MEDICAL PRACTICE

Hospital Topics

The Hammer and the Eye: Beware

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Summary

In reporting this small series of foreign-body injuries to the eye it is emphasized how normal an eye may appear and yet have a foreign body lurking in its anterior chamber. The patient's account of the injury may be very deceptive and an x-ray picture of the eye must be taken if a foreign body is even remotely suspected, particularly if a hammer is mentioned. Prompt diagnosis followed by well executed surgery leads to good results in these cases.

Failure to diagnose an intraocular foreign body can lead to loss of the eye, and anyone responsible for advising a patient who may have sustained such an injury bears a great responsibility. Most intraocular foreign bodies enter the eye through the cornea, so that there is a tendency for aqueous to escape and for the iris to move forward and plug the wound, through which it may actually prolapse. Hence a shallow anterior chamber, an eccentric pupil, and an iris prolapse have become the hallmarks of a perforating corneal wound. The momentum of most perforating foreign bodies carries them into the vitreous,¹ and their size dictates the width of the entry wound and the depth of penetration. The visual prognosis² is directly related to these factors, since not only is the initial trauma to the eye greater with larger foreign bodies but their removal³ inevitably causes further damage to the delicate structures of the eye.

If the foreign body is small the entry wound may be self-sealing, and so the classical signs of perforation are not apparent. Tiny corneal wounds may be difficult to see unless a binocular microscope is used, although some hours after injury the adjacent cornea loses its transparency and a slight haziness

may then betray the perforation. At the corneoscleral junction a small haemorrhage may be the sole indication of something having entered the eye.

The aim of this report on 20 patients from whose anterior chambers metallic foreign bodies were removed, is to stress the possibility of such eyes appearing normal, since in all of them the pupil was round and central and the chamber was of full depth.

Present Series

All but three of the patients were seen within 48 hours of injury. In 12 the fragment was impacted in the iris and so could be directly inspected with the microscope, but in eight the particle was arrested by the iris and fell into the angle of the anterior chamber. In these cases it could be seen only by using a gonioscope (a specially adapted contact lens incorporating a mirror which allows inspection of the angle). In view of the singular lack of evident damage in these eyes it is vital to elicit an exact history whenever there may be a chance of ocular trauma so that an x-ray picture may be taken to exclude the presence of a foreign body.

Those using a hammer and chisel are traditionally at especial risk, and five of the present patients received their injury in this way. A further 10 were hammering a variety of other metal objects. Three had been using a drill, and it should be emphasized that an apparently innocent piece of wood may harbour an unsuspected nail and be the source of a foreign body while the patient complains of no more than a speck of sawdust in the eye. The following case illustrates how little the patient may notice (anything) amiss at the time of injury.

A 26-year-old farmer noted by chance that the vision of his right eye was defective. He had no recollection of any eye injury. The unaided vision of the right eye was 6/12 and that of the left 6/5. There was a small, full-thickness scar in the right cornea with a defect in the iris behind it. Early lens opacities accounted for his symptoms and an x-ray film confirmed the presence of a foreign body. A mature cataract developed (reducing the visual acuity to mere

perception of light) and was later extracted, along with the delivery, by magnet, of a small metal fragment. The final vision was 6/24 with correction.

This case was exceptional in that the visual result was relatively poor. In contrast the remaining patients recovered good vision, as shown in the table.

Final Visual Acuity of the 20 Patients

Visual acuity	..	6/5	6/6	6/9	6/12	6/24
No. of patients	..	6	11	1	1	1

Such excellent results depend in part on prompt referral, since a retained intraocular foreign body may lead to siderosis if the iron content is sufficiently high. The following case illustrates this, as well as re-emphasizing that the patient may regard the initial injury as trivial.

A 46-year-old man complained of failing vision of his left eye. Two years earlier he had been adjusting some part of his car with a steel hammer when he felt something hit the eye. It was a bit red the next day and he saw spots for some four days. The eye settled down sufficiently, however, for him not to seek advice at that time. For a year the vision worsened progressively. There was a small scar in the left cornea with an associated nodule in the iris, in which an x-ray

film showed a foreign body. The iris was brown, in contrast to the blue iris in the other eye, and there was a cataract, reducing the vision to hand movements. The foreign body was removed with forceps and later the cataract was extracted, leaving 6/6 vision with a contact lens. This patient was exceptionally fortunate in retaining such good vision 12 years after the injury despite his presenting the classical signs of siderosis initially.

Another factor allowing good results was the lack of sepsis in any case. Metal fragments that perforate the eye travel at high speed and consequently become so hot that they are sterilized; they therefore rarely cause an endophthalmitis unless the fragment consists of virtually pure copper, in which event a fulminating inflammation usually results as opposed to chalcosis which is the long-term consequence of a retained intraocular foreign body in which the copper content is less than 70%.

We have great pleasure in thanking the surgeons of Moorfields Eye Hospital (High Holborn Branch) for allowing us to make this report on patients under their care.

References

- ¹ Roper-Hall, M. J., in *Systemic Ophthalmology*, ed. A. Sorsby, vol. 3. London, Butterworths, 1964.
- ² Johnston, Stewart, *Transactions of the Ophthalmological Societies of the United Kingdom*, 1971, 91, 895.
- ³ Roper-Hall, M. J., *British Journal of Ophthalmology*, 1954, 38, 65.

A New Look at Infectious Diseases

Anthrax

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Anthrax is a well-known infection of animals which is occasionally transmitted to man. The term "anthrax" is derived from the Greek "anthrakos" meaning coal, and refers to the black eschar typical of cutaneous anthrax. The disease was extensively studied by the pioneers of bacteriology, Pasteur and Koch. In 1877 Koch described the isolation and cultivation of the *Bacillus anthracis*, and the formation of spores, and showed that the organism satisfied all of his four postulates. In 1881 Pasteur showed that a living vaccine could protect animals against anthrax. The organism is a large Gram-positive spore-forming rod with sharply squared-off ends—literally a "big black bacillus." In vivo, it is encapsulated, while smears from skin lesions show the organism lying singly or in short chains. Growth on artificial media occurs readily under aerobic conditions, and sporulation is well advanced after 48 hours. Anaerobic growth may also occur. In culture the bacilli are arranged in strands or long chains with equatorial oval spores. Colonies on nutrient agar are dull, flat, and grey—presenting the "medusa-head" or "curled hair" appearance, which is due to interlacing chains of bacilli growing from the edges of the

colonies. Gelatin-stab cultures show growth with liquefaction resembling an inverted fir tree.

Pathogenicity

Virtually all animals are susceptible to infection with *B. anthracis* but the disease is most common among herbivora. Man is relatively resistant whereas mice and guinea pigs are among the most susceptible laboratory animals. In animals infection is usually through the alimentary tract after ingestion of infected food, but direct infection from animal to animal is rare. Among herbivora, the disease is usually fatal, death occurring rapidly from septicaemia. Just before death the animals excrete bacilli in the urine, faeces, and saliva and the surrounding ground is contaminated by spores from the organisms. Sporulation does not occur in vivo and hence the animal carcasses should be cremated or buried intact without necropsy examination. Spores may remain alive for many years, depending on the nature of the soil and temperature. In some areas in India, Russia, and France the disease never dies out. In Great Britain spore survival in soil is probably short because those surviving the winter may be rapidly destroyed by soil organisms proliferating in the summer. Anthrax in Great Britain is usually "imported" in infected feeding stuffs, such as bone and fish meal, maize, barley, and oil cake. Cutaneous anthrax in animals is uncommon but has been described. It is usually acquired from biting