

Piggyback Intraocular Lens (Poly-Pseudophakia): Expanding Indications of an Under Utilized Technique

Suresh K Pandey^{1,2,3*} and Vidushi Sharma³

¹Visiting Assistant Professor, John A Moran Eye Center, University of Utah, Salt Lake City, USA

²Visiting Clinical Instructor, Save Sight Institute, University of Sydney, Australia

³Director, SuVi Eye Institute & Lasik Laser Center, C 13 Talwandi, SuVi Eye Hospital Road, India

***Corresponding author:** Suresh K Pandey, President, Kota Division Ophthalmological Society (KDOS), Vice President, Indian Medical Association (IMA) KOTA, Director, SuVi Eye Institute & Lasik Laser Center, C 13 Talwandi, Kota, Rajasthan 324 005, India, Tel: +91 9351412449; E-mail: suresh.pandey@gmail.com

Editorial

Volume 3 Issue 3

Received Date: May 26, 2018

Published Date: June 07, 2018

Editorial

Residual refractive surprise remains one of the common indication of intraocular lens (IOL) explantation. Surgical technique to correct residual refractive error after cataract -IOL surgery include IOL explantation and exchange, piggyback IOL implantation, excimer laser refractive surgery. IOL explantation is technically challenging procedure and may be associated with corneal endothelial cell loss, trauma to capsular bag; iris and it may be difficult to perform due to IOL-capsular adhesion. Excimer laser assisted refractive surgery may not be feasible for all ophthalmologist due to lack of access to equipment, dry eye syndrome. The Piggyback Intraocular Lens (IOL) is a rather underutilized method which can actually provide good results by enhancing the refractive outcome after a cataract surgery. In this technique both secondary and primary IOL are implanted in the capsular bag-ciliary sulcus to minimize interlenticular opacity (ILO). Primary piggyback IOL implantation method was initially described by Sanders and Gayton in 1993 in case of microphthalmos and cataract, with IOL power of +46 diopters (D). Eventually, this technique started being utilized for correcting postoperative refractive issues [1].

The secondary Piggyback IOL technique is preferred for refractive error as this method assists in correcting

the error directly and might be reimbursable process. This technique can easily be performed by an experienced surgeon and is also a reversible process, allows chances of correcting a wide range of refractive errors, and offers long term and stable refractive outcomes as compared to other procedures [2].

The piggyback IOL implantation is also known as poly-pseudophakia and the first ever implantation recorded in highly hyperopic eye was conducted by Jim P Gills [3]. Addition another IOL through this technique has proved to be a good method of correcting the residual refractive errors. The power calculations of this technique, unlike that of IOL exchange, entirely depend on the pseudophakic refractive error of the patient. *The data which is required for IOL calculation is piggyback IOL' a A-constant and the equivalent of postoperative pseudophakic refractive spheria* [4]. *In case of postoperative refractive hyperopic errors in patients, the equivalent spherical must be multiplied with 1.5 for calculating the right IOL power for piggyback technique. In case of myopic error, the equivalent spherical must be multiplied with 1.2 for calculating the required IOL power for myopic piggyback* [5]. The power calculations of IOL can also be done through Refractive Vergence Formula or Holladay R formula, which were initially explained by Jack Holladay and then Warren Hill popularized it.

Piggyback IOL implantation is also used to correct the pseudophakic negative dysphotopsia, described as the reporting of dark shadows by the patient in their temporal visual field. This, typically happens, post-cataract surgery with posterior chamber IOL in-the-bag implantation. Research suggests that this can be completely or at least, partially resolved through secondary piggyback IOL implantation in the ciliary sulcus.

In case of refractive surprise with toric lenses, the residual refractive error can be fixed by toric lens rotation [6]. If the toric lens was implanted or rotated on incorrect axis than with the help of power calculations, it can be rotated back to the correct axis. In a situation in which one eye has toric IOL which is slightly off and residual refractive error is not significant or IOL rotation is not feasible, this issue can be compensated when operating in the other eye. The correction of these residual refractive errors and refractive surprises is largely dependent on the surgeon's level of comfort, condition of the eye (capsular bag, endothelial cell count) the type of IOL utilized, and the amount of time passed since the implantation of the lens [7]. If it is only malrotated toric IOL in its initial stage then just a rotation of the toric lens on the correct axis will be helpful to correct the refractive surprise [8]. Toric IOLs can be rotated after few months post-operatively after it has been implanted but it would be difficult to rotate after few years after the surgery due to fibrosed capsular bag and IOL capsular bag adhesion.

If the toric IOL is placed perfectly and a residual hyperopic or a simple myopic error that needs to be corrected after months or years than piggyback technique with Staar AQ5010V would be recommended. In case of residual refractive error due to toric IOL malrotation, it is best to reopen the original incision and the toric IOL which is malpositioned must be aligned with corneal astigmatism's postoperative axis instead of the axis which toric calculator originally targeted. The axes are highly likely to be different slightly [8].

Those patients who have a major postoperative refractive error, have three choices to get it corrected [9]. The first option is the exchange of IOL. This is suitable when executed early on before adhesions have been formed by capsular bags which lock the IOL in its position. This option is best if the surgeon thinks that the current lens implanted can be safely removed while preserving the intact capsular bag. Some complications for this option include zonular dialysis and posterior capsular rupture which destabilizes the implantation of the lens.

Second choice is performing corneal refractive surgery using excimer laser [10]. This is best performed when there is a stable refractive error and the shape of both corneal and cornea is normal. This is not a good option for patients with preexisting higher order aberrations or abnormal corneal topography. Third choice is implanting piggyback IOL which is highly effective for patients with postoperative refractive error. This type of ametropia is mostly not very predictably fixed by using excimer laser treatment as compared to residual myopia.

It is essential to keep in mind that all patients might not be able to endure the secondary piggyback IOL [11]. Contraindications comprise of existence of pigmentary dispersion syndrome, particularly with elevated IOP or glaucoma. The loose zonules in patients as a result of pseudo exfoliation or trauma indicate that they are not suitable for this technique. The patients requiring capsular tension ring for implantation of primary lens are also not good candidates. Another contraindication is the posterior synechiae to capsular bag or ciliary sulcus or asymmetrical fixation of the primary IOL haptics (capsular bag-ciliary sulcus). Furthermore, the patients experiencing a lower count of corneal endothelial cell can be at higher risk of corneal endothelial cell decompensation if this technique is utilized, use of chondroitin sulfate based ophthalmic viscosurgical devices (Viscoat, Alcon Labs, Fort Worth, USA) is helpful to minimize endothelial cell loss.

In spite of the benefits of piggyback IOL, there are still certain potential complications of this technique. The complications include hyphema, glaucoma, iridocyclitis, pigment dispersion, and Interlenticular Opacification (ILO). These complications, however, can be prevented with proper IOL selection and preoperative planning. The ILO has the more possibility of occurring when implanting two hydrophobic acrylics IOLs in the capsular bag with small capsulorhexis. The recommended prevention for ILO is the usage of a hydrophilic acrylic IOL in sulcus. Pigmentary glaucoma and pigment dispersion is more prevalent with hydrophobic (single piece) IOLs placement using anterior optic with sharp edges in the ciliary sulcus [12]. To prevent this, rounded anterior IOLs with optic edges are recommended. Sulcoflex IOL (Rayner, UK) are now available that are specially designed to be implanted in the ciliary sulcus [13].

Conclusion

In conclusion, based on review of literature and author's experience, the secondary piggyback achieves

excellent outcomes and can be the best option for fixing refractive errors as compared to any other technique. Implantation of piggyback IOL in piggyback method is indeed a versatile tool and its expanded usages have started being described by various surgeons. Some has highlighted the lowered amount of complaints from patients regarding negative dysphotopsias, while others have highlighted its effectiveness in fixing the refractive errors in children. Secondary piggyback implantation of sulcoflex toric IOL or multifocal phakic or phakic toric lens can be helpful to correct residual astigmatism or presbyopia. In case of polypeudophakia in children, literature shows that in comparison to implantation of primary single IOL, implantation of temporary piggyback IOL resulted in higher secondary glaucoma risk, increased rate of reoperation, and lower visual acuity [14].

References

1. Gayton JL, Sanders VW (1993) Implanting two posterior chamber intraocular lenses in a case of microphthalmos. *J Cataract Refract Surg* 19(6): 776-777.
2. Habot-Wilner Z, Sachs D, Cahane M, Alhalel A, Desatnik H, et al. (2005) Refractive results with secondary piggyback implantation to correct pseudophakic refractive errors. *J Cataract Refract Surg* 31(11): 2101-2103.
3. Basarir B, Kaya V, Altan C, Karakus S, Pinarci EY, et al. (2012) The use of a supplemental sulcus fixated IOL (HumanOptics Add-On IOL) to correct pseudophakic refractive errors. *Eur J Ophthalmol* 22(6): 898-903.
4. Gayton J, Sanders V, Van Der Karr M, Raanan MG (1999) Piggybacking Intraocular Implants to Correct Pseudophakic Refractive Errors. *Ophthalmology* 106(1): 56-59.
5. Akaishi L, Tzelikis PF, Gondim J, Vaz R (2007) Primary piggyback implantation using the Tecnis ZM900 multifocal intraocular lens: case series. *J Cataract Refract Surg* 33(12): 2067-2071.
6. Masket S, Fram NR (2011) Pseudophakic negative dysphotopsia: Surgical management and new theory of etiology. *J Cataract Refract Surg* 37(7): 1199-207.
7. Srinivasan S, Ting DS, Lyall Da (2013) Implantation of a customized toric intraocular lens for correction of post-keratoplasty astigmatism. *Eye* 27(4): 531-537.
8. Jin H, Limberger IJ, Borkenstein AF, Ehmer A, Guo H, et al. (2010) Pseudophakic eye with obliquely crossed piggyback toric intraocular lenses. *J Cataract Refract Surg* 36(3): 497-502.
9. Thomas B, Auffarth G, Reiter J, Mike P Holzer, Tanja M Rabsilber (2013) Implantation of three-piece silicone toric additive IOLs in challenging clinical cases with high astigmatism. *J Refract Surg* 29(3): 187-193.
10. Jin GJ, Merkley KH, Crandall AS, Jones YJ (2008) Laser in situ keratomileusis versus lens-based surgery for correcting residual refractive error after cataract surgery. *J Cataract Refract Surg* 34(4): 562-569.
11. Hill WE (2008) Refractive enhancement with piggybacking IOLs. In: Chang DF (Ed.), *Mastering Refractive IOLs: the Art and Science*. Thorofare, NJ: Slack Inc, pp: 792-793.
12. Iwase T, Tanaka N (2005) Elevated intraocular pressure in secondary piggyback intraocular lens implantation. *J Cataract Refract Surg* 31(9): 1821-1823.
13. Chang DF, Masket S, Miller KM, Rosa Braga-Mele, Brian C Little, et al. (2009) Complications of sulcus placement of single-piece acrylic intraocular lenses: recommendations for backup IOL implantation following posterior capsule rupture. *J Cataract Refract Surg* 35(8): 1445-1458.
14. Sungsoon Hwang, Dong Hui Lim, Soomin Lee, Daye Diana Choi, Eui-Sang Chung, et al. (2018) Temporary Piggyback Intraocular Lens Implantation Versus Single Intraocular Lens Implantation in Congenital Cataracts: Long-Term Clinical Outcomes. *Investigative Ophthalmology & Visual Science* 59(5): 1822-1827.