

Trabeculotomy in Primary Congenital Glaucoma

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Purpose: To evaluate outcome and frequency of complications involved in Trabeculotomy in pediatric patients.

Material and Methods: A total of 10 children were enrolled from Pediatric Ophthalmology Clinic, Bolan Medical College, Quetta during month of January and February 2013. Only Primary Congenital Glaucoma (PCG) patients were registered. Every patient had complete ocular examination under general anesthesia including anterior segment examination, measurement of intraocular pressure, corneal diameter, gonioscopy, axial lengths, funduscopy and retinoscopy where possible. The success criteria was defined as: Intraocular pressure below < 15 mm Hg (under general anesthesia), simultaneous absence of cup: disc ratio progression, disproportional enlargement of cornea and stoppage or reduction in enhancement of axial length. Follow up period comprised of one, two, four & eight months respectively.

Results: Ten patients under went trabeculotomy. Their mean age at the time of surgery was 15 months (range 10-29 months). The IOP was successfully controlled in 8 patients (80%). The pre-operative measurement was as follow: IOP 30 mm Hg (± 5.7), horizontal corneal diameter 13.06 mm (± 0.6), axial length 21.9 mm (± 0.8), CDR was 0.52 (0.23). The final reading of various parameters was as under: IOP measured under GA 12 mm Hg, horizontal corneal diameter 13.0 mm (± 0.5), Axial length 20.9 mm (0.6) and CDR was 0.3 (± 0.21). 8 patients (80%) had successful surgery while 2 patients (20%) had unsuccessful surgery. 4 (40%) patients had complications comprising of false passage, Iris prolapse, stripes in descemet's membrane and hyphaema.

Conclusion: Trabeculotomy is highly successful procedure in primary congenital glaucoma. The complications observed were quite few in number. Distorted limbal anatomy of Buphthalmic eyes may affect prognosis of surgery. Some of the steps of trabeculotomy are similar to trabeculectomy.

Key words: Trabeculotomy, Congenital glaucoma, Buphthalmos.

Primary Congenital Glaucoma is a worldwide diagnostic and therapeutic challenge. It is responsible for 0.01 – 0.04% of total blindness and 5% of childhood blindness.¹ It is an unusual, inherited anomaly of trabecular meshwork and anterior chamber angle which leads to obstruction of aqueous outflow, increased IOP, and optic nerve damage.² Incidence varies worldwide, as low as 1:20000-30000 live births in western countries, as high as 1:1250 live births in Roman Slovakian.³ It is

typically bilateral (70 - 80%) with male (60%) preponderance. The high incidence is related to parental consanguinity.⁴ Pathogenesis is still disputed; most observers have not been able to document ultra-structurally a continuous endothelial membrane, as initially advanced by Barkan.⁵ It is an isolated trabeculodysgenesis. It is know thought to be due to thick, compacted trabecular sheets.⁶ It is typically autosomal recessive⁷. Medical therapy is accorded a supportive role, definitive treatment is surgical. Both

goniotomy and trabeculectomy give similar good results. Goniotomy clinically introduced by Barkan in 1940s was undoubtedly a great step forward in the surgical management of congenital glaucoma. However, good visibility of chamber angle structures and considerable surgical experience is required for delicate kind of ab-interno surgery⁸. Trabeculotomy was developed by Smith in early 1960's. In the 1970's and 1980's trabeculotomy became an established alternative ab-externo procedure in surgical treatment of congenital glaucoma⁹. The aim of the study was to evaluate outcome and frequency of complications involved in Trabeculotomy.

MATERIAL AND METHODS

A total of 10 children were underwent trabeculotomy. All patients were registered from Pediatric Ophthalmology Clinic, Bolan Medical College, Quetta during month of January and February 2013. The written consent was taken on prescribed form. Only Primary Congenital Glaucoma patients were registered while secondary congenital Glaucoma were excluded. Every patient had complete ocular examination under general anesthesia including anterior segment examination, measurement of intraocular pressure, corneal diameter, gonioscopy, axial lengths, funduscopy, retinoscopy where possible.

Indication for pressure reducing surgery was established if 4 of following criteria were fulfilled: (1) typical symptoms (epiphora, photophobia, blepharospasm) (2) cloudy cornea (3) Increased IOP (4) Increased corneal diameter (5) Increase in axial length (6) Deep excavated cup (7) PCG in contralateral eye.

Success criteria was defined as IOP below 15 mm Hg under general anesthesia, stable axial lengths, disproportional enlargement of cornea, improvement or at least stability of optic disc excavation (absence of CDR progression). Visual function was not taken as criteria since mean age of patients included in study was too young to obtain reliable result concerning visual acuity.

A Limbal based conjunctival flap was reflected above. Following peritomy, wet cautry applied. Subsequently, a 4 x 4 mm lamellar rectangular scleral flap was dissected crossing the grey white border line zone into clear cornea. Then radial incision was given in the middle of underlying sclera, approximately 1 mm away of limbus. The Schlemm's canal was located by either scleral cut down via a deep scleral flap or direct unroofing via a deep scleral flap. To confirm

about localization of Schlemm's canal and avoid false passage, 6/0 prolene or nylon suture was entered. The passive entry of suture or prolene in the passage confirms about proper location of schlemm's canal. Then the trabeculotome was gently passed on either side of incision along the canal for about 5-6 mm, with the other parallel arm of trabeculotome as a guide and the trabeculotome was rotated in the anterior chamber. The trabeculotome swept back and removed. The same procedure was performed on the other half.

Follow-up period comprised of one, two, four and eight months respectively.

RESULTS

Ten primary operations (Trabeculotomy) were performed. Their mean age was 15 months (range 10-29m). Among 10 patients, 6 (60%) were male and 4 (40%) were female. 2 (20%) patients have family history of Congenital glaucoma. Bilateral glaucoma was found in 8 (80%) patients while unilateral glaucoma was found in 2 (20%). Out of 10, 5 patients had opaque corneas (Table 1). The Trabeculotomy was successful in 8 (80%) patients, while 2 (20%) patients' needs second surgery (Table 2). Their intraocular pressure was temporarily controlled with anti-glaucoma medications.

Table 1: Demographics

No. of Patient (Eye)	10 N (%)
Laterality of glaucoma	
Bilateral	8 (80)
Unilateral	2 (20)
Mean age at surgery	15 month (10-29m)
Male	6 (60)
Female	4 (40)
Family History	2 (20)
Opaque cornea	5 (50)

Table 2: Results of trabeculotomy

Diagnosis	Success N (%)	Failure N (%)	Total
PCG	8 (80)	2 (20)	10

Table 3: Basic variables

Variables	Mean Value	SD	Min	Max
IOP at detection of glaucoma (mmHg)	30	5.7	18	32
IOP at the end of study (mmHg)	12	5.3	10	16
Horizontal Corneal diameter at detection of glaucoma (mm)	13.06	0.6	12	17
Horizontal Corneal diameter at the end of study (mm)	13.0	0.5	10	14
Axial length at detection of glaucoma (mm)	21.0	0.8	12	22
Axial length at the end of study (mm)	20.9	0.6	11	22
CDR at detection of glaucoma	0.52	0.23	0.2	0.6
CDR at the end of study	0.3	0.21	0.1	0.5
Refraction at detection of glaucoma (diopters)	-2.5	1.5	+0.5	-4.0
Refraction at end of study	-1.0	1.0	+1.0	-2.0

Table 4: Complication of trabeculotomy

Total	4	
Operative	a. Hyphaema (moderate)	1
	b. False passage	1
	c. Iris Prolapse	1
Early Post-Operative	Stripes in descemet's membrane	1
Late Post-Operative		0

The Intraocular pressure was successfully controlled in 8 (80%) patients. The mean value of Intraocular pressure was 30 ± 5.7 mm Hg pre operatively and 12 ± 5.3 mm Hg at the end of study (measured under general anesthesia). Mean horizontal corneal diameter at detection of glaucoma was 13.06 ± 0.6. The horizontal corneal diameter was observed as

stabilized. Axial length was 21.9 ± 0.8 mm initially. The mean value of axial length was reduced to 20.9 ± 0.6 mm. The enhancement of CDR was also stopped. The refraction was possible in 5 patients only (5 patients had opaque corneas). The myopic shift seems to be stopped finally (Table 3). 4 (40%) patients had complications comprising of false passage, hyphaema (moderate), Iris prolapse and stripes in descemet's membrane (Table 4).

DISCUSSION

External Trabeculotomy has proved to be valuable procedure in the surgical treatment of primary congenital glaucoma. Our results are comparable to those reported by Harms and Dannheim, Singer, Dubois - Poulsen in their publications.^{10, 11}

One of the big advantages of trabeculotomy is that it may be done just as easily in eyes with cloudy cornea as those with clear ones.¹² In settings like Balochistan, where there is lack of awareness, illiteracy, lack of communications the patients of primary congenital glaucoma presents very late with hazy corneas and buphthalmos. So this procedure may be beneficial to treat primary congenital glaucoma in Balochistan, keeping in view of the advantage of trabeculotomy. The numbers of patients of congenital glaucoma with opaque corneas are very high.

Accurate localization of Schlemm's Canal is the key to successful Trabeculotomy and this is made easier in several ways: If scleral flap is sufficiently deep and if sclera is dried, one can often see Iris insertion with portable slit lamp and thus can localize the trabeculum. Use of Prolene (6/0) or nylon suture: After incising the Trabecular meshwork, there is oozing of aqueous. Later on 6/0 prolene or nylon suture is passed to locate the schlemm's canal. Passive entry of suture or prolene in the passage is indication of proper localization of schlemm's canal.

In this case series, tabeculotomy proved to be successful in 8 (80%) cases and failed in 2 (20%) cases. Primary congenital glaucoma responds well to surgical treatment like goniotomy and trabeculotomy from 80 - 93% as noted by Akimoto at al.¹³

The failures occur in eyes with enlarged corneas and in eyes with distorted limbal anatomy like Buphthalmos. 4 patients had complications comprising of false passage, moderate hyphaema (resolved in one week), Iris prolapse (relieved by peripheral Iridectomy) and stripes in Descemet's membrane.

The Trabeculotomy provides a significant reduction of IOP i.e. mean IOP was 12 mmHg (measured under general anesthesia) in most of the patients.¹⁴

Lack of Prognostic factor for the pre-operative IOP should mainly be attributed to measurement in deep anesthesia. A massive reduction (decrease) of IOP has been shown in animal's models after application of halothane. Consequently, it is important to consider that the normal IOP in infants and children ranges between 9-12 mm Hg under general anesthesia with halothane.¹⁵

In this short term study, we conclude that at least there is a decrease or stabilization in enhancement of axial lengths, stability in optic disc excavation. The refraction was possible in 5 patients (5 patients had opaque corneas) indicating low myopia. The progression of myopic shift was stopped during follow up visits. Although primary congenital Glaucoma is described as an entity with leading pathological feature of trabeculodysgenesis resulting in pathologically increased out flow obstruction.

Prognosis of surgery is thought to be influenced by the individual nature of dysgenesis. Axial Length of eye is also a critical factor.

Early manifestation and large ocular dimensions are key to limited prognosis of any pressure reducing surgery in PCG.¹⁶

As re-surgery is often inevitable in congenital Glaucoma owing to lifelong expectancy, a step wise surgical strategy has to be devised, starting with ab interno surgery proceeding to conventional ab externo procedures before using anti-metabolites or cyclo destructive procedures.

The present study has several limitations including relatively small number of patients, short follow-up period, difficulty of measuring visual acuity in too young, pre-verbal patients and poor patients compliance.

CONCLUSION

The trabeculotomy may be performed easily both in cloudy as well as clear corneas. Some of its phases are similar to Trabeculectomy. The complications are not very frequent. Distorted limbal anatomy Buphthalmic eyes may affect prognosis of surgery.

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