

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

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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 anti-glaucoma 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.

(*Chang Gung Med J* 2005;28:85-9)

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

Periocular injection of corticosteroids for the treatment of uveitis was originally described by Nozik in 1972.⁽¹⁾ Reported complications of treatment include pain on injection, swelling, pseudoptosis, subconjunctival hemorrhage, and retinal and choroidal vascular occlusion which are the result of the injection procedure, and cataracts and increased intraocular pressure (IOP) which are common complications secondary to uveitis and corticosteroid usage.⁽²⁻⁴⁾

The association between corticosteroid treatment and posterior subcapsular (PSC) cataracts has been well documented.⁽⁵⁻⁸⁾ 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

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Received: Nov. 5, 2004; Accepted: Dec. 20, 2004

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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.^(7,8,12-16) 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.^(6,7) 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 PGF2 α .⁽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

- Nozik RA. Periocular injection of steroids. *Trans Am Acad Ophthalmol Otolaryngol* 1972;76:695-705.
- Ellis PP. Occlusion of the central retinal artery after retrobulbar corticosteroid injection. *Am J Ophthalmol* 1978;85:352-6.
- Shorr N, Seiff SR. Central retinal artery occlusion associated with periocular corticosteroid injection for juvenile hemangioma. *Ophthalmic Surg* 1986;17:229-31.
- Moshfeghi DM, Lowder CY, Roth DB, Kaiser PK. Retinal and choroidal vascular occlusion after posterior sub-Tenon triamcinolone injection. *Am J Ophthalmol* 2002;134:132-4.
- Black RL, Oglesby RB, von Sallmann L. Posterior subcapsular cataracts induced by corticosteroids in patients with rheumatoid arthritis. *JAMA* 1960;174:166-71.
- Loredo A, Rodriguez RS, Murillo L. Cataracts after short-term corticosteroid treatment. *N Engl J Med* 1972;286:160.
- Skalka HW, Prchal JT. Effect of corticosteroids on cataract formation. *Arch Ophthalmol* 1980;98:1773-7.
- Urban RC, Cotlier E. Corticosteroid-induced cataracts. *Surv Ophthalmol* 1986;31:102-10.
- Kalina RE. Increased intraocular pressure following subconjunctival corticosteroid administration. *Arch Ophthalmol* 1969;81:788-90.
- Herschler J. Intractable intraocular hypertension induced by repository triamcinolone acetonide. *Am J Ophthalmol* 1972;74:501-4.
- Shields MB. *Textbook of glaucoma*, fourth ed. Baltimore: Williams & Wilkins Co., 1998:323-8.
- Spencer RW, Andelman SY. Posterior subcapsular cataract formation in rheumatoid arthritis patients on long term steroid therapy. *Arch Ophthalmol* 1965;74:38-41.
- Williamson J, Paterson RW, McGavin DD. Posterior subcapsular cataract and glaucoma associated with long-term oral corticosteroid therapy in patients with rheumatoid arthritis and related conditions. *Br J Ophthalmol* 1969;53:361-72.
- Cumming RG, Mitchell P, Leeder SR. Use of inhaled corticosteroids and the risk of cataract. *N Engl J Med* 1997;337:8-14.
- Cumming RG, Mitchell P. Inhaled corticosteroids and cataract: prevalence, prevention and management. *Drug Safety* 1999;20:77-84.
- Smeeth L, Boulis M, Hubbard, Fletcher AE. A population based case-control study of cataract and inhaled corticosteroids. *Br J Ophthalmol* 2003;87:1247-51.
- Moorthy RS, Mermoud A, Baerveldt G, Minckler DS, Lee PP, Rao NA. Glaucoma associated with uveitis. *Surv Ophthalmol* 1997;41:361-94.
- Merayo-Llodes J, Power WJ, Rodriguez A, Pedroza-Seres M, Foster CS. Secondary glaucoma in patients with uveitis. *Ophthalmologica* 1999;213:300-4.
- Takahashi T, Ohtani S, Miyata K, Miyata N, Shirato S, Mochizuki M. A clinical evaluation of uveitis-associated secondary glaucoma. *Jpn J Ophthalmol* 2002;46:556-62.
- Ticho U, Lahav M, Berkowitz S, Yoffe P. Ocular changes in rabbits with corticosteroid-induced ocular hypertension. *Br J Ophthalmol* 1979;63:646-50.
- Johnson DH, Bradley JMB, Acott TS. The effect of dexamethasone on glycosaminoglycans of human trabecular meshwork in perfusion organ culture. *Invest Ophthalmol Vis Sci* 1990;31:2568-71.
- Rohen JW, Linner E, Witmer R. Electron microscopic studies on the trabecular meshwork in two cases of corticosteroid-glaucoma. *Exp Eye Res* 1973;17:19-31.
- Weinreb RN, Mitchell MD, Polansky JR. Prostaglandin production by human trabecular cells: in vitro inhibition by dexamethasone. *Invest Ophthalmol Vis Sci* 1983;24:1541-5.
- Rao NA, Forster DJ. Nonspecific therapy of uveitis. In: Podos SM, Yanoff M, eds. *Textbook of Ophthalmology*, v. 2 The uvea. New York: Gower Medical Publishing, 1992:3.1-3.5.

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

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- 背景：** 這篇研究的目的是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：** 發生眼球意外穿孔的機率是1.56%，快速白內障惡化的機率是13.33%，高眼壓症（眼壓大於21毫米汞柱）是76.92% (20眼/26眼)。大部份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眼需要長期降眼壓藥治療，另外3眼接受青光眼科醫師給予小樑切除術治療。在追蹤治療期，青光眼機率は23.1% (6眼/26眼)。
- 結論：** 本研究青光眼發生率是23.1%，這比預期高出許多，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。
(長庚醫誌 2005;28:85-9)

關鍵字： triamcinolone，葡萄膜炎，白內障，高眼壓症，青光眼。

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受文日期：民國93年11月5日；接受刊載：民國93年12月20日。

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