HOW TO ACHIEVE PERFECT CONTINUOUS CURVILINEAR CAPSULORHEXIS IN INTUMESCENT CATARACT UNDERGOING SMALL INCISION CATARACT SURGERY- TIPS FOR BEGINNERS

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ABSTRACT

BACKGROUND

Continuous Curvilinear Capsulorhexis (CCC) is an essential step for cataract surgery. CCC in white intumescent cataract is more challenging due to multiple factors like swollen lens, stretched thin capsule, liquefied cortex obstructing the view and no fundus glow.

The aim of the study is to formulate guidelines to achieve perfect Continuous Curvilinear Capsulorhexis (CCC) in intumescent cataract undergoing small incision cataract surgery.

MATERIALS AND METHODS

In our prospective study, 66 patients with white intumescent cataract underwent cataract surgery by single experienced surgeon. Staining of anterior capsule with trypan blue, soft shell technique of viscoelastic were used and lenticular decompression was carried out by aspiration of liquefied cortical material through 23G needle. CCC was completed using micro capsulorhexis forceps.

RESULTS

We were able to achieve good, average and poor CCC in 84.8%, 7.5% and 7.5% patients, respectively.

CONCLUSION

We conclude that 23G needle is simple and cost-effective mean to decompress the intumescent lens in rural peripheral settings. Soft shell technique and micro capsulorhexis forceps further help to achieve perfect CCC in controlled fashion.

KEYWORDS

Intumescent Cataract, Soft Shell, Lenticular Decompression, Micro Capsulorhexis Forceps.

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BACKGROUND

Continuous Curvilinear Capsulorhexis (CCC) is an essential step for cataract surgery. Every cataract surgeon aims to achieve perfect CCC during the surgery. The incidence of incomplete capsulorhexis associated with white cataract surgery has been reported to be from 3.85% to 28.3%.[1] CCC in white intumescent cataract is more challenging due to multiple factors like swollen lens, stretched thin capsule, liquefied cortex obstructing the view and no fundus glow.

For better visualisation of anterior capsule staining with fluorescein 2% or gentian violet 0.001%, Indocyanine Green (ICG) 0.5%, trypan blue[1,2,3,4] and the patient's autologous blood have been tried. But, most of these have fallen in disfavour due to various reasons. Trypan blue 0.06% is now most preferred dye.

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Visualisation of anterior capsule is easy and any unwanted extension/tear of anterior capsule into periphery can be checked immediately with staining. Thus, it also saves the complication of anterior capsular tear extending to posterior capsule. Pattern of staining of anterior capsule also gives us a clue about any abnormality in anterior capsule. If the staining is uniform and smooth, probably capsule is healthy, but if any deposits or dark staining patches are seen, this can be indicative of calcified spots or shrunken degenerated capsule. In these cases, CCC can't be completed with cystitome. In this situation, we have to grasp the capsule with capsule holding forceps or cut the capsule with the help of Vannas scissors.

In intumescent, cataract swollen lens pushes iris lens diaphragm forward. Increased intralenticular pressure in these cases generates centrifugal force resulting in capsular tear extending towards periphery. Different techniques have been tried for achieving CCC in these cataracts like two stage CCC;[5,6] C-Rhexis technique,[7] femtosecond-assisted capsulotomy,[8] etc. In two stages CCC, first small CCC is performed followed by aspiration of liquefied cortical matter than in second stage large CCC is performed.

High viscosity viscoelastic sodium hyaluroate[1] is also used in intumescent cases to maintain anterior chamber

deep, thereby reducing the chances of tear extending into periphery.

Age-related intumescent cataract add further difficulty in CCC due to weak zonules. We have to be vigilant to rule out zonular dehiscence in these case. Various clues to weak zonules are difficulty in doing CCC in particular quadrant, gush of dye from behind the iris on attempted CCC, fold formation around the needle tip[9] or unusual movements of lens.[9]

Situation becomes more complicated as large capsulorhexis of 6 to 6.5 mm is required for comfortably delivery of nucleus in SICS. Many times, CCC margin extends to periphery and then CCC has to be converted to can opener capsulotomy. Capsulotomy in thickened capsule is also difficult and any attempt to go ahead with capsulotomy further adds up the pressure over already weak zonules. This situation warrants that capsulotomy should be tried using pulling technique with capsule holding forceps rather than pushing technique with capsulotomy needle. Author feels that zonules are not further compromised with pulling technique.

Lastly, adequate peribulbar block ensures patient comfort and compliance throughout the surgery. Short and long-acting local anaesthetics along with adrenaline ensure early onset as well as prolonged action. Adrenaline also reduces intraocular volume due to vasoconstriction and hyaluronidase helps in achieving effective akinesia.

Thus, all these problems associated with intumescent cataract, if addressed properly and timely, it helps us to achieve perfect CCC. In our study, we addressed these concerns and then analysed the outcome in terms of CCC size, shape and any extension.

Objective- The aim of this study was to formulate guidelines for perfect CCC in white intumescent cataract.

MATERIALS AND METHODS

In our prospective study, patients with white intumescent cataract coming to OPD were included. Patients having any other ocular comorbidity, preoperatively-diagnosed zonular dehiscence and traumatic intumescent cataract cases were excluded.

In this study, 66 patients were enrolled during study period April 2014 to April 2016. All the patients underwent surgery by single experienced surgeon taking all the precautions formulated in study protocol to achieve perfect CCC. Postoperatively, the type of CCC was analysed in terms of size, shape and any extension of it into periphery.

Detailed slit-lamp and fundus examination, preoperative investigations were carried out as in routine cataract surgery. They all underwent SICS (small incision cataract surgery) under adequate anaesthesia and akinesia using peribulbar block. We used 2% lignocaine with adrenaline and 0.5% bupivacaine with 15 IU/mL hyaluronidase in 1:1 ratio for peribulbar block.

Wireless eye speculum was applied and superior rectus bridle suture was taken for stabilising the globe and facilitating delivery of nucleus. Adequate length side port with valve action was made with 15 degrees side port blade. Direction of side port blade was kept parallel to iris surface. Before starting CCC, chin was adjusted to keep iris plane horizontal to prevent CCC from extending towards periphery. Anterior Chamber (AC) was formed with air and then 0.06% trypan blue dye was used to stain anterior capsule. Addition of air bubble prevents endothelial toxicity and avoids dilution of dye due to aqueous. Dye was kept in AC for one minute for better staining and then it was washed thoroughly.

Methyl cellulose was used to form the anterior chamber, then high viscosity viscoelastic sodium hyaluronate 1.4% was injected in central part of anterior chamber in all cases.

2 cc syringe with 23G (1 inch) needle was introduced in anterior chamber. Tip of the needle with bevel up was passed under ant capsule at center to withdraw 0.1 to 0.2 cc of milky fluid from intumescent lens. Now, the needle was removed from side port. Aspiration of fluid reduces intralenticular pressure, which is the cause for Argentinian flag sign, i.e. sudden extension of tear into periphery of capsule.

A 26G 0.5-inch needle cystitome was introduced into central anterior capsular opening and flap was made and reflected using pushing technique. AC is reformed with cohesive viscoelastic and micro capsulorhexis forceps is used to complete CCC. Special precaution was taken to pull the capsule flap for 2-3 hours, then release and regrasp again near tearing edge. The pulling force always needs to be directed towards center of cornea. Micro capsulorhexis forceps is very thin and easily passes through the side port. Advantage of using side port for passage of forceps is that AC is always maintained. Fornix-based conjunctival flap was made. A 6-mm long corneoscleral tunnel of about 1.5 to 2 mm away from limbus was made. Delivery of nucleus, irrigation-aspiration of remaining cortical material and intraocular lens implantation was carried out as practiced routinely. Intraoperative difficulties were observed and analysed. Postoperative follow-up examination was conducted like routine cataract cases.

RESULTS

Our aim was to achieve 6 to 6.5 mm of circular and well-centered CCC.

	Numbers	Percentage
Good CCC	56	84.84%
Average CCC	5	7.5%
Poor or failed CCC	5	7.5%
Total	**66**	**100**

Good CCC was defined as when we were able to make perfect circular, well-centered CCC. Average CCC meant CCC was eccentric and vertically oval, while failed CCC was extension of CCC into periphery or CCC converted to can-opener technique.

In all these cases including failed CCC group, we were able to implant PCIOL and no intraoperative complications were observed in these patients.

DISCUSSION

Staining of anterior capsule for better visualisation and use of 1.4% high viscosity viscoelastic[1,9] in intumescent cataract surgery is recommended by Megur and also Bhandari in C-rhexis technique. In our study, we have used soft shell technique for viscoelastic. In this technique, initial use of dispersive viscoelastic-like methylcellulose, followed by cohesive viscoelastic-like sodium hyaluronate in central part of anterior chamber leads to formation of soft shell. Methylcellulose in peripheral part of anterior chamber helps in smooth movement of anterior capsular flap, while sodium hyaluronate in central part exerts enough pressure on anterior capsular flap and helps in maintaining AC deep.

We have used side port for doing rhexis. Megur and Megur has also stressed on the use of side port for rhexis. This prevents escape of viscoelastic, thus maintaining positive pressure in AC and stabilising the capsule.

No correlation was found between age and sex of patient and CCC shape or size.

Different techniques have been tried by various studies to reduce intralenticular pressure.

Megur and Megur have used irrigation and aspiration cannula for reducing intralenticular pressure. Milking technique[10] suggest initial aspiration of liquefied cortical material with 27G needle. We preferred 23G needle over 27G needle, because 27G needle gets blocked being small in caliber. Megur and Megur had suggested side-to-side movement of bevel to prevent occlusion of tip. A 23G needle had been able to reduce intralenticular pressure effectively, thus avoiding occlusion of tip and extension of capsular tear associated with Megur technique.

Decompression of the lens by sweeping movement of OVD cannula from periphery to center for milking[10] of cortex is advised by other author. This technique is debatable, because the capsule is already fragile and thin. They also felt that stroking movement itself could lead to radial tear due to sudden mobilisation of cortex.

In C-rhexis technique by Bhandari,[7] small C-shaped incision of 3 mm x 1 mm opening is made in anterior capsule followed by aspiration of cortical matter with 25G cannula and then completion of rhexis. Dr. Gimbel[5] has advised two-stage techniques for rhexis in intumescent cataract. First, small CCC is made and aspiration of cortical matter is carried out through this opening and then rhexis is enlarged to desired size. Mini-rhexis technique[6] has also advocated two-stage techniques to prevent complications of capsular tear.

Capsulorhexis with phaco probe is also advised, but it needs considerable skill to perform rhexis in controlled manner. Femtosecond laser capsulotomy[8] is not only costly, but it also has the disadvantage in cases with very high intralenticular pressure. In such cases, sudden decompression and subsequent movement of the anterior capsule may lead to incomplete capsulotomy.

CONCLUSION

Small incision cataract surgeries are routinely performed by the beginners in rural peripheral settings. CCC in white intumescent cataract is more challenging due to multiple factors like swollen lens, stretched thin capsule, liquefied cortex obstructing the view and no fundus glow.

These challenges were overcome by simple, yet effective strategies like staining of anterior capsule for visualisation of anterior capsule supplemented by soft shell technique for viscoelastic use. To reduce intralenticular pressure of intumescent lens, 23G needle was used and it was found to be simple yet cost-effective technique, especially in rural settings. Use of micro capsulorhexis forceps introduced through side port further helps to achieve perfect CCC in controlled fashion.

We feel that if difficulties associated with intumescent cataract surgery are taken care of in advance and surgery is planned accordingly the results of surgery are comparable to routine cataract surgery. This paper will help the beginners performing small incision cataract surgery to achieve successful outcome in intumescent cataract cases.

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