Nucleus management with Blumenthal technique: Anterior chamber maintainer

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The Blumenthal`s 'Mininuc' technique enables nuclear expression through a 5-6.5-mm sclerocorneal tunnel incision using a Sheet's lens glide and anterior chamber maintainer (ACM). A 6-mm or larger capsulorrhexis, reduction in nuclear size by hydroprocedure and its manipulation manually into the anterior chamber are performed. The nucleus is expressed out of the chamber by use of hydrostatic pressure created by balanced salt solution delivered continuously through the ACM. This continuous flow from ACM to anterior chamber keeps the eye under positive pressure physiological state besides clearing the chamber of cortex, blood and pigments offering excellent visualization. The procedure, with an initial learning curve, is highly effective, applicable to all grades of cataracts, has minimum intraocular instrumentation resulting in an early rehabilitation of the patient.

Key words: Anterior chamber maintainer, blumenthal, scleral tunnel, lens glide

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The success of a cataract surgery is determined in terms of quicker visual and functional recovery. This is closely related to the size of the wound. In the early 1980s, phacoemulsification was the only available technique for achieving a small incision. Alternative methods were then introduced and Keener[1] in 1983 used a constricting wire loop. Fry[2] gave the phacosandwich technique and Peter Kansas[3] proposed the technique of phacosection. But it was the development of the sclerocorneal pocket tunnel incision by Kratz[4] which revolutionized the non-phaco manual small incision cataract surgery (MSICS). The novel innovation of anterior chamber maintainer (ACM) by Blumenthal[5] in 1987 was another cornerstone which permitted a high-pressure and high-flow system, providing a physiological environment throughout the surgery requiring minimal intraocular instrumentation. The purpose of this article is to describe the detail of nucleus delivery by the Mininuc technique of Blumenthal.

Mininuc Technique

The Mininuc technique can be performed under peribulbar or topical anesthesia. A normotensive state facilitates the construction of sclerocorneal pocket tunnel, delivery of nucleus and expression of epinucleus.[6] A sclerocorneal pocket tunnel is dissected with an external incision varying from 5-6.5 mm depending upon the size of the endonucleus.[7] Creation of large side pockets is essential for accommodating the largest of nuclei [Fig. 1].[8]

Two small beveled entries are made using a 19 or 20G microvitreoretinal (MVR) knife in the cornea adjacent to the limbus. The side port at 10 o'clock can be used for performing capsulotomy, hydrodissection, nuclear manipulation, aspiration of cortex and dialing of intraocular lens (IOL) in the bag. Another port is created at about 5 o'clock in the left eye and 7 o'clock in the right eye for introducing the ACM into the anterior chamber connected to the balanced salt solution (BSS) bottle 50 to 60 cm above the eye for building up sufficient hydropressure.[9]

The ACM is a hollow steel tube with a 0.9-mm outer diameter and 0.65-mm inner diameter.[8]

A continuous curvilinear capsulorrhexis (CCC) created under viscoelastic or fluid is preferred, though a can-opener or envelope can also be made. In a milky hypermature cataract, CCC performed under fluid through ACM can be advantageous as it washes away the white milky fluid improving the visualization of capsulorrhexis edge.[10]

Anterior chamber is entered by forward cutting movements using 3.2-mm keratome to produce a smooth cut which is parallel to the limbus in the cornea.

Hydroprocedures

Hydrodissection and hydrodelineation are performed separating the anatomical layers of the lens from the hard core nucleus facilitating nuclear prolapse from the bag into the anterior chamber through the CCC [Fig. 2]. [11] Adequacy of hydroprocedures can be checked by bimanual rotation of nucleus using two dialers [Fig. 3].[8]

Nuclear delivery

I Nucleus from posterior to anterior chamber

Anterior chamber is filled with viscoelastic. The free nucleus is lifted out of the bag by a Sinskey's hook introduced through the side port while taking care not to injure the capsulorrhexis margin [Fig. 4]. Once a pole is prolapsed out of the bag the nucleus is wheeled out like a tube from a tyre. In the anterior

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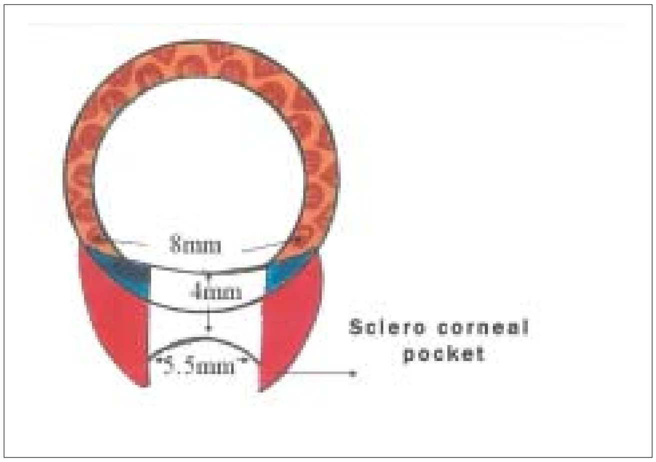

Figure 1: The sclero-corneal pocket tunnel

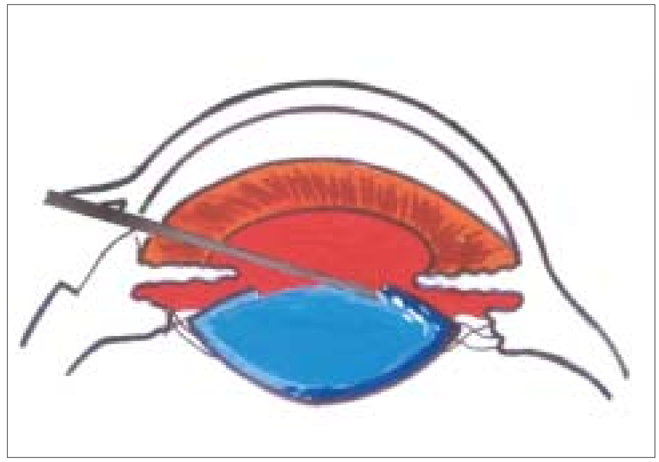

Figure 2: Fluid injection beneath the capsular rim for Hydrodissection

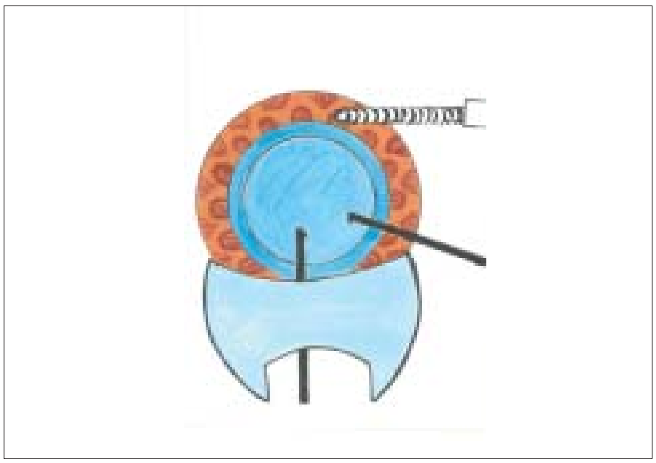

Figure 3: Bimanual rotation of nucleus using two dialers

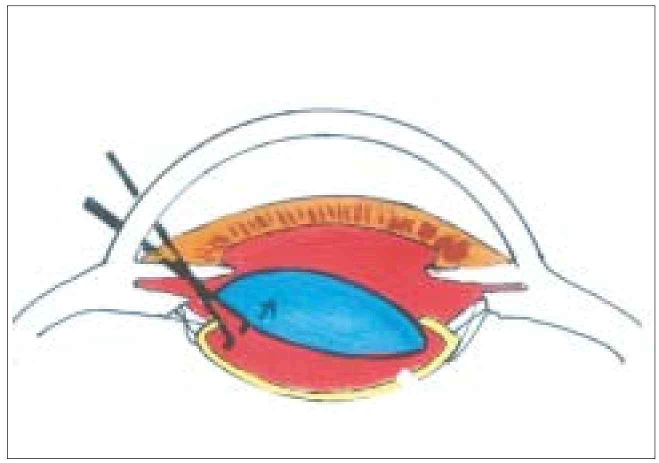

Figure 4: Nuclear prolapse out of the bag

chamber, viscoelastic is injected in front of and behind the nucleus to protect the endothelium.

II Nucleus from anterior chamber to delivery out of the eye

The nucleus is mounted on a lens glide, a piece of plastic 2 cm long, 4 mm wide, 0.3 mm thick, designed by Sheets in 1978[12] is introduced between the nucleus and the iris through the main port. The presence of the glide prevents the nucleus from being misdirected at 12 o'clock position averting a possible zonulysis.[13]

The ACM flow is put on and intermittent pressure is applied on the lens glide at 12 o'clock position. The point of pressure is gradually shifted posteriorly. The nucleus moves and gets engaged into the tunnel through a large (8-mm) inner opening of the tunnel, travels outwards and is eventually expressed. Raising the bottle height hastens the movement of nucleus. The remaining epinucleus and cortex can be hydroexpressed or aspirated.[14] Failure to engage could be due to inadequate internal wound, leaking port or vitreous in the anterior chamber.[15] Whenever the viscoelastic is injected into the anterior chamber, the ACM should be closed, otherwise all the viscoelastic will be expressed out of the eye during any manupulation in the anterior chamber.

Author's modification

Iris repositor is used instead of lens glide for railroading the nucleus.

In hard cataracts or leaking ports, viscoelastic is injected through the ACM (instead of BSS) continuously, which pushes the hard, large nucleus into the tunnel.

Once the tip of a hard nucleus presents at the outlet, it is engaged with a 23G needle and wheeled out. Debulking can also be performed by chipping off pieces from the presenting portion, pushing the nucleus back and re-engaging the reduced diameter.

Irrigation-aspiration

The ACM is connected to the BSS and flow is started, cortex is aspirated by an olive-tipped cannula through the side port. This provides easy access to the cortex in the capsular bag all around, especially at 12 o'clock position and the deep anterior chamber guards against posterior capsular tear.

Intraocular lens implantation

The ACM is removed and chamber is filled with viscoelastic material. Alternatively, IOL can be implanted with ACM with flow of BSS alone. The IOL is implanted within the bag and side ports hydrated. The wound if required is closed with an infinity shaped '∞'; suture and conjunctiva repositioned with the help of bipolar cautery.

Endothelial cell loss by Blumenthal Technique

The endothelial cell loss reported by George *et al*, in nuclear sclerosis Grade 3 or less is 4.21% (SD: 10.29) at six weeks.[16] Wright *et al*, found a mean central and superior cell loss of 16% and 22% respectively at three months when only fluid was used.[17] The authors observed a cell loss of 5.5% at three months when viscoelastic was used for nuclear delivery.[18] Further studies are required for establishing the role of viscoexpression using ACM in hard cataracts.

Conclusion

The Blumenthal technique is innovative, highly effective, reproducible in all grades of cataract, involving minimal intraocular manipulation which can be performed in physiological conditions of a closed system.

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