

# **techniques**

## **Warm balanced salt solution for clearing tear film precipitation during cataract surgery**

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Adequate anterior segment visualization during cataract surgery can be hindered when excessive tear film secretions precipitate on the corneal surface before the initial corneal incision is made. In most cases, room-temperature balanced salt solution applied to the corneal surface clears the debris. However, in cases in which tear film precipitates persist after the use of room-temperature balanced salt solution, the application of warm balanced salt solution can provide rapid and sustained dispersion of the precipitates. We present our experience using this technique.

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Ophthalmic surgeons are intimately familiar with the importance of maintaining a clear cornea during cataract surgery to provide adequate anterior segment visualization. Proper hydration of the exposed corneal epithelium during surgery with room-temperature balanced salt solution often maintains adequate intraoperative corneal transparency. However, in some patients with excessive meibomian gland secretions, this may not clear the precipitated tear film secretions that can accumulate on the corneal surface and obscure visualization of the anterior segment. In these cases, we found that warm balanced salt solution applied directly

to the corneal epithelium at the start of the procedure can quickly clear tear film secretions and provide sustained visualization throughout surgery.

### **Surgical Technique**

This technique is useful in patients having cataract extraction who, at the beginning of surgery, have significant corneal tear film precipitates that do not clear with room-temperature balanced salt solution. The patients are treated with approximately 5 cc of balanced salt solution, available on demand, that is preheated to 37.2°C in a towel warmer. Video documentation of the corneal surface before and after administration of the warm balanced salt solution was obtained for comparison to illustrate the effect of this technique.

### *Comparative Study*

Resting corneal temperatures were measured in 10 healthy subjects at our clinic. The mean age of the 5 men and 5 women was 42.2 years and 39.8 years, respectively. All measurements were obtained the same day between 8:00 and 9:00 AM in the same office by the same examiner. Measurements of changes in corneal temperature after the addition of approximately 5 cc of room-temperature balanced salt solution, followed

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1 minute later by the instillation of 5 cc of balanced salt solution preheated to 37.2°C, were also obtained from the left eye of 6 additional subjects who had been pre-treated with proparacaine and a lid speculum. All temperatures were measured with a CORE infrared digital otic thermometer that was held approximately 3.0 mm from the corneal apex.

## Results

Approximately 5% of the patients who had cataract extraction at our facility over the past year required warm balanced salt solution during surgery. All had persistent corneal surface precipitates after application of room-temperature balanced salt solution. Rapid dispersion of precipitated tear film secretions after administration of the warm solution was observed in each case (Figure 1). No adverse corneal pathology was noted postoperatively.

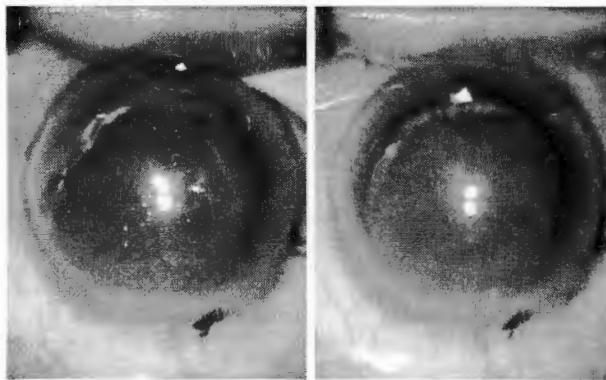
The mean corneal temperature in the right and left eyes of the healthy subjects was 34.1°C ± 0.3°C (SD) and 34.2°C ± 0.5°C, respectively. The difference between men and women was not significant. The mean corneal temperature immediately after instillation of room-temperature balanced salt solution was 31.1°C ± 0.9°C. The mean corneal temperature immediately after

instillation of preheated balanced salt solution was 35.5°C ± 0.9°C. No adverse corneal pathology was noted in any subject.

## Discussion

Although in most cases corneal clarity during cataract surgery can be maintained with room-temperature balanced salt solution, some patients have heavier eyelid secretions that are difficult to clear with this method. In these cases, the use of warm balanced salt solution provides a convenient, quick, and harmless way of clearing tear film precipitation that can accumulate on the corneal surface at the onset of surgery.

Warm balanced salt solution can be made readily available by having several 15 cc containers stored in the same heating units used in most operating suites for keeping a stock of prewarmed intravenous solutions. We also recommend limiting the temperature of the balanced salt solution to 37°C or less as higher temperatures may be irritating to patients having topical anesthesia and may also damage the corneal epithelium. Although previous studies have investigated the effects of various intraocular irrigating solutions on the corneal endothelium<sup>1,2</sup> and compared the external use of balanced salt solution versus corneal surgical shields during cataract surgery,<sup>3</sup> to our knowledge, there have been no reports of the technique we used in the literature.



**Figure 1.** (Otto) *Left:* Corneal surface after application of room-temperature balanced salt solution. *Right:* Corneal surface after application of warm balanced salt solution.

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