Original Article

Comparison of Complications between Forceps and Injector Delivery for Acrylic Multipiece IOL

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Purpose: To compare complications between forceps and injector delivery for Acrylic multipiece intraocular lens (IOL) in phacoemulsification.

Study Design: Non-randomized Clinical Trial.

Place & Duration of Study: Yaqin Vision Eye center from October 2002 to June, 2017.

Material and Methods: All patients undergoing routine phacoemulsification with implantation of foldable acrylic multipiece IOL (Acrys of MA60 AC, Alcon, USA) were included in the study. The patients were divided into two groups according to the method of insertion of the IOL. Group A included patients undergoing foldable implantation with forceps while group B included patients in which injector was used to implant the IOL. Any complications arising during insertion of IOL were recorded in the electronic records of the patients.

Results: There were 820 patients out of which Group A included 408 patients while group B included 412 patients In group A there were 392 (96%) IOLs implanted in the bag and 16 (4%) in the sulcus. In group B there were 396 (96%) IOLs implanted in the bag and 16 (4%) in the sulcus. Forceps delivery needed enlargement of incision to 3.5 – 4.0 mm for IOL insertion with no insertion related complication. While Injector delivery needed only 3.0 mm enlargement of wound with few injectors related complications. These included optic and haptic damage 2 (0.48%), flipping of IOL back to front 4 (0.97%) and posterior capsular rent (PCR) with haptic 1 (0.24%) while injecting.

Conclusion: Delivery of multipiece IOL with injector has more complications compared to forceps delivery.

Keywords: Phacoemulsification, Acrylic intraocular lens, Injector, Forceps.

Cataract surgery is the most common procedure done across the world for the management of the number one cause of treatable blindness[1]. Advancements in cataract surgery have evolved new procedures with small incision producing very little astigmatism postoperatively and thereby producing quick visual recovery for the patient[2]. These requirements are met by phacoemulsification and therefore it has become the most popular technique for cataract surgery during the past decades[4]. Small incision size requires a foldable IOL to be inserted after removal of the cataractous lens. Two techniques have been used to achieve this goal. Folding of the IOL with a specially designed forceps has been a popular technique in the past. The technique is easy to learn with minimal instrumentation. The technique does require the incision to be enlarged. Using an injector has come in vogue in the recent years and it causes less manipulation and minimal wound enlargement. Moreover the risk of infection is reduced due to no contact of the IOL with the lid or conjunctiva during

the insertion. The technique requires a disposable cartridge and injector system which has a learning curve in the beginning[6]. Some studies suggest that forceps delivery of IOL drags microorganisms into eye[7]. Hydrophobic acrylic IOL with square edge design produces the least posterior capsular opacifications[8,9]. The rationale of this study is to compare the complications of forceps versus injector delivery systems for hydrophobic acrylic multi piece foldable IOL in phacoemulsification.

MATERIAL AND METHODS

This non-randomized clinical trial was conducted in Yaqin vision center, Lahore from October 2002 to June, 2017. Approval was obtained from hospital ethical review board. All patients undergoing routine phacoemulsification with implantation of foldable acrylic multipiece IOL (Acrys of MA60 AC, Alcon, USA) were included in the study. The patients were divided into two groups according to the method of insertion of the IOL. Group A included patients undergoing foldable implantation with forceps while group B included patients in which injector was used to implant the IOL. Total 820 patients were included in study. Group A included 408 (49.76%) patients and 412 (50.24%) patients were included in Group B. Patients undergoing phaco trabeculectomy, phaco vitrectomy, lensectomy and implantation of all other types of IOL, were excluded from the study. Any complications arising during insertion of IOL were recorded in the electronic records of the patients.

Surgery in both groups was performed by the same surgeon using a 2.75 mm incision at 12 o clock. The wound was enlarged to 3.5 - 4 mm for forceps delivery of IOL insertion. While in the cases with Injector delivery wound was only enlarged to 3.0 mm. complete evaluations of all patients was done before surgery including complete ocular and systemic history and eye examination including best corrected visual acuity assessment, extra ocular movements and dilated fundus examination on slit lamp. Preoperative kerotometery using Javal-Shiotz keratometer or IOL master and axial length using acoustic or Optical biometer were recorded. Majority of the patients were operated under subtenon anesthesia while some required retrobulbar or topical anesthesia.

All patients underwent a standard surgical procedure and were examined on 1st post-operative day. Slit lamp examination was performed to evaluate post-operative anterior uveitis. Topical antibiotics and steroids ciprofloxacin or moxifloxacin, 0.1% dexamethasone and diclofenac sodium or nepafenac eye drops were prescribed in all cases.

All the data was recorded and analyzed by SPSS-20. Qualitative variables like gender and complications were described in frequency and percentage. Numerical variables like age were described by mean and standard deviation. Complications due to the injecting technique in two groups were compared by applying student's `t' test with significance P value equal to or less than 0.05.

RESULTS

Out of 820 patients Group A included 408 patients with average age of 63 ± 12.2 yrs with 189 (46.32%) males and 219 (53.68%) females while group B included 412 patients with average age of 60 ± 16.4 years with 182 (44.17%) males and 230 (55.83%) females. In group A there were 392 (96%) IOLs implanted in the bag and 16 (4%) in the sulcus. In group B there were 396 (96%) IOLs implanted in the bag and 16 (4%) in the sulcus. Forceps delivery needed enlargement of incision to 3.5 to 4.0 mm for IOL insertion with no insertion related complication. While Injector delivery needed only 3.0 mm enlargement of wound with few injectors related complications. These included optic and haptic damage 2 (0.48%), flipping of IOL back to front 4 (0.97%) and posterior capsular rent (PCR) with haptic 1 (0.24%) while injecting. Injector insertion allowed insertion of IOL in bag in cases of small PCR due to deep and stable chamber

Table 1: Results of Forceps delivery of IOL.

In Bag			In Sulcus		
Intact CCC	**Radial Tear**	**Total**	**Small CCC**	**Radial Tear / PC rent**	**Total**
384	8	392	7	10	16

Group A, n = 408

Table 2: Results of injector delivery of IOL.

In Bag							In Sulcus				
Intact CCC	Small PCR	Radial Tear	IOL Front to Back	Damage to Haptic	Off Center IOL Crack	Total	Small CCC	Radial Tear/PC Rent	Radial Tear Due to Haptic	Haptic Damage	Total
378	6	8	2	1	1	396	5	9	1	1	16

Group B, n = 412

during IOL insertion compared to forceps delivery. These complications with injectors happened in early transition from forceps to injector technique. Patients with haptic damage had to undergo IOL removal with re-insertion of new IOL.

DISCUSSION

Cataract surgery has become a relatively safer procedure with highly predictable visual results due to advanced surgical technique and technology. Now a days patients undergoing cataract surgery expect comparable results to the patients undergoing refractive surgery. But the most important factor limiting final visual outcome after modern cataract surgery is the amount of postoperative astigmatism and it remains unpredictable most of the time. Surgically induced astigmatism (SIA) depends on location, type and length of the incision and to the source of wound closure techniques[8,9].

Self-sealed small-incision surgery with a foldable intraocular lens has become popular with a significantly lower complication rate[10,11]. Foldable intraocular lenses and improved IOL injectors and insertion forceps have made easier intraocular lens implantation through smaller incisions of phacoemulsification.

In studies related to cataract surgery incision size emphasized that the incision should be measured after IOL implantation[12]. In a study by Kohnen and Coauthors[12], they concluded that with use of injectors for IOL insertion cataract surgery incisions are enlarged by approximately 11.0%. Another study done by Mamalis[13] reported that they needed a larger wound for IOLs insertion with forceps as compared to lens insertion with the help of an injector. As in our study wound size with forceps delivery system was slightly larger than the wound with injector delivery system. It is important to know the proper size of a wound to avoid uncontrolled wound enlargement during foldable IOL implantation[14]. We used 2.7 5mm keratome in our study and wound was slightly enlarged in forceps delivery system to minimize risk of uncontrolled wound extension. Radner and Coauthors[15] stated that injecting IOL through a small incision maximizes the chances of corneal damage with tearing of stromal lamellae.

Takeshita et al[16] reported Single-action implantation of a 3-piece Acrys of MA30BA acrylic foldable intraocular lens (IOL) (Alcon) with the help of Monarch II (Alcon) injector. In 134 eyes IOLs were implanted using this technique. Their incision widths were ranging from 3.00 to 3.75mm. All the intraocular lenses were implanted in the capsular bag successfully. Complications observed during IOL implantation were haptic damage in 3 eyes (3%), cracked IOL optic in 3 eyes (3%) and inadequate self-sealing of the incision in 18 eyes (13%). Results of our study also showed small off center optic crack in one patient, 2 patients had haptic damage and 2 patients had back to front delivery of the IOL.

Nasrullah et al[17] conducted a comparative study on intraocular lens implantation with injector and forceps and they concluded that both methods were safe and equal statistically and they did not found any statistically significant difference in surgically induced astigmatism. In their study a Ceeflex single piece IOL was used. They did not report any damage to the IOL compared to our study in which injector caused damage to delicate prolene haptics of the IOL.

Baráková et al[18] studied the results of Acrys of MA30BA multipiece IOL using the Monarch IOL injector system. They explained the facility of this injector system including the IOL position within the cartridge, IOL folding, passage of the lens through the cartridge and unfolding of IOL in the anterior chamber. The results showed that Monarch IOL delivery system is safe and easy to use for implantation of the Acrys of MA30BA IOL. The size of

incision after implantation performs criterion of suture-less technique and corresponds contemporary requirements of the modern cataract surgery of small incision. Unlike our study they did not report any complication with this multipiece IOL.

Khokhar et al[19] recently published a comparative study between effect of using new motorized injector versus manual injector for insertion of foldable IOLs on wound integrity through a 2.2 mm clear corneal incision using single piece Acrys of SN60WF IOL. Parameters for comparison between two groups included intraocular lens safety, final incision width and wound integrity in terms of anterior and posterior wound gape, and detachment of descemet's membrane. They found motorized IOL insertion system gentle and much safer for the intraocular lenses with lesser incidence of IOL nicks. In terms of wound safety, it caused significantly low chances of incision enlargement and better posterior wound integrity. Similarly in this study no damage to the IOL was shown with injector delivery as it was a single piece IOL.

Singh et al[20] showed cartridge cracks during foldable intraocular lens insertion. In 350 consecutive cases small incision cataract surgery was performed. In all cases foldable silicone IOL (Allergan Medical Optics SI-40) was implanted using the Un-folder cartridge and they used 3 viscoelastic agents: sodium hyaluronate (Healon, Vitrax) and sodium chondroitin sulfate-sodium hyaluronate (Viscoat). They observed cartridge cracks in 52 eyes (14.86%). Almost all cartridge cracks (98.1%) observed in cases in which Healon was used to load the intraocular lens. It was noted that in every case of cracked cartridge, there was an evidence of the plunger overriding the optic edge. But we did not encounter such a problem as most of our cases used methylcellulose to inject the IOLs through the cartridge.

The next development in multipiece IOL will be development of a preload injector system which will reduce these complications due to manual loading of the IOL. The superiority of preloaded IOL injector systems has been shown in recent studies by Nanvatny[21] and Wang[22]. Although they have evaluated single intraocular lenses but these designs promise to reduce infection due to intraocular lens insertion further.

CONCLUSION

Delivery of multipiece IOL with injector has more complications compared to forceps delivery. Therefore practice of IOL insertion with injector in wet lab is recommended before switching to this technique.

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