CASE REPORT

Corneal topographic changes after sequential suture removal in a corneal wound burn after phacoemulsification

Savio Pereira, MS, DNB, FPRS, Laxmi Dorennavar, MS, FICO, FPRS, Nikhil R.P., MS, DNB, FPRS, FMR, Sri Ganesh, MS, DNB

This case describes the timing of suture removal and stabilization of refraction in a case of corneal wound burn associated with phacoemulsification. A 70-year-old woman presented with diminution of vision in both eyes for 1 year. O/E lens opacification classification system grade NC4C3P2 cataract was present in both eyes with normal fundus. Primary diagnosis was cataract in both eyes. The left eye was planned for microincision cataract surgery by a trainee under local anesthesia. Corneal wound burn and iris chaffing were noted at the end of surgery, and 3 sutures were placed at the main port. At 15 days and 1 month postoperatively, the uncorrected distance visual acuity (UDVA) was 20/80 with high regular astigmatism showing over cylinder on autorefractometer. Sequential suture removal was done 1 month postoperatively with an interval of 15 minutes between each suture and corneal topography performed after each suture removal. Topography exhibited reduction in astigmatism from 10.6 to 1.2 diopters after suture removal. The UDVA and corrected distance visual acuity after 1-hour post-suture removal was 20/32 and 20/20, respectively, with a refraction of −0.5 diopter sphere/−0.50 diopter cylinder @ 95 degrees, which was stable even at 1-month and 6-month follow-up. We conclude that suture removal can be planned as early as 4 weeks with refraction and keratometric readings being stable even after 6 months.

Corneal wound burn is a serious complication occurring in routine phacoemulsification. Various causes for thermal damage during phacoemulsification are tight wound construction, inadequate irrigation fluid around the phacoemulsification tip, use of excessive power, overfilled ophthalmic viscosurgical device in the anterior chamber, and divide-and-conquer technique of nuclear fragmentation. Signs of corneal wound burn include whitening of the cornea at the incision site with gaping of wound and difficulty to form the anterior chamber at the end of surgery. The requirement of 3 sutures placed in a 2.8 mm incision after wound burn is rare, and the documentation of the corneal topographic changes after sequential suture removal has not been reported, to the authors’ knowledge.

Informed written consent was obtained. Institutional review board/ethics committee approval was obtained.

CASE REPORT

A 70-year-old woman with lens opacification classification system grade 4 (NC4C3P2) cataract in the left eye was scheduled for microincision cataract surgery by a trainee under peribulbar block (lignocaine 2% + bupivacaine 0.5%). Temporal clear corneal incision of 2.8 mm was made. Nuclear fragmentation was done by the divide-and-conquer technique. Phacoemulsification parameters used were: ultrasound power 70% for trenching and 50% for quadrant removal, 300 mm Hg vacuum, and aspiration flow of 34 mL/min. Corneal wound burn and tissue loss were noted at the end of surgery with iris chaffing. Because of severe wound burn and corneal tissue loss at the 2.8 mm main port incision, a single tight central suture was not able to form the anterior chamber, and hence, it was supplemented by the application of 2 additional interrupted 10-0 monofilament nylon sutures (Figure 1, A). Postoperatively, the patient was prescribed G. prednisolone acetate 1% for 6 times a day weekly tapering dose, G. moxifloxacin 0.5% 4 times a day for 7 days, and G. carboxymethyl cellulose 0.5% for 1 month. On postoperative day 1, the cornea had Descemet membrane folds (grade 3), 3 sutures intact, well-formed anterior chamber, and intraocular lens stable in the bag.

RESULTS

At 2 weeks postoperatively, the uncorrected distance visual acuity (UDVA) was 20/80, and retinoscopy/autorefractometer...
both showed cylinders out of normal range. Topography showed 5.8 diopters (D) anterior corneal astigmatism (Figure 1, B) measured using Scheimpflug technology (Pentacam HR; Oculus Optikgeräte GmbH). The suture removal was planned 1 month postoperatively.

At 1 month postoperatively, the patient had an UDVA of 20/80 with no improvement on pinhole. Sequential removal of sutures was performed on the same day. Sutures were removed at a gap of 15 min each on the slitlamp biomicroscope using a 26-gauge needle with aseptic precautions under topical anesthesia (G. proparacaine 0.5%). The superior suture was removed first, followed by inferior and central sutures. Topography was repeated after each suture removal, and the magnitude of astigmatism change was noted (Figure 1, C–E). One hour after suture removal, refraction was checked, and the patient’s vision improved.

Table 1. Preoperative and postoperative visual acuity and refraction.

| Left Eye | Preop | POD-15 | POD-6 mo |
|----------|-------|--------|----------|
| UDVA     | 20/200| 20/80  | 20/32    |
| CDVA     | 20/200| 20/80  | 20/32    |
| Sph (D)  | NA    | NA     | NA       |
| Cyl (D)  | NA    | Over cyl on AR | Over cyl on AR |
| Axis     | NA    | NA     | 90       |
| UNVA     | N18   | N6     | N6       |
| CNVA     | N36   | N6     | N6       |

AR = autorefractometer; CDVA = corrected distance visual acuity; CNVA = corrected near visual acuity; Cyl = cylinder; NA = not applicable; POD = postoperative day; Sph = sphere; UDVA = uncorrected distance visual acuity; UNVA = uncorrected near visual acuity
to 20/20 accepting −0.50 dipter sphere/−0.50 dipter cylinder @ 90 degrees. One month after suture removal, the UDVA was 20/32 and the corrected distance visual acuity was 20/20 with a refraction of −0.50 dipter sphere/−0.50 dipter cylinder @ 95 degrees with no significant change in keratometric readings (Figure 1, F), which was stable even at 6-month follow-up (Table 1). Clinical images were taken using the Haag-Streit anterior segment slitlamp biomicroscope (Model BX 900) (Figure 1, G).

**DISCUSSION**

Possible reasons for wound burn and corneal tissue loss were lens opacification classification system grade 4 (NC4C3P2) cataract, divide-and-conquer technique with 70% USG power, and the main port wound being superficial and more anterior, which was confirmed by anterior segment optical coherence tomography (MS-39; CSO) (Figure 1, H). We wanted to assess the magnitude of astigmatism caused by sutures placed in a small incision of 2.8 mm and the changes occurring in corneal topography immediately after sequential suture removal in patients with corneal wound burn. We also compared the immediate changes in topography and manifest refraction at 1-month and 6-month follow-up after suture removal to determine the wound stability and the earliest time for visual rehabilitation of the patient by spectacles.

After the first suture removal (superior), topography showed astigmatism of 10.6 D, asymmetric bowtie pattern on the sagittal map with anterior and posterior elevation of 11 μm and 20 μm, respectively, in the 3 mm central zone, flattening in the horizontal meridian that coincides with the area of suture, and steeping in the vertical meridian (Figure 1, C). With the second suture removal (inferior), astigmatism reduced to 10.2 D, but asymmetric bowtie pattern was still seen with anterior and posterior elevation of 9 μm and 18 μm, respectively, in the 3 mm central zone and also reduction in the area of flattening of the horizontal meridian on the anterior sagittal map (Figure 1, D). After removal of the central suture that was short and had the most tension, the astigmatism drastically reduced to 1.2 D. This shows that a single tight suture can induce astigmatism up to 10 D, and reversal of astigmatism is seen immediately in topography within few minutes (Figure 1, E). The cornea became regular, with loss of the bowtie pattern and immediate resolution of the elevated areas on the sagittal map. It is known that astigmatism is a vector with both magnitude and direction.6 With each suture removal, we can see the change in the axes and the magnitude of astigmatism (Figure 1, I). Refraction was assessed 1 hour after suture removal, and spectacles were prescribed. After 6 months of follow-up, the keratometry and manifest refraction were documented. These readings were comparable with the readings obtained at 1 month and 1 hour after suture removal. This confirmed that refraction can be assessed and spectacles prescribed as early as 1 hour after suture removal.

Corneal wound burn occurring during phacoemulsification requires multiple tight sutures that often result in poor refractive outcomes because of induced astigmatism. Suture removal can be planned as early as 4 weeks so that the cornea becomes regular and achieves improvement in refractive outcomes at the earliest. Changes in topography can be documented as early as 15 minutes after suture removal, and the degree of induced astigmatism recovers and stabilizes within 1 hour. As keratometry and manifest refraction measured at 1 hour after suture removal and at 6 months show minimal changes, spectacle prescription can be given immediately after suture removal. Thus, visual rehabilitation can be achieved at the earliest, resulting in reduced follow-up visits.

**WHAT WAS KNOWN**
- Wound burn occurring during phacoemulsification has to be managed with sutures that induce astigmatism.
- Wound burn patients might require astigmatic spectacles.

**WHAT THIS PAPER ADDS**
- Timing of suture removal and spectacle prescription.
- Time for refraction to stabilize after suture removal.

**REFERENCES**
1. Floyd M, Valentine J, Coombis J, Olson RJ. Effect of incisional friction and ophthalmic viscosurgical devices on the heat generation of ultrasound during cataract surgery. J Cataract Refract Surg 2006;32:1222–1226
2. Liu Y, Zeng M, Liu X, Luo L, Yuan Z, Xia Y, Zeng Y. Torsional mode versus conventional ultrasound mode phacoemulsification: randomized comparative clinical study. J Cataract Refract Surg 2007;2:287–292
3. Jun B, Berdahl JP, Kim T. Thermal study of longitudinal and torsional ultrasound phacoemulsification: tracking the temperature of the corneal surface, incision, and handpiece. J Cataract Refract Surg 2010;5:832–837
4. Sorensen T, Chan CC, Bradley M, Braga-Mele R, Olson RJ. Ultrasound-induced corneal incision contracture survey in the United States and Canada. J Cataract Refract Surg 2012;38:227–233
5. Long-term corneal endothelial cell loss after cataract surgery. Results of a randomised controlled trial. Oxford Cataract Treatment and Evaluation Team (OCTET). Arch Ophthalmol 1986;104:1170–1175
6. Alpins NA. Vector analysis of astigmatism changes by flattening, steepening, and torque. J Cataract Refract Surg 1997;23:1503–1514

**Disclosures:** S. Ganesh is a consultant to Carl Zeiss Meditec AG. None of the other authors has a financial or proprietary interest in any material or method mentioned.