True exfoliation or lamellar delamination of the lens capsule is a rare disorder in which the lens capsule is thickened and the superficial portion of the lens capsule splits from the deeper layer and extends into the anterior chamber. The pathogenesis of this disorder is not clear, but intense infrared radiation has been thought to be the main causative factor. We describe a patient with a history of heat exposure who had a cataract and was found to have bilateral delamination of the anterior lens capsule. Findings from light microscopy and scanning and transmission electron microscopy demonstrated a lamellar separation of the anterior portion of the lens capsule, confirming the diagnosis of true exfoliation.

**Report of a Case**

An 86-year-old Spanish woman was seen for progressive, painless loss of vision in both eyes. She described a progressive decline in her vision over the past 10 years. Interestingly, she gave a history of helping her mother in the family bakery business in Spain as a child, which involved exposure to open-fire ovens. The patient was otherwise in good medical health.

On initial presentation, her best-corrected visual acuity was 20/200 OU. Her examination was significant for bilateral nuclear sclerotic cataracts and lamellar delamination of both anterior capsules. Clear, diaphanous capsular membranes were seen in both anterior chambers (Figure 1 and Figure 2). The capsular peeling was limited to the central anterior capsule. There was no iris transillumination, pseudoexfoliation, or phacodonesis. The intraocular pressure, optic nerves, and fundi were normal in both eyes. She underwent an uncomplicated extracapsular cataract extraction in her right eye and the central anterior capsule was submitted for pathologic evaluation.

**Pathologic Findings**

Light microscopy (Figure 3) revealed the anterior lens capsule to be split into anterior and posterior layers. The anterior lens capsule had a thickness of 17.3 µm, of which 5 µm was a normal, more darkly staining inner layer, compared with a remaining 12.5 µm of a more lightly staining outer layer. Transmission electron microscopy (Figure 4) disclosed the posterior area to be composed of a homo-
geneous granular material that was arranged in a linear, somewhat banded pattern. The anterior area was composed of less electron-dense material. A cleavage plane was present where the layers had separated.

Areas of degeneration with vacuoles and dilated mitochondria were present in the lens epithelium. Examination of the delaminated anterior layer on scanning electron microscopy revealed sharp irregular margins with an underlying lens capsule that had a smooth anterior surface covered by fibro-granular debris.

**COMMENT**

True exfoliation of the lens capsule or lamellar delamination of the anterior lens capsule is an uncommon disorder resulting in a thin, fluttering capsular membrane on the anterior surface of the lens. First described in the 1920s, it has been observed following heat exposure, trauma, and iridocyclitis. The distinction between true exfoliation and pseudoexfoliation remained un-
clear until 1954 when Theobold\(^2\) clearly differentiated the two entities as distinct.

Pseudoexfoliation syndrome involves deposition of a fibrogranular material on numerous ocular structures, which can include the lens capsule, zonules, iris, ciliary body, vitreous, and even extracocular sites such as skin and visceral organs.\(^5\) Ocular complications can include glaucoma, lens dislocation, and iris microvascular abnormalities. These abnormalities are usually not seen in true exfoliation. Nevertheless, true exfoliation has been observed with pseudoexfoliation and careful examination is required to rule out the presence of both entities.\(^3\)

The association between true exfoliation and glaucoma is ambiguous. Cashwell et al\(^6\) reported 7 of 11 patients with true exfoliation to have glaucoma; however, a relationship between the 2 disorders is still highly speculative.\(^6\)

The patient we evaluated was found to have cataracts as her primary problem, with true exfoliation as an incidental finding. These 2 processes possibly have an underlying causality from the intense infrared radiation exposure our patient endured during her childhood. Infrared radiation exposure seems to increase the incidence of all major types of senile cataracts.\(^7\)

The cause of true exfoliation remains obscure. Traditionally it has been thought to be due to heat or infrared-related changes in the anterior capsule. It has also been associated with trauma or intraocular inflammation. Anderson and van Bockxmeer\(^3\) found that the electrophoretic patterns of the delaminated capsule were different from age-matched normal capsules, and hypothesized that a capsular protein abnormality might play a role. The possibility of heat-activated proteolysis has also been suggested as a cause of the capsular delamination. Brodrick and Tate\(^8\) noted an ultrastructural change in the epithelium of the delaminated capsule, and suggested that their finding of degranulated and dilated endoplasmic reticulum with clumped nuclear chromatin might indicate a cellular abnormality as a potential underlying cause of the scrolling. The epithelium in our case did reveal some areas of vacuolated and dilated mitochondria, but this could not be differentiated from an artifactual finding. True exfoliation should be considered when a patient has a floating membrane extending from the anterior surface of the lens into the anterior chamber.

Accepted for publication April 19, 1999.

Reprints: Carol L. Karp, MD, Bascom Palmer Eye Institute, 900 NW 17th St, Miami, FL 33136.

REFERENCES

4. Naumann G, Schlote-Schrehardt U, Kuchle M. Pseudoexfoliation syndrome for the comprehen-
6. Cashwell LF, Hollerman, IL, Weaver RG, vanRens GH. Idiopathic true exfoliation of the lens capsu-
7. Lydahl E. Infrared radiation and cataract. Acta Oph-
thalmol Suppl. 1984;166:1-63.