent analysis of tears. Fourcroy and Vauquelin state that in their composition they resemble the aqueous humour. The solid materials, however, are extremely minute in quantity, and consist principally of chloride of sodium and extractive matter, therefore no great influence can be exerted on lime by them; but the mucus of the conjunctiva is also poured out in increased quantity, and this contains sulphates, carbonates, and phosphates; it may be expected, therefore, that whatever may be the purity of the lime, it will be rapidly converted into a hydrate by the action of the fluid portion of the tears and mucus, and the carbonates, sulphates, and phosphates of their solid constituents will combine with the lime, forming insoluble compounds, which become more and more marked the longer the lime remains in the eye. The *eau sucré* treatment, then, is not likely to produce much effect, unless used whilst the lime is in a condition to admit of a soluble compound being formed.

Dr. Jacob,[1] commenting on this treatment, has well remarked, "If the lime and sugar be put in the eye together,

[1] 'Dublin Medical Press,' Sept. 20th, 1858.

it is just possible, but not probable, that the caustic properties of the lime might be neutralized; but as it usually happens, the lime has done all the mischief of which it is capable before the case comes into the surgeon's hands. The conjunctiva both of the sclerotic and cornea is in fact destroyed, and the cornea rendered opaque the moment the lime touches them, and no chemical agents can remedy that."

M. Gosselin is of opinion that the opacity caused by slaked lime is due to the penetration of this material into the substance of the cornea, and that the best mode of dispersing it is by the frequent instillation into the eye of a solution of sugar in water.

The action of quicklime he attributes mainly to its heat, coagulating the albumen of the cornea, disorganizing the conjunctiva, and provoking a consecutive purulent ophthalmia, which destroys the eye; nevertheless he thinks benefit may be derived by this application even in such severe cases, as a portion of the lime becoming slaked may be infiltrated into the cornea and remain there.

Soon after I became acquainted with M. Gosselin's views, a case occurred in which I proceeded to test the efficacy of his treatment.

Joseph Rule, aged 57, was admitted into St. Mary's Hospital, April 29th, 1856. Eleven weeks previously he was working at fortifications in course of erection at Milford Haven. A hole had been filled with unslaked lime, when the sea unexpectedly flowed into it; the lime "blew up," knocking him down and filling his eyes with the caustic material. He was carried home, the eyes washed, and a surgeon called in. Violent inflammation with acute pain appears to have followed. He was bled from the arm and salivated; by this treatment the sight of the right eye was

partially restored, but not sufficiently to enable him to go about in safety. He was then sent up to St. Mary's.

The cornea of the right eye was now opaque in two thirds of its extent, the pupil was drawn upwards and inwards, and adherent to the cornea; the right cornea also presented a leucoma, but less extensive than that of the left eye. The active symptoms had subsided, but some iritic inflammation still lingered in both eyes. He was ordered three grains of grey powder with a third of a grain of opium twice daily; the eyes to be bathed with a collyrium of belladonna. On May 1st, an issue was inserted in the left temple. The mouth showing evidence of mercurial action on the 10th, the pills were omitted, and there was ordered to be dropped into the eyes thrice daily, a solution of one drachm of white sugar in an ounce of water. On the 20th, a drop of solution of atropine was placed in the eye every day. May 26th; he states that he can now for the first time distinguish the flowers growing in the garden of the hospital. The upper half of the left cornea has recovered its transparency, the leucoma still lingers in the lower half; it is with this eye that he has sight. The leucoma of the left cornea has undergone little alteration, and the extent of sight is limited to the perception of the shadow of a hand when passed before it.

By his own desire he was now discharged from the hospital, and returned into the country.

The impression left on my mind by this case was, that the sugar solution was of no visible advantage; the improvement which took place was slow and gradual, and due, in my opinion, rather to the influence of the mercury and the *vis medicatrix naturæ* than to the instillations. I tried the treatment in other cases; it was agreeable to the eye, but so far as could be perceived the results were negative.

When the eyes have been thoroughly cleansed, the lids should be painted with the extract of belladonna rubbed down with butter, which soothes pain, and cold or iced water compresses assiduously applied. If the pain be severe a full opiate will be proper; considerable tumefaction of the lids may be expected, and if the patient is of full habit the ocular inflammation may run high with profuse puro-mucous discharge. When this point is reached, warm fomentations afford more relief than the cold applications; it may be necessary to take blood by leeches or cupping, which should be promptly practised if there is throbbing, or a dull, heavy sense of distension in the eye. Low diet and general antiphlogistic treatment will of course be indicated, nor should absolute quiet in a darkened room be neglected in severe cases.

When the sloughs are separating, the local use of a solution of nitrate of silver, two to four grains to the ounce, will be advantageous; but on no account should any preparation of lead be used; the opaque particles will certainly become entangled in the abraded surfaces, leaving a rough and dense deposit, causing, as in the following case, serious suffering.

Robert Wood, aged 30, was admitted into the North London Eye Infirmary, May 16, 1849. Twelve months previously, whilst in the West of England, a quantity of slaked lime was accidentally thrown into both his eyes; much of it was washed out by himself, and he then, being in great suffering, applied to a chemist, who supplied him with a bottle of eye-water, with which he was told to frequently wash the eye, shaking up the bottle at each application; this he strictly adhered to, and the result was most unfortunate. The eyes had since remained in a nearly blind state, tormented with pain, which was aggravated at every movement; there was a perpetual flow of tears and a profuse discharge of

mucus. He sought relief in many quarters, and a variety of caustic and other remedies had been used without effect.

The condition of the surface of each cornea fully explained the cause of the sufferings; a rough incrustation of lime and acetate of lead formed an irregular layer over nearly the whole of the right cornea and two thirds of the left, a small space towards the upper and outer portion being tolerably clear. The friction of this upon the sensitive lining membrane of the lids had produced a highly granular condition, and kept up a constant excitement of the lachrymal gland; hence the profuse lachrymation and the discharge of mucus from the lids.

The patient gladly submitted to the following proceedings.

With an iris-knife I first attempted to scrape away the foreign substance, but making little impression I endeavoured to scale it off, by passing the point of the knife under it; and now with facility, flake after flake was removed, leaving the corneæ nebulous, but free from the irritating mass. A drop of castor oil was finally placed in each eye.

The relief afforded was indescribable; the distressing sense of roughness and of foreign bodies in the eye returned no more; the palpebral conjunctiva speedily lost its granular condition; the vapour of hydrocyanic acid was used with success to diminish the corneal opacity, and at the expiration of three weeks this patient returned to the country free from pain and having useful vision with the left eye; the nebula of the right was too dense to admit of relief, at least in the time.

In cases of injury to the eye from strong acids and alkalies, the full amount of mischief does not develope itself till after the lapse of several days; the cornea may only display a hazy aspect or slight nebula, not sufficient to materially obstruct vision, and the surgeon may congratulate the patient

on the prospect of complete recovery; but after the lapse of ten or twelve days a change for the worse may occur; the cloudiness of the cornea may increase, and suppuration take place (as in the case already related in the practice of M. Desmarres), leading to destruction of the eye.

The appearance presented, after a day or two, by burns caused by escharotics generally, is that of a white or greyish slough, the neighbouring conjunctiva is injected, and patches of extravasated blood lie near the slough. When suppuration follows destruction of the tissues, it commences first in the loose conjunctiva covering the sclerotic, and this may precede formation of matter in the cornea by two or three days. The eschars are generally slow in separating, and when thrown off from the cornea they resemble small masses of suppurating fibre; as these come away they sometimes leave a layer beneath sufficiently clear to excite hopes of regained sight; but these are perfectly fallacious; the thinned layer gives way, and the lens may escape; or failing this, small dark points appear here and there, being protruded portions of iris, which daily become more marked; there being no longer a firm cornea to resist the pressure from behind, the resistance is so much diminished that the iris may be projected forward, laying the foundation of a staphyloma, and thus deformity is added to the loss of vision.

Though chemical injuries of the eye require in the first instance special applications to neutralise their effect, the subsequent treatment will be similar to that required in burns and scalds. Excessive pain is common to all these accidents, and this is best allayed by anointing the lids with extract of belladonna, rubbed down with fresh butter to the consistence of cream; this has a powerful influence in subduing the exalted sensibility of the branches of the fifth pair, and so affording relief. In all these injuries one of the most

grateful topical applications is the *Aqua Opii* of the Prussian Pharmacopœia,[1] to which we have nothing analogous. Applied pure or diluted with water, it materially allays the burning smart of the eye.

The primary effect of cauterization of the eye is to destroy the living tissues with which the escharotic (be it what it may) has come in contact; this is followed by acute inflammation of a puro-mucous character.

To combat this our efforts must be directed. For the first few days cold applications are usually most agreeable, but on no account should Goulard's lotion, or other insoluble preparation of lead, be used, lest the salts of lead be deposited on the eye. The Aqua Opii already mentioned may be used, or as that may not be easily obtainable, cold or iced water may be substituted, and if the sufferings be severe, opiates should be administered. I am partial to the solution of bi-meconate of morphia, as attaining the object with less disturbance of the system than many of the preparations of opium.

Warm applications feel most grateful after the lapse of a few days, and it is proper to consult the feelings of the patient upon this point. Hot water or poppy fomentation is exceedingly agreeable to the eye when the discharge commences, and is useful, not merely as a fomentation, but as cleansing the lids, and preventing accumulation within the eye; if the pain is severe, leeches should be applied. I have seen much benefit from the application of one or two leeches near the angle of the eye for two or three successive days.

[1] The formula is

R. Opii in lamellas dissecti et leni calore siccati unciam unam.
Immitte in retortam vitream et affunde
Aquæ communis uncias duodecim.
Destillent unciæ sex.
Serva caute in vasis bene obturatis.
Sit limpida, coloris expers, odoris debilis.

Sedatives are ever valuable adjuncts, quieting the nervous system, allaying pain, and assisting sleep.

I therefore give opium or morphia freely in severe cases; and it may be advantageous to combine calomel or blue pill with them. Salivation is not necessary, but a mild mercurial action promotes absorption of inflammatory deposit, and assists the restoration of sight.

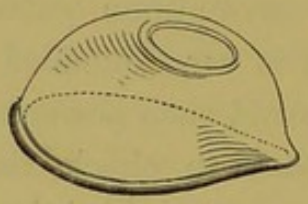
When the acute symptoms are subsiding, the application to the eye of a weak solution of nitrate of silver is attended with advantage; from two to four grains to the ounce of distilled water is, in my opinion, sufficiently strong, though as high as ten grains is recommended by some authorities; but it is far safer to avoid such powerful applications.

It is very important to check the tendency to union between the raw surfaces, and this is best done by drawing the lids from the eye, and keeping an unctuous substance, as castor-oil or salve, between them. A probe may be daily swept along with advantage. The frænæ do not appear until after some time, and when they commence, it is extremely difficult to overcome the tendency to their formation; if bands form, they may be snipped with scissors, which is less painful than breaking them with a probe, and if the state of the eye will admit of it, a glass mask may with great advantage be introduced between the surfaces.

The great evil which usually results from cauterization of the conjunctiva of the eye, and of the lids, whether by burns, scalds, or chemical agents, is the formation of adhesions—symblepharon, or ankylo-symblepharon—according as these involve the lid and eye only, or the lids and the eye altogether. The pertinacity with which these return again and again, notwithstanding the care and pains of the surgeon, is most vexatious. Every one who is familiar with such cases must have experienced this; the instillation of oil, the break-

ing down the adhesions with a probe as fast as they form, and various other contrivances, sometimes completely fail to attain the object, and, as represented in fig. 5, Plate III, the eye is spoiled by unsightly bands, which unite it to the lid. Perhaps the most effectual mode of keeping the surfaces apart, and overcoming adhesions is, after thoroughly destroying any points of union, the introduction of a glass mask (fig. 39), a sort of artificial eye, with an aperture correspond-

Fig. 39.



ing with the cornea. This should fill the space between the eyelids and the eye.[1]

Adhesions usually implicate the lower half of the eye to a greater extent than the upper half, but I have met with cases where adhesion was general. The extent varies from a single band like a thin tendon, spanning from the cornea to the lid, to a firm mass binding the two inextricably together.

In some instances where there is a single adhesion it is fixed by its extremities only, the intermediate portion being free. It is not merely that these adhesions interfere with sight, and render the countenance ill-favoured; there may be also a distressing sense of dragging when the patient attempts to turn the eye from side to side. Dr. Mackenzie mentions that he has been solicited to separate the eyeball from the lids, merely to relieve this, and with no view of restoring sight.

[1] The masks in question are made by Gray and Holford, Goswell Road.

At Moorfields, the treatment by means of free division of the frænæ, and the introduction of the glass mask (fig. 39) is, I am informed, attended with success. The following severe case, resulting from injury by lime, is mentioned in the third number of the 'Ophthalmic Hospital Reports.'

"In the left eye the whole of the palpebral edges were adherent to the globe, and the cornea exposed to the air, covered by dry cuticle of a grey colour; the adhesions were divided with scissors, so as to admit an artificial eye, which the patient wears with great comfort. In the right eye the adhesions were only partial, admitting the tears, and the cornea being partially covered, was transparent at the upper part (the non-adherent portion of the upper lid was inverted); the eyelashes were dissected off, and by a second operation the adhesions were divided with scissors, the outer canthus enlarged to admit a speculum, and an artificial pupil made opposite the transparent part of the cornea. The adhesions re-formed, in spite of many attempts to prevent it. The patient, when the lid is drawn upwards, can count fingers as he could before these operations."

The cases in which the glass mask is found most useful, are those in which the adhesion is partial, as for instance along the margin only of the lid; when the adhesion is general between the upper or lower lid and the globe it is irresistible, pushing the mask from under the lid and re-uniting.

Mr. Wilde,[1] of Dublin, having paid particular attention to symblepharon, found the following mode of operating perfectly successful. With a fine scalpel the frænum is to be dissected from the eye, the flap raised being as large as possible and the dissection being commenced at the point most

[1] 'Report on the Progress of Ophthalmic Surgery for 1846,' p. 24.

distant from the cornea. The extreme apex of the flap should then be attached by a fine suture to the lowest point of raw surface on the *interior of the lid,* and other sutures applied along its edges as the extent of surface may require. By this means the external mucous or cuticular surface of the old adhesion will be presented to the raw surface of the conjunctival cellular tissue on the globe, and thus adhesion prevented. When the adhesion has been of moderate extent, the conjunctiva may be drawn together by three or four points of fine suture.

Mr. Wilde justly observes, that as long a time as possible should be allowed to elapse between the origin of the disease and the period of the operation, for by so doing the band of adhesion becomes lengthened and diminished in vascularity.

My own experience leads me to speak favorably of this operation, and Mr. Walton gives a spirited woodcut of a case in which he operated thus, with perfect success.

Frequent movement and drawing asunder the opposing surfaces is an efficient means of preventing union; to keep the lids constantly closed[1] after cauterization will ensure this evil result. A remarkable instance fell under my notice, in

Fig. 40.

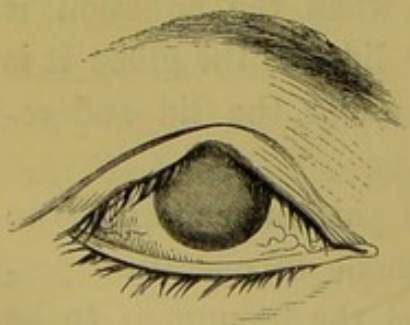
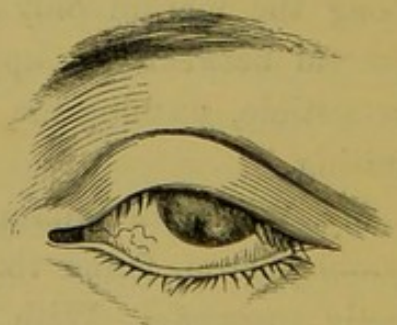


Fig. 41.



which the lids united to the eye, leaving the cornea exposed. Figs. 40 and 41 represent the eyes of a man, seventy-two

[1] I may here remark that *Entropium* is an occasional effect of keeping an eye long closed and covered with dressings, the margin of the lower lid rolling in

years of age, who consulted me in 1851. He had enjoyed good sight until eighteen years prior to my seeing him; at that time a favorite son was drowned, which affliction caused excessive weeping, followed by inflammation of the eyes. To subdue this, very powerful caustic ointment (doubtless nitrate of silver) was used, which aggravated the inflammation to an intense degree, and from that time he had been blind. In 1847, an operation was performed upon the right eyelid, which was separated from the eye and a piece excised, but the eye and lid again united, and he derived no benefit.

The condition when I saw him was as follows. The right eye was permanently open, the upper and under lids being completely adherent to the eyeball. The whole surface of the eye was covered with dry epithelium, the cornea being opaque and grey. A notch in the upper lid indicated the seat of the excision. The lower lid of the left eye was adherent throughout to the eye, but about one third of the upper lid was free; the upper third of the cornea and sclerotic were moist, but the remainder dry and cuticular; the puncta in both eyes were obliterated. Unless moistened with sweet oil the eyes felt distressingly dry and hot.

A fine, athletic young countryman was led into my consulting room, the eyelids being closed. I desired him to open them, when he said he could not, and to my surprise I found that the eyelids were glued by adhesions to the eyes throughout their entire extent. Inquiring how this condition arose, he stated that some months before, he had had a bad attack of inflammation in both eyes; he went to a horse-

under the irregular action of the *Orbicularis palpebrarum*. The best mode of overcoming this embarrassing complication is by the use of a small wire *clip*, which seizes and retains a sufficient fold of integument to prevent inversion, and after this has been worn a fortnight or three weeks the tendency ceases. I have cured several cases of *Entropium Senilis* by the same simple means.

doctor, who rubbed the eyes and eyelids with some burning stuff which gave him intolerable pain; he was then told to go home, poultice his eyes, and on no account to open them; the poor fellow abided but too strictly to this injunction, and when they were to be opened, they were found to be sealed for ever.

I have mentioned two cases where permanent adhesion of the globe to the eye took place; Mr. Walton mentions[1] another, and Dr. Furnari informed M. Desmarres, that during his stay in Africa, he had seen and operated on so large a number of symblepharons from caustics, that he was quite tired of them.

Potent applications of this description are much less used in English practice than formerly, and these sad cases of mismanagement are likely to become more and more rare.

The abuse of stimulating or escharotic applications is, I believe, a more frequent cause of injury than is suspected. Dr. Mackenzie saw severe inflammation of the conjunctiva, with considerable sloughing in the lower fold of that membrane, from red precipitate in powder, which an ignorant pretender had applied to cure a slight ophthalmia. I have seen violent inflammation and a formidable ulceration of the conjunctiva follow the use of an ointment of biniodide of mercury, which was similarly used; but the nitrate of silver is the most frequent agent of mischief; powerful for good if used with judgment, it is all-powerful for evil if misused.

Malingering and Feigned Blindness.—We occasionally meet with instances where, from evil design or hysterical monomania, substances are placed in the eyes for the purpose of exciting pity or wonder. The following is a case of this description.

[1] 'Operative Ophthalmic Surgery,' p. 120.

A girl, an inmate of an Orphan School, was placed under my care at St. Mary's Hospital, by one of the governors, who took an interest in her forlorn condition. She was suffering apparently from chronic inflammation of the right eye, with slight haziness of the cornea. Week after week elapsed without amendment, notwithstanding a variety of treatment, and suspecting that there must be some cause for this, I took the girl into the hospital and desired that she should be watched. All I could learn was, that though always complaining of her eye to me, she never at any other time seemed annoyed by it. This convinced me that she in some way irritated the eye, but she was not detected, and after a month she was re-transferred to the out-patients' department, the eye remaining much the same.

A few days after this, I met the girl a short distance from the hospital, on her way to it to appear before me. I stopped her, and without speaking, drew down the lower lid of the affected eye; the mystery was at once cleared up! A chip of wood had been cunningly placed between the lid and the eye, and was of course always removed when the eye was to be looked at. The chip was quite sodden with mucus, having evidently served this purpose for a long time.

Malingering is, I believe, much more rare in the army than it used to be. Dr. Cheyne remarks, that it was scarcely possible to imagine a more humiliating picture of depravity than was presented by a ward filled with soldiers, labouring under ophthalmia, deliberately produced by their own hands. A regular correspondence has been detected, between these ophthalmics and their friends, requesting that corrosive sublimate, lime, and blue stone, might be forwarded to them, through which and good luck, they hoped to get their eyes in such a state as would enable them to procure their discharge with a pension. The means were most painful, and

the inflammation was kept up under every privation which could make life miserable. Locked up in a dark ward, and permitted to have intercourse only with the officers of the hospital, nurses and orderlies, confined to most disrelishing diet, suffering under painful external applications and nauseating internal medicines; bled and leeched till their nerves were utterly shattered—all these miseries, in many cases, had no other effect than to confirm the men in their determination to destroy one or both of their eyes, in order to obtain dismissal from the service, with the chance of a small pension.

An interesting account is given by Dr. Hennen, of malingering, which came under his own observation. He had placed under his superintendence a corps, in part recruited by convicts, which was ordered to the West Indies. Ophthalmia made its appearance, and the regimental surgeon was led in one case to suspect the application of some acrid substance to the eye. On examination of the person of the patient a paper of corrosive sublimate was found in his possession, with manuscript directions for its use, in which it was recommended to put a minute portion of this substance into the eye on going to bed, to repeat it every third night, and to be cautious not to put too much, lest the eye should be destroyed. There was also annexed to this prescription a form of receipt for removing the artificial disease thus produced. It consisted of a decoction of parsnips and clover, softened by boiling, which was to be applied to the eye, and continued to it during the night. On no other individual of the corps could any deleterious substance be discovered; but it was not a little remarkable, that all the leeches which were applied to him, as well as to other suspected persons, died almost immediately, giving reasonable ground for the supposition that they were poisoned by the action of the mercurial solution.

Sir George Ballingall states that in 1809, 300 of the men of two regiments, who were on duty at Chelmsford, became affected with ophthalmia. The healthy men of the corps were removed to another station, and the sick remained in hospital, but under military command. Information having reached the commanding officer that one of the nurses of the hospital was in the habit of going to a druggist's shop for the purpose of purchasing medicines, suspicions were excited; and in conjunction with the medical officer in charge of the hospital, he made a successful attempt to discover whether the men had any drugs in their possession which might be employed to excite inflammation of the eyes. Accommodation having been provided for about twenty-four men, the number contained in one ward, at midnight the officer made his appearance in the hospital; the men were roused from their beds, and forthwith marched in a state of nudity to the new ward. The old ward was secured for the night; and next day, when the beds were examined, a number of small parcels of corrosive sublimate were found concealed. Means were taken to prevent a supply of this article, and in a very short time two hundred and fifty of the men had recovered, and were then marched to their respective corps.

Corrosive sublimate seems to be the favorite material when it can be obtained, but lime, snuff, the juice and ashes of tobacco are also used by malingerers to excite ophthalmia.

During Sir Ralph Abercrombie's campaign in Egypt, night-blindness was common, but was also often feigned; a remedy was however soon found. In the working parties a blind man was joined to, and followed one who could see, in carrying the baskets filled with earth, and when the sentries were doubled, a blind and a seeing man were put together; thus the malingerers were defeated and the blind turned to

account, for during the night, hearing is often of more importance on an outpost than sight.

A seaman on board the Utile frigate, pretending to be totally blind, and believed to be so, was on one occasion permitted to go on shore, and was attended by a man to lead him about the streets. These two happened to quarrel and even came to blows, when the blind man finding, as might be expected, that he was likely to have the worst of the fray, suddenly regained the use of his sight, and soon got the upper hand of his astonished guide. The latter being worsted, took to flight, was pursued through a great part of the town by his former protegé, and finally received a severe beating from him. Next day the impostor was severely flogged, and never afterwards exhibited any deficiency of vision.

Counterfeit ophthalmia may be recognised, according to Dr. Veitch, by the following indications:—It is generally confined to one eye, usually the right; its progress is unnaturally sudden, commencing and reaching its acmé in one night; the swelling is chiefly in the conjunctiva; it ceases as soon as the vision of the eye is rendered imperfect, but continues to present itself after the adoption of the most vigorous measures against contagion or infection.

In addition to this, it may be stated that ophthalmia, when counterfeit, is generally confined to privates of indifferent character, and does not extend to officers, women or children, which is not the case with true ophthalmia.

A most curious instance of hysterical monomania has been related by Dr. Lopez, in the thirty-second volume of the 'American Journal of Medical Science.' A young lady pretended that, whilst staying with some friends in the country, some object fell from the ceiling as she lay in bed, and alighted on her cheek just below the lower lid. In the course of the night she professed to have been awakened by intense

pain in her left eye, which continued at intervals until the morning, when the eye was found to be inflamed, and she removed, by rubbing, two fragments, which were recognised as portions of a spider. The same thing was repeated in the afternoon, whereupon she returned to Charleston, and was placed under the care of Dr. Lopez; under this gentleman's charge she continued for two months, during which period between forty and fifty spiders, of three different species, were removed from her eyes, often by Dr. Lopez himself; and yet so cleverly was it managed, that in spite of every care to detect her, the actual introduction of the insect into the eye was never discovered.

Fortunately her eyes were not permanently injured by these tricks, and after imposing on her friends for more than two months, she abandoned her malpractices, and the eyes then speedily recovered.

The ophthalmoscope will often lead to the discovery of changes in the eye pronounced incurable, but in reality slight. Its utility was exemplified in the late Crimean war among the young soldiers, some of whom were malingering, and others might have been pronounced blind and unfit for duty and placed on lists for pensions; in fact, in the absence of the ophthalmoscope, it would have been impossible to decide whether their cases were exactly as represented or not; but the use of this instrument at once cleared up doubts, showing slight extravasations of blood, &c., not necessarily of an incurable character.[1]

[1] J. Hogg, 'On the Ophthalmoscope,' p. 13.

## CHAPTER X.

When one eye has been destroyed by injury, the mischief in many cases does not rest there; the other eye takes on morbid action, and total blindness is the frequent result. To prevent this result has been one of the advantages derived from the employment of anæsthetics, for it has enabled us to perform fearlessly, and with perfect confidence, operations from which we formerly shrank, not so much from their danger to life, as from the severity of suffering inseparable from their performance.

The term "sympathetic" or "reflex" ophthalmitis has been employed to designate the insidious inflammation which ranks amongst the most intractable of ocular diseases; and it is now known that as the disease depends on a distinct exciting cause, no remedies addressed to the eye secondarily affected avail whilst the primary exciting cause continues in force.

The sympathy between the eyes, which is so familiar to us, is readily explicable when the anatomical relations in which they stand is remembered. The decussation of the fibres of the optic nerves and the direct communication established between the retinæ of the two eyes, by means of the interlacement in the chiasma, bring at once within our comprehension the channel by which morbid irritation is conveyed from one eye to its fellow;[1] it is well known that if an

[1] A remarkable illustration of the effects of sympathy between the eyes is mentioned in the 'Lectures' of Dr. Brown-Séquard. "I know," says he, "of a

eye has received injury or suffered from inflammation, the injudicious use of the sound eye speedily excites pain in the injured organ, and *vice versâ*. So great is the influence of a diseased eye on a sound eye, that I have seen several instances in which, one eye being lost, not a gleam of light could be borne by the other eye; but when that was carefully covered, the blind eye could be examined at leisure, the light of the mid-day sun not being perceptible to it.

The sympathetic influences, or reflex phenomena, are in some instances curious. In strumous ophthalmia a violent fit of sneezing is a common result of exposure of the eyes to light, the excitement of the retinæ diffusing itself to the branches of the fifth pair, supplying the Schneiderian membrane, and giving rise to the sensation of tickling in the nose, whence the sneezing.

A singular case came under my notice last spring. A young lady had, from purulent ophthalmia in youth, a dense and projecting cicatrix of the left cornea; whenever she lay with her head in any other position than turned to the left, violent sneezing came on; she therefore invariably lay on her back with her head so turned. I cut away the cicatrix from the cornea, and from that time she lost all tendency to sneeze, and was able to assume any posture without inconvenience.

The ordinary characteristics of sympathetic inflammation are, dimness of sight, passing with more or less rapidity into blindness, from slow disorganizing inflammation; at first the appearances are by no means indicative of the formidable

most curious case of inflammation of the cornea and conjunctiva, followed by ulceration and opacity of the cornea, due to overwork with the microscope. It has occurred in a distinguished friend of mine, Dr. F., now professor at Lille. In this case anæsthesia and a degree of atrophy of the face were produced at the same time as the ophthalmia, on the *left* side, the micrographer making use of his *right* eye."—*Lancet*, Nov. 20th, 1858.

nature of the disease; there is some sclerotic redness around the cornea, and the iris becomes discoloured; according to my experience effusion of lymph upon the capsule of the lens is an early result. Still the surgeon may fairly imagine that a mercurial course, with the local aid of belladonna, will restore the eye; unfortunately experience shows that such expectations are seldom realised; the sclerotic redness varies—sometimes nearly disappearing, at other times being considerable. The pain, too, varies, but from the commencement there is dull aching over the brow, which increases in extent and severity when there is accession of inflammation. From the commencement, alteration of colour and of form in the iris, steadily proceeds; that membrane gradually becomes dull, discoloured, often of a dingy green hue streaked with dark lines; an early condition is adhesion of the margin of the pupil to the capsule of the lens, and this gives rise to a peculiar change. This binding down of the pupil cuts off the communication between the anterior and posterior chambers, effusion takes place in the posterior chamber, and the iris being the most yielding membrane is bulged forwards in a convex form. Thus it may remain, or it may undergo a change the result of parenchymatous inflammation. The appearance is precisely that which might be expected from absorption of fibres of the true iris and the projection of pouches of uvea through the interstices. Such was supposed to be the condition by Jaëger, who called attention to it, but Klemmer asserts that the change is really a thickening of the iris in parts from lymph which is thrown out, and that the dark colour is caused by pigment which is also deposited.

The pupil presents at first a faint greyish tinge from the effusion of a delicate layer of lymph, but as this increases, the whiteness becomes more marked, being spotted here and

there with black pigment. Thus, disorganization too often proceeds—the vitreous humour becomes fluid—the eye loses its consistence—the retina its sensibility, until at length atrophy and shrinking of the globe with total blindness is the sad result.

There are instances in which the attack is rapid and the symptoms of inflammation marked from the commencement. Dr. Mackenzie mentions a case in which a patient, who had suffered an injury to the right eye, incautiously read a book in small type for three or four hours in the evening; the following day the left eye showed marked iritis, even to the effusion of lymph, for the upper edge of the pupil was tagged to the capsule of the lens, and in spite of all treatment the mischief ran on to complete destruction of the eye.

There is a chronic form more insidious in its character, but not less destructive than the acute form. It begins with mistiness of sight and the appearance of clouds passing before the eye, generally accompanied by muscæ and scintillations; the sight may even be temporarily suspended.[1] The usual condition of the pupil is that of contraction, but it may be dilated and feeble in its action. As there is little visible in this stage, the danger may be easily overlooked, but when the iris becomes implicated, constituting the second stage, there is less risk of mistake. There is now dulness and discoloration of the iris; a blue iris has usually a greenish hue—a hazel or brown iris, a reddish tint. The margin of the pupil will be seen to present one or more tags of lymph binding it to the anterior capsule of the lens, and some injection of the zone around the iris will appear. The sight will be more impaired than can be accounted for by the iritic

[1] See a valuable paper by Mr. Vose Solomon, 'British Medical Journal,' June 13th, 1857.

symptoms, and the patient makes complaint of supra-orbital pain.

The eye is now in the utmost peril, and unless the exciting cause of irritation be removed, blindness will surely follow. This blindness will be caused by the sympathetic inflammation passing into the third stage, which may present one of two forms. Either amaurosis with softening of the vitreous humour, wide dilatation of the pupil, and subsequently glaucomatous cataract; or closure of the pupil from effusion of lymph, with in some cases hardness, in others softening, of the globe.

To arrive at a definite idea as to the influence of injuries in exciting sympathetic inflammation, I have searched various authorities, which with my own notes give sixty-two cases; of these the following is an analysis.

*Analysis of* 62 *cases of Sympathetic Ophthalmia.*

| | |
|---|---|
| Wound from chip of metal . . . . | 14 |
| „ splinter of wood . . . | 2 |
| „ fork . . . . . | 3 |
| „ arrow . . . . . | 2 |
| „ copper cap . . . . | 8 |
| „ glass . . . . . | 3 |
| „ shot . . . . . | 2 |
| „ scissors . . . . . | 3 |
| „ nail . . . . . | 1 |
| „ screw-driver . . . . | 1 |
| „ awl . . . . . | 3 |
| „ knife . . . . . | 3 |
| „ reaping-hook . . . . | 1 |
| Blow from stone . . . . . | 4 |
| „ from stick . . . . . | 5 |
| „ against nail . . . . . | 1 |

| | |
|---|---|
| Blow from a crane . . . . . | 1 |
| Burn from metal . . . . . | 1 |
| „ sulphuric acid . . . . | 1 |
| „ mortar . . . . . | 2 |
| Explosion of gunpowder . . . . | 1 |
| | — |
| | 62 |

It will be seen that wounds from foreign bodies appear to be those which most frequently give rise to sympathetic inflammation. Dr. Mackenzie thinks that it is most apt to be excited if the wound has produced a protrusion of the iris and such a cicatrix as keeps the remainder of the iris perpetually on the stretch, and that it is especially liable to occur if the retina has been divided or lacerated. There is this curious fact, that so far as I am aware sympathetic inflammation is not a consequence of the operations for cataract or artificial pupil, though extensive wounds are thereby inflicted on the cornea and iris, and in many cases the iris is involved in the cicatrix. Again, gun-shot wounds, though generally destructive to the eye, comparatively seldom excite sympathetic inflammation. But these usually occur among sportsmen, who have the good sense to submit to rigid discipline for a considerable time after the immediate effects of the injury have subsided.

When I reflect on the cases which have fallen under my notice, I strongly suspect that the absence of this discipline has much to do with the occurrence of the disease. The working classes undoubtedly present the largest number of examples, and they are unable and unwilling to give their eyes that repose which prudence demands after the receipt of injury; on the contrary, they are only too eager to return to work whilst the eyes are still irritable, and thus the flame

is lighted up which too often involves the second eye in the destruction of its fellow.

Constitution and habits are not to be overlooked. Dr. Jacob believes that, "it has been most frequently observed amongst besotted operatives and idle young men, who abandon themselves to sensual enjoyments and an irregular life, as well as amongst young persons of either sex, badly fed, clothed, and lodged; specific constitutional disease, especially scrofula and rheumatism, or even syphilis, are probably predisposing causes, and greatly influence the progress and consequences of the disease." [1]

It might be supposed that the class of miners and quarrymen who fulfil many of the above conditions, would be liable to this disease; accidents to their eyes are very common, yet, somewhat to my surprise, I learn from reliable sources that sympathetic inflammation is extremely rare amongst them.

Mr. Robathan, Mr. Tayler, and Mr. Hughes, all of whom have had large experience amongst miners, quarrymen, and iron-workers, concur in this opinion.

Nevertheless we may safely conclude that too early use of the eyes after accidents does predispose them to sympathetic inflammation; and it is incumbent upon us to impress on our patients after accidents, as we impress on them after operations, the importance of not trying their eyes or taxing their powers of vision by too speedily resuming those labours which fatigue the eyes. This often involves both forbearance and self-denial on those whose daily bread depends upon their labours; but it is better for them to make a temporary sacrifice, however great, rather than incur the ruin in which blindness would involve them.

[1] 'On the Inflammations of the Eyeball,' p. 304.

It will be gathered from what has been said, that sympathetic ophthalmia is but little amenable to treatment; it may be palliated and slumber for a time, but, with rare exceptions, it ultimately runs its course. The treatment which is applied with confidence to ordinary inflammations here falls powerless. Mercury, and iodide of potassium, have little control over this disease, nor are bloodletting and blisters of much avail. The only remedy I have seen exercise a controlling influence is an issue in the temple; in one case it certainly did arrest the disease, when everything else had failed. The patient was a little girl, an out-patient at St. Mary's in 1856, who had run a fork into her left eye; all ordinary treatment failed to quiet this eye; it atrophied and sank. The right eye then became irritable, intolerant of light, and the sight imperfect. I decided to try an issue in the left temple, as a last resource before excising the atrophied eye, and at the expiration of three weeks the inflammation had subsided in the left eye and the right had become much stronger. Steel and quinine were prescribed, and the issue kept open six weeks, at the end of which, the left eye had become perfectly quiet, and the right had regained its power of vision. I saw the girl in November, 1858. The left eye had atrophied to one fourth of its natural size, but the right had continued perfectly strong and well.

Mr. B. Bell relates a case,[1] in which sympathetic ophthalmia yielded to a long-continued mild mercurial course, but the injured eye passed at an early period into a quiescent state, and Mr. Bell properly remarks, that had this eye continued inflamed and painful, it is very doubtful if any remedies would have succeeded in saving the other eye. This is

[1] 'Report of Cases at Edinburgh Eye Infirmary,' 1857.

ever an important point to bear in mind. So long as an injured eye remains quiet and free from irritation, we may reasonably hope that the other eye will escape; but in many cases the injured organ remains tender at one point, generally the upper portion, and so long as this tenderness, this shrinking from a touch exists, there is risk of irritation arising in that eye, and implicating its fellow.

In the treatment of sympathetic inflammation by operation, we have the choice of two proceedings. One, founded on a veterinary practice of destroying an inflamed eye to preserve the other, consists in cutting away a small portion of the injured eye sufficient to allow of the escape of the altered contents of the tunics if distended, and the removal of the lens and capsule if cretaceous. The advantages of this operation have been ably supported by Mr. Walton and Dr. Taylor. The other mode is excision of the injured eye.

I confess that though the first has its advantages, I lean to the latter proceeding. Four cases have fallen within my own knowledge, in which evacuation of the contents of the eye and collapse of the globe formed no protection against subsequent irritation of the other eye.

In one case the right eye had been burst by a racquet ball, and was reduced to a mere button. The left eye was attacked two months after the accident by sympathetic ophthalmia, and the sight was lost.

In the second case the globe of one eye was cut open by an arrow and the contents evacuated; sympathetic inflammation destroyed the other eye.

In the third case, a patient who was in St. Mary's Hospital in 1852, the left eye was utterly destroyed by an explosion of gunpowder. Twelve weeks afterwards, the right eye took on sympathetic irritation, and was ultimately lost,

the operation of excision not being then practised for such cases.

The fourth case was that of a young lady, with staphyloma of the left eye, and commencing irritation of the right. I removed a portion of the staphyloma, and evacuated the lens and part of the vitreous humour. The eye did well, and for some weeks the right eye was free from irritation. To my vexation it then returned, and I performed excision of the collapsed globe. The patient recovered from the operation within a week, and the right eye speedily acquired strength.

The main reason why I give preference to excision is, that by that means only are we sure that the cause of irritation is removed. The patients recover rapidly, the operation under chloroform is not more severe than the minor proceeding, and by excising the eyeball, leaving the muscles, a mass remains on which an artificial eye can be fitted with great success; on this point I speak with confidence and the experience of many cases.

A case, related by Mr. B. Bell, is instructive, showing the little influence extraction of the lens exerts over sympathetic ophthalmia.[1]

W. M., a stout, healthy young man, from Montrose, was struck accidentally with a stick upon his right eye about six years ago. The organ was severely injured at the time, and has been a continued source of suffering and discomfort ever since. The following was its condition when he applied at the Eye Infirmary. Pupil widely dilated, and occupied by a milky capsular cataract; iris healthy in colour but oscillating; sclerotic slightly injected, but cornea sound. Vision nearly gone, but there was great irritability and lachrymation on exposure to light. During several months the eye

[1] 'Report of Cases at Edinburgh Eye Infirmary,' 1858.

had been weak and irritable, with progressive dimness of sight.

As the cornea and iris were healthy, it was determined to try the effect of extracting the lens of the right eye, and so giving the organ an opportunity of subsiding into a quiet condition, on the complete evacuation of the aqueous humour. A section of the cornea was made, and the opaque capsule being opened the lens came away perfectly clear. No vitreous humour escaped, and the wound speedily healed. No material benefit followed the operation, and the eye continued weak and irritable.

The globe was therefore removed, and the result was most satisfactory. The left eye speedily recovered its strength and perfection of sight, and the patient was able to resume with comfort his former avocations.

To Mr. Augustin Prichard, of Bristol, may fairly be ascribed the merit of pointing out fully the effects of injury of one eye on its fellow, and of recommending extirpation of the diseased eye as soon as there is evidence of sympathetic inflammation. A very interesting table of cases accompanied his paper,[1] which at once attracted attention at home and abroad.

Mr. Critchett followed up the subject, the practice of excision of the eye was extensively tried, and the effect of the operation, in arresting or relieving sympathetic irritation, is now generally admitted.

The following table of cases illustrates my own experience.

[1] 'Association Journal,' Oct. 6th, 1854.

## TABLE.

| | | | |
|---|---|---|---|
| Mr. A. F., æt. 22. | Blow on right eye from cricket-ball, followed by melanotic change. Globe excised March 28th, 1856. | Left eye irritable and unable to bear exertion; mists; sight failing. | No return of disease. Left eye became strong and equal to work. |
| Captain C., æt. 36. | Right eye cut with glass. Globe atrophied. Subject to frequent attacks of inflammation. Globe excised May 6th, 1856. | Left eye. Sympathetic inflammation. Iris slightly discoloured, and pupil irregular. | Left eye gradually became quiet, but will probably be unequal to exertion. |
| Jane H., æt. 16. | Wound of left eye by a fork. Globe atrophied. Frequent neuralgia and inflammation. Globe excised May 30th, 1856. | Right eye intolerant of light. Objects misty. Cannot read more than a few lines. | Relief marked. Right eye speedily lost mist and photophobia. |
| Mr. E., æt. 46. | Lens of left eye displaced posteriorly by needle-operation. Eye blind. Distressing neuralgia for two years. Globe excised November 3d, 1856. | Utterly unable to read or use right eye from irritability and photophobia. | Cure complete. Is carrying on an extensive business in Manchester without distress to the eye. |
| Mr. J. T., æt. 42. | Blow on right eye. Subject to attacks of inflammation for sixteen years. Is of gouty diathesis. Globe enlarged and vision extinct. Eye excised January 19th, 1857. | Left eye irritable, and unequal to exertion; frequent mists and muscæ. | Cure complete. Left eye now equal to any amount of work. |
| Miss U., æt. 17. | Left eye received blow in youth; is largely staphylomatous. Globe excised February 20th, 1857. | Right eye always irritable and unequal to exertion. | Can now read, write, and work, with right eye. |

| | | | |
|---|---|---|---|
| Mr. J. H. B., æt. 37. | Blow on right eye from tennis-ball. Eye glaucomatous and subject to intense neuralgia. Globe excised March 12th, 1857. | Left eye misty, unable to read or distinguish small objects. Intolerant of light. | At expiration of three months left eye clear and equal to moderate exertion. |
| R. W. Apps, æt. 48. | Left eye destroyed by blow from hammer. Case described page 211. Eye excised December 9th, 1857. | Right eye impaired, and gas-lamps have the appearance of fireworks. | Right eye at first benefited; afterwards chronic retinitis seriously impaired vision. |
| H. L., æt. 42. | Left eye wounded by splinter of iron; subsequent inflammation and atrophy. Eye excised January 10th, 1858. | Right eye so misty and intolerant of light that he cannot work. Frequent brow-ague. | Right eye improved so much that he was able to work at the end of six weeks. |
| T. S., æt. 34. | Right eye injured by splinter of wood eleven years previously. Eye glaucomatous. Excised February 1st, 1858. | Left eye painful, clouds float before it; muscæ. Sight much impaired. | Left eye much relieved. |
| Mrs. E. J., æt. 60. | Left eye received blow in 1848; soon after became blind; has been repeatedly inflamed; much neuralgia. Eye excised April 7th, 1858. | Right eye, deep-seated, dull throbbing; frequent clouds, and is very misty. | Right eye greatly relieved at the expiration of six weeks; ultimate result not known. |
| J. D., æt. 56. | Left eye wounded with hay fork three years since. Atrophy after much suffering. Globe excised June 6th, 1858. | Right Eye misty, cannot read; any attempt to do so brings on pain. | Returned to the country at the end of three weeks; right eye improving. |
| S. I., æt. 39. | Right eye wounded by fragment of iron twelve months since. In constant inflammation and pain. Globe excised August 9th, 1858. | Left eye, sparks and muscæ, rolling clouds before it; is unable to work. | Marked relief, though eye is yet far from strong. |

Though excision of the injured eye arrests the mischief in the other eye in the majority of cases, it occasionally fails to do so. The earlier the operation is performed, the greater the chance of cure; but when the excision has been delayed so long that disorganization has commenced, or even the inflammatory condition obtained firm root in the second eye, success is doubtful; nevertheless, it is proper to give the eye the chance of restoration, as certain blindness is the alternative. Mr. Holmes Coote communicated to me particulars of cases strongly corroborating this view, cases in which the prognosis was most unfavorable, but on which Mr. Coote operated with the best results.

About twelve months elapse before a person who has lost an eye becomes accustomed to his new condition. Trifling actions constantly remind him of his imperfection, and he cannot with certainty measure distances, pour wine into a glass, snuff or extinguish a candle, &c.; the effort of writing or reading is great. Time and practice gradually lessen these difficulties, but we cannot too strongly warn our patients that henceforward the labour which ought to be performed by two eyes now devolves upon one, and that the greatest caution should be observed not to overwork it. The same rule applies to those who have recovered sight of an eye by operation; they should especially avoid straining their eye by candle-light, or by reading in railway-carriages, and should at all times cease work the moment the organ feels fatigued.

Excision of Globe.—The operation appropriate to the removal of eyeballs which have undergone injury, and in which the morbid action is limited to the globe, is that of enucleation or excision, in which the eye is dissected out with as little disturbance as possible to the other contents of the orbit. This operation was introduced by Dr. Ferrall, of

Dublin, in 1841; on the Continent, by M. Bonnet, of Lyons; in London, by Mr. Critchett; and is now, with various modifications of detail, in common use. The proceeding, which I find simple and easy of performance, is the following.

The instruments required are—a pair of straight, short-bladed, lancet-edged scissors; a pair of strong, blunt-pointed scissors, curved on their flat sides; forceps; a blunt strabismus hook; elevators for the lids; a syringe; and small sponges.

Two assistants besides the administrator of chloroform are desirable.

The patient being fully chloroformed, the elevators are to be firmly placed under the lids, which are to be drawn asunder. The operator then divides with straight scissors the conjunctiva at the point of reflection, beginning at the lower part and working round. In like manner, the ocular fascia is to be divided, whereby the tendons will be exposed. The strabismus-hook is now to be taken in hand and the tendons raised and divided in the following order: rectus externus, rectus superior, rectus inferior, rectus internus. The globe will then start forward, and the tendons of the obliqui can be reached and severed.

I now usually find it convenient to slide two fingers along the outer side of the eye until the optic nerve is felt; it is to be taken between the points of the fingers, which protect the globe; then guiding the blades of the curved scissors by these fingers, the optic nerve is to be divided with a firm stroke, and with one or two more strokes the remaining slight attachments can be cut through and the operation completed.

It is very desirable that the form of the eye should be retained whilst the posterior attachments are divided, therefore no hook or needle should be used which can lacerate the globe and evacuate its contents. When the tunics are thinned by staphylomatous projections, slight pressure will burst them.

As the last strokes of the scissors cause free effusion of blood, a syringe-full of iced water should be thrown into the orbit; cold water speedily stops the bleeding, and enables us to examine the posterior part of the orbit: any loose strips of conjunctiva should be removed.

I have a strong objection to stuffing the orbit with charpie or lint; it is unnecessary, and excites irritation and suppuration. In one case I tied a branch of the ophthalmic artery, but the application of ice or iced water, with pressure external to the lids, will almost certainly stop bleeding. In a single case only had I serious hæmorrhage, and that was in a gentleman of gouty constitution.

When the eye has been removed, the lids are powerless; their power is restored when an artificial eye is inserted.

I have not mentioned division of the external canthus; this is often not necessary, but should be done if there is not room for the free performance of the last steps of the operation.

When the eye has been excised in the manner described, the muscles being left, form in the process of healing a solid projecting mass, admirably adapted for supporting an artificial eye. It might be supposed that this would be motionless; such is far from the case, as the muscles form new points of attachment one with another, imparting a considerable amount of movement to the false eye, consentaneously with the other eye. It is important that the artificial eye should be inserted early, or adhesions will form, materially interfering with its adaptation and action. Not only is the orbit fit to receive it in from four to eight days after the operation, but by raising and supporting the flaccid lids it affords positive relief.

The treatment after excision of the eye is simple. For the first six or eight hours complaint is made of pain in the orbit and head, which is best subdued by a full opiate; the lighter

the dressings the better; soft rag dipped in iced water laid upon the lids and supported by a bandage may be applied during the first forty-eight hours; after this time, soft linen, moistened with cold cream or simple cerate, may be laid upon the lids, and bathing with warm water three or four times a day is always grateful. A small artificial eye should be first introduced for a short time, and each day the orbit will bear it longer. The full-sized eye can be introduced in about a fortnight.

Strict attention to the bowels and rigorous diet are proper for a week after the operation.

Loss of an Eye in relation to Life Assurance.—In concluding this chapter, I propose to offer a few remarks on a subject which, though important, has, I believe, been hitherto passed over by ophthalmic writers. I allude to the position as to life or casualty assurance, in which a person stands, who has lost an eye by injury.

Notwithstanding the important relations of the eyeball and its direct connexion with the brain, wounds, the result of operation or otherwise, are very rarely fatal. Excision of the eye cannot be regarded in any other light than a formidable proceeding, yet I can confidently assert, after considerable experience, that I know of no operation of equal magnitude from which the recovery is so rapid and so certain.

When we bear in mind that the great majority of patients who undergo the operation of extraction of cataract are advanced in life, many of them on the verge of the grave, it is matter of surprise that death is not hastened by the shock to the sytem and the necessary discipline; yet death after such operations, directly traceable to them, is most rare.

Mr. Watson has related a case in which delirium tremens came on, and the patient died on the third day after the ex-

traction, but he was a spirit-drinker, and thoroughly bad subject for operation.[1]

A remarkable case has been published by Dr. Toogood, in which the patient sank, not from the effects of the operation, but from sheer alarm at the prospect of the application of leeches afterwards. A young woman, aged 23, underwent the operation of solution of cataract in both eyes, at the Bridgewater Eye Dispensary, February 18th, 1839. "Nothing unusual occurred, but on the next morning she complained of pain in the right eye, extending over the temple and brow, and the iris appeared somewhat hazy. Leeches were ordered, which excited the most extraordinary alarm in her mind. She exclaimed immediately, 'Oh, I can never have leeches; I shall die if I have leeches.' Her breathing became very much hurried and laboured, her apprehension for her ultimate recovery so great that every means of quieting her alarm failed; palpitation of the heart succeeded, with delirium, great prostration of strength and violent perspiration; and in spite of all treatment she died at 1 a.m., the next day, breathing to the last in the same laborious manner." [2]

A case is mentioned by Beger,[3] quoted from Rincker, of a patient, aged 64, who died on the eleventh day after the operation of depression of cataract, worn out by the irritation produced thereby. Such cases are very rare. Simple wounds of the eyes are far less painful and give rise to far less disturbance of the system than might be expected. Ophthalmic surgeons constantly meet with instances in which so little disturbance is caused, even by the more severe operations, as those for extraction of cataract and artificial pupil, that the eye recovers without any pain after the first pang has sub-

[1] 'Edinburgh Med. and Surg. Journal,' p. 107, 1835.

[2] 'Reminiscences of a Medical Life,' p. 54.

[3] 'Das Blutauge,' p. 58.

sided; tenderness of the eye, and perhaps a sensation of grit may endure for a few days, but in eight or ten the eye is convalescent.

The worst consequences which may be expected to result from wounds of the eye, are loss of vision of that eye, and of the other eye by sympathetic irritation; there, with rare exceptions, the mischief ends, except that loss of vision necessarily exposes the sufferer to accidents and risks in a greater degree than persons possessing sight. The probability of an eye which has been extinguished by accident taking on, or causing morbid action, is in direct ratio to the length of time that it has remained quiet and free from irritation after the injury. So long as it is irritable and inflamed by slight causes there is an amount of risk to the other eye, but if it recovers from the accident quickly, and remains free from morbid action, we may assume that the risk of its exciting sympathetic inflammation is very small.

If, however, a second accident befalls the injured eye, the danger to the other eye is greater than after the first injury.

In order that I might ascertain the frequency of accidents to the eyes requiring assistance, I have obtained particulars of this class of cases from several large ophthalmic hospitals.

The number of cases of wounds and injuries of the eye, recorded at Moorfields during the last eighteen years, amounts to 5165. I am indebted to Dr. Bader for the following particulars:

| 1839 | 1840 | 1841 | 1842 | 1843 | 1844 | 1845 | 1846 | 1847 | 1848 |
|---|---|---|---|---|---|---|---|---|---|
| 135 | 171 | 187 | 197 | 209 | 213 | 162 | 300 | 401 | 327 |

| 1849–50 | 1851–52 | 1853–54 | 1855 | 1856 | 1857 |
|---|---|---|---|---|---|
| 368 | 484 | 525 | 521 | 482 | 483 —Total, 5165. |

Mr. Crosby Leonard has kindly furnished me with the particulars of the same class of cases which have presented themselves at the Bristol Eye Infirmary during ten years.

| | 1847. | 1848. | 1849. | 1850. | 1851. | 1852. | 1853. | 1854. | 1855. | 1856. |
|---|---|---|---|---|---|---|---|---|---|---|
| Contusions, &c. . . . | 52 | 53 | 57 | 35 | 46 | 52 | 56 | 61 | 63 | 45 |
| Burns . . . . | 21 | 29 | 22 | 13 | 15 | 10 | 18 | 14 | 26 | 25 |
| Iron impacted in cornea . | 64 | 49 | 41 | 34 | 46 | 43 | 28 | 49 | 44 | 39 |
| Other foreign bodies . . | 21 | 25 | 44 | 48 | 44 | 33 | 46 | 51 | 33 | 48 |
| Wounds of globe . . | 24 | 25 | 17 | 20 | 29 | 21 | 28 | 21 | 17 | 23 |
| Injuries from lime . . | 11 | 9 | 11 | 6 | 11 | 7 | 11 | 11 | 6 | 9 |
| Injuries from gunpowder . | .. | .. | .. | .. | .. | 2 | 3 | 1 | .. | 3 |
| Cataracts from accidents . | 6 | 5 | 3 | 5 | 4 | 12 | 5 | | | |
| Sting by a bee . . | .. | .. | .. | 1 | | | | | | |
| | 199 | 195 | 195 | 162 | 195 | 180 | 195 | 208 | 189 | 192 |

Total . . 1910

In 11,233 cases, relieved at St. Mark's Ophthalmic Hospital, Dublin, there were—

| | |
|---|---|
| Injuries of eyelids . . . . . | 46 |
| Injuries of cornea . . . . . | 238 |
| Injury of iris . . . . . | 68 |
| Injury of lens . . . . . | 111 |
| Total . . . | 463 |

Among 14,740 cases at the Liverpool Eye Infirmary, I find the large proportion of 1297 injuries of the eye. In the report for 1848, Mr. Neil remarks that in 1847, which was a busy year, the number of cases of working men, having received injuries to the eyes from causes connected with their daily avocations, was 362; while in the comparatively dull year, 1848, there were only 288 cases of this description. This spoke of diminished employment, whilst ophthalmia, indicating poverty and debility, had increased.

I am indebted to Mr. Vose Solomon for the following list, taken from the records of the Birmingham Eye Infirmary, from July 1st, 1854, to June 30th, 1858. Total number of patients 12,334.

| | |
|---|---|
| Foreign body on cornea . . . . | 285 |
| „ on conjunctiva . . . | 5 |
| „ in anterior chamber . . | 3 |
| „ in posterior chamber . . | 1 |
| Wound of cornea . . . . . | 89 |
| „ sclerotic . . . . . | 10 |
| „ iris . . . . . | 9 |
| Burns and scalds . . . . . | 229 |
| Symblepharon . . . . . | 21 |

| | |
|---|---|
| Injury from lime, acid, &c. | 22 |
| Contusions or wounds of eyeballs | 65 |
| Concussion of retina | 52 |
| Dislocation of lens | 3 |
| Traumatic cataract | 97 |
| Total | 891 |

Mr. Hogg[1] has given an interesting table, showing the comparative effect of occupations in the production of eye-diseases. Average of 6000 cases treated at the Royal Westminster Ophthalmic Hospital.

| In-door occupations requiring close attention, but not necessarily in crowded rooms. | | In crowded rooms or workshops. | | Out-door occupations. | |
|---|---|---|---|---|---|
| Artists | 4 | Blacksmiths | 71 | Bricklayers | 45 |
| Carvers and Gilders | 8 | Bootmakers | 28 | Carpenters | 75 |
| Copper-plate Engravers | 7 | Clerks | 80 | Cabmen and Coachmen | 71 |
| Cutlers | 6 | Compositors | 30 | Charwomen | 34 |
| Engravers | 15 | Dressmakers | 84 | Labourers | 305 |
| Jewellers | 10 | Governesses | 24 | Porters | 57 |
| Lithographic Printers | 13 | Laundresses | 52 | Painters | 32 |
| Opticians | 4 | Machinists and Engineers | 94 | | 619 |
| Musicians | 10 | Milliners | 29 | | |
| | 77 | | 492 | | |

It will thus be seen how frequent are injuries of the eyes among the wage-folk and artisans of our cities; yet more common are they in the mining and quarrying districts, far away from the aid of public institutions. Mr. Robathan, surgeon to the extensive mining and iron-works at Risca, informs me that scarcely a day passes without accidents to the

[1] 'On the Ophthalmoscope,' p. 76.

eyes. The most common to miners and colliers are burns, severe blows when blasting, and from other causes. To iron-workers, burns, blows from pieces of iron or steel, the fracture of the ends of their tools, &c. Thus, whilst in these gigantic establishments the field of observation is large, a knowledge of the management of injuries to the eye is most important.

I have been much struck recently with the varying amounts awarded as compensation for the loss of an eye. It was with indignation that I read in the report of a cause tried at the Rochdale County Court, that *twenty-six shillings and sixpence* had been considered sufficient compensation to a poor lad, one of whose eyes was maliciously destroyed by another boy filling it with lime. The Rotherham County Court were more liberal, awarding £15 to an iron-worker, whose eye was destroyed by the carelessness of a fellow-workman. A case has been mentioned in a previous chapter, in which a farmer sought compensation for injury to one of his eyes from a missile thrown at him by an officer. He claimed, in the first instance, £2000 (I am informed), but the referees awarded £700, which was accepted with very ill grace.

The value of an eye is in reality variable; it is of less value to a husbandman who follows the plough than to a skilled artisan; and though the loss to every one is grievous, the fortunate possessor of ample means can better spare an eye than an artist, an architect, or a surgeon. As the idea of projection or roundness can only be gained by the combined action of the two eyes, the prospects of an artist are most seriously damaged if deprived of this power, so important in his profession.

The helplessness of a person who has lost the sight of one eye has passed into a proverb, and the inability to see objects on the blind side exposes the individual to peril, especially

in London, where the crowded state of the streets often render it difficult to cross with safety, even with the advantage of both eyes; and the risk will be increased if there be deafness, especially on the side which is deprived of sight, as vehicles coming rapidly may neither be seen nor heard.

The class of injuries which, according to my experience, are most likely to set up disease of a formidable nature in the eye, and which, therefore, are of especial importance in the present inquiry, are blows and contusions; and the disease likely to be originated thereby is melanosis. It may possibly be said that there is no proof that there is direct connexion between the two, but there are a sufficient number of instances recorded to justify us in supposing that the blow and subsequent disease stand in the relation of cause and effect.

Though blindness of both eyes is only exceptionally the effect of injury to one, it must be borne in mind, that the pursuits and occupations of a person who has lost one eye materially influence the preservation of the other; as the entire labour is then thrown upon it, it is evident that any pursuit requiring intense visual application is injurious; and the risk will be great in proportion to the length of time during which the strain on the eye is kept up, and the amount and position of light in which the work is carried on. A man working minutely for many hours consecutively, with a strong light in front of him, is exposed to great risk; so is a man who pursues similar minute work in insufficient light.

There are also trades and occupations in which the risk to the eye from direct injury is great; as, for instance, smiths, quarrymen, miners, millstone-dressers, masons, engineers, cutlers, &c. In a casualty proposal against blindness, an extra premium should be charged to such persons.

The previous history and habits of an individual are to be

taken into consideration. If one eye has been the seat of syphilitic iritis, for instance, and the other eye is destroyed by injury, the risk to the remaining eye will be considerable, especially if the constitution retains the taint of disease.

The following are my conclusions:

1. The simple destruction of an eye by accident is not likely to directly influence the duration of life.

2. The probabilities of complete blindness diminish in proportion to the length of time which has elapsed since the recovery of the eye from injury.

3. Hereditary tendency to blindness will increase the risk; in some families the predisposition is marked.

4. The occupation of the individual, his habits, and the amount of labour thrown upon the remaining eye, will materially influence the probabilities of blindness.

# APPENDIX.

As the last sheets of this volume were passing through the press, the valuable Report,[1] referred to at page 89, was published, and I am indebted to the courtesy of the Director-General of the Army Medical Department for an early copy; it enables me to supply the particulars of the case of tetanus mentioned at page 144, and I shall extract the observations made on injuries of the eye.

"Wounds of the eye and its appendages demand some serious consideration. Independent of the importance of this organ, as the optical instrument, it will be seen that three cases, at least, of death were due to wounds of it, and although it unfortunately happens that in the great majority of cases seen by the military surgeon, there is little opportunity for the display of ophthalmic surgery, as conservative of vision, it seems desirable to point out the nature of the lesions which have been most ordinarily met with.

In one instance, a man of the 88th regiment was wounded by a musket ball, which entered at the inner angle of the left eye, and made its exit close to the lobule of the right ear, passing behind the nasal bones. Neither eye appeared

[1] 'Medical and Surgical History of the British Army which served in Turkey and the Crimea during the war against Russia in the years 1854-55-56.'

to have been organically injured, yet the vision of both was irreparably destroyed. On examination, the pupils of both were found to be much dilated, and they did not act to the stimulus of light. No appreciable inflammation of the eye-balls followed, nor could any other change in the shape or appearance of the several structures composing them be detected, but the eyes became at once and remained completely amaurotic, the man asserting that he was even unable to distinguish between bright light and total darkness. The wound gave little trouble, and he was invalided to England well, but totally blind, about a month after its receipt, and discharged from the service in this condition. In this case we are driven to the supposition that the concussion produced by the ball had injured the optic nerves, and it is to be hoped that lapse of time might restore some amount of useful vision. The case of tetanus, from injury to the optic nerve, has been already alluded to. In another instance, a double tooth of a comrade was found imbedded in the globe of the eye; and in a third, a portion of another man's skull was removed from between the lids; but generally it was from sand or small gravel stones, struck up by shot, or propelled by shell explosions, that injuries to this organ occurred. The removal of foreign bodies in this situation is imperatively called for, not only to prevent or moderate inflammatory action in the injured organ, but in cases where only one eye is wounded, to prevent the extension of inflammation to the opposite eye by sympathy, and thus prevent the loss of a soldier to the service. It will be seen by the return, that twenty-four out of forty-two cases of injury to one eye, returned to duty without leaving the Crimea, only fifteen of this series having been sent away for further treatment, and the majority of these subsequently returned to duty at home, or from Scutari.

"In most of the instances before us the vision of the injured eye was entirely lost, and complete collapse of the eyeball happened. In a few instances, however, small particles of stone were removed from the cornea, without having penetrated into the interior of the organ. In one such case, which occurred in the 77th regiment, the injury was followed by traumatic cataract of the wounded eye; but these fragments of stone sometimes penetrated into the interior of the eye; where visible, the proper practice would undoubtedly appear to be to remove them by incision, but no case is recorded where such was effected and vision retained.

"No case is recorded of a musket ball or other foreign body, lodged behind the eyeball, but enormous swelling, with inflammation of the eye and lids, sometimes followed the lesions already mentioned, requiring active treatment by incision, bleeding, and free leeching for its control; but in no instance was the entire removal of the eyeball called for.

"One case occurred where both eyes were irrevocably destroyed by the gravel thrown up by a shell-explosion, complicated with extensive bruising and laceration of the face; one testis had been cut away entirely, and more than half of the other, with a large portion of the integument of the scrotum, by a fragment of shell, and a severe laceration of the forepart of both thighs existed. Both eyes had been penetrated and were collapsed; no bleeding of any consequence took place from the divided end of the cord; the parts were simply cleansed and lightly dressed, and notwithstanding the severe nature of the general injuries, he was invalided to England at the expiration of two months, well, but quite blind.

"No less than four cases of loss of both eyes took place from explosions of magazines. These are returned among miscellaneous wounds and injuries, but two of them were

cases identical with those last mentioned, where the coats of the organ had been perforated by fragments of foreign bodies driven against them, and vision was entirely lost, the eyeball collapsing; but in one instance the eyes seemed to have been disorganized by the direct force of the concussion conveyed by the medium of the air. In this case the aqueous humour would appear to have been forced between the layers of the cornea, as though no rupture of the eye existed, and the eyeball was full and retained its natural rotundity, a complete bluish white opacity of the whole of this membrane was found to have taken place within a few hours of the receipt of the injury. In this case the amount of inflammatory action set up was very slight, but vision was completely and permanently destroyed.

"In wounds of the eyelids and other appendages of the eye, considerable care and nicety of adjustment were occasionally called for, as every practical surgeon may well understand, and in wounds of the eyelids the use of sutures was more urgently called for to prevent subsequent deformity than in almost any other part of the body."

| | Total treated. | Died. | Discharged to duty. | Invalided. |
|---|---|---|---|---|
| Penetrating wounds with lesion of | | | | |
| one eye . . | 42 | 3 | 24 | 15 |
| both eyes . . | 2 | .. | .. | 2 |

One of the deaths was caused by tetanus, and two by inflammation of the membranes of the brain supervening, where one eye had been destroyed.

*Case of Tetanus.*—Private William Harding, 1st Battalion Rifle Brigade, was admitted into the Regimental Hospital, on

the 5th of September, with a severe contusion of the face, and very considerable swelling on the left side of the head. The injury had been inflicted by the explosion of a shell, which drove a quantity of stones and gravel into his face; much of this was removed. The eyelid of the left eye was found to have been divided, and the eye destroyed. He complained of very great pain of the face and eye, but there were no remarkable constitutional symptoms. On the 7th of September, in syringing out the orbit, a hard substance was felt, and with some difficulty a piece of stone, the size of a large walnut, but of angular shape, was extracted, and much gravel in small fragments was afterwards washed out of the orbit. This relieved him much, and he was very easy till the 9th, when he complained of twitching about the mouth, and on putting out his tongue it was violently and involuntarily bitten by spasmodic contraction of the temporal and masseter muscles. The sterno-cleido-mastoid muscle was also much affected with spasms. These were increased or brought on by any attempt to protrude the tongue or to swallow.

The spine was blistered and sprinkled with morphia, calomel frequently given in small doses, and chloroform exhibited; but the tetanic symptoms continued and became worse, and he died in great pain on the 11th, having remained perfectly sensible the whole time.

On examination after death, it was found that the bony orbit was extensively fractured, including the orbital plates of the frontal, superior maxillary, and æthmoid bones. The sclerotic coat of the eye was torn open, and much gravel imbedded in its interior, and some fragments had been forced into the substance of the optic nerve.

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