Ocular Complications after a Sub-Tenon Injection of Triamcinolone Acetonide for Uveitis

Hsi-Kung Kuo, MD1,2; Ing-Chou Lai, MD1; Po-Chiung Fang, MD1; Mei-Ching Teng, MD1,2

Background: The purpose of this study was to evaluate the complications of a sub-Tenon injection of triamcinolone acetonide in patients with uveitis.

Methods: We retrospectively reviewed the records of uveitis cases treated from 1999 to 2003 in Kaohsiung Chang Gung Memorial Hospital. Thirty patients (45 eyes), who received a sub-Tenon injection of 0.5 ml of a triamcinolone acetonide suspension for uveitis control, were included, and 16 (26 eyes) of these patients underwent intraocular pressure (IOP) monitoring for over 3 months after the procedure.

Results: The incidence of ocular penetration was 1.6% and of rapidly progressive cataracts was 13.3%. The incidence of ocular hypertension (>21 mmHg) was 76.9% (20/26). The ocular hypertension in most cases was controlled with topical medications, with recovery of normal IOP. Long-term topical antiglaucoma medication was given for 3 eyes, and another 3 eyes (11.5%) received a trabeculectomy performed by glaucoma specialists. The incidence of glaucoma during the follow-up period after treatment is 23.1% (6/26).

Conclusions: The 23.1% incidence of glaucoma in this study is higher than expected. Careful pretreatment evaluation and post-treatment monitoring of IOP are mandatory for patients with uveitis receiving a sub-Tenon injection of triamcinolone acetonide.


Key words: triamcinolone acetonide, uveitis, cataract, ocular hypertension, glaucoma.

The association between corticosteroid treatment and posterior subcapsular (PSC) cataracts has been well documented. All routes of long-term administration, including systemic and topical, can induce cataracts. However, no specific factor relating cataract formation to the corticosteroid dose or duration of therapy has been established. Steroid-induced glaucoma resembles that of chronic open-angle glaucoma. Numerous studies have confirmed that increased IOP may occur with topical, systemic, or...
periocular administration of corticosteroids, although it is more common after local therapy.\(^{1,9-11}\) A periocular injection was reported to be the most likely administration route to induce a rise in the IOP.\(^{11}\)

In this study we review our experience of using a sub-Tenon injection of triamcinolone acetonide for uveitis control and focus on the complications associated with this treatment.

**METHODS**

This retrospective study included patients with uveitis treated from January 1999 to December 2003 at Kaohsiung Chang Gung Memorial Hospital. In total, 30 patients (45 eyes) who received a sub-Tenon injection of triamcinolone acetonide for uveitis control during the study period were identified by a chart review and were included in this retrospective study. A sub-Tenon injection was performed at the superotemporal or inferotemporal quadrant under topical anesthesia. A single 20 mg (0.5 ml) dose of triamcinolone acetonide suspension was given, and this was repeated 3 months later if necessary. All injections were performed by the authors or an assistant resident doctor. Data collected by the chart review included the age, gender, diagnosis of uveitis, intraocular pressure (pretreatment and post-treatment), lens status, and complications of the procedure. The IOP was checked at every monthly visit using a pneumo-tonometer or an applanation tonometer. Ocular hypertension was defined as an IOP $\geq 21$ mmHg. Rapidly progressive cataracts were defined as rapidly progressive posterior subcapsular opacity with lens extraction performed within 1 year after the injection.

**RESULTS**

There were 30 patients (45 eyes) included in this study. A sub-Tenon injection of triamcinolone acetonide, selected as adjuvant treatment for severe anterior uveitis and posterior uveitis, was the major treatment for intermediate uveitis. Topical corticosteroids were used for all cases with severe anterior uveitis. Combined low-dose oral prednisolone, colchicine, and/or cyclosporine were used in some cases of posterior uveitis, particularly with Behcet's disease. The diagnoses of the patients are shown in Table 1. Fifteen patients received an injection in both eyes, and 15 patients in only a single eye. In total, 64 injections (1–4 times/eye) were given. Sixteen of the 30 patients (including 26 eyes) who had IOP follow-up for more than 3 months were included in the IOP/glaucoma survey. This subgroup of patients received a total of 47 injections. Major complications included ocular penetration in 1 eye, rapidly progressive cataracts in 6 eyes, ocular hypertension in 20 eyes, and glaucoma in 6 eyes.

Ocular penetration occurred in 1 of 64 injections, yielding an incidence of 1.56%. A floater was noted by this patient immediately after the injection. An indirect ophthalmoscopic examination revealed a puncture site with mild hemorrhage at the superotemporal retina and spreading of the drug suspension in the vitreal cavity. Retinal photocoagulation was immediately performed around the penetration site and no further sequelae occurred.

Four patients (6 eyes, 13.33%) developed rapidly progressive cataracts. The 2 patients with both eyes affected had intermediate uveitis. Low-grade inflammation with cystoid macular edema persisted in these 2 patients. An injection of triamcinolone acetonide for inflammation control was given twice in 1 eye and 4 times in 3 eyes. No accompanying systemic steroids were used in these patients. Another 2 patients, each with uveitis affecting 1 eye, had Behcet's disease and posterior vasculitis in the affected eye. Both of the eyes with uveitis were treated with 2 injections. Cataracts progressed rapidly during the treatment period in these 6 eyes. Two of

| Table 1. Diagnoses of Uveitis and the Number of Patients |
|---------------------------------|----------------------|----------------------|
| Diagnosis                        | All patients group   | IOP/glaucoma group   |
| HLA-B27-associated anterior uveitis | 5                   | 1                   |
| Intermediate uveitis              | 11                   | 7                   |
| Vogt-Koyanagi-Harada disease      | 2                    | 1                   |
| Sympathetic ophthalmia           | 1                    | 0                   |
| Behcet's disease                 | 2                    | 0                   |
| Vasculitis                       | 3                    | 2                   |
| Sarcoidosis                      | 1                    | 1                   |
| Punctate choroiditis             | 3                    | 2                   |
| White-dot syndrome               | 1                    | 1                   |
| Pediatric panuveitis             | 1                    | 1                   |
| Total number of patients         | 30                   | 16                  |

**Abbreviations:** HLA: human leukocyte antigen; IOP: intraocular pressure.
the 6 eyes with rapidly progressive cataract received extracapsular cataract extraction, and 4 eyes received phacoemulsification. All 6 eyes had intraocular lens implantation. The postoperative course was smooth without apparent inflammation.

Sixteen of the patients (26 eyes) had their IOP monitored for a minimum of 3 months. Among them, 10 patients had uveitis affecting both eyes, while 6 were affected in only 1 eye. In this IOP/glaucoma survey group, 20 eyes developed ocular hypertension within 3 months of the sub-Tenon injection of triamcinolone acetonide. The incidence of ocular hypertension in these eyes was 76.9% (20/26). Most eyes recovered to a normal IOP without (3 eyes) or with (11 eyes) short-term topical anti-glaucoma medications. Long-term topical anti-glaucoma medications were given in 3 eyes with glaucomatous visual field defects, and another 3 eyes (11.5%) received a trabeculectomy performed by glaucoma specialists. The incidence of glaucoma after the sub-Tenon injection of triamcinolone acetonide for uveitis was 23.1% (6/26). Of the 10 cases in whom both eyes were affected, 7 patients had ocular hypertension and 2 patients had normal IOPs in both eyes. There was a high rate (90%) of a simultaneous IOP response to a sub-Tenon injection of triamcinolone acetonide.

**DISCUSSION**

Periocular injection of corticosteroids is a widely used procedure for the treatment of uveitis. It can deliver corticosteroids directly to the posterior segments of the eyeball and avoid steroid-associated systemic side effects. The reported severe complications include central retinal arterial occlusion, retinal and choroidal vascular occlusion, cataracts, and increased IOP. The former 2 complications possibly result from the intra-arterial injection or ocular penetration.(2-4) A sub-Tenon injection is more difficult to perform than other periocular injection techniques. To achieve an accurate approach to the sub-Tenon space, the needle has to be placed close to the sclera. This possibly increases the incidence of ocular penetration. In this series, 1 penetration was induced by a junior resident doctor, suggesting the importance that the technique be performed by an experienced operator. For safety, all patients must be checked after the injection.

PSC cataracts are a common side effect of the use of corticosteroids. The relationship between long-term systemic corticosteroid therapy and the formation of PSC cataracts was originally proposed by Black et al. in the 1960s.(5) All widely used routes of administration, including oral, inhaled, and topical, have been reported to be associated with this complication.(6-9) Although the cataractogenic effects of corticosteroids are well established, some patients may be more susceptible than others. The total corticosteroid dosage and the time course during which the corticosteroids are given appear to significantly affect the degree of risk.(6) Few studies have investigated the dose response between sub-Tenon injections of triamcinolone acetonide and cataract formation. In this study, 6 eyes experienced rapid progression of cataracts after 2 or 4 injections (with a total dose of 50 or 100 mg of triamcinolone acetonide). In addition to a sub-Tenon injection of triamcinolone acetonide, ocular inflammation and topical steroids might have contributed to the formation of cataracts.

The incidence of uveitis-associated secondary glaucoma has been reported to be in the range of 9.6% to 18.3%. These differences depended on the clinical characteristics of the uveitis.(17-19) Takahashi et al. reported that steroid-induced glaucoma occurred in 8.9% of cases of uveitis-associated secondary glaucoma.(19) The clinical features of steroid-induced glaucoma resemble those of chronic open-angle glaucoma, with a normally appearing anterior chamber angle and the absence of symptoms. It occurs more commonly in individuals who have chronic open-angle glaucoma or a family history of glaucoma. It is generally agreed that the rise in IOP results from a reduction in the facility for aqueous outflow.(11,17) The reported mechanisms responsible for IOP elevation include an excess accumulation of glycosaminoglycans in the aqueous outflow system, suppression of the phagocytic activity of trabecular endothelial cells, and inhibition of the synthesis of PGE2 and PGF2α.(20-23)

Intraocular pressure elevation usually develops within a few weeks of administration of potent corticosteroids.(17) In this study, we surveyed the IOP status within 3 months after a sub-Tenon injection of triamcinolone acetonide and found the incidence of ocular hypertension to be 76.9%. The 23.1% incidence of glaucoma in this study was higher than expected. A periocular injection of depository
steroids was reported to be the more likely to induce an IOP rise than the administration of other types of corticosteroids. (11) It might be necessary to surgically excise the remaining drug for IOP control. Another important observation in this study was the high rate of a simultaneous response of IOP in both eyes after a sub-Tenon injection of triamcinolone acetonide. Individual variation seems to be an important factor.

Corticosteroids are available as topical, periocular, and systemic preparations. The different routes of administration have various indications and side effects. Periocular injection of corticosteroids is the preferred method for intermediate and posterior uveitis, particularly in unilateral cases. (24) As it is not currently possible to precisely predict who will respond to steroid treatment, careful pre-treatment evaluation and post-treatment monitoring of IOP are mandatory for patients receiving a sub-Tenon injection of triamcinolone acetonide for uveitis.

REFERENCES

葡萄膜炎病患接受結膜間質下注射triamcinolone後
相關的眼部併發症

郭錫恭  賴盈州  方博炯  鄧美琴

背 景： 這篇研究的目的在於評估葡萄膜炎病患接受結膜間質下注射類固醇 triamcinolone 後
相關的眼部併發症。

方 法： 回顧1999年到2003年就診的葡萄膜炎病患，共收錄因控制葡萄膜炎而接受結膜間質
下注射0.5cc的 triamcinolone 的30位病患（45眼），其中的16位（26眼）術後眼壓追
蹤達3個月以上。

結 果： 發生眼球意外穿刺的機率是1.56%，快速白內障惡化的機率是13.33%，高眼壓症（眼
壓大於21毫米柱）是76.92%（20眼/26眼）。大部分高眼壓症經局部降眼壓藥物治療
可回復到正常眼壓。但是有3眼需長期降眼壓藥治療，另外3眼接受青光眼科醫師
給予小梁切除術治療。在追蹤治療期，青光眼機率是23.1%（6眼/26眼）。

結 論： 本研究青光眼發生率是23.1%，遠比預期高出許多，術前小心評估及術後追蹤眼壓對
於因葡萄膜炎而接受結膜間質下注射 triamcinolone 的病患是必須的。

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關鍵字： triamcinolone，葡萄膜炎，白內障，高眼壓症，青光眼。