Malik`s Technique of Continuous 2% Hydroxymethylcellulose (HPMC) Infusion Assisted Nuclear Delivery in Manual SICS

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Abstract

Manual small incision cataract surgery primarily involves prolapse of nucleus into the anterior chamber followed by its extraction by one of the various methods of nuclear delivery. Large, hard nuclei and certain techniques like phacosandwich/phacofracture predispose to shallowing of anterior chamber, increasing the likelihood of endothelial damage. We describe a simple maneuver to protect this important layer by continuous infusion of 2% hydroxymethylcellulose through the anterior chamber maintainer (ACM) by the assistant during nuclear delivery which can be combined with any method of SICS. This is also useful in preventing endothelial damage by a novice surgeon during the learning phase.

Keywords: SICS, ACM, endothelium, hydroxymethylcellulose

Introduction

Manual small incision cataract surgery (SICS) is preferred by many surgeons over phacoemulsification in hard brown or black cataracts. In SICS, the nucleus is brought out of the capsular bag into the anterior chamber and extracted outside the eye using Blumenthal`s method, microvectis technique, fish hook, viscoexpression, phacosandwich or phacosection. As the nucleus is maneuvered in the anterior chamber, the corneal endothelium is exposed to surgical insult, more so in complicated cases, hard cataracts and methods involving greater anterior chamber instrumentation. Ophthalmic viscosurgical devices (OVDs) play an important role in modern cataract surgery by maintaining adequate space, facilitating intraocular lens (IOL) implantation and protecting the corneal endothelium. In this article we describe how 2% hydroxymethylcellulose infusion through anterior chamber maintainer (ACM) in SICS offers additional protection to the endothelial cells during nuclear delivery.

Principle

During the process of nuclear delivery, there is a tendency for the anterior chamber to collapse. This predisposes the corneal endothelium to injury by nuclear touch. Harder nuclei are likely to induce greater endothelial loss. Also, more instrumentation inside the chamber as in techniques

Figure 1: 2% hydroxymethylcellulose (HPMC) injected through ACM in the Modified Blumenthal technique

Figure 2: Nucleus bisection in phacosection with simultaneous injection of 2% hydroxymethylcellulose (HPMC) through ACM by the assistant
like phacosection and phacosandwich cause shallowing of anterior chamber and inadvertent endothelial touch. A continuous infusion of 2% HPMC through the ACM during this stage prevents anterior chamber turbulence.

**Technique**
Under local or topical anaesthesia, the sclerocorneal tunnel is constructed, the size depending on the nucleus grade and the technique of SICS to be used. Two side ports are then made using microvitreoretinal blade (19 or 20 G), one at around 10 o’clock and the other at 5 o’clock in left eye and 7 o’clock in right eye (for fixing the ACM). Capsulotomy is performed and following hydrodissection, nucleus is prolapsed into the anterior chamber under OVD cover. The ACM is attached to a syringe containing 2% HPMC that is to be injected by the assistant. The plunger is pushed and the injection is started slowly under microscopic visualization. Excessive injection can lead to rise in intraocular pressure and even nucleus drop. If the pressure rises but nucleus does not progress towards the internal lip of the sclero- corneal tunnel, then the internal opening should first be enlarged using a keratome and then the infusion resumed. In the Modified Blumenthal technique, an iris repositor is placed through the tunnel behind the nucleus and intermittent taps are given. A needle in the other hand helps in guiding the nucleus out and debulking it. In Phacofracture and phacosandwich, a vectis is placed behind the nucleus and a Sinskey’s hook (or especially designed cutter as in phacofracture) is kept in front of the nucleus. In phacosandwich, the nucleus is brought out in toto, sandwiched between the two instruments. In phacofracture, the two instruments are moved towards each other dividing the nucleus in two or three fragments. The pieces are separated and brought out one by one using a forceps. Till the nucleus is delivered, the 2% HPMC injection is continued. The ACM is then removed and immediately flushed with basic salt solution (BSS) as delay can lead to its blockage.

**Discussion**
Shallow anterior chamber with hard cataract makes the corneal endothelial cells more vulnerable to cell loss. Though ACM is classically used in manual SICS for hydroexpression of the nucleus, its combined use with ultrasonic phacoemulsification is reported to minimize damage to corneal endothelial cells in hard cataracts. In SICS, much emphasis has been given to submerge the nucleus in OVD while it is manipulated in the anterior chamber. Many viscoelastic substances are available for cataract surgery and differ depending on their physical and chemical properties. The OVD 2.0% hydroxypropylmethylcellulose (2.0% HPMC) has low zero-shear viscosity and dispersive characteristics. These properties of 2.0% HPMC make it suitable for injection through ACM as cohesive OVDs are difficult to inject through ACM. An additional advantage of this maneuver is that it provides a safeguard during the learning phase where the assistant can ensure a deep anterior chamber throughout while the trainee surgeon struggles to deliver the nucleus. To conclude, 2.0% HPMC infusion through ACM during nuclear delivery in SICS serves to protect the corneal endothelium from trauma due to nucleus and instrument touch. It is particularly useful in techniques involving multiple instrumentation inside the anterior chamber and hard cataracts. It can be combined with any technique of SICS during the learning phase to avoid endothelial trauma.

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**References**

1. Jaggernath J, Gogate P, Moodley V, Naidoo KS. Comparison of cataract surgery techniques: safety, efficacy, and cost-effectiveness. *Eur J Ophthalmol* 2014; 24:520-6.
2. Malik KPS, Goel R. Manual of Small incision cataract surgery. New Delhi: CBS Publishers & distributors Pvt Ltd;2011. Nuclear management;pp. 34-47.
3. Miyata K, Maruoka S, Nakahara M, Otani S, Nejima R, Samejima T, et al. Corneal endothelial cell protection during phacoemulsification; low versus high molecular weight sodium hyaluronate. *J Cataract Refract Surg* 2002; 28:1557-60.
4. Rainer G, Menapace R, Findl O, Georgopoulos M, Kiss B, Petternel V. Intraocular pressure after small incision cataract surgery with Healon5 and Viscoat. *J Cataract Refract Surg* 2000; 26:271-6.
5. Arshinoff SA, Jafari M. New classification of ophthalmic viscosurgical devices - 2005. *J Cataract Refract Surg* 2005; 31:2167–71.
6. Hwang HB, Lyu B, Yim HB, Lee NY. Endothelial Cell Loss after Phacoemulsification according to Different Anterior Chamber Depths. *J Ophthalmol* 2015; 2015:210716.
7. Blumenthal M, Moisissiev J. Anterior chamber maintainer for extracapsular cataract extraction and intraocular lens implantation. *J Cataract Refract Surg* 1987; 13:204–6.
8. Chen G, Wang D, Du Y, Huang H. Effect of continuous ultrasonic phacoemulsification with anterior chamber maintainer on corneal endothelial damage in hard nuclear cataract. *Eur J Ophthalmol* 2015; 25:198-201.
9. Malik KP, Goel R. Nucleus management with Blumenthal technique: anterior chamber maintainer. *Indian J Ophthalmol* 2009; 57:23-5.
10. Davis AE, Lindstrom RL. Corneal thickness and visual acuity after phacoemulsification with 3 viscoelastic materials. *J Cataract Refract Surg* 2000; 26:1505-9.
11. Arshinoff SA. Dispersive and cohesive viscoelastic materials in phacoemulsification. *Ophthalmic Pract* 1995; 13:98-104.