Effectiveness of trabeculectomy plus trabeculotomy in the reduction of intraocular pressure in patients with primary congenital glaucoma

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Abstract

Objective: To evaluate the effectiveness of trabeculectomy trabeculotomy in the reduction of intraocular pressure in patients with primary congenital glaucoma. Material and methods: A pre-experimental before and after study was conducted with several measurements after; patients with intraocular pressure ≥ 21 mmHg were included, of both sexes, and children under six years, which had the trabeculotomy trabeculectomy. Success was defined as the reduction of intraocular pressure < 21 mmHg within three months after the procedure. For the descriptive analysis, medians with ranges and quartiles 25 and 75 were used. For the inferential analysis, we conducted a visual graphic and analysis of variance for repeated measures of Friedman. A value of p < 0.05 was considered as significant. The software used was SPSSv15. Results: 16 eyes were included with intraocular pressure 27.75 mmHg (23-40), vertical and horizontal corneal diameter of 14 mm (12-16), who had undergone trabeculectomy with mitomycin C trabeculectomy; at three months after surgery the intraocular pressure was 12.5 mmHg (8.5-23) (p <0.001) and no changes were observed in the corneal diameters. An eye with a flat anterior chamber was observed as an adverse effect. Thirteen eyes required topical hypotensors to achieve the target intraocular pressure. Conclusions: The treatment with trabeculectomy trabeculotomy in primary congenital glaucoma is effective in the reduction of the intraocular pressure. (Gac Med Mex. 2015;151:669-73) Corresponding author: Rocio Azeneth Tolentino Reyes, azeneta@gmail.com

KEY WORDS: Primary congenital glaucoma. Trabeculectomy trabeculotomy. Intraocular pressure. Corneal diameter.

Background

Childhood glaucoma comprises a heterogeneous group of conditions resulting from a structural defect in aqueous outflow known as primary glaucoma; or a disease that, associated with this anomaly, shows iridodysgenesis, irido-corneal dysgenesis or some other systemic disease, such as Sturge-Weber or neurofibromatosis, which is known as secondary glaucoma¹. Primary congenital glaucoma (PCG) is an uncommon disease, but it is the most common form of infantile glaucoma, with a frequency of one case per 10,000 births, a number that increases in populations with high incidence of consanguinity. Presentation of the disease is bilateral in up to 70% of cases, frequently asymmetric, although observations suggest that in 25-30% of cases it can be unilateral². In addition, this type of glaucoma causes...
Design

A pre-experimental before-and-after study design with several post-procedure measurements was used, and patients diagnosed with CPG with ≥ 21 mmHg IOP, from both sexes and younger than six years, who underwent trabeculotomy with trabeculectomy, were included. Success was defined as IOP reduction (dependent variable) < 21 mmHg within 3 months after the procedure. For descriptive analysis, medians with quartiles were used. For inferential analysis, a graphic analysis was performed and the ANOVA for Friedman’s repeated measures was used. A p-value < 0.05 was considered to be significant, and the statistical package SPSS version 15.0 was used for calculations.

An exploration was performed under anesthesia at the moment prior to the trabeculotomy plus trabeculectomy, where the following was examined: previous IOP by means of the Schiotz tonometer, corneal diameters measurement and biomicroscopy to assess corneal transparency. The surgery was subsequently performed: a corneal bridal suture with 7-0 vicryl was placed in order to facilitate exposure of the upper conjunctiva. A limbus-based conjunctival flap was then created onto the upper limbus (at 1 or 11 o’clock). A rectangular flap with an approximate size of 2 x 3 mm was then dissected towards the limbus, into half or two thirds of scleral thickness. Mitomycin C was applied in a cotton swab, which was placed beneath the flap for 2 min; subsequently, the area was rinsed with 30 cc of physiological saline.

Using high magnification, a radial incision was carefully performed on the underlying sclera, tearing with the blunt end of a slit knife. The incision was made on the transition zone between the blue cornea (trabecular band) and the scleral tissue, where Schlemm’s canal is located. The canal is identified when a reflux of aqueous humor is observed as coming from the incision, occasionally mixed with blood. The Vannas scissors were introduced at the incision level in the exposed canal, seccioning it 1 mm at each side. The double trabeculotome, right and left, was then inserted into the incision and its advancement without resistance into the canal lumen was checked. A controlled rotation was then applied towards the anterior chamber, thereby crossing the internal side of Schlemm’s canal, breaking the trabecular mesh and the angle’s...
embrionary tissue. In a similar way, the trabeculotome was introduced through the other end of the incision. Schlemm’s canal internal wall was sectioned in an extension of about 120º. A small portion of tissue was then excised from the corneo-scleral bed, with an approximate size of 1 x 2 mm, including some trabecular mesh and a portion of Schlemm’s canal (trabeculectomy), followed by a peripheral iridectomy. The scleral flap was repositioned and sutured onto the corners with 10-0 nylon interrupted stitches. The conjunctiva was closed using 7-0 vicryl simple sutures; at the end, antibiotic drops were applied and an occlusive dressing was placed.

The next day after the procedure, the patient was assessed at the outpatient clinic for corneal transparency and bi-digital IOP; in addition, topical antibiotic and antiinflammatory was started, and next reviews under anesthesia were scheduled at 1 month and 3 months after the first surgery. In the following 2 explorations under anesthesia, IOP was assessed again with the Schiotz tonometer, as well as corneal transparency and diameter.

Results

Sixteen eyes from 10 patients of the Ophthalmology Department of the High Specialty Unit Nº 25 with the diagnosis of PCG and intraocular pressures higher than 21 mmHg, who underwent trabeculotomy plus trabeculectomy, were included. Four patients (40%) were of the male sex and 6 (60%) of the female sex, with median age of 2 years (range: 1-6); six of them had bilateral disease.

Median IOP prior to trabeculectomy was 27.7 mmHg (23-40); at 1 month of the surgical procedure, it was 12 mmHg (7-25), and at 3 months, 12.5 mmHg (8.5-23) (p < 0.001).

With regard to vertical (p 0.223) and horizontal (p 0.368) corneal diameters, a median of 14 mm (12-16) was observed for all 3 measurements. All patients were applied mitomycin C during the surgical procedure and only one adverse effect occurred: a shallow chamber secondary to overfiltrating surgery, which required closure of the trabeculectomy flap. The use of coadjuvant hypotensive agents was necessary after surgery in order to achieve the IOP goal in 13 eyes (Fig. 1).

Discussion

PCG is a condition characterized by an alteration of the iridocorneal angle that difficults aqueous humor outflow, which results in IOP increase and, therefore, vision is affected by changes produced to the optical nerve, as well as in corneal transparency and eye globe size. The classical symptom triad PCG presents with is comprised by photophobia, epiphora and lacrimation; the observed signs are: corneal opacity, increased corneal diameter, optic nerve with wide excavations and IOP increase. PCG is characterized for requiring surgical treatment, with several procedure options, such as goniotomy, a procedure that is performed when the cornea is transparent, which is a condition not present in most patients, since IOP increase causes corneal opacity, thus making iridocorneal angle visualization impossible. Trabeculotomy is also performed in patients with this disease and has the advantage that it can be performed in spite of corneal opacity; however, being a blind procedure, Schlemm’s canal might not be correctly canaled or the tissue could cover the surgical area again. In addition, more than one surgery is often necessary in order to stabilize IOP. Thus, trabeculotomy plus trabeculectomy surgery was implemented, since by performing two procedures in one without the need for a clear cornea, favorable results are more likely to be attained.

In this prospective research work, 16 eyes were accepted, with a 3-month follow-up. In the study by Mulaney, which is retrospective, a total of 100 eyes were included, from 1991 to 1996, with a mean follow-up of 304 days. Campos-Mollo conducted a similar study...
where trabeculotomy plus trabeculectomy was used as initial surgical procedure; it was a retrospective study of 22 eyes with a mean follow-up of 8.5 years.23

The primary endpoint of this study were the changes in IOP after trabeculotomy plus trabeculectomy surgery; at 3 months' follow up, a median of 12.5 mmHg (8.5-23) was observed, a figure slightly higher than that found by Campos-Mollo, Moral-Cazalla and Belmonte-Martínez in their study, where they had a 8.9-year follow-up with a mean of 10.89 ± 4 mmHg. Campos et al. considered IOP higher than 21 mmHg to be a surgical failure, a situation that occurred in 4 (18%) out of 22 studied eyes and which underwent a second trabeculectomy; conversely, in our study, 2 (12.5%) of 16 studied eyes continued with figures higher than 21 mmHg, which prompted the placement of an Ahmed valve to each one of them.21

In the present study, when corneal diameter progression was assessed, no changes were observed in vertical or horizontal diameter, with a median of 14 mm (12-16). In the aforementioned study by Campos et al., neither was an increase in corneal diameter observed, and very similar figures of 13.4 mm (12-15) were found. In the study by Beerman et al., preoperative corneal diameter mean in the group undergoing trabeculotomy plus trabeculectomy was found to be 13.6 mm ± 1, and that of corneal diameter at 6 months was 13.46 mm ± 0.93, and in the group undergoing trabeculectomy with mitomycin C, preoperative diameter was 13.53 mm ± 1.1 and, 6 months after surgery, it was 13.46 mm ± 1.1.18

Mandal et al. studied patients with advanced PCG who underwent trabeculotomy plus trabeculectomy; the use of postoperative topical ocular hypotensive agents was required in 11 out of 157 assessed eyes,15 in contrast with findings in our study, where 13 of 16 observed patients required at least one topical hypotensive agent to reach the IOP goal.

Here, only a shallow chamber secondary to overfiltrating surgery was observed as an adverse event; in this patient, closure of the trabeculectomy flap was required in order to improve IOP. Conversely, in the study by Mandal, 4 patients had shallow anterior chamber, with re-intervention being required only in 4 cases. In the study by Beerman, in the group that underwent

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trabeculotomy plus trabeculectomy in one eye, flat bleb occurred as an adverse event, shallow anterior chamber in 2 eyes and hyphema in other 2.  

This investigation was carried out with 16 eyes from 10 PCG-diagnosed patients who underwent an exploration under preoperative anesthesia, where IOP was assessed using a Schiotz tonometer and vertical and horizontal diameter was measured; subsequently, trabeculotomy plus trabeculectomy surgery was carried out, and the patients were assessed the next day to rule out any adverse events. In addition, they were examined, again under anesthesia, 1 month and 3 months after surgery to check IOP and corneal diameters, with a significant improvement found in patients treated this way. Only in two eyes was a second hypotensive procedure required; in both cases, an Ahmed valve was placed and in one there was an adverse effect, shallow chamber associated with surgical overfiltration, thereby undermining closure of the trabeculectomy scleral flap, which stabilized IOP. With regard to corneal diameters, no modifications were observed in the corneal diameter length. However, longer follow-up with a larger number of patients should be considered for future research, as well as conducting a randomized trial (Tables 1 and 2).

**Conclusions**

In the present study, the effectiveness of trabeculotomy plus trabeculectomy was assessed in the decrease of IOP in this type of patients, by means of 3 measurements that were carried out during an exploration under anesthesia prior to surgery, and 1 month and 3 months later. In conclusion, this study suggests that trabeculotomy plus trabeculectomy is effective in the reduction of IOP in patients who had PCG and, therefore, there is no progression in vertical and horizontal corneal diameters after the procedure. However, both the number of patients included and the follow-up were short, and there was no control group.

**References**

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