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ORIGINAL COMMUNICATIONS.

## ON INJURIES TO THE EYE FROM SHOT, Etc.

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THERE is a class of injuries to which sportsmen are especially liable, and which medical men are sometimes called upon to treat under circumstances the reverse of favourable. Upon these I propose to offer a few observations.

Cover shooting is a frequent source of injuries to the eye, from the circumstance of small shot being very liable to glance from the branches of trees in unexpected directions, and also from the eagerness of some sportsmen, who cannot resist a tempting shot, regardless of the proximity of others, whereby many persons have been blinded for life. Fragments of copper caps are another source of injury to these organs, though less frequently so than formerly, from the superior make of the caps themselves, and of the gun-locks; and, lastly, the eyes may be punctured or lacerated by thorns.

**INJURIES FROM SHOT.** The external effects produced upon the eyeball by a shot-pellet are, according to my observation, three in number. If the shot be spent, it will bruise and not penetrate the eye, causing considerable ecchymosis externally, and not unfrequently paralysis of the retina. If the eye be struck obliquely by the round pellet, it will glance off, cutting a little furrow which marks its course; but if the eye be struck point blank, or if the shot has been flattened or jagged by previous collision, the tunics will probably be penetrated, and the shot will lodge in the interior of the globe. The peculiarly tough structure of the sclerotic offers great resistance to the progress of a shot; hence, it frequently glances off altogether, if the outer side of the eye be struck, or lodges in the orbit, if the inner side. Those cases, in which a grain of shot pierces the eye; (except when fired at a very short distance), appear to be most frequent when the lid is struck in the first instance; as, for example, by a shot glancing downwards from the branch of a tree. Much, however, will depend on the angle of incidence and on

the velocity, whether the sclerotic be penetrated or not. The following is an illustration of the first description of injury.

CASE. A man, æt. 32, was acting as "marker" to a party of sportsmen, and had ascended a tree to obtain a good view. A covey of partridges rose between him and the gentlemen, who were distant about one hundred yards, and on their firing at the birds, several shot struck about him, and one hit his left eye: the pain was at the moment acute, and the sight greatly impaired. He came under my notice two days afterwards, and I found considerable ecchymosis over two-thirds of the sclerotic, but no breach of surface. The frequent application of cold and astringent collyria speedily removed all traces of the blow; and the sight was gradually recovered.

Of injuries arising from over-eagerness, three examples have been seen by me; but as the main points were similar in all, the brief recital of one case will suffice.

CASE. A party were beating a wood for pheasants, and in the excitement of several birds rising, a gentleman shot at one, without observing that another sportsman was in the line of fire. Three shot struck his face, and his left eye received one. As a wound in the eye was visible, great alarm was created, and medical assistance was promptly obtained. The impression was, that the shot had lodged in the globe, and such was the belief when the case was seen by me, some days subsequently. On careful examination, however, the groove which marked the course of the shot was clearly discernible: the eye had been struck about a line from the margin of the cornea, and there was quite the appearance, under a lens, of a piece having been chipped out. This was so far satisfactory, showing that the shot was not, as supposed, buried in the eye, and a fine probe, which traced the bottom of the wound in the sclerotic, rendered this certain. There was rather a smart attack of inflammation, but the case eventually did perfectly well.

When the eye has been struck by a shot, there is generally considerable ecchymosis, and the patient is much frightened; but our prognosis may be favourable if no shot-hole is visible, or if, by the assistance of a lens, the little groove above described can be discerned, though perhaps obscured by the effused blood; if, however, vision has been extinguished by the blow paralyzing the retina, a cautious opinion, as to the restoration of vision, is advisable. The following case is interesting, from the severe effects produced by a small particle of gravel forcibly propelled against the eye; effects resembling those attendant on a shot-wound, which, for a time, it was believed by the patient to be.

CASE. On the 18th of July, 1851, I was requested by Dr. Archibald Cockburn of Kensington, to visit a gentleman who had met with an accident on the previous day. He was playing at cricket with his sons, and a small fragment of gravel was struck up either by the bat or ball, and driven against his right eye with such force, that vision was instantly extinguished. The agony was intense, and the gentleman felt convinced that he had been shot. The most judicious treatment had been adopted by Dr. Cockburn; but, in spite of leeches, fomentations, etc., the pain continued, though in a less degree, and the patient passed a feverish and restless night.

On examination, much ecchymosis and considerable inflammation,

involving the sclerotic and iris, was apparent; the pupil was dilated and motionless, and the iris tremulous. Just at the junction of the cornea with the sclerotic at the inner side, a cut about a line in length was visible; and a gap at the ciliary margin of the iris at the same spot indicated that that membrane had been torn from its attachment. The pupil was displaced downwards and outwards, and a hand held up could be scarcely discerned.

Active antiphlogistic treatment was adopted, and every endeavour made by inunction and internal administration, to bring the patient under the influence of mercury. No effect, however, was produced, and the following report from Dr. Cockburn leads me to fear that the result of the case will be unsatisfactory. "I saw little of him after you went out of town, as he got impatient and used the eye freely, and went out against my warnings. He was never salivated, though he took a good deal of calomel. The eye was not improved, and he could barely distinguish my figure in the room; the pupil remained very dilated and angular."

When a shot penetrates the eye and lodges in the globe, the consequences cannot fail to be most serious. The following case occurred in the practice of Dr. Butter of Plymouth.

CASE. A gentleman, aged 50, was struck by a shot in the left eye, and instantly lost the sight. His sufferings during the succeeding fortnight were not great, but then, and from time to time, during the four years and a half which preceded his application to Dr. Butter, the most agonising pain would shoot, like a flash of lightning, through his left eye and his head; and his sufferings, together with the disturbance produced in the vision of the other eye, led him to seek relief from operative measures. On the 9th of September, 1831, Dr. Butter extracted the lens of the injured eye, and found it to consist of calcareous matter and bone; some gritty matter was also syringed out, but no relief was afforded, and on the 23rd of February, 1833, Dr. B. proceeded to make another attempt to extract the shot. A portion of sclerotica was removed with scissors, and an aperture made sufficiently large to allow of the exploration with a probe of the cavity of the eye, the vitreous humour being evacuated; still no shot was found, nor was there alleviation of suffering; and, as a last resource, it was determined to extirpate the eye, which severe operation was performed on the 23rd of the following September. On the parts which had been removed being examined, a duck-shot was found impacted so firmly in the optic nerve, just at its junction with the retina, that some force was required to detach it. Ultimately, the case did well.

If the shot can be seen in the anterior chamber, there can be no hesitation as to the propriety of extracting it by an incision through the lower part of the cornea; but if it be hidden in the globe, all unnecessary poking or probing is to be strongly deprecated; no possible advantage can result from stirring up the vitreous humour with a probe in the hope of finding the shot, and such a proceeding cannot fail to deprive the patient of the faint chance of recovery he otherwise has. Under such circumstances, the room should be darkened, and the most absolute quiet enjoined; the head should be well elevated, and not allowed to move; the eye should be equally motionless, and the sound eye ought to be closed with a strip of plaster, to prevent

the other opening from sympathy; rags dipped in cold water should be applied to it; the bowels should be freely opened, and depletion practised according to the age and constitution of the patient.

Shots may lodge in the orbit: and when there, they give rise to distressing neuralgia, and have even caused symptoms of inflammation of the brain. The following case, which came under my notice some years ago, is remarkable, as showing by what a small body death may be caused, when the bones of the orbit are penetrated.

CASE. Some children, in the neighbourhood of St. Bartholomew's Hospital, were playing with a sixpenny brass cannon, and to increase the report, had loaded it with a small piece of tobacco-pipe, scarcely bigger than a duck-shot. A little girl was standing a few paces from the muzzle of this toy, and when it was fired, she fell, and was carried into the hospital—dead. I was a student at the time, and have a vivid recollection of the embarrassment felt to account for the fatal result, as no wound was apparent; at length a speck of blood was noticed at the inner corner of one of the eyes, and on close examination, an insignificant puncture was discovered just within the lids. *Post-mortem* examination showed that the missile had struck that spot, glanced along the eyeball, and passing through the roof of the orbit, had buried itself deep in the substance of the brain.

INJURIES FROM FRAGMENTS OF COPPER CAPS. Fragments of copper cap will sometimes strike the eye and inflict serious wounds, of which I have seen several examples. Such cases were of frequent occurrence from imperfection in the construction of these implements when first invented, but they are less numerous now, and more frequently arise from exploding caps with a hammer, than from their legitimate use.

A young gentleman, aged 14, at one of the large public schools, was amusing himself and some schoolfellows with exploding copper caps by striking them with a hammer. A fragment struck his left eye, cut through the upper lid, and inflicted a formidable wound on the globe, immediately above the cornea. Medical assistance was obtained, but the youth concealed the truth, and stated that the wound was caused by a fall. The truth became known some months afterwards; and then the question arose, as to whether the fragment of the cap had remained in the eye or not, especially as a yellowish object was indistinctly visible in the wound. I saw him in June 1848, when the condition was as follows;—the globe was reduced in size about one-fourth, soft and boggy; the iris tremulous; the pupil was dilated and motionless, and vision was so far extinguished that there was barely perception of light. The wound in the sclerotic was filled by semitransparent material, through which a yellowish substance was perceptible. My first impression was that this was metallic; but on careful examination, with a lens and by a probe, I satisfied myself that such was not the case, and that it was merely coloured lymph. Although the eye had been acutely inflamed at the time of the accident, it had become quiet, and had been free from pain for some weeks. This circumstance, combined with the result of the examination, led me to conclude that the fragment of copper was not in the eye; restoration of vision was, however, hopeless.

Mr. Crompton, of Manchester, has detailed<sup>1</sup> the symptoms resulting from the presence of a fragment of copper in the eye, and my experience entirely accords with that gentleman's. The wound is generally clearly incised, heals rapidly, and for a period, varying from a few days to a month after the accident, the patients appear in a fair way of recovery; but at the expiration of that time, they are commonly suddenly seized with most acute pain in the eye, attended with extensive chemosis, swelling and redness of the lids, and frequently haziness of the cornea. The pain and acute symptoms may gradually subside, but will surely recur again and again, until the eye is brought into a state of chronic irritation, most distressing to bear, and not unfrequently leading to sympathetic irritation in the other eye, which may extend to destruction of vision.

The following is the plan of proceeding adopted by Mr. Barton, in whose practice seven cases occurred. It is equally applicable to a pellet of shot, or a fragment of copper cap, rolling loose in the eye.

The patient being placed in a convenient position, a large flap of the lower part of the cornea is to be cut as in the operation of extraction, but it must then be snipped off with a pair of scissors. The operation being acutely painful, and the eye irritable, chloroform may be advantageously employed. A linseed meal poultice is to be applied, and we may pretty confidently expect to find the foreign body in the poultice in the course of a few days; of course collapse of the globe is the consequence of the operation, but the disfigurement may be remedied by an artificial eye.

A shot becomes discoloured, and a fragment of iron is oxidised by remaining for some time in the eye, but the copper undergoes no change, and its edges continue as sharp and angular as at the moment of its entrance.

In the case above mentioned, the diminution in the size of the globe was a marked feature; and this is a common result of laceration of the sclerotic by a shot or a fragment of metal. The consistency of the vitreous humour is gradually lost at the same time that it becomes diminished in quantity. The colour of the iris is altered, and the membrane becomes tremulous; the globe shrinks to from one-fourth to one-third of its natural size, and as a visual organ the eye is rendered useless. If, however, the cornea be penetrated by a fragment of metal, it may fall into the anterior chamber, of which a case was related by me in the *Lancet* of 30th December, 1843; or it may pass through the iris, produce cataract by opening the capsule of the crystalline, and lodge deep in the eye. Dr. Mackenzie has repeatedly seen grains of powder propelled through the cornea into the lens, so as to cause cataract; and one case was very remarkable. A grain of powder, propelled through the cornea, traversed the lower part of the iris, in which it left a considerable opening, and striking the lens, produced cataract. Gradually the opaque substance cleared away behind the false pupil, and vision was restored. The natural pupil remained much longer cataractous, but at length it also cleared, and the patient saw well with a cataract glass.

A very remarkable case of recovery from a gun-shot wound of the

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<sup>1</sup> London Medical Gazette, vol. xxi, p. 175.

eye is related by Professor Stœber of Strasburg, in the third volume of the *Annales d'Oculistique*.

CASE. A child, seven years of age, was stealing fruit in a garden, when the owner fired at him, and wounded his right eye. The man was brought before the authorities, and declared in his defence, that the gun was only loaded with salt. Two experienced surgeons, after making an examination of the eye, reported that the wound had been more probably caused by salt than by lead. The man therefore escaped with a fine of twenty-five francs. Nearly a year afterwards, a foreign body was observed under the lower lid, on depressing which, a round black substance was discovered. The child was then brought to Professor Stœber, who found that the body in question was evidently a grain of shot, and that it was freely moveable between the conjunctiva and sclerotic, at the lower and outer part of the eyeball. There was a mark of a wound at the lower and outer border of the cornea, and corresponding to this, a circular lacerated opening in the iris. The pupil was immoveable, and vision was reduced to the mere perception of light.

The mother stated, that the eye frequently became red and painful, especially at changes of weather; and Professor Stœber considering that this irritability arose from the presence of the shot, decided to remove it, but was utterly foiled on several occasions by the restlessness of the child. The shot remained; nevertheless the eye gradually recovered, and sight returned to such a degree that very small objects could be discerned, though it never became as strong as the sight of the other eye. This case is highly instructive, showing that an amaurosis, nearly complete, and of more than two years' duration, can be removed by the unaided efforts of nature, notwithstanding the presence of a foreign body, which might have been expected to have kept up perpetual irritation. Such a result, though scarcely to be hoped for, offers encouragement in similar cases.

When there is a wound in the upper eyelid from any missile, it is important to ascertain whether the eye has been injured, a circumstance which may be overlooked by the attention being confined to the more conspicuous laceration. There may be a fragment left under the lid, or a wound in the upper part of the sclerotic, or even a fragment sticking in the coats of the eye. Demours mentions a case of this sort, where a double grain of shot passed into the sclerotic and remained fixed, one grain being without and the other within. The proper mode of proceeding is to direct the patient to look on the ground, and then to raise the lid by drawing up the integuments with the point of the finger towards the brow: a view of the sclerotic may thus be obtained; but if there be reason to suspect the presence of a foreign body between the eye and the lid, the latter should if possible be everted, or if this cannot be done, a stream of tepid water should be thrown under the lid by means of a syringe, whereby the substance will most probably be washed out.

INJURIES FROM THORNS. These are far from uncommon in the country. If the thorn has penetrated the sclerotic, it should, if entire, be carefully drawn out; but if it has been broken, it becomes much more difficult to remove. I have had one such case, and the plan adopted

with success was as follows: having bound up the sound eye, and fixed the other with the points of the fingers of my right hand, a slight superficial incision was made with a sharp cataract needle on each side of the thorn, then with a pair of fine forceps it was grasped and smartly twitched out: the eye did perfectly well. A common consequence of a thorn striking through the cornea, is traumatic cataract; and it is singular to observe the rapidity with which opacity of the lens takes place. The injury is often followed by instant blindness; but that cannot arise from the mere injury to the lens, though I have seen it distinctly turbid one hour after it had been pierced by a thorn. This injury is attended with more pain than a gun-shot wound, and the subsequent inflammation is often of great severity.

CASE. Mr. Thompson, residing near Ashbourne in Derbyshire, was struck by a thorn in the left eye on the 24th of February 1851, and instantly lost his sight. His right eye had been rendered blind twelve years previously by a wound from a fragment of iron. Severe inflammation followed both accidents; but though it was subdued in the eye last injured by the judicious measures adopted by Mr. Gregory, of Youlgrave, the patient continued blind. He was placed under my care last July, his condition being as follows:—the right pupil was blocked up with a mass of lymph strongly adherent to its margin, and it was drawn upwards and inwards; from the concavity of the iris, it was clear that the lens was no longer in existence. The left eye presented adhesions of the pupil to a soft capsulo-lenticular cataract. On the ninth of July, I opened the capsule in this eye, disturbing the lens but little; and not the slightest inflammation followed.

Professor Jäger, of Vienna, was then staying with me, and on the 20th of July he operated at my request on the right eye of Mr. Thompson; making a free incision through the sclerotic, he then introduced a pair of fine forceps, acted on by a spring, behind the iris, the opaque and very tough capsule, and seized and drew it out. For five days the progress of the case was everything that could be desired, but on the evening of the sixth day, violent inflammation set in, and in spite of the most active treatment, the pupil became closed again with lymph. Mr. T. returned into the country, and I did not see him until the 1st of October. On examination, it appeared that the cataract had entirely disappeared from the left eye, and there was vision through a small opening in the capsule. This was enlarged on the following day with a cutting needle, and he can now see very satisfactorily. It is proposed to make a central aperture through the lymph occupying the pupil of the right eye, when the organ is in a fit state for the operation.

A case once came under my notice, where the *hook* of an artificial fly had caught in the conjunctiva of the eye and had passed through the lid, just at the outer canthus: clumsy attempts had been made to extricate it, and a very awkward lacerated wound was the result. What should be the proper mode of proceeding in such a case? Obviously to push the hook forward until the barb is fairly exposed, then to snap it off with pliers or forceps above the barb. The shaft can then be withdrawn with ease.

There is one point with reference to wounds through the cornea to

which it is proper to direct attention. The immediate consequence of opening the anterior chamber is escape of the aqueous humour, whereby the iris, losing its support, falls forward, and is exceedingly liable to become entangled in, or adherent to, the wound, whereby the pupil becomes distorted, diminished in size, and incapable of performing its proper movements. Should this speedily ensue, the iris may often be disengaged by placing the patient before a window, and suddenly opening the eye; the natural action induced is powerful contraction of the iris, which draws it out of the wound. It is recommended by many writers to push the protruded part back with a probe; but so far as my experience extends, the bruising of the membrane by this proceeding is highly objectionable, as tending to excite iritis. The exposure to light three or four times, and belladonna subsequently, are at least safer, and probably quite as effectual as the other plan. An elegant mode of keeping the pupil dilated, is by rubbing upon the brow a solution of four grains of sulphate of atropine in half an ounce of glycerine. This is a more cleanly application than extract of belladonna; and it does not dry so readily.

In conclusion, I venture to offer the following remarks. If a surgeon be called to an injury of the eye, the organ should be carefully and gently cleansed from all blood and coagula, and once for all, fairly and thoroughly examined. This can be done with ease, and little pain at first; but if delayed till inflammation has set in, it will become both difficult and hazardous. If there be a foreign body in the eye, no time should be lost in extracting it if possible; if not, the patient should be kept quiet in bed, subjected to the strictest antiphlogistic discipline, and carefully watched. It should never be forgotten that the integrity of the organ depends on the *prevention* of inflammation, and that this is chiefly to be accomplished by the measures adopted within the first three days after the accident. The condition of the lids will be the criterion of the state of the eye; so long as they remain free from tumefaction and natural in appearance, all is going well; but not so, if a little puffiness appear at the internal angle, and gradually steal over the upper lid. There will then be some uneasiness in the eye, and the patient will complain of annoyance from scalding tears. If active measures have not been before adopted, not a moment should now be lost in resorting to them. Time is precious, inflammation is commencing, and every effort should be made to arrest its progress. The patient, if robust, should be bled from the arm, cupped from the mastoid process, or leeches may be applied there or to the temple. The cold wet rags must give place to frequent fomentations with hot water, and mercury, combined with a sedative, should be administered.

Such are the main features of treatment; but too much attention cannot be paid to the apparently minor points of absolute quiet, strict discipline, gentle handling, and little interference with the eye by opening it unnecessarily; and lastly, general careful watching on the part of the surgeon, that if mischief be threatened, it may be arrested at the very outset.

19, Berkeley Square, October 1851.