Original Article

Manual Small Incision Cataract Surgery : Experience at a Military Hospital

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Abstract

Background : Small incision cataract surgery came into practice with the advent of phacoemulsification. However, manual small incision cataract surgery (SICS) is a useful alternative for those who do not have access to phacoemulsification machine.
Method : A total of 69 cases of cataract were undertaken for manual incision cataract surgery and intra ocular lens (IOL) implantation using 6mm straight incision. The surgical technique and postoperative results are compared with the results of phacoemulsification and IOL implantation.
Result : Average postoperative astigmatism was ± 0.75 dioptres. Postoperative uncorrected visual acuity (UCVA) of 6/18 or better was observed in 51(71.9%) cases after first week of the surgery.
Conclusion : The study concludes that both phacoemulsification and small incision cataract surgery with intraocular lens (IOL) implantation are effective methods. However SICS with IOL implantation is a useful alternative in the absence of phacoemulsification machine.

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Key Words : Manual Small Incision Cataract Surgery (SICS); Extra Capsular Cataract Extraction (ECCE); Phacoemulsification; Intraocular lens implantation.

Introduction

In 1967, Charles Kelman performed the first phacoemulsification procedure on the human eye, heralding the beginning of small incision cataract surgery [1]. This procedure addressed the problems of healing, inflammation, suture related problems like irritation and astigmatism which are the major problems encountered with cataract surgery involving wide incisions (9.5 to 10.5 mm chord length).

Small incision cataract surgery (SICS) is also being practised by many eminent surgeons of the world. One such popular technique is anterior chamber maintainer assisted mini-nuc technique described by Professor M Blumenthal [2]. In SICS the nucleus of the lens is delivered through a 5.5 to 6.5mm self–sealing scleral tunnel incision as compared to 3.2-4 mm incision in phacoemulsification. This technique leads to greater postoperative comfort, quicker visual rehabilitation and results in lesser post operative astigmatism as compared to ECCE with sutured limbal wound [3]. Before starting phacoemulsification, it certainly helps if the surgeon is familiar with steps of manual small incision cataract surgery like continuous curvilinear capsulorhexis (CCC), hydroprocedures and nucleus manipulation in the bag [4].

Material and Method

A prospective study on SICS and intraocular lens implantation was conducted at a peripheral hospital from Aug 02 to Feb 04. A total of 69 cases of cataract have been included. Aim of this study was to record the results of SICS and to compare the results of this procedure vis a vis phacoemulsification and intraocular lens implantation as reported in the literature.

In all cases visual acuity and intraocular pressures (IOP) were recorded. Keratometry and axial length measurement with USG A-scan for IOL power calculation was done. Snellen chart at 6-metre distance was used for recording visual acuity. Intra ocular pressure was recorded with Schiotz tonometer. Slit lamp examination under full pupillary dilatation was done in all cases for evaluation of anterior segment. Binocular indirect ophthalmoscopy for evaluation of posterior segment was done in all but the cases of mature cataract. Cases with small rigid pupil which did not allow capsulorhexis of at least 5.5mm size, cataract with large and brown nucleus and eyes with suspected low corneal endothelial cell count (evaluated by specular reflection at slit lamp) were excluded. Cases with anterior segment disorders like anterior uveitis, glaucoma, pseudoexfoliation, corneal opacity/dystrophy were also excluded from this study. Small incision goal in cataract surgery can be achieved in 99.8% cases if patient selection is done with care [5].

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Procedure

Cases were performed under peribulbar anaesthesia using 3ml lignocaine (Xylocaine) 2% with 3 ml of Bupivacaine (Marcain) 0.75% mixed with hyaluronidase 7.5 turbidity units per ml. A limbal side port entry was made at 10 o' clock position using 20 gauge V-lance knife (Alcon). Another anterior chamber(AC) entry was made at 6 o'clock position for fixation of 20-gauge anterior chamber maintainer. Continuous curvilinear capsulorhexis (CCC) was performed under 2% hydroxy propyl methyl cellulose, using ½ inch 26 gauge bent needle as cystitome. In cases of mature cataract, 0.1% Trypan blue (Bluring) was used under an air bubble to stain the anterior capsule before undertaking CCC. Average size of CCC was 5-6 mm. Cortical cleaving hydrodissection and hydrodelineation was performed in all cases and freely rotating nucleus was prolapsed out of the capsular bag into the anterior chamber. Anterior chamber maintainer connected to infusion bottle at a height of 75 cm from the operation table was fixed to the paracentesis at 6 o'clock after the above procedures have been completed.

After fashioning a superiorly placed fornix based conjunctival flap and achieving haemostasis, anterior chamber maintainer fluid line was opened fully and 6 mm groove scleral incision centered at 12 o' clock, 1 mm behind the limbus, cut perpendicularly to approximately ¼ the scleral thickness, was made. Scleral tunnel was dissected into the clear cornea for about 1.5 to 2 mm using crescent knife so that the horizontal length of the pocket at its anterior most part was about 8 mm. Anterior chamber was entered using 3.2 mm angled keratome. 5.2 mm extender keratome was used to enlarge this opening into the anterior chamber (Fig 1a to 1d). The nucleus prolapsed into the anterior chamber , was delivered through the scleral tunnel incision by hydro dynamic expression after engaging the nucleus into the internal opening of the scleral tunnel using iris repositor to open the tunnel fully and leaving it closed alternatively (Figs 2a and 2b). In cases where nucleus will not express, the incision was enlarged to 7mm or standard ECCE was resorted to disregarding the scleral tunnel incision.Cortical wash was done using 20-gauge side port canula having an opening on its front surface, mounted on 5ml syringe.

In the bag, posterior chamber intraocular lens (PC IOL) placement was done through the scleral tunnel with anterior chamber maintainer in on position. Intra cameral injection pilocarpine 0.5% was used for papillary constriction only in cases with flabby iris or, where iris sphincter injury had occurred during nucleus delivery. An air bubble was placed into the AC where considered necessary, due to leakage from paracentesis wound. The AC maintainer was disconnected and the side port openings were hydrated (Fig 2c) by intrastromal injection of irrigating fluid using hydrodissection canula. No suture was applied except in cases where integrity of the wound was considered doubtful. In cases where scleral tunnel wound was found leaking, a single figure of eight mattress suture was placed. Postoperatively the patients were treated with topical steroids and nonsteroidal anti-inflammatory drops for six weeks.

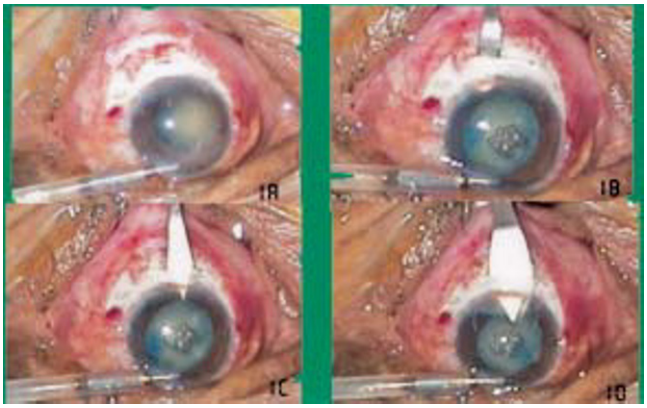

Fig. 1 : Scleral tunnel incision : a. Groove scleral incision centered at 12 'o'clock; b. Dissection of scleral pocket with crescent knife; c. Anterior chamber entry with angled keratome; d. Enlarging the internal opening of the scleral tunnel

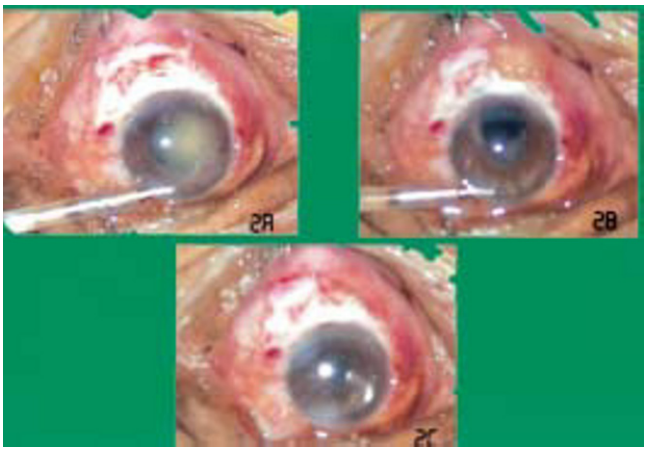

Fig. 2 : Nucleus delivery and IOL implantation : a. Nucleus proplapsed into the anterior chamber; b. Nucleus delivered by hydroexpression; c. Lens implantation complete and anterior chamber entry ports at 10 and 6 o'clock hydrated

During postoperative period, cases were examined for visual acuity and refraction. Slit lamp examination was done and glasses were prescribed after 6 to 8 weeks of surgery. Patients included in this series were followed up for 6 months.

Results

Out of the 69 patients studied, 44 (63.8%) were males and 25 (36.2%) were females. Categorywise, five (7.2%) cases were serving personnel, 14 (20.3%) cases were ex-servicemen and 50 (72.5%) cases were dependents of serving/ex-service personnel. In our series maximum number of cases 21 (30.4%) were grouped in 61 to 70 years of age. The distribution is shown in Table 1. Out of 69 cases, PC IOL was implanted in 66

Table 1

Age distribution of the cases (n=69)

Age (years)	No. of cases (%)
Up to 40	3 (4.3%)
41- 50	10 (14.5%)
51 - 60	17 (24.6)%
61 - 70	21 (30.4%)
71 - 80	18 (26%)

(95.7%) cases and AC IOL in three (4.3%) cases.

59 (85.5%) cases achieved best-corrected visual acuity (BCVA) of 6/12 or better. Six (8.7%) cases had BCVA between 6/18 and 6/24. Four (5.8%) cases had BCVA of 6/36 or less. Postoperative uncorrected visual acuity (UCVA) of 6/18 or better was observed in 51 (71.9%) cases after first week of the surgery. Postoperative astigmatism ranged from 0 to ± 2.25 dioptres. Out of 69 cases, 59 (85.5%) cases had astigmatism of 0 to 1 dioptre. In four (5.8%) cases astigmatism ranged from ± 1.25 to 1.75 dioptres. Six (8.7%) cases had astigmatism of ≥ ± 2 dioptres. Average astigmatism calculated by vector analysis was ± 0.75 dioptres. Majority (75%) of the cases showed against the rule (ATR) change. The distribution of astigmatism is shown in Fig 3. The commonest per-operative problem faced in our series was encountering the iris in the scleral tunnel during nucleus delivery in 7 (10.4%) cases. However in all these cases nucleus could be delivered successfully.

In one (1.4%) case, buttonholing of the anterior scleral flap occurred and it was converted into standard ECCE. Disturbance of vitreous occurred in four (5.8%) cases, out of which, in one case posterior chamber IOL could be placed successfully into the capsular bag and in other three cases anterior chamber IOL was implanted after anterior vitrectomy. Three cases (4.3%) had to be converted to limbal incision in view of the failure of nucleus to express through scleral tunnel incision (two cases) and due to posterior capsular dehiscence (PCD) (one case).

Mild striate keratopathy was seen in five (7.2%) cases, which resolved within 3-5 postoperative days. In one (1.4%) case, early stromal corneal oedema and later corneal decompensation occurred. Pupillary distortion was observed in five (7.2%) cases. Three (4.3%) cases showed early posterior capsular opacification (PCO) that was noticed within first six months after surgery. The details of complications are shown in Table 2.

Table 2

Complications in small incision cataract surgery (n-69)

Minor complication		
Striate Keratopathy	5	(7.2%)
Pupillary distortion	5	(7.2%)
Posterior capsular opacification	3	(4.3%)
Major complication		
Vitreous disturbance	4	(5.8%)
Corneal decompensation	1	(1.4%)

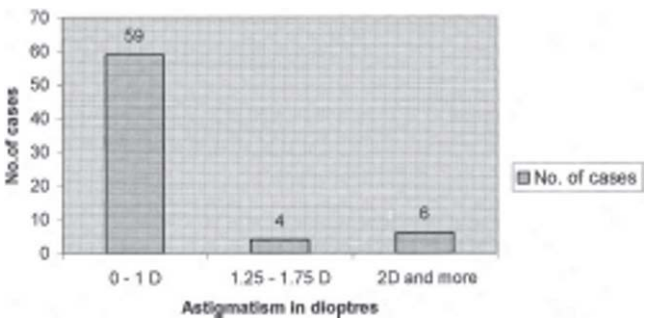

Fig. 3 : Postoperative astigmatism

Discussion

Smaller cataract incisions are better than a larger incision for reasons of wound integrity and control of iatrogenic astigmatism. There also seems to be an agreement amongst surgeons and patients that self-sealing incisions are preferred to sutured incisions. However variations of external incisions have been described as straight, frown (chevron) and inverted 'V' shaped. These incisions made within incision tunnel will be astigmatism equivalent [6]. In our study we have chosen straight incision in view of ease of construction and the fact that 'V'shaped incision has a potential for radial tear in the roof of scleral tunnel during insertion of IOL [3]. In addition the straight incision proves advantageous if the incision size needs to be increased in cases where the nucleus fails to express through the 6mm incision.

Iris was encountered in the scleral tunnel in seven (10.4%) cases due to intra operative pupillary constriction (four cases) and premature entry into the anterior chamber (three cases), which was managed by use of intra cameral adrenaline and repositioning the iris with methylcellulose.

Posterior capsular dehiscence (PCD) leading to disturbance of vitreous occurred in one case. PCD occurred during the process of hydrodissection. In this case a superior limbal incision had to be fashioned disregarding the scleral tunnel incision and the nucleus was delivered through the same after the nucleus was engaged by a needle passed into the anterior chamber through the side port paracentesis at 10 o'clock position. Zonular dialysis during nucleus delivery resulted in vitreous disturbance in three cases. In three cases with vitreous disturbance, anterior chamber IOL was implanted successfully after anterior vitrectomy. In one case (with Zonular dialysis in the inferior quadrant), PC IOL could be implanted without any problem.

The rate of vitreous disturbance/loss of 5.8% in our series compares well with 8.1% rate of vitreous loss in SICS (Blumenthal technique) and 5% in phacoemulsification in a series of 2095 cases [7].

In one (1.4%) case of early stromal corneal oedema and later corneal decompensation, mismatch between the corneal wound size and the nucleus size was surmised as the cause of this result. These relate to the cases when nucleus does not express [5] and one had to think about converting to standard ECCE to avoid excessive corneal endothelial insult that may result in subsequent corneal decompensation. In the setting of phacoemulsification rate of conversion to ECCE is 3.7%[8]. In our series we had to convert to standard ECCE in four (5.8%) cases. Our relatively higher rate

may be attributed to a cautious approach and a relatively smaller series.

59 (85.5%) of our patients achieved BCVA of 6/12 or better. In a randomised trial [9] 90% of the patients undergoing phacoemulsification through 3.2mm clear corneal incision (on steep corneal axis) and IOL implantation had 6/9 or better vision with spectacles at the end of 6 weeks, which is better than our results with SICS as far as postoperative visual outcome is concerned. The incision size and the choice of incision site on the steeper site in these cases is the likely cause of better postoperative acuity. Apart from the larger incision size, we had used incision centred on 12 o'clock position in all cases.

Six (8.7%) cases had a final BCVA between 6/12 and 6/24. Three cases in the latter group showed early posterior capsular opacification (PCO), two cases had undergone anterior vitrectomy with AC IOL implantation and one had heavy pigment deposit on the PC IOL. Two cases with evidence of age-related macular degeneration (ARMD), one with posterior capsular plaque and one with corneal decompensation fell into the group of 4 (5.8%) cases having BCVA of 6/36 or less.

Average astigmatism at the end of 6 weeks was ± 0.75 dioptre which compares well with the results of phacoemulsification in a randomised trial where astigmatism (mean cylinder dioptre) was < 1 dioptre [9]. Our results also compares well with the results of the series reported by Malik et al [10], who reports astigmatism of 0.75 ± 0.35 dioptre at 4 weeks post-op in SICS with 6mm straight incision. As regards postoperative astigmatism, published evidence [11] report that the difference in surgically induced astigmatism between SICS and phacoemulsification with rigid IOL was not statistically significant. The astigmatism is least, if the incision is within the astigmatically neutral funnel and smaller incision farther away from cornea lead to less astigmatism [12]. In addition preoperative keratometry helps in managing preexisting astigmatism by making suitable choice for incision site. We have used incisions centered at 12 o'clock position only for reasons stated above.

Postoperative irritability of the eye was seen in five (7.2%) cases. Four (5.8%) of these were the cases which had suffered vitreous disturbance. One (1.4%) case with postoperative irritability of eye developed corneal decompensation later.

In conclusion both phacoemulsification and small incision cataract surgery (SICS) with intraocular lens (IOL) implantation are effective methods of dealing with cataract.

Conflicts of Interest

None identified

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