Double-Ring and Double-Layer Sign of the Anterior Lens Capsule During Cataract Surgery

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Background: Splitting of the lens capsule with a double-ring contour during continuous curvilinear capsulorrhexis has not often been reported.

Case: An 86-year-old woman underwent phacoemulsification cataract extraction with intraocular lens implantation in the right eye. Preoperatively, the anterior lens capsule appeared normal.

Observations: A double-ring sign was observed during capsulorrhexis. During intraocular lens implantation, the capsule developed radial tears, and a double layer of the capsule was noted. The patient’s postoperative course was uneventful.

Conclusions: The findings in our patient may be uncommon and may differ from but resemble true exfoliation. Jpn J Ophthalmol 2001;45:657–658 © 2001 Japanese Ophthalmological Society

Key Words: Anterior lens capsule, cataract surgery, double-ring and double-layer sign.

Introduction

Splitting of the lens capsule with a double-ring contour during continuous curvilinear capsulorrhexis has been reported as an uncommon event.1,2 We recently examined a patient with a double-ring and a double-layer sign of the anterior lens capsule during cataract surgery. In our clinical experience, this is quite unusual.

Case Report

An 86-year-old woman complained of blurred vision in both eyes in November 1999. She had had acute angle closure glaucoma in her left eye and had undergone laser iridotomy in both eyes 15 years previously. Her past medical history was otherwise non-contributory: she had not previously experienced heat exposure, ocular trauma, or uveitis. Her family history for ocular disease was unremarkable.

On initial examination, her best-corrected visual acuity was 0.2 OU. Intraocular pressure was 16 mm Hg OU. The right cornea appeared clear. Hazy cornea with Descemet’s fold was seen in the left eye. Nuclear sclerotic cataracts were visible in both eyes. The anterior capsule appeared normal bilaterally. There was no pseudoexfoliation noted bilaterally. Both fundi appeared ophthalmoscopically normal.

The patient underwent phacoemulsification cataract extraction with implantation of a foldable acrylic lens in her right eye on June 20, 2000. A continuous curvilinear capsulorrhexis was performed with a bent-tip 25-gauge needle. During capsulorrhexis, the lens capsule began to split. The capsulorrhexis was continued until it was completed for 360°; both layers of the split capsule held together. After completing the capsulorrhexis, a double line of the entire capsulorrhexis edge (double-ring sign) was observed. Phacoemulsification and aspiration of residual cortex were performed uneventfully. The intraocular lens (Acrysof, MA60BM; Alcon Laboratories, Ft. Worth, TX, USA) was implanted, using a forceps. At the time of intraocular lens implantation into the capsular bag, radial tears of both capsule layers developed at 4 o’clock, but did not cause rupture of the posterior lens capsule. The small incised sclerocorneal wound was not sutured.

The patient’s postoperative course was uneventful.
Her right visual acuity was 0.8 on July 8, 2000. The double-ring of the capsule edge and a double-layer of the lens capsule at the radial tears were visible (Figure 1).

**Discussion**

Our patient’s anterior lens capsule appeared normal preoperatively. However, a double line at the capsulorrhexis edge (double-ring sign) was observed during surgery. These findings were previously described by Braude and Edward. Wollensak and Wollensak, Wollensak and Wollensak reported that a double-ring sign at the capsulorrhexis edge was observed in about 30% to 40% of their cataract patients. Shinjo et al reported a double-ring sign in 16 eyes of patients following cataract surgery, and suspected that this frequency may not be rare. However, we have examined 300 patients who have undergone capsulorrhexis and have failed to find the double-ring sign in any patient other than the present one. There is no accurate incidence of the double-ring sign. It may be influenced by the patient’s condition such as age and history, surgical procedures, observation methods, and other factors. We consider that the double-ring sign during capsulorrhexis may be uncommon.

Braude and Edward reported that the splitting of the lens capsule did not alter the integrity of the capsulorrhexis for phacoemulsification, cortical aspiration, or intraocular lens implantation. Wollensak and Wollensak reported that there were no radial tears of the lens capsule in 10 patients with a double-ring structure at the capsulectomy margins. In our patient, however, radial tears developed during intraocular lens implantation. It remains unclear whether the development of such tears was caused by the fragility of the split capsule or was iatrogenic.

The double layer of the lens capsule at radial tears was visible in our patient. These findings may differ from but resemble true exfoliation (lamellar delamination of the lens capsule), in which the superficial portion of the lens capsule splits from the deeper layer and extends spontaneously into the anterior chamber, as demonstrated by others. True exfoliation of the anterior lens capsule has been observed following heat exposure, trauma, and iridocyclitis. Our patient had not experienced any of these conditions. The pathogenesis of the double-ring and double-layer sign in our patient was obscure. Our patient previously had had angle-closure glaucoma in her left eye and had undergone laser iridotomy in both eyes. Cashwell et al reported that 7 of 11 patients with true exfoliation had a history of glaucoma. However, our patient did not have glaucoma in her right eye. It remains unclear if the previous laser iridotomy was involved in the development of the double-ring and double-layer signs in our patient.

The excised anterior capsule of our patient was not available for histopathologic study. Splitting of the capsule in the double-ring sign was previously demonstrated histologically. Wollensak and Wollensak suspected that structural alterations in the border layers between the zonular lamella and the capsule proper are a precondition for double-contour formation. Fisher and Pettet reported that the thickness of the capsule underlying the anterior attachment of the zonule increases steadily with age. Most patients with double-ring sign or true exfoliation have been elderly.

We believe that a double-ring and a double-layer sign in the anterior lens capsule during cataract surgery may be uncommon, and may differ from but resemble true exfoliation.

**References**