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**Original Article**

# Efficacy and Surgical Outcome of Trabeculectomy with Mitomycin-C in Congenital Glaucoma with Hazy Cornea

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## ABSTRACT

Glaucoma is characterized by an optic neuropathy associated with raised intraocular pressure (IOP) and visual field defect **Objective:** To determine the efficacy and outcome of trabeculectomy augmented with anti-metabolite mitomycin-C in children with childhood glaucoma. **Methods:** A total of 40 eyes of 22 diagnosed cases of congenital glaucoma were studied. All these children underwent mitomycin-C augmented trabeculectomy from July 2017 to August 2020. The primary outcome was control of postoperative intraocular pressure (IOP) at the end of one year. A target pressure of <15mmHg was set as target pressure to label a successful surgical outcome. **Results:** The mean age of the patients enrolled in the study was 26.8 12.2 years (range: 8 – 32 months) with a male to female ratio of 7:4. The mean SD IOP before trabeculectomy surgery was (31.5 8.6) (range: 21 – 53) mmHg. At the one-year follow-up, the mean postoperative IOP was (19.4 7.9) (range: 9 – 48) mmHg. Target IOP < 15 mmHg was successfully achieved in 27 (67.5%), 24 (60.0%) and 22 (55.0%) eyes at postoperative 1, 6 and 12 months respectively. Repeat trabeculectomy was required in 5 (12.5%) eyes, while 5 (12.5%) eyes developed corneal perforations and 3 (7.5%) eyes developed phthisis bulbi. **Conclusion:** Trabeculectomy with mitomycin C can be a primary surgical intervention in congenital glaucoma. However, repeat surgery may be required and other related surgical complications can occur after this surgery in patients with uncontrolled IOP.

## INTRODUCTION

Glaucoma in pediatric patients is characterized by intraocular pressure (IOP) of more than 21mmHg, cupping of the optic disc, increased diameter of the cornea, progressive myopia, and increase in ocular dimensions out of proportions with the normal growth leading to buphthalmos and visual field defects due to optic neuropathy [1]. Primary congenital glaucoma (PCG) is characterized by isolated angle anomalies with or without congenital anomalies of the iris and ocular enlargement [2]. It is responsible for 5% of childhood blindness though its incidence is variable worldwide [3]. However, it is usually bilateral (70-80%), with 60% of the patients being male (60%) [4]. The exact prevalence of PCG in Pakistan is not known [5]. The mainstay of treatment is surgery, with medical therapy having a supportive role. Surgical options include goniotomy, trabeculotomy, and trabeculectomy with or without anti-metabolites. Goniotomy is the first line of treatment and is performed in cases with the transparent cornea [6]. However, once the cornea becomes opaque, trabeculotomy or trabeculectomy is preferred [7]. Trabeculectomy has shown a high failure rate in the pediatric population, mainly due to increased fibroblastic activity at a young age, leading to scarring and failure of the procedure [8,10]. Over decades, anti-

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metabolites like mitomycin-C (MMC) have gained popularity to improve the outcome of trabeculectomy in children. The objective of this study was to evaluate the outcome of trabeculectomy assisted with MMC as a primary surgical procedure in pediatric patients with congenital glaucoma.

## METHODS

After taking its institutional approval, we conducted this study following tenets of Ethical Medical Practice as laid down in the Declaration of Helsinki. Parents of the patients gave consent for their children to be enrolled in the study. Twenty-two children (40 eyes) were enrolled in this study. Only patients who did not have any previous ocular surgery history were included. These included patients with primary congenital glaucoma, congenital cataracts and glaucoma, and some patients with posterior embryotoxon and some other anatomical anomalies of the anterior segment. MMC augmented trabeculectomy was carried out on these patients as the primary procedure. All surgeries were performed between July 2017 to August 2020 at the Department of Ophthalmology, Jinnah Hospital, Lahore. Examination under anesthesia (EUA) of all these patients was done to establish the diagnosis and measure IOP (mmHg), corneal diameters (mm) using a caliper, axial length of the eye (mm) using an A-scan, and anterior segment examination using portable slit lamp and surgical microscope. A handheld Perkins applanation tonometer was used to measure IOP in the early stages of anesthesia.

A routine trabeculectomy procedure with application of 0.2mg/ml MMC for 2 minutes on bare sclera was performed after performing peritomy and securing hemostasis. A rectangular partial thickness scleral flap measuring 3.0 mm2 was created. A full-thickness sclerotomy measuring 1 mm2 was performed, followed by peripheral iridectomy and closure of the wounds with an interrupted 10/0 nylon suture. We re-examined our patients weekly for one month and then monthly for the next whole year. A target pressure of 15 mmHg was labelled as a measure of surgical success at the end of one year with no to minimum topical glaucoma medications. We analyzed the data using SPSS software version 23.0. Mean with standard deviation were calculated for quantitative variables like age and values of IOP at various follow-up visits. Qualitative variables were analyzed in terms of frequencies and percentages. Paired t-tests were applied to compare the resultant IOP with pre-operative value on follow-up visits.

## RESULTS

We operated on 40 eyes of 22 children with PCG with MMC augmented trabeculectomy. The mean age of the study population was (26.8± 12.2) (range: 8 – 32) months with a female to male ratio of 1:1.75 (Table 1).

| Gender | No. of patients (%) |
|---|---|
| Male | 14 (63.6) |
| Female | 8 (36.4) |
| Male: Female = 1.75 : 1 | |
| **AGE (MONTHS)** | **NO. OF PATIENTS (%)** |
| < 12 | 7 (31.8) |
| 12-24 | 2 (9.1) |
| >24 | 13 (59.1) |
| Mean Age ± SD = 26.8 ± 12.2 (range: 8 – 32) months | |

**Table 1:** Age and Gender distribution (N=22)

An isolated diagnosis of primary congenital glaucoma was made in 26 eyes (65.0%). Other co-morbidities that were seen included coloboma of iris and adherent leucoma in 1 eye (2.5%), congenital cataract in 4 (10.0%), and posterior embryotoxon and iridocorneal dysgenesis in 2 eyes (5.0%). The mean IOP before trabeculectomy and postoperative IOP at 1 year follow-up were was (31.5± 8.6 mmHg) (Range: 21-53 mmHg), and (19.4± 7.9 mmHg) (Range: 9 – 48 mmHg) respectively ($p < 0.001$). The mean change in IOP after the surgical intervention was significantly improved at all follow-up visits as compared with the pre-surgery values (p-value < 0.0001) (Table 2).

| IOP (mmHg) | Mean ±SD | Range (mmHg) | *p-value* |
|---|---|---|---|
| Pre-operative | 31.5 ± 8.6 | 21 – 53 | *<0.0001* |
| After 1 month | 15.4 ± 7.8 | 4 – 42 | |
| After 6 months | 17.9 ± 8.1 | 6 – 42 | |
| After 12 months | | 9 – 48 | |

**Table 2:** Comparison of mean Pre- and Postoperative Intraocular Pressure

Out of 40 eyes, a target pressure of <15 mmHg was observed in 27 (67.5%) eyes postoperatively in the first month. However, the success rate decreased with time, and 24(60.0%) and 22(55.0%) eyes showed our desired control at 6 and 12 months, respectively (Table 3).

| Postoperative IOP | After 1 month n (%) | After 6 months n (%) | After 12 months n (% |
|---|---|---|---|
| Controlled (< 15 mmHg) | 27 (67.5) | 24 (60.0) | 22 (55.0) |
| Raised (> 15 mmHg) | 13 (32.5) | 16 (40.0) | 18 (45.0) |
| *P- values* | *0.011* | *0.048* | *0.258* |

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**Table 3:** Post-Operative Control of Intraocular Pressure

Some surgical complications were also observed in our patients. These included phthisis bulbi in 3 eyes (7.5%), thinning of the bleb in 2 (5.0%), corneal abscess in 1 eye (2.5%), and corneal perforation in 5 eyes (12.5%) which was treated with conjunctival flap. Re-trabeculectomy was carried out in 5 eyes (12.5%).

## DISCUSSION

We report our experience managing young children with congenital glaucoma with trabeculectomy with MMC. Patients had to undergo second revision surgery or were put on topical medications to control their disease. About a quarter of the patients also faced some form of surgery and disease-related complications. Childhood glaucoma is a very challenging disease to manage. As it is caused by angle dysgenesis, the mainstay of treatment is surgical intervention [11]. Patients diagnosed early with better corneal status can undergo goniotomy, whereas the children who present with advanced buphthalmos require more aggressive surgical intervention. Patients in developing countries usually present very late with an advanced form of the disease with cloudy corneas at presentation. This makes goniotomy impossible to perform. On the other hand, the trabeculotomy has its own limitations if the eyeball's size is too large because the Schlemm's canal remains compressed and is not visualized. Though a widely carried out procedure, trabeculectomy is a challenging procedure in the pediatric population. It is challenging to delineate the margins of the anatomical limbus in patients with advanced buphthalmos. Due to excessive globe expansion, creating scleral flaps usually leads to perforation and, sometimes, vitreous expression from the surgical site. The profuse healing response in children leads to excessive fibrosis at the surgical site leading to bleb closure and, eventually, surgical failure. Therefore, the recent trend has been shifted to concurrent use of anti-metabolites like MMC and 5-fluorouracil (5-FU) to prevent excessive fibrotic reaction over the area of scleral flaps hence, increasing surgical success rate [12]. An earlier study carried out a study on trabeculectomy with MMC in a higher concentration of 0.4 mg/ml for 3 minutes in pediatric glaucoma patients [13]. They observed complete success in 55% of eyes (IOP < 21 mmHg) at the end of one year; however, 27.5% of eyes required the addition of a single anti-glaucoma medication11. Another group reported a success rate of 94.7% with anti-metabolite augmented trabeculectomy in older children (mean age 7.6 years) [14]. This implies that the success rate of trabeculectomy increases as the age of the patients increases, indicating better and controlled postoperative fibrotic proliferation compared with the patients in the younger age group [15]. Another study also supported the importance of age at the time of surgery [16]. They reported that the success rate of trabeculectomy increased as the patient's age increased, but there was also an increased risk of antimetabolite-induced complications. Some investigators have advocated the use of a higher concentration of MMC in the pediatric population up to 0.5mg/ml for a longer duration of time [17]. But they have failed to demonstrate a higher success rate, which undercuts their proposition and makes the chances of anti-metabolite-related adverse effects less likely with routine 0.2 to 0.3mg/ml [18]. Furthermore, some reports have shown no difference in the surgical outcome of goniotomy, trabeculotomy, or combined trabeculotomy/trabeculectomy cases of primary congenital glaucoma [19]. This study highlighted possible demographic and racial disparities in response to surgical intervention in the Chinese population. We propose that the difference in the success rates reported in various studies are explained by the time of intervention and the severity of the disease at the time of intervention [19]. Other Limiting factors include differences in ethnicity, variations in the age groups, mean duration of follow-up, and per-operative concentration of MMC [20].

## CONCLUSION

We conclude that trabeculectomy with MMC helps control IOP in more than half of pediatric glaucoma patients. However, the success rate of the surgery decreases with the advancing postoperative period, and the surgery is associated with various complications. A quarter of the patients require additional revisional surgery to control their disease.

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