EARLY DIAGNOSIS OF SIDEROSIS RETINAE 
BY THE USE OF ELECTRORETINOGRAPHY 

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With 8 fig. 

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Sooner or later every ophthalmologist discovers that it is not always easy, or indeed possible, to remove foreign bodies from within the eye. After the immediate risk of infection from the intruding fragment has passed, the intraocular tissues may heal round certain types of foreign body with no irritation. Fragments of steel and iron or non-magnetic alloys of these with other metals may, if left to rust in the eye for long, give rise to far-reaching pathological changes in the intraocular tissues. These changes have been described under the general term siderosis and in most cases they produce blindness.

It is not always possible to predict whether an unremoved foreign body will produce siderosis or not, since this result is dependent on a number of factors, such as the nature and position of the fragment, about which it is often difficult to be certain. In order to cause siderosis the foreign body must contain iron in a condition capable of oxidation and be in contact with the intraocular fluid. If, for instance, the fragment is embedded in the wall of the eye-ball it is often impossible to discover, either by ophthalmoscopy or X-ray examination, whether it is in a position where it is likely to produce siderosis. Further, even where the nature and situation of a foreign body suggests that there is a real danger of siderosis developing, the surgical intervention necessary for removal is also usually extremely risky. Under these circumstances the choice of the most hopeful procedure is very difficult — if the likelihood of siderosis, with its consequent loss of sight, is great then the risk of operation must be accepted, if the likelihood of siderosis is thought to be slight it is better to wait. In this, by no means unusual, dilemma the possibility of diagnosing an incipient siderosis of the retina in order to obtain a clear indication for or against surgery

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is obviously of the greatest value. Fortunately the initial phases of siderosis, often difficult or impossible to recognise by other means, are accompanied by pathological changes in the electroretinogram which are, in the very earliest stages, reversible. In consequence, electroretinography may in certain cases provide useful guidance in deciding for or against a dangerous operation for the removal of a foreign body. The information so far collected is concerned only with foreign bodies containing iron. I do not yet know how far similar information can be obtained for fragments of other metal.

The pathogenesis of xenogenous indirect siderosis.

In order to produce siderosis a foreign body must be capable of oxidation and stainless steel fragments will not, therefore, produce siderosis (Mayou, 1925; Dollfuss & Borsotti, 1938). Also an oxidable fragment must be in some contact with water and oxygen and for this reason an increased circulation of intraocular fluid and raised oxygen tension will favour the development of siderosis by accelerating the rate of corrosion. These latter conditions are, naturally, largely dependent on the position of the foreign body. For instance, a rapid envelopment by a layer of fibrin or connective tissue will help to protect it from the intraocular fluid. Cases have been described in which fragments so embedded have remained in the eye for several years without causing siderosis (e.g. 14 years in Lloyd’s case). In general however, the first signs of siderosis may be expected within a few months of the entry of a foreign body if this is not quickly removed, although the factors outlined above can cause great variation in different cases. Thus, the shortest time I have been able to find recorded is 24 hours (Lamb, 1928) in a case in which the intruding fragment was already partially rusted. It is inadvisable, therefore, to place much reliance on the time taken for symptoms to develop when considering a case in which siderosis is likely to appear.

Various suggestions have been put forward as to what happens when an iron fragment corrodes in the eye. Leber (1881), Bunge (1890) and Hipel (1894) believed that the iron combines with carbon dioxide from the surrounding fluid to produce ferric carbonate which, as a result of oxidation, is then precipitated as ferric hydroxide (rust), while Ausin (1891) held the view that the dissolved iron forms ferric albuminate. The first of these