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Postoperative ^{90}Sr β-irradiation for pterygium and the related factors for recurrence

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Abstract

• AIM: To investigate the efficacy and safety of postoperative ^{90}Sr β-irradiation for patients with pterygium and analyze the recurrence-related factors.

• METHODS: Between May 2006 and September 2008, seventy-nine patients with 93 pterygium eyes were treated with surgery and postoperative ^{90}Sr β-irradiation. After doing bare sclera technique of pterygium excision, postoperative ^{90}Sr β-irradiation was carried out. A total dose of 2400 cGy dose was used in three fractions (800 cGy, each time, one week apart). At the cut off time (three months), the recurrence rate was calculated and compared between male and female, young (<40 years) and old (≥40 years), fresh and relapsing pterygium.

• RESULTS: Recurrence of the pterygium treated with surgery and postoperative ^{90}Sr β-irradiation was observed in 7 of 93 (7.5%) cases. Recurrence-related factors analysis revealed that younger age (<40 years), relapse cases were risk factors for local recurrence. Complications noted were few: including moderate conjunctivitis, postoperative pain, photophobia and an increase in tear flow. However, no long-term serious side effects were observed in this study, such as scleral necrosis or radiation cataract.

• CONCLUSION: Bare sclera technique of pterygium excision followed by fractioned ^{90}Sr β-irradiation is a safe and effective therapy to prevent a relapse and can be performed without serious side effects. The study also showed several factors might influence the therapy efficacy, such as age and previous surgical treatment.

• KEYWORDS: ^{90}Sr β-irradiation; pterygium; recurrence
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INTRODUCTION

A pterygium is a fleshy, wing-shaped conjunctival encroachment onto the cornea, usually on the nasal side, unilateral or bilateral. It is thought to be an irritative phenomenon due to ultraviolet light, drying and windy environments, since it is common in persons who spend much of their time "out of doors" in sunny, dusty or sandy, windblown surroundings. If the pterygium is encroaching on the pupillary area, it should be removed surgically along with a small portion of superficial clear cornea beyond the area of encroachment. But this lesion can relapse after surgery. At present, there are various surgical methods for its removal[1], but very few clinical guidelines are available on the optimal treatment of primary or recurrent pterygium. Studies had reported that risk factors for postoperative recurrence are former surgery on the pterygium, especially in younger age, unprotected exposure to sunlight, and a positive family history[2]. As bare sclera excision technique is associated with a high recurrence rate in a range from 32% to 88%[3,4], the implementation of adjuvant post-surgical treatment measures like radiotherapy[5] or mitomycin C[6] is highly effective to reduce recurrence rates. In our study, bare sclera excision technique and postoperative^{90} Sr β-irradiation was used in treatment of pterygium. This method was proved to be an effective and safe method for pterygium removal. Another goal of the study was to analyze recurrence-related factors, such as gender, age and previous surgical treatment.

MATERIALS AND METHODS

Patients During the period May 2006 to September 2008, seventy-nine patients (41 male and 38 female) with 93 pterygium were recruited. The mean age was 47.9 years (ranged from 25 to 79 years). The median follow-up period was 15 months (ranged from 3 to 28 months). The analysis was restricted to patients who had received 3 fractions of 800 cGy β-irradiation with a total dose of 2400 cGy and were followed up for a period of at least 3 months. Patients who hadn't finished all fractions or had received other adjuvant therapy were excluded from the analysis. The operations were carried out under local anesthesia. After instillation of local anaesthetic benoxil (oxybuprocaine hydrochloride), a 1:1 mixture of 20g/L lidocaine hydrochloride with 7.5g/L bupivacaine hydrochloride was injected subconjunctivally in order to separate the conjunctiva from the underlying fibrovascular tissue. Then the pterygium was separated from the corneal limbus by blunt dissection with use of an iris spatula. The head and neck of the pterygium invading the cornea were removed with a surgical blade, while the body and base of the pterygium were dissected with conjunctival scissors. The wound bed was scraped to clean cornea and sclera, then bleeding vessels were cauterised. The conjunctiva edge was rolled inward and sutured with 10-0 monofilament nylon to the

sclera leaving a bare area.

Methods Postoperative ^{90}Sr β-irradiation was performed after surgery. A single dose of 800 cGy was used each time, one week apart, up to a total dose of 2400 cGy. The procedure was as follows: after the patient got a local anesthesia with benoxil, the lids were separated with speculum. In order to prevent an eye movement during the treatment, the patient was asked to fix a point on the wall using the unoperated eye. The affected area, including the fleshy conjunctival part, was covered with the ^{90}Sr applicator. During the treatment, we should pay a special attention to the limbus thickness. The treatment process should be precisely timed. Postoperatively, we administered topical steroid and antibiotic drops 3 times a day from the first postoperative day up to 7 days. Sutures were removed around 7 days later. The definition of pterygium recurrence varies among studies. Most ophthalmologists define pterygium recurrence as corneal recurrence, which includes regrowth of fibrovascular pterygium-like tissue crossing the limbus onto the cornea, fibrovascular recurrence attaining the same degree of corneal encroachment as the original lesion, or regrowth exceeding 1mm onto the cornea[1]. We use the criterion that regrowth exceeding 1mm onto the cornea to determine the recurrence of pterygium.

Statistical Analysis Statistical data analysis was performed with SPSS 17.0. Comparisons of recurrance rate between groups were made useing Chi-square test. $P < 0.05$ was considered statistically significant.

RESULTS

Out of 93 pterygium operated, a total of 7 (7.5%) recurrences were observed. Patients were grouped according to recurrence-related factors including gender, age and therapy history. 41 patients (48 pterygium) were men and 38 patients (45 pterygium) were women. The patients' mean age was 47.9 ± 14.7 years, 45 patients (53 pterygium) were more than 40 years old and the rest 34 patients (40 pterygium) were less than 40 years old. In 64 patients (74 eyes) the pterygium was primary; in the remaining 15 patients (19 eyes) there was history of surgical treatment. There was no significant difference between male and female ($P = 0.485$); the gender did not affect recurrence rate. The recurrence rate was significantly higher in the younger age group (6/40 *vs*1/53, $P = 0.048$) and in the recurrence lesions group (4/19 *vs*3/74, $P = 0.044$) that had previously been treated by surgery.

Side effects of postoperative ^{90}Sr β-irradiation were modest during the period of follow-up. A few patients were observed with local pain, conjunctivitis, photophobia or an increase in tear flow. None of the patients showed severe side effects related to ^{90}Sr β-irradiation viz scleral necrosis and radiation cataract.

DISCUSSION

The treatment of pterygium is still quite controversial, with various treatments being advocated in the scientific literature. The various treatments for pterygium aim at reducing recurrence of the lesion. Bare sclera technique excision of a pterygium without adjuvant treatment has an unacceptably high recurrence rate and therefore should not be used. Bunching of conjunctiva and formation of parallel loops of vessels at the limbus usually denotes a conjunctival recurrence. Recent findings suggested that pterygium was not just a degenerative lesion, but could be a result of uncontrolled cell proliferation[7,8]. Radiation prevents the proliferation of fibroblasts and further angiogenesis, thus reducing its recurrence[9]. In the early of 1970s, it is reported that radiation has been shown to inhibit corneal wound healing, with prominent effect on fibroblast proliferation. It is demonstrated that dose-dependent inhibition of human tenon's fibroblast proliferation up to a plateau at exposures of 1000cGy [10]. In the treatment of pterygium, initially a high dose of β-irradiation was applied without surgical excision, the aim being to induce regression of the lesion. Administration of β-irradiation after surgery, particularly for recurrent pterygium, was widely adopted, with subsequent reports indicating a low recurrence rate. It is suggested that postoperative β-irradiation of 3 weekly 800cGy fractions reduces the likelihood for pterygium recurrence. When the β-irradiation is fractionated, satisfactory results can be achieved with low morbidity. Smith *et al*[5] reported a very satisfactory result with immediate postoperative β-irradiation of 2500cGy in 5 fractions for prevention of recurrence. Isohashi *et al* [11] showed recurrence of the pterygium after postoperative ^{90}Sr β-irradiation to be 7.7% (97 of 1253 cases). Mourits *et al* [12] compared long-term effects of patients with primary pterygium treated with bare sclera excision technique followed by ^{90}Sr β-irradiation or by sham irradiation. They reported the usage of 2500cGy single-dose postoperative ^{90}Sr β-irradiation is an effective treatment with lasting results that reduces the risk of primary pterygium recurrence and very few complications. Doses administered varied considerably in different studies. Typical doses have been of the order of 2000-6000cGy[13], frequently given in fractions. Kal *et al*[14] demonstrated for pterygium recurrence after bare sclera surgery and ^{90}Sr β-irradiation, a biologically effective dose of about 3000cGy seems to be sufficient to reduce the recurrence rate to less than 10%. We chosen 2400cGy in 3 fractions in order to get expected result and minimize the side effects.

There are some safety issues to be considered when using postoperative ^{90}Sr β-irradiation. First of all, the eyeball should be fixed during the radiotherapy. Eye fixation can reduce the incidence of scleral necrosis. The second safety issue is that the cornea should be protected, when the affected area is covered with the ^{90}Sr applicator. Third, the dosage of ^{90}Sr β-irradiation and treatment time should be precise. The last but not the least, the patient should be examined everyday carefully for 10 days in order to avoid occurrence of serious side effects. If the patient has feeling of pain or chemosis, we should be extremely cautious to carry out the treatment.

In this study, we also analyzed the factors related to local recurrence of the pterygium, after surgery and ^{90}Sr β-irradiation. The reason for high recurrence rate of pterygium in younger patients (< 40 years) could be that younger persons have more opportunity to exposure to ultraviolet

radiation and stronger ability of fibroblast proliferation. The healthy Bowman's membrane seems to act as a barrier to the in growth of conjunctival tissues. In patients of recurrent pterygium with previous history of surgery, the cause for recurrence could be the destruction of normal limbal structure and the changes in the tear film. There were some reports suggesting a high recurrence in males[11]. In contrast, our data didn't show statistically difference between male and female. However, our study is a retrospective analysis, and prospective studies are required to overcome the selection bias and prove this point.

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翼状胬肉术后^{90}Sr β 射线敷贴治疗疗效观察及复发相关因素分析

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摘要

目的:评估翼状胬肉切除术后^{90}Sr β 射线敷贴的疗效及安全性,分析翼状胬肉复发的相关因素。

方法:2006-05/2008-09 翼状胬肉患者 79 名 93 眼行切除术后^{90}Sr β 射线敷贴治疗。计算翼状胬肉复发率,同时比较男性与女性,年龄 <40 岁与 ≥40 岁,原发性及复发性翼状胬肉在治疗后的复发率。

结果:翼状胬肉复发 7 眼。<40 岁及既往手术或其他治疗后复发性翼状胬肉患者复发率较高。翼状胬肉术后^{90}Sr β 射线敷贴治疗后并发症少见,包括轻微的结膜炎、术后疼痛、畏光、流泪等,但未发现严重的长期并发症,特别是无巩膜坏死及放射性白内障的发生。

结论:翼状胬肉术后^{90}Sr β 射线敷贴治疗安全、有效,能降低翼状胬肉的复发率,且无严重并发症出现。年龄及复发性翼状胬肉可能影响治疗结果。

关键词:^{90}Sr β 射线敷贴治疗;翼状胬肉;复发