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/ by Wm. Ellery Briggs.**

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NOTES ON THE ELECTRO-MAGNET IN OPHTHALMOLOGY, WITH A REPORT OF NINE CASES.

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Read before the Sacramento Society for Medical Improvement.

No recent advance in ophthalmic surgery surpasses in its beneficial results the use of the electro-magnet in those cases in which it is applicable. It is essentially a conservative procedure, often enabling the operator to save an eye that previous to Hirschberg's success in perfecting this instrument would have been enucleated, or have remained a dreaded source of sympathetic ophthalmia. I believe that the magnet is used far less frequently than its undoubted value demands. Practically, an error in the diagnosis of a penetrating foreign body is very rare, and even should the operator fail to remove the extraneous substance the eye is not necessarily left in a much worse condition. With proper care and under antiseptic precautions there is, as a rule, but slight inflammatory reaction following the introduction of the magnet, and the visual acuteness is not materially lessened. Should no foreign body be present, but little damage has been done, while if one remain, the indications for a more radical operation will soon be manifest.

When we consider the aggregate number of suitable cases occurring, the reported operations are certainly meagre; and from this may in part arise the lack of a more general appreciation of this invaluable instrument. For this reason I have concluded to publish the following cases upon which I have operated during the past eight years. Case I was reported to the California State Medical Society (Transactions 1881-82), and was the first case reported on the Pacific Coast. Cases II, III and IV were reported to the same Society (Transactions 1883-84). The remaining ones are now published for the first time. I regret that I have not preserved the records of two unsuccessful cases not included in the following:

Case I.—M. A——, blacksmith, residing in a neighboring town, while at work, felt that something had struck his right eye. A physician who saw the case was unable to recognize the presence of a foreign body. After four days, during which time the eye had been

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intensely painful, the patient came to Sacramento. Upon examination I found a small wound in the cornea, below the centre and in the middle line, with a black speck in the iris near the pupil. The pain was sufficient to prevent sleep, and there was considerable inflammatory exudation upon the iris and in the anterior chamber. An incision was made in the cornea, with a Graefe's cataract knife, near the lower border, the point of the electro-magnet was passed into the anterior chamber towards the foreign body, which was attracted, attaching itself to the magnet and being withdrawn with it. It was a piece of steel more than two mm. in length. Eserine was instilled, and a compress and bandage applied. The following day atropine was used. Three days later the patient returned home with perfect vision.

Case II.—J. M——, blacksmith, while working, felt that something had penetrated his left eye. When seen a few hours after the injury the eye was injected, freely lachrymating, with vision little above the perception of light. The corneal wound, injured iris and lens, could be readily seen, but the foreign body was not detected. There had been free hemorrhage into the vitreous. From the nature of the wound a foreign body was believed to have lodged within the eye. A point of the electro-magnet was accordingly introduced into the vitreous through an incision made in the conjunctiva and sclerotic between the external and inferior recti muscles. It was held in position a few seconds, and upon withdrawal a small fragment of steel was found to be attached. Atropine was instilled, and a compress and bandage applied. The inflammation which followed was slight, and in four weeks the eye was free from irritation. Traumatic cataract remained, but with a fair visual field.

Case III.—F. W—— was injured in the ciliary region of the left eye. The eye contained a large quantity of blood, and no foreign body could be seen. The wound was slightly enlarged backwards and a point of the magnet introduced but failed to attract the foreign body, and after two unsuccessful attempts at extraction the eye was enucleated. A piece of steel was found, firmly impacted in the sclerotic at the fundus.

Case IV.—T. B—— was seen the evening of the injury. A wound in the centre of the corneal hemisphere was detected and a foreign body lodged in the iris near the pupil. The next day a corneal incision was made near the lower border, and a point of the magnet introduced into the anterior chamber. Before the magnet had reached the foreign body it was seen to jump from its position and was withdrawn attached to the instrument. A compress and bandage and cold water dressings were applied. The eye recovered with no untoward symptoms, and the patient was discharged in ten days with perfect vision.

Case V.—J. O——, a blacksmith, was examined one hour after injury. I found a large wound of the right cornea, implicating the external portion of the ciliary region and the border of the iris. The lens was dislocated downwards. So much blood had escaped into the vitreous that it was impossible to see the fundus, and no foreign body could be detected. It was thought worth while to try to save the eye, and accordingly the electro-magnet was introduced through the wound made by the foreign body, but without success. Upon the second introduction the characteristic click was felt, and a large, irregular piece of steel was withdrawn, attached to the magnet. Atropine, cold applications and rest were ordered, and at the end of four weeks the patient was discharged, able to count fingers at fifteen feet. Later, however, the vision was lost from detachment of the retina. The eye has remained free from pain or irritability.

Cases VI and VII.—These were two cases of unsuccessful attempts to extract steel from eyes in which there was every indication of foreign bodies being present. In the first case I enucleated the eye, and found a small particle of steel in the fundus, attached to the sclerotic. In the second case the patient refused to have the eye enucleated, and soon after left Sacramento, so that I am unaware of the final result.

Case VIII.—M. T——, æt. 26, machinist, was struck in the left eye with a chip of steel on January 18, 1889. According to his statement, several oculists who had examined him were uncertain whether or not a foreign body were in the eye. When he consulted me, four days after the injury, there was considerable photophobia, a moderate degree of pain, and some conjunctival and pericorneal injection. A small corneal wound, which had healed, just below and external to the centre, could be seen. Atropine revealed some posterior synechia, and quite extensive injury to the lower half of the lens. I was unable to satisfy myself that there was a foreign body present, and the patient consulted Dr. Barkan, of San Francisco, who kindly wrote me that he was pretty certain that the foreign body was in the vitreous, close to the injured lens. I did not, therefore, longer hesitate to operate. An incision, under cocaine anesthesia, was made through the conjunctiva and sclerotic posterior, to the ciliary region, about midway between the external and inferior rectus muscles, and the point of the magnet connected with 20 Leclanché cells was introduced. Upon withdrawing the instrument, I was gratified to see a piece of steel caught in the wound, whence it was removed with the forceps. It was a nearly straight and even splinter, a little more than 4 mm. in length and 1 mm. in thickness. There was scarcely any inflammatory reaction, and the symptoms which previously existed rapidly subsided. The visual field was good, but the lens was becoming cataractous, with vision reduced to $\frac{20}{200}$. It was thought

best not to extract the lens until some future time, and the patient returned to his work in Los Angeles about three weeks later.

Case IX.—M. V——, æt 29, a stonecutter, while sharpening his tools on April 8, 1889, was struck in the left eye with a splinter of steel. His fellow workmen were unable to see a foreign body, and as there was no pain for several days he did not consult a physician until the 14th. He had noticed that vision was somewhat less acute than usual, and the eye was slightly congested. The physician who first saw the patient, and who sent him to me, noticed a small, nearly square, perforation close to the pupillary border of the grey iris, which he very naturally mistook for a foreign body. Upon close inspection a small scar was found about half way from the centre to the lower border of the cornea and the perforation of the iris above mentioned, which appeared black like the pupil, and for the same reason. Under atropine, an ophthalmoscopic examination showed that a piece of steel had lodged in the vitreous apparently five or six mm. posterior to the lens. The injury to the lens was not extensive and vision was about $\frac{20}{70}$. The electro-magnet was introduced in the same position as in the previous case, and upon withdrawing the instrument after a second introduction a foreign body a little less than two mm. long and one mm. thick was seen attached to the point. Atropine, cold applications and rest were ordered, and strict antiseptic precautions observed. In less than a week all irritation had subsided and the patient went to work with vision about the same as when first examined.

In Cases I and IV, the fragments of steel could be seen adherent to the irides near the pupillary border and the extraction might have been made with the forceps. In the first case, however, the splinter was in such close proximity to the anterior lens surface, that a slight depression, which might have been unavoidable in grasping it, would have put the eye in jeopardy by the production of traumatic cataract. The superiority of the magnet can readily be appreciated in such cases.

Cases II, V, VIII and IX, were typical ones, in which the great value of the magnet was practically demonstrated, as without its aid each of these eyes would have sooner or later required enucleation. In Case V there was extensive injury to the ciliary region, iris and lens, and a considerable escape of vitreous, but the eye retained useful vision for three months. Since then it has not been a source of uneasiness, and cosmetically it is far superior to an artificial eye. Cases II, VIII and IX have not been operated upon for cataracts which were produced by the passage of the splinters

of steel through the lens, but the eyes present every prospect that an operation will restore useful vision to them.

Cases III, VI, VII, and two unreported cases, were unsuccessful, from the fact that the magnet could not extract the foreign bodies.

The first four cases of the foregoing series were operated upon under ether; in the remaining ones the local anesthesia produced by a four per cent. cocaine hydrochlorate solution was found sufficient. During the past two years I have observed strict antiseptic precautions in this, as well as in most other operations upon the eye. I have found that less than 16 or 18 Leclanché cells do not develop the full power of my magnet. I at first used a Grenet cell as suggested by Hirschberg but found that the single fluid battery was far less satisfactory than the Leclanché cell. The magnet was made under my instructions from the description of Hirschberg's instrument, and is similar in its construction. The great majority of foreign bodies that lodge within the eye are splinters of steel. For this reason the electro-magnet has a larger scope of usefulness than would at first appear. When a piece of steel has lodged within the anterior chamber, or has penetrated the iris or lens, it can usually be extracted with the forceps, but the electro-magnet offers a safer means of removing such bodies. The incision, which should be made through the cornea, near its border, where the foreign body can be most readily reached, need be no larger for the introduction of the point of the magnet than for the forceps. And the manipulation of the forceps necessary to grasp the particle will generally cause more injury to the delicate tissues than the introduction of the magnet point. It is rarely necessary to touch the fragment, as it will be attracted from some distance, unless it is firmly adherent to the tissues.

When the steel is lodged in the vitreous chamber, and is beyond the reach of the forceps, the inestimable boon of an electro-magnet can be fully appreciated. If the surgeon is convinced from the appearance of the wound, from the direction whence the foreign body came, and from the internal injury to the eye, that something has lodged within the globe, I believe he is derelict in his duty to his patient if he does not attempt to extract it with the electro-magnet. If the foreign body can be seen in the vitreous chamber, there can then be no question of the necessity of prompt operation. Unless the wound made by the penetrating

steel be in such a position as to enable the point of the magnet to be introduced without injury to the lens or iris, a new opening should be made posterior to the ciliary region, in the closest proximity to the probable location of the foreign body.

Since having saved several eyes which, without the aid of the electro-magnet were destined to sure destruction, I have hesitated less to employ it than formerly. It produces but little inflammation, and with care does not endanger the chances of the eye's recovery, even if a foreign body be not found. It is almost the only hope of getting a splinter of steel out of the vitreous chamber—the cases in which we are so fortunate as to reach it with the forceps being very rare. In cases where the foreign body has injured the lens and penetrated the vitreous I have usually not removed the lens until some future time. This rule should not be followed when the lens can be extracted without complicating the operation; as, for instance, if the steel can be readily reached through a corneal incision, which would be required to remove the lens, or in case the lens is so severely damaged that its substance, escaping into the anterior chamber, is a source of danger to the eye.

From my experience I have arrived at the following conclusions:

1. The electro-magnet is generally a safer instrument for the extraction of fragments of steel from the anterior chamber, from the iris, or from the anterior portion of the lens than the forceps.
2. It is practically our only resource when the steel has penetrated the vitreous chamber.
3. It is safe to retain quite extensively injured eyes, if the offending body be promptly removed and thorough asepsis observed.

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