

METALLOSIS

Siderosis bulbi develops from retained intraocular iron. It is a well-recognized result of retained IOFBs and is capable of producing visual loss. The time of onset and degree of destruction vary depending on the iron content and location of the IOFB. Siderosis is characterized histopathologically by accumulation of iron in metabolically active cells. Cells of the retinal pigment epithelium, the corneal epithelium, the lens epithelium, the pupillary constrictor muscles, the trabecular meshwork, and the pars plana are most commonly involved.⁶⁰

Clinical signs of siderosis include iris heterochromia, mydriasis, reduced visual acuity, dark brown deposits beneath the anterior lens capsule, and cataract formation.⁶⁰ Electroretinographic abnormalities are common and may occur before visual acuity decreases. Classic electroretinographic changes consist of an initial supernormal signal followed by a progressive decrease in the b-wave amplitude. The implicit time usually remains normal.^{23 61} These changes may be progressive and irreversible despite IOFB removal.⁶⁰ They may be accompanied by electrooculographic and dark-adaptation study abnormalities.⁶² The visual prognosis for siderosis is good, with most eyes achieving a final visual acuity of 20/40 or better.^{61 62} A posterior IOFB has a slightly worse prognosis than an anterior or intralenticular one.^{60 62} Cataract formation is common and may be treated by routine extraction.^{60 62}

Chalcosis occurs with copper retention in the eye, and vision loss depends on the copper concentration of the IOFB. Pure intraocular copper produces a rapidly progressive, severe, purulent panophthalmitis culminating in phthisis. Treatment of this inflammation necessitates immediate removal of the cuprous material to prevent further irreversible damage. Alloys with more than 85% copper produce vision loss by depositing copper in Descemet's membrane, the vitreous cavity, and the internal limiting membrane of the retina. This deposition is apparent clinically as Kayser–Fleischer rings, greenish refractile deposits in the internal limiting membrane, anterior subcapsular sunflower cataracts, and greenish discoloration of the iris and vitreous. ²³

⁶³ Vision loss with these changes may be mild, with 90% of eyes maintaining a visual acuity of 20/60 or better. ⁶³

IOFBs containing less than 85% copper typically produce no discernible copper deposition and no vision loss. ⁶³

3 *Inert* : do not require removal (i.e. glass, plastic, sand, stone, ceramic, gold, platinum, silver, aluminum).

Reactive : cause inflammation/toxicity and must be removed (i.e. copper [$\geq 85\%$ causes severe endophthalmitis, $< 85\%$ causes chalcosis, $< 70\%$ is relatively inert], iron [siderosis], wood/plant material [significant inflammation and higher risk of endophthalmitis]).

4 *Chalcosis* : mild intraocular inflammation, deposition of copper in the anterior lens capsule (sunflower cataract) and Descemet's membrane (Kayser-Fleisher ring), and retinal degeneration. The iris may become green and the pupil sluggishly reactive to light.

Siderosis : iris heterochromia (hyperchromic on involved side), mid-dilated minimally reactive pupil, lens discoloration (brown-orange dots from iron deposition in lens epithelium, generalized yellowing from involvement of cortex), vitritis, pigmentary RPE degeneration with sclerosis of vessels, retinal thinning, and atrophy. In both diseases, the ERG is reduced or even absent.

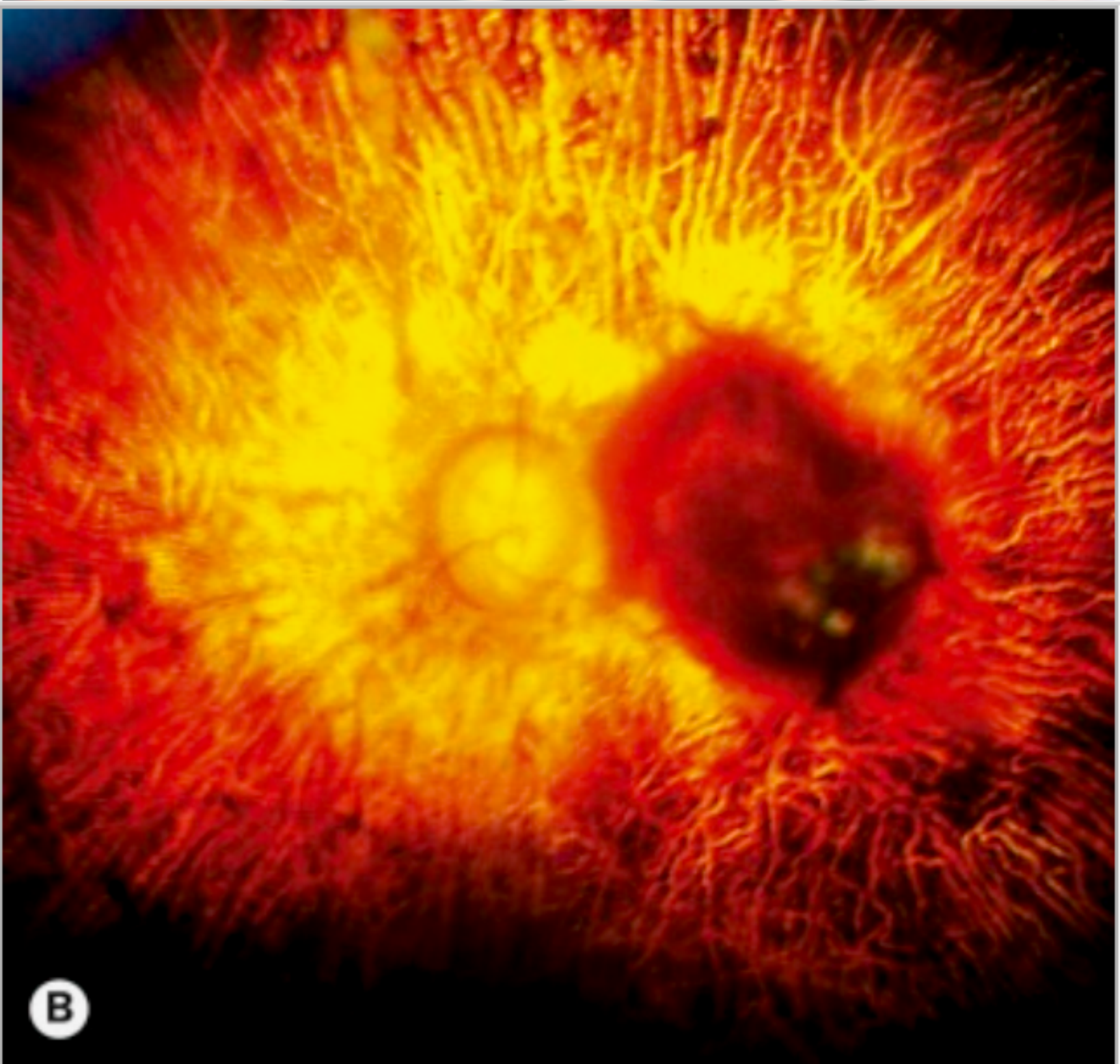
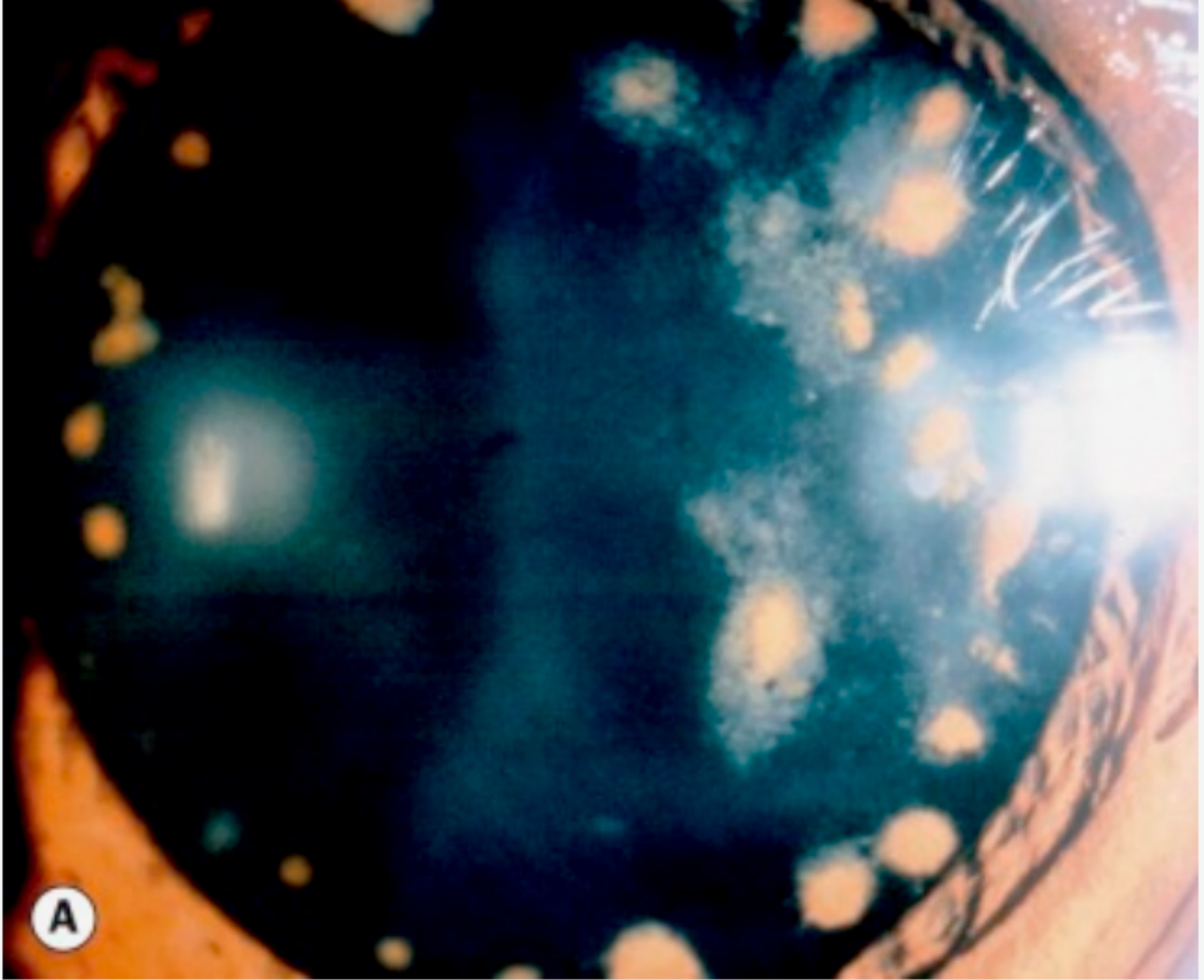


Fig. 21.30

Siderosis oculi. **(A)** Lenticular deposits; **(B)** atrophy of the retina and retinal pigment epithelium (RPE) associated with an impacted ferrous foreign body

(Courtesy of W Lisch – fig. A; J Donald M Gass, from *Stereoscopic Atlas of Macular Diseases* , Mosby 1997 – fig. B)

progressive loss of vision. Copper containing alloys with less than 85% copper cause chalcosis. Chalcosis can result in a Kayser-Fleischer ring, greenish heterochromia, sunflower cataract of the anterior capsule, and refractile deposits in the macular region often with peripheral sparing. Copper alloys of greater than 85% result in a sterile endophthalmitis. Removal of the IOFB is essential in the management of these sequelae.

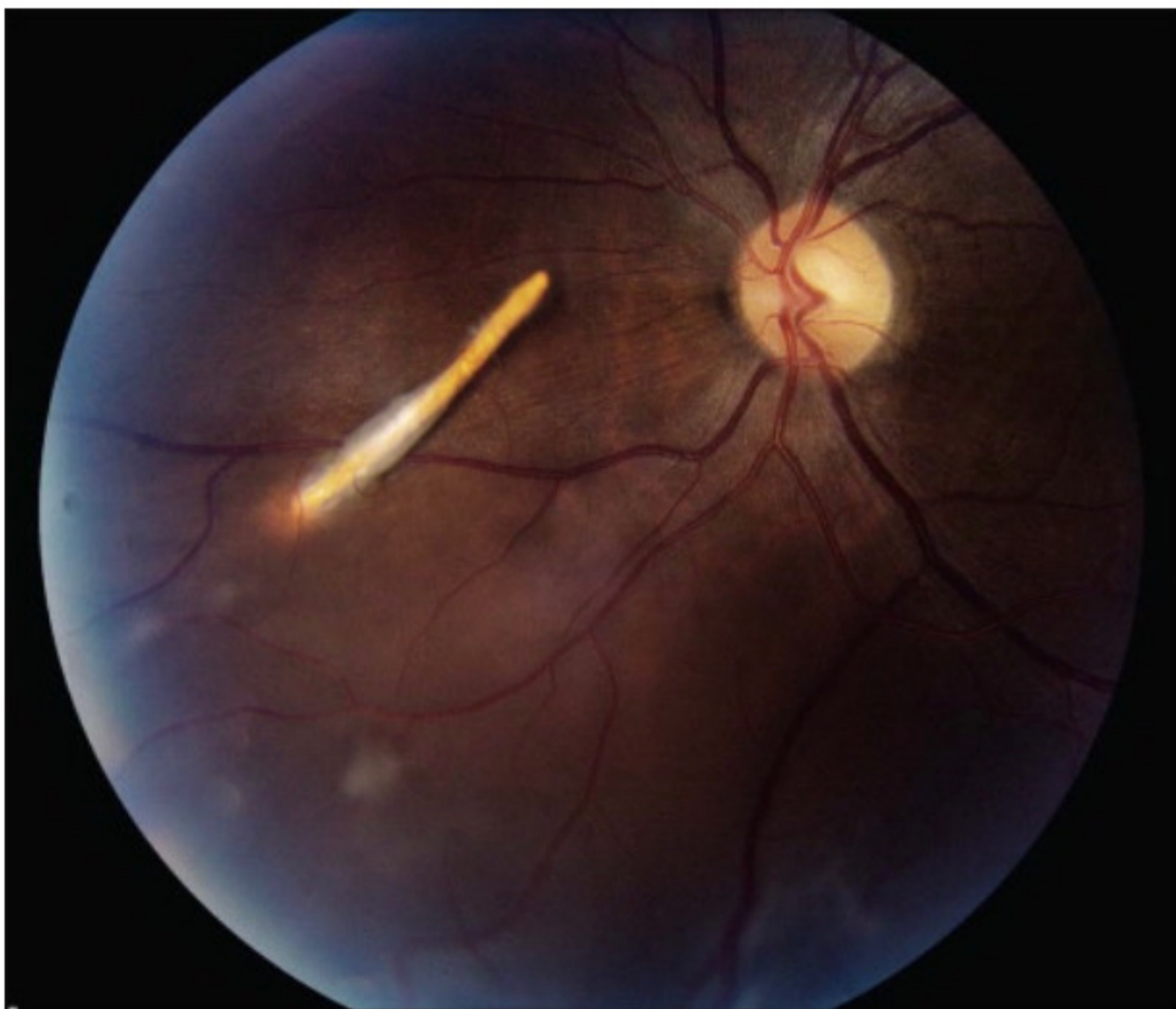


Fig. 6-42-5 Copper intraocular foreign body. Acute presentation of a patient with a penetrating wire injury. (Courtesy of Dr. Andrew Pearson and Dr. Drew Sommerville. University of Kentucky Department of Ophthalmology.)

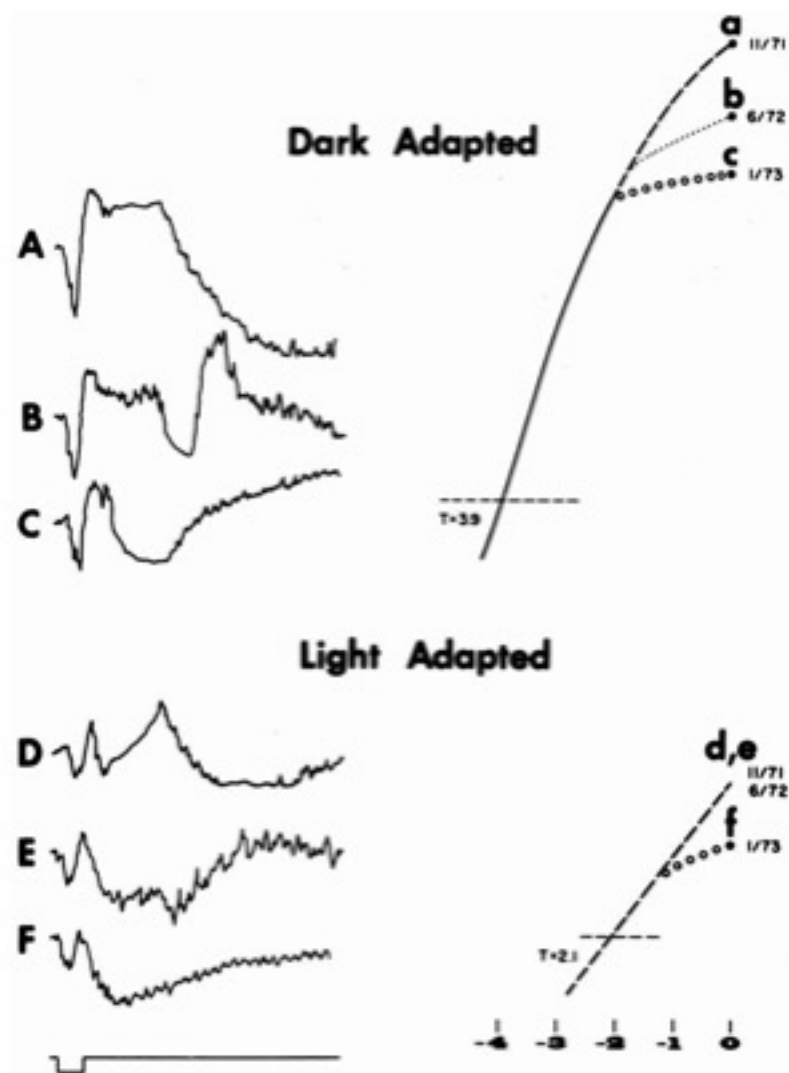
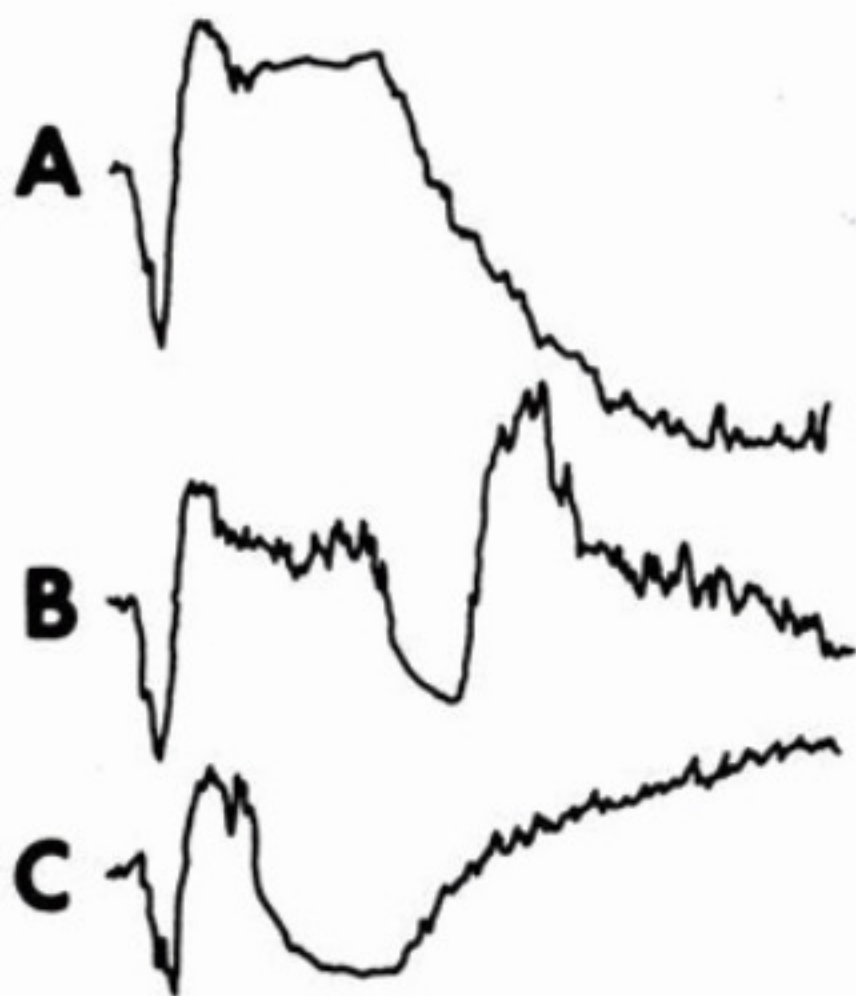


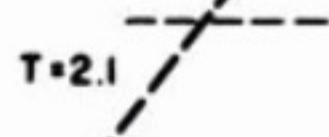
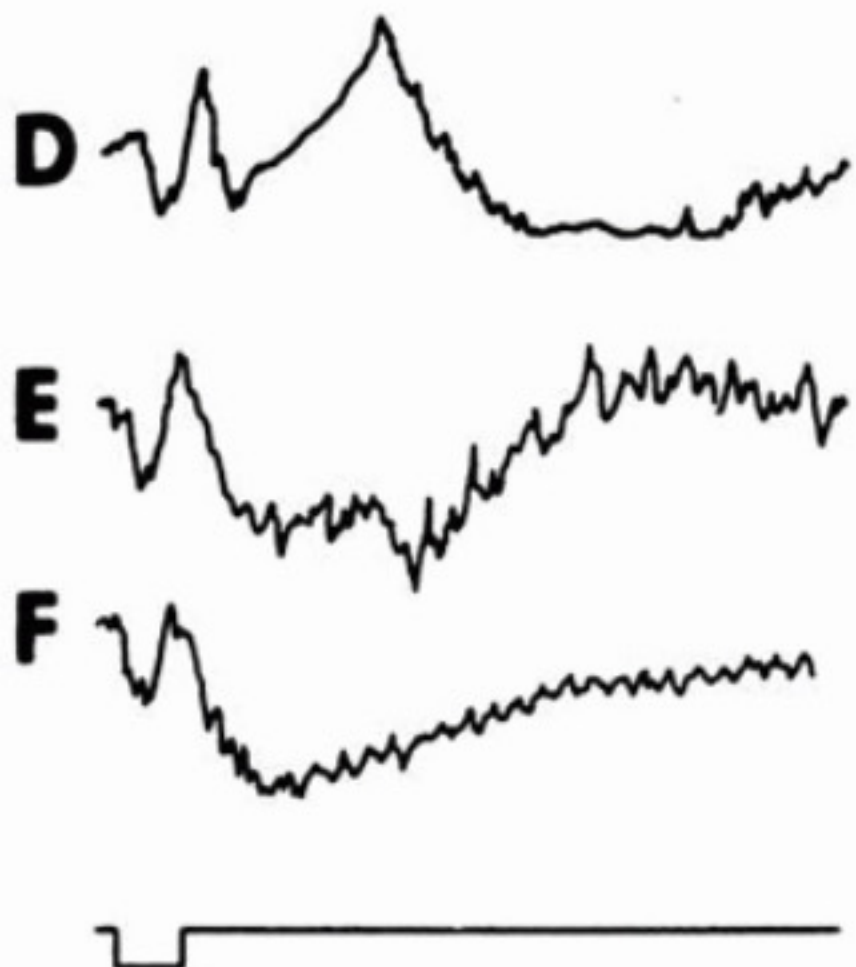
Fig. 32. Electroretinographic changes in siderosis. These responses were obtained on three different occasions from a patient with an intraocular foreign body containing iron. Note progressive reduction of b-wave amplitude over a 15-month period in both dark- and light-adapted conditions.

Dark Adapted



d 11/71
b 6/72
c 1/73

Light Adapted



d,e 11/71
6/72
f 1/73

-4 -3 -2 -1 0