Original Article

Outcome of Mitomycin-C Augmented Trabeculectomy in Primary Congenital Glaucoma

P.S Mahar, A. Sami Memon, Sadia Bukhari, Israr A. Bhutto

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See end of article for authors affiliations

Correspondence to:
P.S Mahar
Isra Postgraduate Institute of Ophthalmology,
Al-Ibrahim Eye Hospital
Malir, Karachi, Pakistan

Purpose: To evaluate the efficacy of trabeculectomy with Mitomycin-C (MMC) in controlling intraocular pressure (IOP) in children with primary congenital glaucoma (PCG).

Material and Methods: The medical records of 37children (50 eyes) with PCG were reviewed. All patients underwent trabeculectomy with MMC (0.2 mg/ml) from January 2008 to December 2010. The pre and post-operative Intraocular pressure (IOP) was the main outcome measure evaluated using analysis of variants (ANOVA).

A Successful IOP was defined as an IOP under 15 mm Hg without any anti-glaucoma medication at the end of 1 year follow up.

Results: A total of 50 eyes of 37 children were evaluated. The mean ± SD age of children were 23.8 ± 14.2 months (Range 1 month to 36 months). The gender distribution showed predominance of male at 25(67.7%) and 12 (32.4%) female. The mean ± SD preoperative IOP was 30.4 ± 6.3 mm Hg (Range 22 – 52 mm Hg). The postoperative IOP at 1 month, 6 month and 12 months were 16.6 ± 8.9 mm Hg, 18.4 ± 8.5 mm Hg and 20.3 ± 8.2 mm Hg respectively (range 4 – 48 mm Hg). The mean postoperative IOP was significantly decreased compared with preoperative value (P < 0.0001). Out of 50 eyes, IOP was controlled (≤ 15 mm Hg) in 34 eyes (68%) at first month, while at 6 and 12 month, control was seen in 32 (64%) and 29 (58%) eyes respectively.

Conclusion: The success rate of MMC augmented trabeculectomyin terms of controlling IOP of <15 mm Hgoccurredin 58% eyes in children up to age of 3 years with PCG at the end of 1 year follow up.

The true prevalence of primary congenital glaucoma (PCG) is not known in this country, but it occurs in about 1 of 10,000 live births in USA,[1] with 80% of affected children developing glaucoma within the first year of life. The condition is usually managed surgically. The surgical techniques are designed to eliminate the resistance of aqueous outflow created by structural abnormalities in the anterior chamber angle. These congenital changes include presence of non-permeable Barkan's membrane covering the trabecular meshwork and insertion of anterior ciliary body and iris overlapping the trabecular meshwork[2,3]. The goniotomy is a procedure of choice in cases with clear cornea[4]. Once cornea becomes opaque, trabeculotomy or trabeculectomy are preferred as an initial procedure[5]. Trabculectomy has been reported to have low success rate in children compared to adults[6, 7]. This is mainly due to excessive scarring caused by increased fibroblast activity in young age[8].

Over the decades, success rate of trabeculectomy has improved in children with the concomitant use of mitomycin-C (MMC), an antimotabolite and an antifibrotic agent. This retrospective study was aimed to evaluate the outcome of MMC-augmented trabeculectomy regarding control of Intraocular pressure (IOP) in children with PCG.

MATERIAL AND METHODS

The medical record of 37 children (50 eyes) were evaluated, who were diagnosed with PCG with increased IOP and went under trabeculectomy as a primary procedure augmented with MMC. All surgeries were performed between January 2008 to December 2010 at Isra Postgraduate Institute of Ophthalmology, Al-Ibrahim Eye Hospital, Karachi. The diagnosis of PCG was established after examining the children under anesthesia (EUA), measuring IOP, corneal diameters, axial length of the eye, anterior segment and fundus examination when possible. The IOP was measured in the early stage of the anesthesia with hand held Perkins applanation tonometer. In bilateral cases, both eyes were operated in the same sitting, but for the second eye all instruments were re-sterilized with fresh prep and draping.

Surgical technique

After putting 7-0 vicryl traction suture in clear cornea at 12-0 clock position, a fornix based conjunctival flap was fashioned from 10 to 2-0 clock position. The hemostasis of episcleral blood vessels was achieved with wet field bipolar cautery. Three sponges soaked in MMC with concentration of 0.2mg/ml (0.02%) were placed under tenon's capsule over sclera for duration of 4 minutes. The MMC exposed area was irrigated with about 50ml of balance salt solution (BSS). A triangular partial thickness scleral flap measuring 3x3mm was created. The internal sclerotomy was performed with Kellys punch measuring about 1x1mm. The anterior chamber was filled and maintained with viscoelastic substance. After peripheral iridectomy, the scleral flap was closed with 3 interrupted 10-0 nylon sutures. The conjunctiva was sutured back at limbus with 10-0 nylon suture. At the end of procedure, subconjunctival injection of dexamethasone and gentamycin was given.

The postoperative medical regimen included Moxifloxacin 0.5% (Vigamox-Alcon, Belgium) 4 times a day, Dexamethasone 0.1% (Maxidex-Alcon, Belgium) 4 times a day andTropicamide 1.0%(Mydriacyl-Alcon, Belgium) twice a day. All children were examined at day 1, week 1, week 4, week 8 and then at 12 weeks subsequently. At week 4, EUA was carried again with measurement of IOP, corneal diameters, axial length, anterior segment and fundus examination. All 10-0 nylon conjunctival sutures were removed at this stage. The antibiotic and dilating drops were also discontinued at 4 week postoperatively. However topical steroids were maintained for another month.

The successful outcome of trabeculectomy was defined as IOP measuring under 15 mm Hg without any topical anti-glaucoma medication. Visual acuity was not taken as an outcome measure since the age of children in this study was too young to obtain reliable results.

All data was analyzed by using SPSS version 17. Mean ± SD was calculated for age and pre and post-operative IOPs and frequencies and percentages were calculated for gender, visual acuity and final outcome in terms of raised or control IOP at month 1, month 6 and month 12 follow up. Repeated measure ANOVA (analysis of variants) was applied to compare the mean IOP between pre and postoperative at different follow-ups while Chi-square test for proportion was applied to compare the final outcome at 5% level of significance.

RESULTS

A total of 50 eyes of 37 patientswithPCG underwent MMC augmented trabeculectomy to control their IOPs. Themean ± SD age of patients was 23.8 ± 14.2 months (Min – Max = 1 – 36 months). The Majority of cases had age > 24 months. The Gender distribution showed 25 (67.6%) male and 12 (32.4%) female patients (Table I).

The mean ± SD pre-operative IOP was 30.4 ± 6.3 mmHg (Min – Max = 22 – 52 mmHg), while post-operative IOP after 1 month, 6 months and 12 months was 16.6 ± 8.9 mmHg, 18.4 ± 8.5 mmHg and 20.3 ± 8.2 mmHg respectively (Min – Max = 4 – 48 mmHg). Themean post-operative IOPs were significantly decreased as compared with pre-operative IOPs (p-value < 0.0001) (Table 2).

Out of 50 eyes, IOP was controlled (≤ 15 mmHg) in 34 (68%) eyes post operatively at first month, this proportion is significantly high (p-value = .011). while at 6 and 12 months IOP were controlled in 32 (64%) and 29 (58%) eyes respectively (Table 3).

DISCUSSION

The treatment of primary congenital glaucoma still remains challenging. The definitive treatment is surgical, with medical therapy being used transiently. The goniotomy is a procedure of choice in children with clear corneas[9]. In our country, because of the late presentation of the child and the delay in the proper diagnosis, most of the children with PCG present with cloudy corneas. Once cornea becomes hazy and angle

structures are not visualized, goniotomy cannot be performed. The trabeculotomy can be recommended in such cases but because of the larger eye balls, the schlemm's canal remains compressed and cannot be visualized, making it also a difficult procedure to perform[10]. Although trabeculectomy is widely performed drainage surgery, it also remains technically difficult in children with congenital glaucoma due to distorted limbalanatomy and scleral thinning, leading to inadvertent scleral perforation.[11]It is also considered to be less successful in young children due to thick tenon's fascia and an exaggerated response to the healing process with increased fibroblastic reaction. As a result, use of antimetabolites such as MMC has gained acceptance for improved outcome in childhood glaucomas.

Table 1: Age and Gender Distribution (n = 50)

	No. of Patients
Gender Male : Female = 21 : 1	
Male	25 (67.6)
Female	12 (32.4)
Age (Months) Mean ± SD = 23.8 ± 14.2	
≤ 12	11 (29.7)
13 - 24	4 (10.8)
> 24	22 (59.5)

Over the years, several studies have found the success of primary trabeculectomy in congenital glaucoma comparable to that of goniotomy and trabeculotomy[12-14].

Pechuho and colleagues[15] carried out trabeculectomy with MMC (0.4mg/ml for 3 minutes) in children with PCG. Their cohort of patients consisted 40 eyes of 30 patients, age between 15 days to 10 years with duration of follow up between 1 to 36 months. In their series, complete success was observed in 55% eyes (IOP <21mm Hg) and qualified success (IOP <18mmHg with addition of single anti-glaucoma medication) in 27.5% eyes. Susana et al[16] achieved an overall success rate of 67% with a mean follow up 17 months in a series of 56 patients (79 eyes) with primary congenial or developmental glaucoma. Their success rate is higher than ours (at 58 %). This difference can be attributed to the higher age group included in their study. Sidoti and colleagues[17] showed a success rate of 59% in a case series of 29 eyes with a mean follow up of 25.1 ± 16 months. Although they included children up to age of 18 years in their study and also a higher concentration of MMC was used (0.5mg/ml). Beck[18] reported success in 67% ± 13% of eyes (total 49 eyes) at 12 months under going trabeculectomy with MMC. However the age of patients in their series was 17 years or younger with mixed type of primary or secondary infantile glaucoma.Al-Hazmi et al[19] reported a successful outcome of trabeculectomy with MMC in 39% of eyes in children with pediatric glaucoma up to age of 7 years with mean follow up of 1 year.

Table 2: Comparison of Mean IOP Pre and Post Operative (n = 50)

IOP	Mean ± SD	Min - Max	P-value
Preoperative	30.4 ± 6.3	22 - 52	< 0.0001
After 1 month	16.6 ± 8.9	4 - 42	
After 6 months	18.4 ± 8.5	6 - 42	
After 12 months	20.3 ± 8.2	9 - 48	

Table 3: Post Operatively IOP (n = 50)

Postoperatively IOP	After 1 Month n (%)	After 6 Months n (%)	After 12 Months n (%)
Controlled	34 (68)	32 (64)	29 (58)
Raised	15 (32)	18 (36)	21 (42)
P-values	0.011	0.048	0.258

Controlled = (IOP ≤ 15 mm Hg)

Some workers have found no difference in success rate with different surgical procedures in PCG.Zhang and coworkers[14], in a retrospective study of 81 eyes of 48 patients with PCG under 4 years of age, reported no significant difference in success rate of primary trabeculectomy, trabeculotomy or combined trabeculotomy / trabeculectomy, with mean follow up of 5.49 ± 3.09 years. However, they concluded that over 4 years of follow up, success rate of trabeculectomy and combined trabeculotomy / trabeculectomy declined

more slowly than that of trabeculotomy.Dietlein[20] and colleagues performed trabeculotomy in 17 eyes of 11 patients, trabeculec-tomy in 29 eyes of 17 patients and combined trabeculotomy / trabeculectomy in 15 eyes of 10 patients with PCG. Their study revealed no significant difference in the surgical outcome between various procedures.

It is extremely difficult to compare various studies and their outcome of success in children with PCG due to different racial background, ethnicity, variation in age group, concentration of mitomycin used and mean follow up time. The surgical outcome of trabeculectomy, regarding control of IOP is definitely less in pediatric population compared to the adult patients[21, 22].

The principal limitation to our study is its retrospective nature with no control group.

CONCLUSION

The success rate of MMC augmented trabeculectomy controlling IOP of <15mm Hg in children up to the age of 3 years with PCG was seen in 58% of eyes at the end of 1 year follow up in our institute. The remaining eyes required second surgical procedure or addition of anti-glaucoma medication to control the IOP.

Author's affiliation

Prof. P.S Mahar
Isra Postgraduate Institute of Ophthalmology
Karachi

Dr. A. Sami Memon
Isra Postgraduate Institute of Ophthalmology
Karachi

Dr. Sadia Bukhari
Isra Postgraduate Institute of Ophthalmology
Karachi

Dr. Israr A. Bhutto
Isra Postgraduate Institute of Ophthalmology
Karachi

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