Management of the Argentinian flag sign in open-sky cataract extraction

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We present a case in which the Argentinian flag sign occurred in a patient who had combined keratoplasty and open-sky cataract extraction for acute perforated hydrops. The patient had advanced keratoconus and an intumescent cataract. The complication was managed using an open-sky approach rather than a closed anterior chamber approach. Although capsule tears are more likely to occur in open-sky conditions because there are no forces against the pressure in the capsular bag, our technique followed the principles of a closed anterior chamber technique and avoided maneuvers that could extend the tears posteriorly. An intraocular lens was safely implanted in the bag with the haptics placed perpendicular to the capsule tears.

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White and intumescent cataracts are challenging because the pressure created by hyper hydration of lens fibers can cause spontaneous tears that extend to the periphery during capsulorhexis. Measures to prevent this unexpected complication have been described; however, they are not effective in an open-sky cataract extraction and can result in occurrence of the Argentinian flag sign.

CASE REPORT

A 56-year-old man with a history of bilateral cataracts and advanced keratoconus presented with acute perforated hydrops in the left eye (Figure 1, top). A combined procedure of penetrating keratoplasty (PKP), open-sky cataract extraction, and intraocular lens (IOL) implantation was planned.

During excision of the opaque recipient cornea, a white intumescent cataract was seen (Figure 1, bottom). The anterior capsule was initially stained with VisionBlue (Dutch Ophthalmic, USA). The liquefied cortex was aspirated with a 27-gauge needle before the capsulorhexis was started; however, immediately after the initial opening,
A spontaneous radial capsule tear extending to the periphery occurred with the typical Argentinian flag sign appearance (Figure 2). Following the occurrence, the cortex was gently aspirated with a Simcoe cannula to decompress the capsule and lens apparatus (Figure 3, top). Because it was not possible to complete a continuous curvilinear capsulorhexis (CCC), a can-opener capsulorhexis was performed. Gentle pressure was applied to prolapse and remove the nucleus (Figure 3, bottom), the remaining cortex was carefully aspirated, and the capsular bag was filled with a cohesive ophthalmic viscosurgical device (OVD). No posterior capsule tear was noted, and a 3-piece IOL was implanted in the bag (Figure 4, top), placing the haptics perpendicular to the capsule tear (Figure 4, bottom). The PKP was completed with interrupted sutures.

No complications occurred postoperatively. At 6 months, the corrected distance visual acuity was 6/12.

**DISCUSSION**

In intumescent cataracts, lens aspiration with a 27-gauge or 25-gauge needle (or with the phaco tip) is highly recommended before the capsulorhexis to prevent unexpected radial capsule tears. In addition, a highly cohesive OVD can be used to pressurize the anterior chamber against the pressure of the intumescent lens and facilitate completion of the CCC.²,³

Radial capsule tears are more likely to occur in an open-sky cataract extraction in which there are no forces against the capsular bag pressure, and the measures that prevent tears in a closed anterior chamber are usually not effective.

Other approaches should be considered if cataract extraction has to be done with the open-sky technique. General anesthesia is preferable as a retrobulbar or peribulbar block increases the posterior eye pressure. In cases not suitable for general anesthesia, a retrobulbar or peribulbar block can be administered; however, gentle eye massage should be performed until the anesthesia is well diffused. In addition, 100 mL of mannitol 20% can be given 60 minutes before surgery to dehydrate the vitreous and lower the intraocular pressure.⁴

The femtosecond laser-assisted system for capsulotomy in intumescent white cataract appears to be safe and technically feasible; however, opaque corneas, as in our case, are not suitable for femtosecond laser use.⁵

To our knowledge, there are no reports describing the management of a radial capsule tear in open-sky cataract surgery; however, the same principles as in...
a closed anterior chamber are valid. After a radial capsu-
le tear occurs, it is essential to first decompress the lens by gentle aspiration.1,6 The can-opener capsulorhexis can then be performed or the capsulorhexis can be completed with a scissors.6 Gentle pressure on the globe (avoiding perpendicular forces against the capsule tear) will prolapse the nucleus so it can be removed. A careful examination should be done to determine posterior extension of the tear and vitreous loss. All remaining cortex must be aspirated carefully without extending the tear. A 3-piece IOL is preferable and can be implanted in the bag if no posterior extension of the tear is seen.1,6 Finally, if the IOL is implanted in the bag, the haptics should be positioned perpendicular to the direction of the radial capsule tear. This will prevent excessive pressure in the bag and further extension of the tear. Completion of the PKP will restore a closed anterior chamber. Finally, the position of the IOL should be confirmed.

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