# Accepted Manuscript


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PII: S1091-8531(16)30407-4

DOI: 10.1016/j.jaapos.2017.07.203

Reference: YMPA 2681

To appear in: *Journal of AAPOS*

Received Date: 10 September 2016

Revised Date: 9 July 2017

Accepted Date: 12 July 2017

Please cite this article as: Tartarella MB, Fortes Filho JB, Twenty-five-gauge sutureless lensectomy in infants with congenital cataract, *Journal of AAPOS* (2017), doi: 10.1016/j.jaapos.2017.07.203.

# Twenty-five-gauge sutureless lensectomy in infants with congenital cataract

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*Submitted September 15, 2016.*
*Revision accepted July 11, 2017.*

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**Word count: 2,019**
**Abstract only: 183**

**Abstract**

*Purpose*

To evaluate the incidence of intra- and postoperative complications of transconjunctival 25-gauge (25G) sutureless *pars plicata* lensectomy.

*Methods*

The medical records of patients <12 months of age with congenital cataracts who underwent 25G sutureless lensectomy were reviewed retrospectively. Patients were evaluated at postoperative days 1, 7, 15, 30, 60, and 90 and every 3 months thereafter. Visual acuity outcomes and intra- and postoperative complications were described and analyzed.

*Results*

A total of 72 eyes of 44 infants were included; 28 patients (64%) had bilateral cataract. Median follow-up was 28 months (range, 12-93 months). In 47 eyes (81%) there was improved visual acuity after surgery. Intraoperative adverse events occurred in 9 eyes (13%). Postoperative complications occurred in 14 eyes (19%): 6 eyes (8%) had secondary visual axis opacification, 6 eyes (8%) had secondary glaucoma, 1 eye (1%) had posterior synechiae, and 1 eye (1.4%) had retinal detachment.

*Conclusions*

Transconjunctival pars plicata 25G sutureless lensectomy is a minimally invasive technique for congenital cataract treatment. No postoperative complications were observed in 81% of eyes. Visual acuity improved in 81% of the operated eyes.

Treatment of congenital cataract consists of removal of the opacified lens, correction of the subsequent aphakia, and visual rehabilitation. Lensectomy is one surgical approach to treat congenital cataracts. Soft cataracts in infants can be easily aspirated with small-gauge instruments, and anterior vitrectomy should be performed in order to obtain a clear visual axis during the amblyogenic period.[1,2] The small gauge of the 25-gauge (25G) vitrectomy system allows for a micro-incision and minimally invasive sutureless surgery. The purpose of this study was to analyze 25G transconjunctival sutureless pars plicata lensectomy outcomes in infants with congenital cataract.

**Subjects and Methods**

This study was approved by the Tartarella Institute of Ophthalmology Ethics Committee, and the study protocol adhered to the tenets of the Declaration of Helsinki (as revised in Edinburgh 2000). Informed consent regarding surgical treatment for pediatric cataract was obtained for all included patients.

The medical records of consecutive patients <1 year of age with unilateral or bilateral congenital cataeract who underwent surgery using 25G transconjunctival sutureless lensectomy technique at Tartarella Institute of Ophthalmology from 2005 to 2015 were reviewed retrospectively. Patients with membranous cataracts with collapsed capsules or congenital glaucoma were excluded. The same surgeon (MBT) performed all surgical procedures. Patients underwent surgery under general anesthesia at Albert Einstein Hospital. Preoperative anterior segment slit-lamp biomicroscopy, binocular indirect ophthalmoscopy, and retinoscopy were performed in all patients. Intraocular pressure was measured under anesthesia at the time of surgery. Ocular ultrasound was performed when the lens opacity was dense. Doppler ultrasound examination was performed when any vitreous anomaly was observed and persistent fetal

vasculature (PFV) was suspected in order to detect and localize the presence of blood flow. Best-corrected visual acuity was assessed with age-appropriated tests, such as the Teller Acuity Cards (Teller Acuity Cards II, Stereo Optical Company Inc, Chicago, IL) or the Lea Gratings Visual Chart (Good-Lite Elgin, IL).

Lensectomy and anterior vitrectomy were performed with the Accurus Surgical System or with Constellation Vision System (Alcon Labs, Forth Worth TX) using the 25G system sterile vitrectomy kit.

Periocular skin was prepared with povidone iodine 5% and povidone iodine 0.5% eye drops were instilled in the conjunctival fornix. Transconjunctival sclerotomies were placed at 2 and 10 o´clock hours at 1.5 mm posterior from the corneal limbus. The trocars were inserted through lens equator area toward the lens nucleus (Figure 1A). A two-port approach was used: one port for the vitreous cutter handpiece and a second port for the infusion line connected to a 27-gauge cannula, suitable to be inserted through the 25G trocars (Figure 1B). Continuous irrigation was required to maintain intracapsular bag pressure and to preserve lens capsule integrity during aspiration of the lens material. An initial hydration of the lens nucleus was followed by an intrabag removal of the cataract nucleus and cortex using a 25G vitreous cutter and aspirator. Lensectomy settings were at a maximum cut rate of 800 cut/minute and vacuum of 400 mm Hg. These parameters were lowered if any capsule defect was detected.

A posterior capsulotomy of approximately 4 mm was performed by turning the 25G vitreous cutter downward. This was followed by a shallow anterior vitrectomy, with the settings at a maximum cut rate of 1.500 cut/minute and vacuum of 150 mm Hg. External beam optic fiber was used to improve vitreous visibility (Figure 1C).

As final step of the procedure, an anterior circular capsulotomy was performed with the

microvitrector, from the posterior face of the anterior capsule, turning the cutter upward. No viscoelastic substance was used. Afterward, the trocars were removed and the previously disconnected conjunctiva overlapped the self-sealing sclerotomy incisions. No sutures were required. Subconjunctival injection of 0.5 ml of steroid (0.50 mg of dexametasone) and 0.5 ml of antibiotic (20 mg of gentamicyn) was performed. All eyes were left aphakic.

Postoperatively topical tobramicin 4 times daily and topical prednisolone acetate 1% every 2 hours were administered and tapered over 1 month. Tropicamide 1% eye drops were prescribed twice a day for 15 days.

The patients were evaluated after surgery at postoperative days 1, 7, 15, 30, 60, and 90 and every 3 months for the first year, and twice a year thereafter. Spectacles or contact lenses were prescribed after surgery.

Occurrence of adverse events during surgery and postoperative complications were clinically assessed and analyzed. Last follow-up evaluation of best-corrected visual acuity were compared with preoperative values and classified as no-change or improvement or deterioration of visual acuity.

The $\chi^2$ test was used to compare postoperative complications according to age at surgery, incidence of persistent fetal vasculature (PFV), and follow-up period.

**Results**

A total of 72 eyes of 44 children (21 male [48%]) were included. The median age at presentation was <1 month (range, birth to 12 months). Twenty-eight patients (64%) had bilateral cataracts. According to etiology, 27 eyes (38%) had idiopathic cataract, 19 eyes (26%) had hereditary cataract, 18 eyes (25%) had cataracts as a part of systemic syndromes, and 8 eyes (11%) had PFV.

According to lens morphology, 31 eyes (43%) had lamellar cataract, 20 (28%) had total cataract, 15 (21%) had nuclear cataract, and 6 (8%) had subcapsular cataract.

Median age at surgery was 2 months (range, 1-12 months). According to the age of the infants, 17 eyes (24%) had surgery at 1 month of age, 27 (38%) at 2 months of age, 13 (18%) at 3 months of age, and 20 at at least 4 months of age.

Intraoperative adverse events occurred in 9 eyes (13%): 5 eyes had unplanned iridectomy, 3 eyes with PFV had intraocular bleeding (1 eye had a mild vitreous hemorrhage and 2 eyes had anterior segment hemorrhage), and 1 eye had unplanned posterior capsulotomy during lens aspiration and subsequent loss of a small portion of lens material into the vitreous. Intraoperative adverse events were addressed at the primary procedure. The vitreous hemorrhage did not affect the direct visibility to perform the lensectomy and was treated by anterior vitrectomy using a higher infusion pressure. Soft lens material dropped in anterior vitreous could be easily removed during anterior vitrectomy with a slow irrigation rate. A small amount of anterior segment bleeding occurred in 2 eyes with PFV, and the blood clots were aspirated from the anterior chamber.

Median follow-up was 28 months (range, 12-93 months). Postoperative complications were detected in 14 eyes (19%): secondary visual axis opacification occurred in 6 eyes (8%), secondary glaucoma in 6 eyes (8%), posterior synechiae in 1 eye (1%), and retinal detachment occurred in 1 eye (1%). Those complications occurred at a median of 12 months after surgery (range, <1 month to 73 months). Postoperative complications occurred in 9 eyes (16%) of children who underwent surgery at < 4 months of age. Statistical analysis of the postoperative complications in eyes that underwent surgery before 4 months of age showed no statistical significant difference compared with eyes operated after 4 months of life ($P = 0.471$ [$\chi^2$]). All 6

cases of secondary glaucoma occurred in infants <4 months of age at surgery.

Postoperative complications occurred in 3 eyes with PFV (37.5%). Statistical analysis of the postoperative complications in cases of PFV showed no statistical significant difference when compared with the eyes with congenital cataracts ($P = 0.180$ [$\chi^2$]).

Additional procedures were performed in 12 eyes (17%). Vitrectomy was performed in 2 eyes to treat secondary visual axis opacification. Neodymium-YAG laser posterior capsulotomy was performed in 4 eyes. All 6 patients that developed secondary glaucoma required surgery in order to control intraocular pressure.

Forty-seven eyes (81%) showed improved best-corrected visual acuity; 10 eyes (17%) had no change postoperatively; and in 1 eye (1.7%) best-corrected visual acuity deteriorated after retinal detachment.

**Discussion**

Surgical approaches to treat congenital cataracts may vary according to surgeon's decision, morphology of the cataract and patient's age. Infant Aphakia Treatment Study (IATS) was a prospective randomized clinical trial comparing the treatment of unilateral aphakia with a primary intraocular lens (IOL) implantation or with contact lens fitting in babies <7 months of age. According to the IATS results, the rate of complications and reoperations were numerically higher in the IOL group. But functional results did not clearly favor either treatment group.[3,4]

The 25G pars plicata lensectomy is a minimally invasive technique that has the potential to improve the approach of congenital cataract surgery. This technique is performed under a closed system that maintains the stability of the anterior chamber during intrabag lensectomy, and it avoids postoperative corneal astigmatism that may facilitate contact lens fitting soon after surgery.[5] Secondary IOL implantation in the sulcus or in the remaining bag can be performed at

a later date.

The 25G sclerotomy creates a self-sealing incision, with no need of suture. You and colleagues[6] investigated the healing course of sclerotomies in 15 children undergoing 25G sutureless pars plana vitrectomy by ultrasound biomicroscopy imaging. All sclerotomy sites were healed at postoperative week 4, and no leakage or vitreous incarceration from the scleral wound was found. Chee and Lam[7] evaluated the results of 25G lensectomy with limbal side ports for the management of congenital cataract in 20 eyes and obtained successful surgical outcomes.

In this present study, 25G transconjunctival pars plicata sutureless lensectomy was performed in infants and allowed smaller incisions that required no sutures. Fluid or vitreous leakage, hypotension, or complications related to the sclerotomies or to the sutureless technique did not occur. The transconjunctival approach promoted a good coverage of the sites of the sclerotomies and avoided conjunctival peritomy and sutures.

Intraoperative adverse events that occurred during surgery were handled at the same time of the primary intervention. Unplanned iridotomy at the pupillary area occurred during the opening of the anterior capsule when the cutter was turned upward, but this did not affect the results.

Postoperative complications occurred mainly within the first year after surgery. Secondary visual axis opacification was detected in 8% of the eyes. All children that developed secondary glaucoma were <4 months of age at time of lensectomy, suggesting that children at this age group are at a greater risk.[8,9]

The 25G instrumentation has an efficient vitreous cutting system, avoiding vitreous traction. Retinal detachment occurred after 8 years of follow-up in 1 patient with Down syndrome; however, in this particular case the retinal detachment might be associated with

myopic retinal degeneration and with axial length growth.[10] Postoperative complications occurred in a higher percentage in eyes with PFV, but this 25G pars plicata approach technique facilitates the stalk handling. Postoperative complications were not related to the technique itself. The 25G vitrectomy system may be used in other situations to solve secondary axis opacification, or it can be combined with other techniques, including IOL implantation, or techniques that require the integrity of the capsular bag.[11,12]

Transconjunctival pars plicata 25G sutureless lensectomy in infants showed satisfactory functional and anatomical results, and 81% of the eyes improved best-corrected visual acuity.

The current study is limited by its retrospective nature, the relatively small number of cases, and the short follow-up period. Nevertheless, transconjunctival pars plicata 25G sutureless lensectomy is a minimally invasive technique for congenital cataract treatment, with good results achieved in this patient cohort.

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**Legends**

**FIG 1.** Stages in transconjunctival pars plicata 25-gauge sutureless lensectomy A, Transconjunctival sclerotomy and trocar insertion. B, Bimanual intrabag lensectomy: nucleus and cortex aspiration. C, Posterior capsulotomy and anterior vitrectomy.