Comparative Evaluation of Trabeculotomy-Trabeculectomy with Mitomycin C vs Trabeculectomy, with Mitomycin C for Primary Congenital Glaucoma

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INTRODUCTION

Primary congenital glaucoma is hereditary childhood glaucoma secondary to abnormal development of the filtration angle, which occurs unassociated with any systemic abnormalities. Primary congenital glaucoma is the most common type of pediatric glaucomas and is accounting for 55% of them. Its overall occurrence is about 1 in 10,000 live births; affect less than 0.05% of ophthalmic patients. Combined trabeculotomy-trabeculectomy with mitomycin C is the standard procedure that is practiced; trabeculectomy with mitomycin C is another alternative and most people are well-versed with this procedure. In our study, we wanted to see whether trabeculotomy in combination with trabeculectomy lead to further lowering of IOP and improve success rate as compared to trabeculectomy alone in eyes with primary congenital glaucoma.

MATERIALS AND METHODS

All the cases that attended the OPD and Glaucoma Clinic of Dr Rajendra Prasad Centre for Ophthalmic Sciences, AIIMS, New Delhi were included in the study (bilateral and unilateral). It was a prospective randomized control study. The sample was 32 eyes and out of them 14 was bilateral cases and four were unilateral cases. The study was done from December 2006 to June 2008.

Inclusion Criteria
1. Primary infantile congenital glaucoma
2. Age <2 years.

Exclusion Criteria
1. Secondary glaucoma
2. Glaucoma associated with other ocular anomalies
3. Glaucoma associated with systemic anomalies
4. Dense corneal opacity not allowing view of anterior chamber for trabeculotomy.

History and Examination

A detailed history of the patient regarding the illness was taken, its duration, prior EUA, treatment. Any significant history associated with birth of the child was taken along with the family history.
Office examination of the patient was conducted in which the corneal diameters were measured and looked for gross features like corneal edema and Haab’s striae. Records of any previous EUA were obtained. Informed consent from the parents was taken before EUA along with the consent for the surgery if required.

Examination under Anesthesia

A definite protocol for evaluation and management was followed for all patients. Examination was performed under general anesthesia in which induction was done with thiopentone sodium 5 mg/kg, fentanyl 2 mg/kg and vecuronium 1 mg/kg and after intubation maintained on isoﬂurane 0.6 to 0.8%. IOP was evaluated with perkins tonometer 2 minutes after the induction and detailed examination of the eye including corneal diameters, Haab’s striae, density of corneal edema, any opacity, anterior chamber depth, angle structures were visualized with Koeppe’s lens, status of the crystalline lens, examination of the fundus, cup disk ratio and gross examination of retina is done with direct ophthalmoscope and if required with indirect ophthalmoscope. In case the surgery was required, child was maintained in general anesthesia.

Surgical Procedure

Trabeculectomy with Mitomycin C

The operation is performed under general anesthesia using an operating microscope with 10× to 40× magnification. Mitomycin C in the concentration of 0.02% is applied subconjunctivally for a period of 3 minutes. The rectangular flap containing trabecular meshwork and canal of Schlemm as mapped out earlier is excised by making a radial incision on either side of radial incision made for trabeculotomy and excising the scleral block with Vannas scissors. A peripheral iridectomy is performed. The corneoscleral flap is reposited and sutured with 10-0 monofilament nylon with one suture at each corner of the flap posteriorly. The conjunctival flap is reposited in place and sutured with 8-0 polyglactin. Antibiotic ointment is applied and the eye is bandaged.

Trabeculotomy-Trabeculectomy with Mitomycin C

The operation is performed under general anesthesia using an operating microscope with 10× to 40× magnification. Mitomycin C in the concentration of 0.02% is applied subconjunctivally for a period of 3 minutes. The canal of Schlemm lies just anterior to the scleral spur. A superficial radial incision starting from the blue zone and extending toward the white zone is made. A stream of normal saline over the site of incision helps in better visualization. The incision is very carefully deepened until the aqueous oozes from the cut ends. Small horizontal incisions are made on either side of this and the right-sided Harm’s trabeculotomy is inserted till the heel of the trabeculotome lies in the radial incision. Then the trabeculotome is rotated into the anterior chamber.

Postoperative Regimen

All the patients’ pad and bandage was opened next morning and were started on one drop topical antibiotic steroid combination consisting of flouroquinolones (ofloxacin, gatifloxacin 0.3%) and prednisolone acetate 1%. 2 hourly for the first week followed by six times for next 3 weeks and later on the drug was tapered every week. Then the dosage was given a drop of tropicamide 1% thrice a day in the operated eyes for 1 month along with an eye ointment with antibiotic steroid combination consisting of polymyxin B sulfate, neomycin sulfate and hydrocortisone at night was given for 2 weeks.

Follow-up

A definite protocol was followed for all the patients postoperatively. Visual acuity was assessed with Teller acuity chart for children less than 1.5 year and with Cardiff acuity in children between 1.5 and 3 years. Those children who could not perform these two tests were assessed for their perception of light. Examination was done under general anesthesia at 1 week, 15 days, 1, 3 and 6 months intervals. At each visit patients were examined and corneal diameters, edema, anterior chamber depth, IOP, bleb appearance, fundus picture were noted. Refraction was done at 1.5 months and 6 months.

Success Criteria

Surgical success and failure were defined in the protocol and success criteria were judged and analyzed by the following criteria:

1. If the final IOP was less than or equal to 18 mm Hg without any medication it was considered ‘complete success’.
2. If the final IOP was less than or equal to 18 mm Hg with one medication it was considered ‘qualified success’.

RESULTS

The change of IOP was significant when the preoperative was compared with postoperative IOP in both the groups and the trend of IOP was comparable in both the groups (Graph 1 and Table 1).

The vertical corneal diameters in both the groups were comparable throughout the study (Graph 2 and Table 2).
Success of Surgery

Success of surgery was defined as complete success when IOP < 18 mm Hg under general anesthesia without any medication and qualified success as IOP < 18 mm Hg with one medication under general anesthesia.

In trabeculotomy-trabeculectomy group success was seen in 75% (n = 12) of the patients and among them 56.25% (n = 9) showed IOP control without any medication and 18.75% (n = 3) showed IOP control with one medication and 25% (n = 4) had more than the IOP that is required for success.

In trabeculectomy group, 81.25% showed success. Among them 62.5% (n = 10) showed control of IOP without any medication and 18.75% (n = 3) showed control of IOP with one medication and 18.75% (n = 30) had more than the IOP that is required for success.

Complication

There was no sight threatening intraoperative and post operative complications. Complications were seen in 37.5% of cases. Two eyes (6.25%) had flat bleb for which needling was done with 5-fluorouracil to decrease the fibrosis which later fared well. Four eyes (12.50%) had shallow anterior,
which later fared well after anterior chamber reformation. One eye (3.12%) had to undergo retrabeculectomy after 6 months in which we had a choroidal detachment which resolved with systemic steroids. Three eyes, 9.37% cases, had hyphema (Table 4).

No anesthetic complications were noted.

**DISCUSSION**

Primary congenital glaucoma is the most common type of pediatric glaucomas and accounting for 55% of them. Its overall occurrence is about 1 in 10,000 live births; affect less than 0.05% of ophthalmic patients. Children or young adults undergoing filtering surgery do not enjoy the same success as do those of older age group. The barriers to success of filtering surgery in children include thick tenons capsule, rapid wound healing response, lower scleral rigidity and a large buphthalmic eye with thin sclera. Additionally, conjunctival scarring from previous ocular surgery may limit the success of repeat surgery in children with congenital glaucoma. The prognosis of the primary congenital glaucoma is affected by various factors, such as time of presentation, severity and the time of surgery. The earlier in life the disease occurs, the worse the prognosis and the more severe the case, the higher is the failure rate. While the medical treatment of primary congenital glaucoma is useful as a temporary measure or as an adjunctive therapy, surgery is always necessary.

The conventional operative procedures described for congenital glaucoma were goniotomy, goniopuncture, goniotomy combined with goniopuncture. These procedures can be carried in cases with clear cornea to allow visualization of angle structures at the time of operation. Further these procedures are preferable in cases having maximal corneal diameter up to 14 mm. Although classic operation for developmental glaucoma has been goniotomy, introduced by Barkan in 1938, it has been tempered by poor success rate in patients with primary congenital glaucoma. Schaffer followed 287 eyes long enough to be quiet certain of success or failure of goniotomy. The glaucoma was considered cured, if the IOP remained 20 mm Hg without any antiglaucoma medication. for at least 6 months and the cupping of the optic nerve remained the same or improved.

Overall, the success rate was 76.7%. However, when the signs and symptoms of glaucoma were present at birth or over the age of 24 months (congenital or juvenile type), the success rate was close to 30%. In contrast, one or two goniotomies cured 90% of the cases diagnosed between the ages of 1 and 24 months. Broughton and Parks published the results of their 20 years of their experience with goniotomy to treat congenital glaucoma. The results of normalizing the IOP with goniotomy were practically identical.

Beck and Lynch described a technique performing 360° trabeculectomy in a single procedure using a 6-0 propylene suture fragment and reported an 87% success rate after one procedure, which is equal to standard trabeculectomy techniques.

Filtration surgery creates an opening in the sclera over the anterior chamber, which allows the aqueous humor to drain under the conjunctiva, thus converting the potential subconjunctival space into a real space, the filtering bleb. The increased drainage of the aqueous fluid lowers the IOP. Failure occurs when the drainage is in adequate to lower the IOP. Natural wound healing process tend to shift the balance between overfiltration and underfiltration toward failure by causing subconjunctival fibrosis, bleb encapsulation, or closure of the sclerectomy. Mitomycin C has emerged as an effective antimetabolites for topical use during trabeculectomy.

Trabeculectomy is a procedure which is familiar to most of the ophthalmologists, whereas trabeculotomy requires an entirely separate approach and expertise and larger learning curve. Trabeculotomy is the most commonly performed antiglaucoma procedure, and most ophthalmologists are conversant with the procedure. Trabeculotomy is enjoying resurgence now in congenital glaucoma. Trabeculotomy has an advantage in that, compared with goniotomy, it does not require clear cornea. Since most of the patients in India present late and with opaque corneas, goniotomy is difficult. So combined trabeculotomy-trabeculectomy is one of the options in Indian scenario. But trabeculotomy in itself is difficult procedure which needs a larger learning curve and expertise for which Schlemm’s is identified to rotate the trabeculotome. So a procedure which most of the persons are well-versed with, is easier to perform than a complicated procedure lie trabeculotomy-trabeculectomy. Although there have been better results in combined trabeculotomy-trabeculectomy with mitomycin C but some of the studies have shown equitable results. Moreover, theoretically when combined trabeculotomy-trabeculectomy with mitomycin C is performed the chances of intraoperative and postoperative complications are higher.
then when trabeculectomy with mitomycin C alone is done. In our study we wanted to see whether trabeculotomy in combination with trabeculectomy lead to further lowering of IOP and improve success rate as compared to trabeculectomy alone in eyes with primary congenital glaucoma.

We found that the mean preoperative IOP in trabeculotomy-trabeculectomy group decreased from 24.87 + 6.81 to 12.5 + 4.9 mm Hg and was 15.87 + 4.09 mm Hg at the end of 6 months and in trabeculectomy mean preoperative IOP decreased from 27.25 + 4.55 to 13.12 + 5.36 mm Hg and was 15 + 5.36 mm Hg at 6 months. There was no statistical difference in the comparative IOP in both the groups. Previous studies have shown a success of 54 to 92.3% in trabeculectomy group and 78 to 93.5% in trabeculotomy-trabeculectomy group. Our study showed equitable results in both the groups but the follow-up here was only for 6 months which is too short to give any stern conclusions. We need to further follow-up the patients for a longer period to deduct firm conclusions. In most of the studies the failure rates were seen in younger children less than 6 months but in our study the value was equally seen in all the age groups.

We had complications in 37.5% of the patients. Two eyes (6.25%) had flat bleb for which needling was done with 5-fluorouracil to decrease the fibrosis which later fared well. Four eyes (12.50%) had shallow anterior, which later fared well after anterior chamber reformation. One eye (3.12%) had to undergo retrabeculectomy after 6 months in which we had a choroidal detachment which resolved with systemic steroids. Three (9.37%) cases had hyphema. We had no episode of endophthalmitis. No anesthetic complications were noted.

Both trabeculotomy-trabeculectomy with mitomycin C and trabeculectomy with mitomycin C can be practiced as the surgeries for congenital glaucoma. Mitomycin C application has got definite advantage by decreasing the fibrosis. This study was a short one. For a child with primary congenital glaucoma, life is large but these 6 months are not enough as though to say which is best, so longer follow-up is required.

CONCLUSION
Small sample, limited period of follow-up (6 months) makes it difficult to deduce firm conclusions. The results of both the groups were comparable and both the procedures can be taken up as primary procedures in case of congenital glaucoma. Larger studies with long-term follow-up are required to deduce firm conclusions.

REFERENCES