

Nucleus management in manual small incision cataract surgery by phacosection

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Nucleus management is critical in manual small incision cataract surgery (MSICS), as the integrity of the tunnel, endothelium and posterior capsule needs to be respected. Several techniques of nucleus management are in vogue, depending upon the specific technique of MSICS. Nucleus can be removed in toto or bisected or trisected into smaller segments. The pressure in the eye can be maintained at the desired level with the use of an anterior chamber maintainer or kept at atmospheric levels. In MSICS, unlike phacoemulsification, there is no need to limit the size of the tunnel or restrain the size of capsulorrhexis. Large well-structured tunnels and larger capsulorrhexis provide better control on the surgical maneuvers. Safety and simplicity of MSICS has made it extremely popular. The purpose of this article is to describe nucleus management by phacosection in MSICS.

Key words: Cataract, nucleus, small incision cataract surgery

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Introduction

Manual small incision cataract surgery (MSICS) is gaining popularity.^[1] Nucleus management is an important part of MSICS.^[2] Blumenthal described a minification of nucleus wherein the nucleus and epinucleus are dissected into smaller elements by proper hydrodissection and hydrodelamination.^[3]

The nucleus is expressed through the tunnel by pressurizing the anterior chamber with a continuous fluid inflow through an anterior chamber maintainer (ACM). The nucleus is guided out of the eye with the help of a Sheet's glide. The sclerocorneal tunnel is created like an inverted funnel, with a larger internal opening. Side pockets are created in the sclera to capture the leading hemicircumference of the nucleus. There are several modifications to this technique, with the use of mechanical or visco assistance instead of hydroexpression. In viscoexpression, the nucleus is moved into the anterior chamber, and then the posterior lip of the tunnel is pressed down with a wire vectis after engaging the upper pole of the nucleus.^[4] Viscoelastic is now continuously injected into the anterior chamber (AC), either through the main tunnel or through the side port. The positive pressure pushes the nucleus out through the tunnel. Some techniques involve pulling the superior rectus bridle suture to further pressurize the globe.

In phacosection, the nucleus is divided into two^[5] or three^[6] parts vertically. Each segment is delivered from the AC with visco-sandwich technique. Bisecting or trisecting the nucleus avoids stretching of the tunnel during delivery, minimizes the surgically induced astigmatism and offers maximum protection to the endothelium. The epinucleus and most of the cortex are removed along with the nucleus. The purpose of this article is

to describe nucleus management by phacosection technique in MSICS.

Materials and Methods

A good cortical cleaving hydrodissection is performed to completely separate the capsule from the cortex. Hydrodelineation is not performed. The nucleus is rotated within the capsule using a 26-gauge cannula in the right hand and Sinsky hook in the left hand [Fig. 1]. This bimanual motion is akin to rotating the steering wheel of a car, and puts no stretch on the zonules and creates a cleavage between peripheral loose cortex and the inner firm cortex. Nucleus is then pushed gently to its left with the Sinsky hook by 1 mm or so, engaging the front surface of the nucleus at its center. The tip of the 26-gauge cannula is then passed under the right edge of the nucleus, and the equator is lifted up to a plane slightly in front of the capsular bag. The nucleus is then rotated anticlockwise, bimanually. The cannula supports the nucleus just behind its equator, and the Sinsky hook gives the rotating push in an anticlockwise direction. As the right edge of the nucleus is lifted up to the front of the anterior capsule, the rest of the nucleus gets rotated out of the bag like a screw coming out of a bolt. The two instruments actually work on the equator of the nucleus, with a slight lifting force [Fig. 2]. The nucleus should remain well centered throughout this bimanual procedure to avoid zonular stretch, as lateral movement of the nucleus exerts a stretch on the opposite zonules.^[7] This precaution is especially important in myopes, mature cataracts, brown cataracts, pseudoexfoliation and subluxations. The epinucleus and majority of the cortex remain attached to the nucleus, and get removed during these maneuvers. In very soft nuclei, like in posterior subcapsular cataracts, the 23-gauge cannula is passed right into the center of the nucleus, like a stick inside a lollypop. The entire nucleus is nudged and maneuvered into the AC. Good hydrodissection facilitates this.

Endothelial protection is of paramount importance and is achieved by continuous injection of dispersive viscoelastic

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Figure 1: Bimanual rotation of the nucleus



Figure 2: Bimanual rotation of nucleus through a smaller rhexis

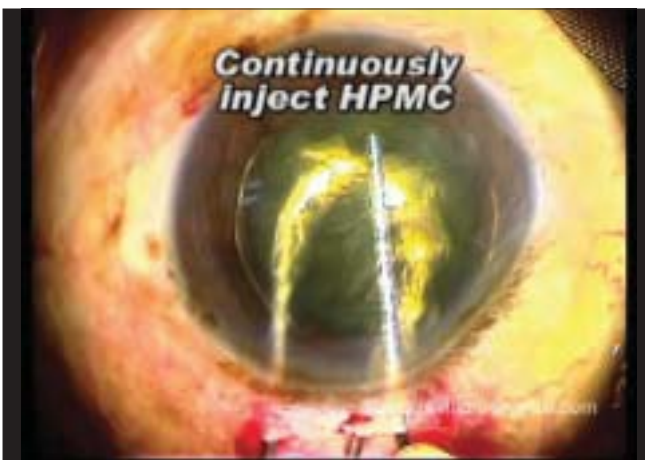


Figure 3: Bisection of the nucleus



Figure 4: Visco-sandwich-expression of the second half of the nucleus

throughout the next few steps. Once the entire nucleus is in the AC, the wire vectis is held in the left hand and the 26-gauge cannula on a 2-mL visco syringe in the right hand. The thumb of right hand is on the piston, continuously injecting the dispersive viscoelastic. The 12 o' clock nucleus is slightly lifted up with the cannula and the wire vectis is passed under the nucleus in conformity with the biconvex shape of the nucleus. The posterior bulge of the nucleus should not be pushed by the advancing wire vectis as it makes the nucleus move downwards. Beware of the inferior iris as it should not be caught between the vectis and the nucleus. The lower end of the vectis is visible through all types of nuclei, and if the tip is not visible, then it is possibly behind the iris. The 26-gauge half-inch cannula is now aligned in front of the nucleus, continuously injecting the dispersive viscoelastic. The cannula is now slowly pressed towards the vectis so that its shaft bisects the nucleus [Fig. 3]. The vectis is held steadily supporting the exact middle of the nucleus. The blunt shaft of 26-gauge cannula can bisect any nucleus, however hard it may be. The visco is injected between the two halves of nucleus to confirm that they are fully separated. If any connections remain, they need to be nudged with the cannula. Otherwise, the second half of nucleus tends to follow the first half during its extraction, causing an endothelial touch.

The vectis is now slipped under the left half of the nucleus. The cannula supports the nucleus on its front surface. By injecting viscoelastic continuously, the sandwich containing the vectis, nucleus and cannula is slowly extracted out through the tunnel. The direction of the movement is in line with the tunnel, and is not to be altered till the lower end of the nucleus is out. Care should be taken that the scleral valve does not engage the upper pole of the nucleus. This can be achieved by raising the upper end of the nucleus anteriorly and depressing the posterior lip of the tunnel as the nucleus enters the tunnel. The viscoelastic is then injected in front of the right half of nucleus, which is then moved to the center of AC, in line with the tunnel. It is similarly sandwiched between the wire vectis and visco-injecting cannula and gently taken out of the eye [Fig. 4]. It should be remembered that the viscoelastic is continuously injected throughout, which not only protects the endothelium but also prevents the AC from collapsing. A dispersive viscoelastic, such as hydroxyl propyl methyl cellulose (HPMC) or chondroitin sulfate, protects the endothelium better than cohesive viscoelastics.

Capsulorrhexis should be large in MSICS. It is wise not to dial out the nucleus if the capsulorrhexis is undersized. A single small nick at 10 o' clock with a cystitome at the edge

of the capsulorrhexis creates a relaxing incision. A good hydrodissection can still be performed starting from a point opposite the site of relaxing incision. Before that, remove any viscoelastic from the AC, and keep the tunnel open so that there is a resistance free passage for the fluid to go out of the eye. Aim only for a fluid wave and not for lifting or prolapsing the nucleus with fluid. During the cortical aspiration stay away from the area around the relaxing cut till the very end. The cortex will hold the cut capsule together preventing the tear from extending into the posterior capsule.

At times, the nuclear fragment can break into pieces in the tunnel. If it is a small fragment, it can be removed by viscoexpression.^[8] If it is large, it is better to push it back into the anterior chamber with viscoelastic before reattempting. The Epinucleus and much of the cortex is generally removed with the nucleus. If the epinucleus is left behind, it is best managed by vectis assisted viscoexpression. It is brought to the center of the AC using a cannula. Then, it is viscoexpressed by depressing the posterior tunnel wall, assisted by a wire vectis.^[9]

Nuclear management in MSICS is simple, effective, efficient, practical, and suits every type of cataract. The stretch on zonules and posterior capsule are minimal, and so, challenging cases can be safely handled. Complications are least and results are excellent. In phacosection, the bisected halves of the nucleus easily glide out, without stretching the tunnel.^[10] A rectangular tunnel of size 6 mm x 2.5 mm is adequate, and as the tunnel is not stretched, heated or torn, the corneal topographic parameters are not significantly altered. A properly placed incision can be used to neutralize the preexisting astigmatism in MSICS.^[11] Phacosection helps in reducing the size of incision in MSICS.

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