Original Article

Efficacy of Goniotomy in Management of Primary Congenital Glaucoma

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Purpose: To assess the effectiveness of goniotomy in children suffering from primary congenital glaucoma.

Material and Methods: 22 patients were selected from pediatric outdoor of LRBT Free Eye and Cancer Hospital, Lahore. 37 eyes of those 22 patients underwent goniotomy. Regular follow-up visits were planned after their surgery on which their intraocular pressure (IOP), cup/disc ratio (CD Ratio) and horizontal corneal diameters were recorded. Final post-operative IOP, CD Ratio and corneal diameters were recorded on the 180th post-operative day.

Results: 37 eyes of 22 patients were operated. Their demography showed that 14 patients (64%) were male and 8 patients (36%) were female. Mean age of the patients was 9.54 months, ranging from 2 – 36 months. On 180th postoperative day, it was seen that IOP decreased in 92% cases, CD ratio reversal occurred in 67.6% eyes and horizontal corneal diameters remained stable in 75.7% eyes.

Conclusion: Goniotomy is an effective procedure to treat children having primary congenital glaucoma.

Primary congenital glaucoma (PCG) is a group of disorders characterized by improper development of the aqueous drainage system of the eye. It is detected by raised intraocular pressure (IOP). Infantile eyes have elastic sclera and cornea, and therefore, stretch in response to raised IOP resulting in an enlarged globe. The classic symptoms include epiphora, photophobia and blepharospasm, which are secondary to corneal edema. The signs and symptoms tend to be variable.

PCG is the most common developmental glaucoma. Its patients are classified according to age at which it is first diagnosed. Patients detected at birth or within first month are known as newborn PCG, those during the first two years as infantile and older ones diagnosed thereafter are known as Juvenile PCG[1].

PCG occurs in newborns of Western countries 1 in 5000 to 1 in 22000[2].

Several theories have been proposed to suggest the pathogenesis of PCG. Barkan's theory suggested that PCG was due to an imperforate inner layer of pretrabecular tissue named Barkan's membrane[4]. Another theory by Anderson suggested that the defect responsible was premature or excessive collagen formation in the trabecular meshwork. This leads to resistance to the outflow of aqueous.

The management of congenital glaucoma is primarily surgical. Goniotomy and Trabeculotomy are the commonly done procedures. The aim of goniotomy, introduced by Barkan in 1936, is to circumferentially incise the trabeculum and therefore, reduce the resistance to the outflow of aqueous humour[5]. The objective of our study was to see that how effective goniotomy was in controlling IOP, in causing reversal of CD ratio and in stabilizing corneal diameters.

MATERIAL AND METHODS

This was a quasi experimental study. All the patients included in this study were selected from Pediatric Outdoor of Layton Rahmatulla Benevolent Trust Free Eye and Cancer Hospital Lahore. Non-probability purposive sampling was done and a sample of 37 eyes of 22 patients was selected. Inclusion criteria included

patients having PCG who needed goniotomy as the surgical procedure to treat glaucoma. Patients who were excluded were those who had horizontal corneal diameters more than 15 mm or the ones who had undergone any other ocular surgery or who had any coexisting ocular or systemic disease.

After selecting the patients, informed consent was taken from the parents. Demographic profile of the patients was noted including their name, age, sex and address. Detailed history was taken from the parents. History of any previous eye or systemic disorders or surgeries was noted. Special emphasis was given to the family history of glaucoma and eye disorders. Parents were asked about the health of the rest of their children, if any.

Detailed ocular examination was completed under sedation. Examination included detailed anterior segment and dilated fundus examination, measurement of IOP and horizontal corneal diameters. IOP was measured by using handheld Perkin's tonometer after anesthetizing the patient's cornea with 0.5% Proparacaine (Alcaine) eye drops. Measuring calipers were used to assess the horizontal corneal diameters.

Parents of the patients were counseled regarding the surgical procedure thereafter informed consent was taken.

All goniotomies were done by one Pediatric Ophthalmologist. The surgery was done under general anesthesia. Swan Jacobs goniotomy lens was used to visualize the angle of the anterior chamber. Paracenteses was done with a 22 gauge needle, after making a self sealing port with same needle. Carbachol was injected to constrict the pupil. After bending needle at 90 degrees, it was attached with a syringe containing viscoelastic. Anterior chamber was filled with viscoelastic and trabecular meshwork incised as far as possible. The surgeon then made another port, 90 degrees away from the first port, so that the remaining angle could be treated as far as possible. The anterior chamber was washed with Balanced Salt Solution containing syringe attached with a hydrodissection canula. Ports were hydrated in the end and an air bubble was left in anterior chamber.

Patients were prescribed topical antibiotic and steroid eye drops along with cycloplegics post-operatively. Visits were planned on the 1st postoperative day, 1st and 2nd postoperative weeks, and 1st, 2nd and 6th postoperative months.

On each follow-up visit, IOP was recorded, CD ratio observed and horizontal corneal diameters measured. All data was recorded on a proforma specially designed for the study. Data was analyzed using the computer software SPSS version 11. Mean and standard deviation were calculated for the pre-operative and post-operative IOP. They were compared using paired 't' test. $P < 0.05$ was considered significant. Reversal of CD ratios and stabilization of horizontal corneal diameters were expressed as percentages.

RESULTS

Sample was of 22 patients (37 eyes). Majority of patients were male – 14 male patients (64%) and 8 female patients (36%).

Mean age of the patients was 9.5 months, ranging from 2 – 36 months, (Figure 1). 15. Bilateral surgery was performed on (68%) patients 7 patients (32%) were operated on one eye.

Mean pre-operative IOP was 18.92 ± 5.08 mmHg, whereas mean postoperative IOP was 12.03 ± 5.08 mm Hg (Figure 2). Both these values were compared using paired 't' test and $P < 0.05$, showing statistically significant difference.

The IOP decreased in 34 eyes (92%) after goniotomy and only 3 eyes (8%) had raised IOP in spite of surgery.

CD ratio reversal occurred in 25 eyes (68%). There was no change in CD ratio in 9 eyes (24%), while 3 eyes (8%) showed increased CD ratio even after goniotomy. (Figure 3)

Horizontal corneal diameters remained stable in 28 eyes (76%) whereas, 9 eyes (24%) had increased corneal diameters after surgery.

In our study, 9 eyes (24%) needed a repeat goniotomy while 2 eyes had to undergo trabeculectomy.

DISCUSSION

PCG is an uncommon disease. Since it is very rare, it is often misdiagnosed or sub-optimally treated. It is estimated that if an ophthalmologist in a non-specialist center in the Western world wanted to see a new case of PCG, it would be expected every 5 years[6].

A prospective, national population based study of pediatric glaucoma in the United Kingdom showed some very interesting results regarding the ethnic

origin and the incidence of PCG. In a comparison of ethnic groups and type of glaucoma, it revealed that 75% of Asian children (India, Pakistan, Bangladesh) with glaucoma had primary glaucoma compared to 33-43% of children of other ethnic origins. The highest incidence in defined ethnic group was in Pakistani origin children, almost 9 times that of Caucasians[7].

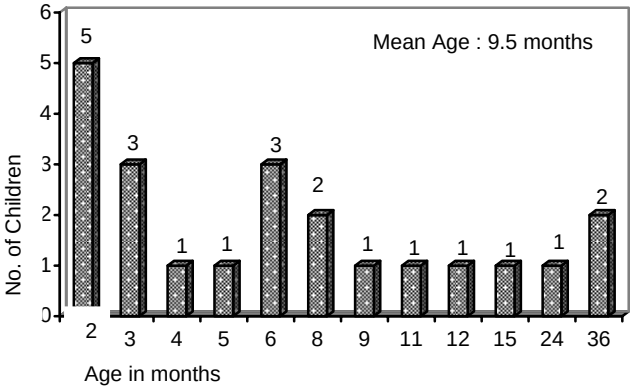

Fig. 1: Age at Presentation

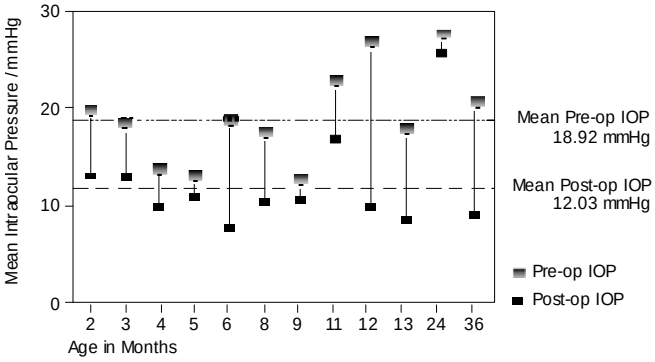

Fig. 2:

The management of PCG is mainly surgical. Goniotomy is one of the procedures performed to treat PCG. Goniotomy is a good option in cases of children having clear cornea and where the surgeon is familiar with the technique.

Success rates of goniotomy have ranged between 68 – 100%. Its outcome being better in children than in adults[4]. Our results are within this range.

Although surgery for PCG is effective, many patients require repeated surgeries to achieve the necessary control of IOP[8]. In our study, 9 eyes (24%) needed a repeat goniotomy and 2 eyes (5%) later had trabeculectomy.

Goniotomy has one advantage over other filtering procedures: the conjunctiva remains undisturbed. Therefore, a filtering procedure, such as trabeculectomy, can be done easily if required afterwards.

Enlarged corneal dimensions are thought to influence the prognosis of goniotomy. A corneal diameter more than 14mm is associated with bad prognosis in some reports[6, 9, 10]. In our study, the 3 eyes in which the IOP increased despite surgery were the ones with corneal diameters more than 14mm.

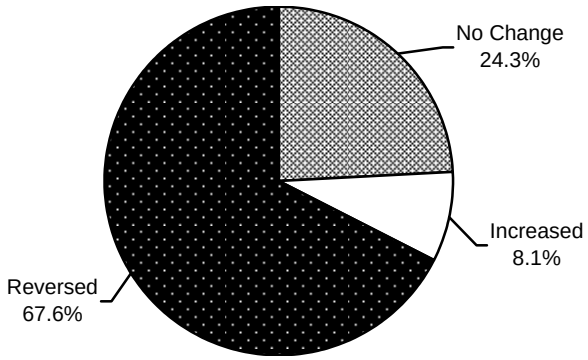

Fig. 3: Post-operative Cup / Disc Ratio

CONCLUSION

This study proves efficacy of goniotomy in cases of primary congenital glaucoma patients. It is a fresh reminder to pediatric glaucoma specialist that it is simple and effective procedure for primary congenital glaucoma with clear corneas, still leaving surgeon with rest of the options.

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Ordering Imaging Investigations

Imaging facilities despite being available now in most of the places are expensive and not without risks. These should be ordered to facilitate clinical localization and expectation of particular findings to reach proper diagnosis, plan appropriate management and provide more accurate prognosis of the history of the disease and only if the information is not available by simpler, safer and less expensive means.

Prof. M. Lateef Chaudhry
Editor in Chief