Original Article

Safety and Efficacy of Combined Trabeculectomy for Primary Angle Closure Glaucoma with Persistent Ocular Hypertension

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Abstract

Purpose: To investigate the safety and efficacy of combined trabeculectomy for primary acute angle closure glaucoma with persistent ocular hypertension.

Methods: A total of 36 patients (40 eyes) with primary acute angle closure glaucoma, who were treated with combined trabeculectomy in the Ophthalmology Unit of our hospital, were selected. Before the procedure, patients were assigned to ocular hypertension group (≥ 40 mm Hg) or control group (< 40 mm Hg) based on intraocular pressure. These two groups were followed up for one year, and compared for post-operative visual acuity, intraocular pressure, filtering bleb, anterior chamber depth, and the occurrence of complications.

Results: At 1 week, 6 months, and 12 months after the procedure, intraocular pressure was controlled in both the ocular hypertension group and the control group, without significant differences between the two groups (P>0.05). At 1 week, 6 months, and 12 months after the procedure, all of the patients, in both groups, had improved in terms of visual acuity, with a significant difference before and after the procedure for the ocular hypertension group (P<0.05). After follow-up at 12 months, the two groups presented no statistically significant differences in anterior chamber depth, filtering bleb survival, or the incidence of post-operative complications (P>0.05 for all).

Conclusion: It is feasible, safe, and effective to perform combined trabeculectomy on patients with primary acute angle closure glaucoma complicated by persistent ocular hypertension. (***Eye Science 2011;26:166-170***)

Keywords: acute angle closure glaucoma; intraocular hypertension; trabeculectomy; safety

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Glaucoma is one of the most common acute-onset ophthalmologic conditions that lead to blindness. In China, primary acute angle closure glaucoma predominates, and is mainly treated with surgery. Traditionally, it is believed that a filtering surgery under persistent intraocular hypertension is associated with more complications, with patients prone to serious complications such as expulsive supra choroidal hemorrhage and ciliary block glaucoma. Therefore, it bears significant risk and provides unfavorable efficacy[1,2]. Consequently, it is suggested that surgery should be performed when intraocular pressure is under control. However, in a clinical setting, intraocular pressure is sometimes still high after comprehensive medical treatment in some patients.For these patients, the new insight is adopting surgical treatment as soon as possible, in order to prevent further impairment of visual function and preserve the remaining visual function. In recent years, a combined trabeculectomy, that is, a traditional trabeculectomy plus an adjustable scleral flap suture and the use of anti-metabolic agents, has gradually been introduced into the clinical treatment of glaucoma, and its advantages are gaining more and more recognition from scientists[3,4]. In this study, clinical data were retrospectively analyzed from the patients with primary acute angle closure glaucoma under persistent intraocular hypertension who were treated with a combined trabeculectomy between September 2007 and May 2010, in the Ophthalmology Unit of our hospital; they were evaluated to determine the long-term safety and efficacy of the surgery, in the hope of providing an evidential basis for the clinical application of a combined trabeculectomy in the treat-

ment of patients with primary acute angle closure glaucoma under persistent intraocular hypertension.

Data and methods

Clinical data

A total of 36 patients (40 eyes) with primary acute angle closure glaucoma, who underwent a combined trabeculectomy in the Ophthalmology Unit of our hospital between September 2007 and May 2010, were selected, including 15 males (18 eyes) and 21 females (22 eyes). They were aged between 38 and 80 years, with an average of 62.5±8.6 years. After admission, they were treated with a combination of systemic and topical intraocular pressure reducing agents for three days, and were then assigned to intraocular hypertension group (≥40 mm Hg) or a-control group (<40 mm Hg) based on their intraocular pressure before the procedure. The intraocular hypertension group consisted of 20 patients (23 eyes), including 8 males (11 eyes) and 12 females (12 eyes); the mean age was 61.5±8.2 years; the preoperative intraocular pressure ranged from 40 to 75 mm Hg, averaged 58.6±11.2 mm Hg; and the preoperative visual acuity ranged from hand movement to 0.25. The control group consisted of 16 patients (17 eyes), including 7 males (7 eyes) and 9 females (10 eyes); the mean age was 63.6±10.2 years; the preoperative intraocular pressure ranged from 10 to 36 mm Hg, averaged 18.3±6.5 mm Hg; and the preoperative visual acuity ranged from 0.1 to 07.

Treatment methods

All of the patients, in both groups, were treated with a combined trabeculectomy. After peri-bulbar anesthesia, intermittent pressured massage was conducted to reduce intraocular pressure, to the extent possible. An anterior chamber puncture was performed at 10 am on the corneal limbus to release the proper amount of aqueous humor, and thereby slowly reduce intraocular pressure. When the scleral flap was prepared, a cotton pad the same size as the scleral flap, soaked with 0.2–0.4 mg/mL mitomycin C, was placed under the scleral flap for 2–5 min; thesurgical wound and adjacent tissue were then rinsed thoroughly with a balanced saline solution. Again, an anterior chamber puncture was performed, at the previous puncture site, to slowly release the aqueous humor and to further reduce intraocular pressure.When intraocular pressure was below the normal level, the tissues of the cornea and the corneal limbus, at the center of scleral bed immediately adjacent to the base of the scleral flap, were resected, together with the corresponding peripheral iridotomy, over a wider base. Top angle of the scleral flap was sutured with two stitches, using 10-0 nylon thread, with one stitch of adjustable thread on each side. At the end of the procedure, tobramycin 4 mg and dexamethasone 2.5 mg were injected subconjunctivally, and then the treated eye was covered. After the procedure, antibiotics were systemically and topically administered to prevent infection, perroutine, and eye massage was conducted as necessary. Intraocular pressure, filtering bleb, post-operative complications,and intraocular reactions were closely monitored. Generally, the adjustable sutures were removed soon after the surgery (1–14 days after the procedure); however, the timing was determined based on the shape and function of the filtering bleb, the intraocular pressure, and the formation of the anterior chamber after the procedure; the removal of suture can be delayed up to 4–6 weeks post operatively.

Follow-up and observed parameters

All of the patients, in both groups, were followed for more than one year and were compared for the changes in intraocular pressure and visual acuity, both before the procedure and at 1 week,6 months, and 12 months after the procedure. The depth of the anterior chamber, the formation of filtering bleb, and the occurrence of postoperative complications were also observed during the follow-up for patients in both groups. A shallow anterior chamber was rated, as proposed by Speath: in grade Ⅰ, the peripheral iris was in contact with the corneal endothelium; in grade Ⅱ, the entire iris was in contact with the corneal endothelium, with the remaining interspace between the lens and the corneal endothelium in the pupil area; in grade Ⅲ, the iris and the lens were in complete contact with the corneal endothelium, while the anterior chamber completely disappeared. The shape of the filtering bleb was classified according to Honfeld[5]: type Ⅰ blebs represented small cystic blebs; type Ⅱ were extensive flat blebs; type Ⅲ

consisted of scar blebs; and type Ⅳ were encapsulated blebs. Blebs of type Ⅰ and Ⅱ were functional, while those of type Ⅲ and Ⅳ were non-functional.

Statistical analysis

SPSS11.0 statistical software was used for the data analyses. Measurement data were compared between the two groups using a *t*-test, whereas numerical data were compared between the two groups using the χ^2 test. $P<0.05$ was used as a sign of significant difference.

Results

Changes in intraocular pressure before and after the surgery in two groups were indicated in Table1.

A significant difference was noted when comparing the pre-operative intraocular pressure in the two groups ($P<0.05$); at 1 week, 6 months, and 12 months after the procedure, no significant differences were found in the intraocular pressure of the two groups ($P>0.05$), show in table 1.

Visual acuity, before and after the procedure, in the two groups

At 1 week, 6 months, and 12 months after the procedure, visual acuity was improved in both groups; a significant difference was seen in post-operative visual acuity in the intraocular hypertension group ($P<0.05$), but not in the control group ($P>0.05$), as shown in table 2.

Table 1 The intraocular pressure between the two groups (mm Hg) before and after the procedure

	n	Preoperatively	1 week postoperatively	6 months postoperatively	12 months postoperatively
intraocular hypertension group	20	58.6±11.2	10.8±3.1	17.5±6.8	19.5±7.3
Control group	16	18.3±6.5	11.2±2.9	16.4±5.9	18.2±6.2
t		9.82	0.725	0.907	0.675
P		<0.05	>0.05	>0.05	>0.05

Table 2 Visual acuity before and after the procedure between both groups (eye)

Groups	<0.1	0.1-0.5	>0.5
Intraocular hypertension group (23)			
Preoperatively	19	4	0
1 week post-operatively	6	12	5
6 months post-operatively	4	12	7
12 months post-operatively	4	11	8
Control group (17)			
Preoperatively	0	12	5
1 week post-operatively	0	11	6
6 months post-operatively	0	10	7
12 months post-operatively	0	10	7

Comparisons of the depth of the anterior chamber, the bleb formation, and the occurrence of complications after the procedure between the two groups

Within 24 hours of the procedure, all of the pa tients were observed, and an anterior chamber formed in 21 eyes in the intraocular hypertension group, with a grade Ⅱ shallow anterior chamber in 2 eyes. In the control group, an anterior chamber formed in 15 eyes, with a grade Ⅰ shallow anterior chamber forming in one eye and a grade Ⅱ shallow anterior chamber in another eye. No statistically significant differences were detected between the two groups ($P>0.05$). The anterior chambers were restored, for patients in both groups, after conservative treatment. During the follow-up, no shallow anterior chambers, or missing anterior chambers, were found in either group, and the anterior chambers were well developed. Formation of filtering bleb was observed during 12-month follow-up; functional filtering bleb was observed in 20 of the eyes in the intraocular hypertension group, with non-functional bleb in 3 eyes. As for the control group, functional bleb was found in 15 eyes, with non-functional bleb was found in 2 eyes. No statistically significant difference was noted between the two groups ($P>0.05$). No serious complications, such as choroidal hemorrhage, choroidal detachment, ormalignant glaucoma, were seen during post-operative follow-ups in either group.

Discussion

In the past few years, a considerable amount of

data has suggested that, among numerous factors that impair optic nerves in glaucoma, damage induced by persistent intraocular hypertension on the optic nerve, and its prognosis, is not only related to the level of intraocular pressure, but closely associated with the duration of the intraocular hypertension[6,7]. When intraocular pressure is above 40 mm Hg, it may cause acute anterior ischemic optic neuropathy, retinal venous embolism, and even retinal arterial embolism. Therefore, glaucoma patients with intraocular hypertension should receive a combination of topical and systemic intraocular pressure reducing agents as soon as possible. Currently, there are contradicting opinions on the best time for surgery on glaucoma patients with persistent intraocular hypertension. Generally, it is optimal to perform surgery when intraocular pressure is under control and below 20 mm Hg, since this can remarkably reduce the occurrence of intra- and post-operative complications[8]. Nevertheless, for those patients whose treatment failed to bring their intraocular pressure under control after 72 h, with the adequate dosage of pressure-reducing agents, it is not possible to control intraocular pressure with medical treatment, and persistent intraocular hypertension will definitely cause further damages to the optic nerves, leading to irreversible visual loss or complete blindness. In addition, the longer the persistent intraocular hypertension lasts, the more risky the surgery will be, and the more complications will be seen during and after the surgery, with poorer efficacy. However, the treatment of such patients, under persistent intraocular hypertension, with anti-glaucoma surgeries is still controversial, and has drawn much attention among ophthalmologists.

In this study, the safety and efficacy of a combined trabeculectomy for primary acute angle closure glaucoma under intraocular hypertension was investigated. The results show that intraocular pressure was restored to different degrees, in the intraocular hypertension group and the control group at 1 week, 6 months, and 12 months after the procedure, without a significant difference between the two groups ($P>0.05$). Visual acuity was also improved in both groups; the visual acuity difference after the procedure was significant for the intraocular hypertension group ($P<0.05$), though no significant change was noted in the control group before and after the procedure ($P>0.05$). This suggests that a combined trabeculectomy yields a favorable efficacy when it is performed under intraocular hypertension, as most of the patients preserved good visual acuity and their intraocular pressure was under control. During the 12-month follow-up, no statistically significant differences were found when comparing the two groups in terms of anterior chamber depth and filtering bleb ($P>0.05$). In addition, no serious complications, such as choroidal hemorrhage, choroidal detachment, or malignant glaucoma, were seen after the procedure. This demonstrates that a combined trabeculectomy is safe when performed under intraocular hypertension. This may be related to the fact that an anterior chamber puncture was performed to slowly release some of aqueous humor during the procedure, so that the intraocular pressure was gradually decreased in these patients with acute closure glaucoma under intraocular hypertension before the tra beculectomy was performed. Additionally, other new techniques, including the use of mitomycin C, adjustable sutures, and eye massage, were also rather effective in preventing and reducing serious post-operative complications.

To improve the safety and success rate of surgery under intraocular hypertension, and to reduce intra- and post-operative complications, we think that the following points should be well attended to during surgery, based on our experience: ①Adequate pre-operative preparation to reduce intraocular pressure, to the extent possible. ②During the surgery, before making incisions on the anterior chamber, an anterior chamber puncture should be performed to slowly release aqueous humor, so as to reduce intraocular pressure. It is preferable that intraocular pressure is gradually decreased; this requires certain surgical skills and should never be done quickly. ③ Eye massage should be conducted after the retro-bulbar anesthesia, so as to reduce post-operative intraocular pressure and maintain the patients' filtering path. ④ Mitomycin C is an anti-metabolic agent that effectively inhibits the excessive proliferation of fibroblasts in the filtering region, depressing scar formation in the filtering path and filtering bleb. However,

notably, the decision to use mitomycin C should be based on the age of the patient and the thickness of the fascia, as seen during the surgery, so as to prevent the formation of a filtering bleb leak. More over, the concentration and treatment duration should be rigorously controlled during the surgery, followed by adequate rinsing with a balanced saline solution. ⑤The scleral flap should be sutured with adjustable sutures. Adjustable sutures can automatically adjust the filtering capacity of filtration surgery for glaucoma. As a result, it not only helps maintain the normal depth of the anterior chamber, avoiding a shallow anterior chamber and an excessively low intraocular pressure right after the procedure, it also maintains the normal functions of filtering bleb and prevents the occurrence of a shallow anterior chamber after the procedure by removing the adjustable suture at a proper time. In the long run, it provides favorable intraocular pressure control and improves the effective rate of glaucoma surgeries[10].

In conclusion, clinically serious impairment, induced by persistent intraocular hypertension, should be actively attended to, rather than wait passively for intraocular pressure control through medical treatment. An undue delay of surgery often causes unnecessary pain and serious irreversible damage to the optic nerves of patients. With adequate pre-operative preparation, and good surgical skills and post-operative management, it is safe and effective to perform a combined trabeculectomy under intraocular hypertension.

References

1 Ren J. Observation of Glaucoma Surgery in Persistent High Intraocular Pressure. International Journal of Ophthalmology, 2009, 9 (4): 775-776.

2 Yang X, Fang YH. Surgical Treatment of the Primary Acute Angle-closure with ContinousHigh IOP. Medical Information, 2008, 21 (7): 610-614.

3 Huang SS.Trabeculectomy for Primary Acute Angle Closure Glaucoma with Persistent High Intraocular Pressure.Chinese Journal of Practical Ophthalmology, 2004, 11 (22): 887-888.

4 Niu XH. Surgical Treatment for Primary Angle Closure Glaucoma under Persistent Intraocular Hypertension. Chinese Journal of Practical Ophthalmology, 2006; 13 (2): 152.

5 Iwao K, Inatani M, Ogata-Iwao M, et al.Restricted Post-trabeculectomyBleb Formation by ConjunctivalScarring. Graefes Arch ClinExpOphthalmol, 2009, 12(2): 115.

6 Long QB, Peng AB, Xu N. Clinical Analysis of Trabeculectomy for Primary Acute Angle-closure Glaucoma with High Intraocular Pressure. Journal of Anhui Health Vocational & Technical College, 2008, 7(2): 27-28.

7 Peng LG, Zhang MX, Du ZL. Observation of Efficacy of Surgical Treatment for Acute Angle Closure Glaucoma under Persistent Intraocular Hypertension. Chinese Medical Journal of Metallurgical Industry, 2008, 25 (2): 186-186.

8 Zhou WB.Clinical Glaucoma.2nd edition. Beijing People's Medical Publishing House, 2000, 391-392.

9 Chen YH, Gang Y, Wang YY. Surgical Treatment of Primary Angle-Closure Glaucoma with Persistent High Intraocular Pressure. Guide of China Medicine, 2010, 8 (2): 161-162.

10 Su BQ, Yu HZ. Surgical Treatment for Primary Angle Closure Glaucoma under Persistent Intraocular Hypertension.China Practical Medical, 2009, 4(13): 79-80.