Original article:

Small incision cataract surgery with horizontal nucleus dividing forcep

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Abstract:
Introduction: Small incision cataract surgery (SICS) is a popular technique in Indian scenario. Size of incision is the major concern in cataract surgery. Size of nucleus decides the length of incision required. In our technique a specially designed forcep is used to divide the nucleus in two pieces. Our aim was to study the outcome of nucleus management with horizontal nucleus dividing forcep in SICS.

Material and methods: seventy five patients of cataract operated with horizontal nucleus dividing forcep during study period from Feb 2009 to Jan 2010. Results were documented.

Results: Out of 75 patients 30 were male and 45 were females. Fifty six (74.66%) patients were between the age group of 51-70 yrs. Forty seven (62.66%) of patients were with Grade III nuclear cataract followed by Grade II 12(16.01%) and Grade IV in 10(13.33%). Size of incision was between 4-5 mm in 43 (57.33%) patients. 27(36.01%) patients had incision size between 5-5mm. only 5 (6.66%) patients required >6mm incision.1 (1.33%) patient had intraoperative zonulodialysis and 10 (13.33%) had minimal corneal edema (<10 descemet’s folds).

Conclusion: With this technique incision size can be reduced up to 4 mm. This is a safe and simple and economical procedure.

Keywords: small incision cataract surgery, horizontal nucleus dividing forcep, cataract.

Introduction
Small incision cataract surgery (SICS) is a popular technique in Indian scenario. In SICS nucleus is delivered manually through a sutureless wound. Size of incision is the major concern in cataract surgery. Various techniques are used to decrease the size of incision. Size of nucleus decides the length of incision. Delivery of the intact nucleus requires bigger incision. Dividing the nucleus in two or more pieces manually makes it easier to deliver the nucleus thereby decreasing the size of incision. Damage to the corneal endothelium and posterior capsule are the major concerns in SICS. There are various techniques of nucleus management in SICS like Blumenthal’s technique, phacofracture using wire snare/bisector/trisector, Preschool phacofragmentation, manual multiphaco-fragmentation, Quarter’s extraction technique, chopstick’s technique, Phacopunch, jaw’s slider pincer technique, double wire snare splitter technique, Khouri manual phacofragmentation, nylon loop phacosection etc. 

[1,3,4,5,6,7,8,9,10] In these techniques the instruments are in close
proximity to the corneal endothelium and posterior capsule, which can cause damage to these vital structures. Our aim was to study the outcome of nucleus management with horizontal nucleus dividing forcep in SICS.

**Material and method**

Observational study of 75 patients of cataract operated with horizontal nucleus dividing forcep during Study period from Feb 2009 to Jan 2010. Study was conducted at tertiary care centre, Latur. Patients were observed for intraoperative ease of nuclear division, length of incision, complications during nucleus management like damage to corneal endothelium, iris, lens capsule and zonules. Postoperatively patients were examined for corneal edema and intraocular inflammation. Written informed consent for the procedure was taken from all in patients.

**Inclusion criteria** – All patients with cataract willing to get operated were included in the study.

**Exclusion criteria-** 1) Patients with non dilating pupil. 2) Patients having zonular weakness on examination. 3) Shallow anterior chamber.

Ethical institutional clearance was obtained for the study.

**Surgical technique-** The surgery is performed under peribulbar anesthesia. Under all aseptic precautions, painting and draping is done. Wire speculum is applied. Superior rectus suture is taken. Fornix based peritomy is done. Haemostasis achieved. Partial thickness scleral groove is made 2mm posterior to the limbus. Size of incision depends upon the grade of nucleus from 4mm to 6mm. Sclerocorneal tunnel dissection is done up to 2mm in clear cornea. Side port made on right side, 90 degrees away from the main incision. Anterior capsule stained with Trypan blue dye. Continuous curvilinear capsulorhexis is done. Anterior chamber (A/C) is entered through the main wound with the 3.2mm blade and the incision is extended sideways. Hydro delineation is done with cannula or Simcoe’s irrigation aspiration cannula. With hydro delineation left pole of the nucleus is prolapsed out of the bag. If this does not happen then the A/C is filled with the viscoelastic and left pole of the nucleus is lifted with the dialers to make the nucleus to stand vertical. After the left pole of the nucleus gets prolapsed in the anterior chamber, viscoelastic solution is injected from left side of the nucleus to make it stand oblique or vertical. Softer nucleus can be made to stand vertical. The forcep is inserted in the A/C with closed blades. As the tips get close to the nucleus the blade are opened passing the blade from side of the nucleus at or just below the center of the nucleus. The blade are made to separate with the left hand by separating the handle if required so that the tips of forcep will pass easily by the side of the nucleus. The tips of the forcep should be at the edge of the nucleus inferiorly. At this time the blades of the forcep is at the papillary plane. Once the tips are in proper position the blades are closed with pressure on handle. Direction of force should be horizontal and slight upwards. Force should never be directed inferiorly or superiorly. As the pressure is applied, the nucleus will be divided into the two pieces, upper and the lower one (Image 1). Both pieces will be laying horizontal, upper one in the A/C and lower one in the bag. Second attempt is required sometimes in hard cataracts. Superior piece is delivered with the
The A/C is filled with the viscoelastic solution. Lower piece is taken to the A/C with the dialer and then delivered with viscoelastic solution. Cortex is aspirated through the side port. Intraocular lens is inserted in the bag. A 5mm optic lens goes the 4mm external incision with little pressure. A/C is maintained with viscoelastic solution throughout the procedure. A/C is formed with the saline / air. Stability of the chamber is checked. Superior rectus suture is removed. Subconjunctival injection of the Gentamycin and Dexamethasone is given Antibiotic steroid ointment is applied and eye is patched.

**Horizontal nucleus dividing forcep** – This forcep is designed by author 1. It is a combination of a corneal scissor and a McPherson forcep. Blades are like forceps without a cutting edge. The length of the blades is 10mm, distance between tips in resting position is about 5mm and can be increased if required in hard cataracts by pressing on the handle. In resting position the blades are separated like scissor and are lying horizontal. When closed the maximum width of the forcep will be less than 3mm at joint and this will be at the crossing of the blades. The blades approximates with each other on applying pressure on handle. Handle is having spring action like a corneal scissor. The blades are joined with handle at an angle such that when the handle is held like a pen the blades are parallel to the plane of the iris. Blades have serrations on inner side for better grip of nucleus (Image 3 and Image 4).

**Results**

Total 75 no of patients were operated. 30 were male and 45 were female.

### Table 1 – Age wise distribution of patients

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>No of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>31-40</td>
<td>04</td>
<td>05.33</td>
</tr>
<tr>
<td>41-50</td>
<td>12</td>
<td>16.01</td>
</tr>
<tr>
<td>51-60</td>
<td>34</td>
<td>45.33</td>
</tr>
<tr>
<td>61-70</td>
<td>22</td>
<td>29.33</td>
</tr>
<tr>
<td>71-80</td>
<td>03</td>
<td>04.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>75</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

### Table 2 - Grading of nucleus

<table>
<thead>
<tr>
<th>Grade of nucleus</th>
<th>No of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>06</td>
<td>8.00</td>
</tr>
<tr>
<td>II</td>
<td>12</td>
<td>16.01</td>
</tr>
<tr>
<td>III</td>
<td>47</td>
<td>62.66</td>
</tr>
<tr>
<td>IV</td>
<td>10</td>
<td>13.33</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>75</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

### Table 3 - Length of scleral incision

<table>
<thead>
<tr>
<th>Size of incision</th>
<th>No of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-5mm</td>
<td>43</td>
<td>57.33</td>
</tr>
<tr>
<td>5-6mm</td>
<td>27</td>
<td>36.01</td>
</tr>
<tr>
<td>&gt;6mm</td>
<td>05</td>
<td>06.66</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>75</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
Table 4- Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>No of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>zonular dehiscence</td>
<td>1 (1.33%)</td>
</tr>
<tr>
<td>Corneal edema (mild)</td>
<td>10 (13.33%)</td>
</tr>
<tr>
<td>Uneventful</td>
<td>64 (85.34%)</td>
</tr>
<tr>
<td>Total</td>
<td>75 (100%)</td>
</tr>
</tbody>
</table>

**Image 1:** Division of nucleus with the forcep.

**Image 2:** Delivery of nuclear piece by viscoexpression.

**Image 3:** Horizontal nucleus dividing forcep Front view.

**Image 4:** Horizontal nucleus dividing forcep Side view.

**Image 5:** Post op day1 – Grade 1 cataract.
Table 1 shows patients between 31-40 yrs of age were 5.33%.
Patients between 41-50 yrs of age were 16.01%.
Patient between 51-60 yrs of age were 45.33%.
Patients between 61-70 yrs of age were 29.33%.
Patients between 71-80 yrs of age were 4%.

Table 2 shows patients with GR I nuclear cataract were 8%.
16.01% had GR II nuclear cataract
62.66% had GR III nuclear cataract
13.33% had GR IV nuclear cataract

Table 3 shows Length of scleral incision.
57.33% patients required 4-5mm of incision.
36.01% were operated with 5-6mm of incision.
6.66% patients required >6mm incision.
Patients with grade IV nuclear cataract required larger incision. (Image 5 and Image 6)

Complications - Table 4 shows complications observed.
Intraoperative complications - 1 (1.33%) patient had intraoperative zonular dehiscence while breaking the nucleus. Postoperative complications - Post operatively minimal Corneal edema (<10 descemet’s folds) was present in 10 patients which was resolved in 2-3 days. Corneal edema was more common in patients with grade IV nuclear cataract patients.
Corneal edema was paracentral where nucleus touched endothelium. (Image 7)

Discussion
In various techniques of SICS pressure is applied vertically from above and below the nucleus to break it in to two or more pieces. [1] In Blumenthal technique A/C maintainer is required and nucleus is delivered intact. It requires special port for A/C maintainer and larger incision. [1, 5, 12]
In delivery with wire vectis, nucleus is delivered intact. This requires a bigger incision. Wire vectis is difficult to insert behind the nucleus. Chances of damage to capsule and iris are more.
In delivery with wire vectis and dialer/ chopper (phacosandwich), vectis is placed behind and another instrument is placed in front. The chances of damage to posterior capsule, endothelium and iris are highest in this technique.\cite{1, 9, 11} In SICS with snare a special snare is required. It is difficult to pass a snare around nucleus along with chances of damage to endothelium.\cite{1, 3} In phacofracture technique, an instrument is passed behind the nucleus and another instrument is passed in front and pressure applied on to the nucleus. Chances of damage to posterior capsule and endothelium are high in this technique.\cite{1, 12} In our technique nucleus is made to stand vertical/ slightly oblique in the papillary area. A/C is formed with viscoelastic. Then the blades of forcep are passed from sides parallel to iris plane at the centre of nucleus. The blades are under vision away from corneal endothelium, iris and posterior capsule. This minimizes chances of damage to these structures. Then forcep is closed and nucleus is divided in two pieces. Pressure is applied in horizontal direction with minimal uplift taking care not to press on capsular bag or against corneal endothelium. Nuclear pieces are delivered one by one. The blades of forcep are away from endothelium, iris and capsule chances of damage to these structures are less.

In our study no of male patients were more than females. 56/75 (74.66%) patients were between the age group of 51-70 yrs owing to the maximum incidence of cataract in this age group. 47 (62.66%) of patients were with grade III nuclear cataract. Incision size was between 4-5mm in 43 (57.33%) of patients and between 5-6 mm in 27 (36.01%) of patients. Incision size of >6mm required in 5 (6.66%) of patients. 1 (1.33%) patient had zonular dialysis intraoperatively. Mild corneal edema was the main postoperative complication (10.33%). No patient had severe corneal edema. Our findings are correlating with study by Parikshit M Gogate\cite{2} 2009. No patient had post operative iritis in our study.

**Conclusion**

Most of the patients in our study were between 50-70 yrs of age as cataract is more common at this age. Most of the patients had grade III – IV nuclear cataract. Incision size can be reduced to 4 mm. This technique can be used in all grades of cataract safely. This is a simple technique to master. Chances of complications are less. Thus this is a safe, simple and economical procedure. This technique is not useful in patients with small pupil and Zonular weakness and shallow A/C.

**References**