Mid-Term Results of Filtering Surgery in Corticosteroid-Induced Glaucoma Patients

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Abstract

Aim: To analyze the mid-term effect of filtering surgery in patients with corticosteroid-induced glaucoma (CIG).

Methods: This case-series study consisted of 20 eyes of 15 corticosteroid-induced glaucoma patients who received trabeculectomy or non-penetrating trabecular surgery (NPTS) from March 2005 to March 2008. Both preoperative and postoperative intraocular pressure (IOP), cup – disk ratio, Humphrey visual fields, number of glaucoma medications were recorded. Characteristics of postoperative blebs were analyzed with Ultrasound biomicroscope (UBM), and slit-lamp. Bleb grading and Ultrasound biomicroscope were performed on all glaucoma surgery eyes at a single final time point.

Results: 14 eyes were performed trabeculectomy, 6 eyes were performed NPTS. Mean IOP before and after trabeculectomy were 30.5±13.1 and 11.4±3.8 mmHg (p<0.01), respectively. Mean IOP before and after NPTS were 20.3±4.7 and 12.2±3.1 mmHg (p<0.01), respectively. The mean vertical cup-disk ratio (VCDR) was 0.54 before surgery compared with 0.55 just after surgery. No significant changes were found in visual fields before and after surgery (P=0.06). According to the outcome of final IOP, success rate was 100%. Based on slit-lamp and Ultrasound biomicroscope evaluation of the bleb, 90% of blebs were functional and 10% were non-functional.

Conclusions: The mid-term glaucoma management in CIG patients undergoing surgery indicated a successful outcome in final IOP and fairly good prognosis for visual function, without antiglaucoma medication.

Keywords: Corticosteroid-induced glaucoma; IOP; Visual field; Filtering bleb; Slit-lamp; Ultrasound biomicroscope

Introduction

Corticosteroid has long been recognized to raise intraocular pressure (IOP) [1,2]. IOP rise is related to duration of treatment, corticosteroid type and dose as well as individual susceptibility [3]. Steroid has been shown to produce an IOP rise over a period of weeks in both normal and glaucomatous eyes [4-6].

Ending corticosteroid treatment is the first step to reduce IOP. However, IOP cannot be controlled medically in some patients even after discontinuing corticosteroid therapy and progressive vision loss and glaucomatous optic neuropathy occur. Therefore, trabeculectomy or non-penetrating trabecular surgery (NPTS) is needed to prevent further optic nerve damage. Several clinical studies have evaluated bleb morphology and the effectiveness of trabeculectomy and NPTS in lowering IOP in primary open angle glaucoma, pigmentary glaucoma, pseudoexfoliation glaucoma, and normal tension glaucoma [7,8]. However, it remains uncertain whether these two surgeries are really effective in controlling IOP and protecting the optic nerve. Therefore, we conducted this case series study on patients who underwent trabeculectomy or NPTS to report the mid-term effects of the visual field outcome as well as the IOP control outcomes .The hypothesis of this study is that corticosteroid-induced glaucoma (CIG) patients get good results after surgery.

Methods

Our study was a case series. Twenty eyes of 15 patients diagnosed with corticosteroid-induced glaucoma were included. All patients underwent trabeculectomy or NPTS at the Department of Ophthalmology, Beijing Tongren Hospital from March 2005 to March 2008; they were called in for follow up in December 2009. We studied postoperative effects, including IOP, vertical cup/disk ratio (VCDR) and visual field. IOP was measured by Goldmann applanation tonometry .Successful filtration was defined as IOP lower than 21 mm Hg without antiglaucoma medication (no or fewer topical glaucoma medications) [9]. Fundus photography was performed to assess vertical cup-to-disc ratio (VCDR). All subjects underwent static automated white-on-white threshold perimeter with SITA Fast strategy (program 30-2, model 750, Humphrey Instruments, Dublin, CA). This study was approved by Ethics Board of Beijing TongRen Hospital.

Corticosteroid-induced glaucoma diagnostic criteria were as follows: 1) local or systemic use of glucocorticoid for more than 3 months; 2) similar clinical performance to primary open-angle glaucoma; 3) no other type of glaucoma; and 4) no history of ocular trauma or surgery [10]. Maximal medical therapy was tried prior to surgery in all cases. Written informed consent was obtained from all subjects.

A glaucoma specialist (WNL) performed all trabeculectomies and NPTS. The trabeculectomies were performed with a limbus based conjunctival flap with intraoperative 5-fluorouracil or mitomycin C. NPTS were also performed by the same surgeon (WNL) as described in detail in earlier reports [11].

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Paired t test was used to analyze the data. P value less than 0.05 was considered statistically significant.

**Bleb evaluation by slit-lamp**

Morphology of blebs was classified into four types according to Kronfeld’s [12] standard: type I, small vesicle (Figure 1); Type II, diffuse; type III, encapsulated; type IV, flat (Figure 2). Type I and II are functional filtering blebs; type III and type IV are non-functional filtering blebs [13]. All blebs were classified prospectively by one examiner (FJ).

**Bleb evaluation by Ultrasound biomicroscope**

Ultrasound biomicroscope examination was performed 21-57 months after surgery (mean: 40.3±13.0 months) using the Ultrasound biomicroscope SW3200 (Tianjin Suoer, China). The Ultrasound biomicroscopewas set at a 5.0×5.0 mm field of view with 76dB of gain, 5 dB of gain compensation and 1-3 mm delay. With aid of a normal saline-filled cup, we scanned the entire filtering structure. For each eye, we recorded six images.

A total of 22 filtering blebs after trabeculectomy or NPTS were analyzed by Ultrasound biomicroscope. Taking into account the characteristics of internal reflectivity and scleral flap, we classified the blebs into four types according to the method of Yamamoto [14]. All Ultrasound biomicroscope was performed by the same operator (MDP).

**Results**

Twenty eyes of 15 patients were included in the study. Follow up period ranged from 21 to 57 months (mean: 40.3±13.0 months). The mean age of patients was 30.4±16.9 years (13-66 years). Six were male and nine female. Mean duration of steroid usage pre-operative was 17.1±19.2 months. All patients had open angles with gonioscopy examination.

Preoperative patient characteristics are presented in Table 1, which shows methods of steroid administration in corticosteroid-induced glaucoma patients. None of the patients used the antiglaucomatous drugs after filtrating surgery.

The most common reasons for steroid use were allergic conjunctivitis and LASIK (4 patients, each, topical dexamethasone 0.1%), nephritis (2 patients, prednisolone, oral), renal transplant (2 patients, prednisolone, oral), pemphigoid (1 patient, oral prednisolone), systemic lupus erythematosus, SLE (1 patient), macular edema due to retinal vein occlusion (1 patient, injection of triamcinolone acetonide).

No previous glaucoma surgery had been performed before this study. After surgery all patients had IOP less than 21mmHg without further medication. As described in Table 2, the mean IOP before and after trabeculectomy were 30.5±13.1 and 11.4±3.8 mmHg (p<0.01) respectively. Mean IOP before and after NPTS were 20.3±4.7 and 12.2±3.1 mmHg (p<0.01), respectively (p<0.001). All patients had used 1-4 antiglaucomatous drugs preoperatively, mean± SD (1.87±1.19),
such as timolol, adrenergic agents, beta-blocking agents, pilocarpine or latanoprost, but none used the above drugs after filtrating surgery.

The mean VCDR was 0.54 before surgery compared with a VCDR of 0.55 just after surgery. No significant changes were found in visual fields before and after surgery (P>0.05) (Table 3), consistent with mean of 0.55 just after surgery. No significant changes were found in visual cup-disk ratio 0.54 0.55 0.06

Pattern Standard Deviation 9.18±2.99 9.41±3.67 0.57
Mean Deviation -19.73±8.43 -18.95±10.95 0.49

Paired t test was used to evaluate the data

Table 3: Preoperative and Postoperative Mean Deviation and Mean Pattern Standard Deviation and cup-disk ratio in the CIG patients.

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eye had high reflectivity inside the bleb, however both eyes’ IOP were less than 21mmHg (table 1, patient 7 and patient 13) during the fellow up. A possible explanation is that trabeculectomy may help the patient to pass through the time of higher IOP and protect optic nerve; even the bleb is non-functioning at the end of follow up time, the outflow of aqueous humor back to normal.

Our results are meaning for patients with systematic disease who cannot stop corticosteroids, such as renal transplant recipients. In-time filtering surgery is necessary, not only for the patient’s well-being, but also to prevent further damage to the optic nerve. Our findings suggest that surgery may be a good alternative for the treatment of parts of corticosteroid-induced glaucoma patients.

Our study was subject to limitations; first the sample size is relatively small. Second, 7 of the patients have had both eyes included in our study, as it is possible that both eyes in the same person will respond in the same manner this may generate bias in outcomes. Third, Laser trabeculectomy was not carried out in TongRen hospital at that time; the surgeons tend to perform surgery on CIG patients.

In summary, our mid-term results indicated that patients with corticosteroid-induced glaucoma may have a good outcome after trabeculectomy or NPTS. In time surgery may help patients passing through the period of high IOP and prevent optic nerve damage and corresponding visual field loss.

References