REVIEW OF LITERATURE
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Although there are numerous medical and surgical approaches for treating pterygium, there are also several attendant complications. Of greatest concern is recurrence of pterygium, which is often accompanied by increased conjunctival inflammation and accelerated corneal involvement. Repeated surgical procedures often only worsen the situation, as loss of conjunctival tissue and scarring can result in obliteration of fornices and mechanical restriction of extra-ocular movement.

Historically, from the earliest times medical treatment has been found unsatisfactory and attempts at local medication such as by the application of solid sodium chloride (Beard & Dimitry, 1945) the topical use of steroids (Vadala, 1953) or the sub conjunctival injection of hyaluronidase (Anastasi, 1953), a method which according to Hilgers (1960) stimulates rather than inhibits growth, have proved of little value. Surgical treatment is at present the only satisfactory approach, supplemented in case of recurrences by radiational treatment as by X-rays (Hilgartner et al, 1948; Gibson, 1951) or beta- irradiation (King, 1950; Mead and Robertson, 1957) or by the instillation of antimitotics (triethylene thiophosphoramid, Meacham, 1962; Mori, 1962).

In general, the indications for operation are continued progress of the growth so that there is a danger of involvement of the central area of the cornea, interference with ocular mobility and the development of diplopia, but some authorities consider that every pterygium is potentially progressive and should be removed as soon as possible. Some authorities advise that radiation should be given immediately or shortly after surgical removal as a prophylactic against recurrences, particularly if there is much deep
vascularisation (Maed and Robertson, 1957; Elliott, 1962; Haik, 1962), while others consider that it should be postponed until recurrences develop (King, 1950) a lamellar corneal graft applied to the denuded area of the cornea after excision of the pterygium, as first suggested by Magitot (1916), is an effective method of avoiding recurrences & may improve the cosmetic results (Cameron, 1964).

No surgical technique is universally accepted as being perfect, as is shown by a recurrence rate often as high as 30-80% in countries with high solar radiation (Kamel, 1946; D’Ombrain, 1948). A multitude of different operative techniques have been advocated which were reviewed by King (1950), Del Reo Cabanas (1952), Walter (1961) & others. The most important are:

**Excision with simple closure of the wound** including an area of clear cornea in advance of the pterygium & covering the defect in the sclera by suturing the conjunctival margins. (Von Arlt, 1850-74).

**The bare- sclera method** in which after excision of pterygium the small area of sclera in relation to the affected area of the cornea is not covered by conjunctiva but thoroughly denuded of subconjunctival tissue & allowed to heal by granulation (Boeckmann, 1897; D’ombrain, 1948; Mcgavic 1949)

**Excision & plastic repair** either with a movable conjunctival flap (Campodonico, 1922; Bangerter, 1943). A graft of free conjunctiva (Elschnig, 1926; Spaeth, 1926), mucus membrane from the lip (Duverger, 1926), amniotic membrane (Panzardi, 1947) or the skin as a thiersch grafts (Hotz, 1909; Wiener 1928)

**Transplantations operations** wherein the head of the pterygium is dissected from the cornea & transplanted under the conjunctiva away from the
limbus so that any future growth will be innocuous; this may be effected beneath the lower bulbar conjunctiva (Desmarres, 1851; McReynolds, 1902), beneath the upper (Neher 1939) by splitting the pterygium horizontally & burying one half above & the other below (Knapp, 1868), or by folding the pterygium back on itself (Rosen, 1948).

At the present, there are four major approaches to the treatment of this disease, specifically - surgical procedures, beta-irradiation, laser, and drugs including antineoplastic & anti-metabolite drugs. The use of adjunctive therapies like anti-mitotics & irradiation has been shown to be associated with severe sight threatening complications like scleral thinning, scleral necrosis, punctuate epitheliopathy, pyogenic granulomas cataracts, glaucoma, corneal perforation etc.

**A.L. Anduze and J.M. Burnett**, conducted a study to examine the complications and results of a novel approach to the use of mitomycin-C in pterygium surgery; to identify the lowest effective dosage required to prevent recurrence; and to select those high-risk pterygia that could benefit from mitomycin-C use. One hundred thirty-five eyes of 128 patients were treated with a single, intraoperative, subconjunctival injection of mitomycin-C at the site of excision. Three different dosages—0.2, 0.1, and 0.05 ml—at a strength of 0.5 mg/ml were used. There were only two recurrences (1.5%); both occurred in eyes that had undergone previous pterygium surgery. One recurrence happened with the 0.2-ml dosage, and the other with the 0.1-ml dosage. These recurrences occurred in association with early wound dehiscence. Complications included temporary and prolonged discomfort, tearing, hyperemia, subconjunctival hemorrhage, wound dehiscence, and pigment accumulation. In conclusion the persistence and intensity of
discomfort noted at the higher dosage prompted these authors to suggest that only high-risk pterygia should receive mitomycin-C.

Sanchez-Thorin JC, Rocha G, Yelin JB (1998) conducted a Meta-analysis on the recurrence rates after bare sclera resection with and without mitomycin C use and conjunctival autograft placement in surgery for primary pterygium. Five eligible studies were retrieved, three comparing bare sclera resection with and without mitomycin C use, one comparing bare sclera resection with conjunctival autograft placement, and one comparing both. The pooled odds ratio for pterygium recurrence in patients who had only bare sclera resection was 6.1 (95% confidence intervals, 1.8 to 18.8) compared with the patients who had conjunctival autograft placement and 25.4 (9.0 to 66.7) compared with the patients who received mitomycin C. In conclusion the odds for pterygium recurrence following surgical treatment of primary pterygium are close to six and 25 times higher if no conjunctival autograft placement is performed or if no intra/postoperative mitomycin C is used, respectively. Surgeons and clinical trialists should not be encouraged in the use of bare sclera resection as a surgical technique for primary pterygium.

Ajayi B, Bekibele CO (1999) conducted a retrospective study to evaluate the effectiveness of post-operative beta-irradiation in the management of pterygium. A total of 124 eyes of 95 patients were operated using bare sclera method followed by application of 2500-3500 rads of Sr 90 beta-radiation. Recurrence occurred in 8 eyes (6.9%). The complications consisted of scleral necrosis, conjunctival inflammation, corneal opacities, grittiness, and cataracts.

K.R.Kenyon, M.D.Wagoner & M.E.Hettinger in 1985 first described the technique of conjunctival autografting, comprehensively. The technique and results of conjunctival autograft transplantation for advanced and recurrent
pterygium were presented for 57 eyes of 54 patients. The pterygia were primary in 16 eyes & recurrent in 41; among the latter group, 14 patients had diplopia resulting from cicatrical involvement of the medial rectus muscle. In all cases, free conjunctival grafts from the supero-temporal bulbar conjunctiva of the same eye were used to resurface exposed sclera & extra-ocular muscle. There were no intra-operative complications. Mean post-operative follow-up was for 24 months (ranged from 1 to 67 months). Only 3 pterygia recurrent (5.3%); 2 were successfully remedied by a second conjunctival autograft, whereas the third did not require any additional procedure. In all 14 patients with diplopia, extra ocular movement was restored. They recommended this surgical approach as a safe & effective means of treating pterygia complicated by conjunctival scarring with extra ocular muscle involvement & requiring concurrent fornix reconstruction.

**BDS Allan, P Short, G J Crawford et al (1993)** conducted a cross sectional review of 93 eyes of 85 patients by slit-lamp examination, a minimum of 6 months after pterygium excision and free conjunctival autografting of six recurrences (6.5%) four were asymptomatic with minor recurrences. Complications (wound dehiscence, three cases; Tenon’s granuloma, one case; conjunctival cyst, one case ) were all corrected by minor surgical revision without sequelae. Unaided aquities were unchanged or improved 3 months after surgery in 86 cases. They concluded that this study demonstrates a low recurrence rate for a safe technique in an area in which ongoing ultraviolet light exposure levels are high and pterygia are prevalent.

**M Guler, G Sobaci, F M Mualu, E Yildrium et al (1994)** conducted a prospective study to evaluate limbal conjunctival autotransplantation in the management of cases with recurrent pterygium. Thirty one patients were
treated by limbal conjunctival transplantation. During the mean follow up period of 10 months, 4 recurrences (13.3%) occurred and they concluded that this was a successful method to prevent secondary recurrence in the management of recurrent pterygium in patients under 40 years of age.

**P P Chen, R G Ariyasu, V Kaza et al (1995)** conducted a prospective study to determine the rate of recurrence and complications after bare sclera excision of primary pterygium followed by low-dose mitomycin-c (0.2 mg/ml twice daily for five days), placebo (balanced saline solution), or conjunctival autografting. Twenty four patients received mitomycin-c, twenty three conjunctival autograft, and 17 placebos. The recurrence after mitomycin-c and conjunctival autograft was 38% & 39% of eyes respectively, after mean followup of 12.3 & 13.5 months. the recurrence rate after placebo was significantly higher (88%) after mean followup of 9.3 months. Increasing age was associated with significantly fewer recurrences after controlling for pterygium type (atrophic, noninflamed or inflamed). They concluded that conjunctival autograft and low dose mitomycin-c are equally effective as adjunctive treatment after excision of primary pterygia. Both methods have significantly lower rates of recurrence than bare sclera excision alone, and neither is associated with severe complications after one year of follow up. Complications, although, were seen more commonly with mitomycin-c (33%) than with conjunctival autografting (13%).

**Shiro Amano, Yuta Motoyama, Tetsuro Oshika et al (2000)** conducted a comparative study of intraoperative mitomycin C and irradiation in pterygium surgery To compare the rate of recurrence and complication after surgery for primary pterygium performed by one surgeon using either intraoperative mitomycin C or irradiation. retrospective study was performed of 164 eyes in 164 patients who had undergone primary pterygium surgery.
After the pterygium was excised, the bare sclera was covered by sliding adjacent superior conjunctiva. 103 eyes received intraoperative mitomycin C (0.04%, 150 seconds) and 61 eyes irradiation (total dose 21.6 Gy). The mean follow up period was 20.2 months (range 1-66 months). The recurrence rate after mitomycin C and irradiation was 8.74% and 23.0% of eyes, respectively, after mean follow up of 17.9 and 31.2 months, respectively. The Kaplan-Meier survival analysis revealed a significantly better outcome for those who had intraoperative mitomycin C. The mean interval to recurrence was not significantly different between the two groups. They concluded that the intraoperative administration of 0.04% mitomycin C is more effective than irradiation as an adjunctive treatment for pterygium surgery in the patient population examined in this study.

**Vergara-Sintamario; Montoya-Gonzalez; MarthaCecilia et al (2000)** conducted a study to determine the efficacy of the surgical procedure called limbal conjunctival autograft transplantation (LCAT) for the treatment of pterygium, on typical patients from Mexico. This retrospective noncomparative study was reviewed in patients with pterygium who underwent the procedure LCAT. Surgeries were performed from October 1999 to December 2000. Sex, age, relation with ultraviolet light, line of vision acuity, extent of corneal invasion, recurrence rate and complications were analyzed. 67 patients were included (60.8% being female). 42% were related to sun exposure. The mean follow-up time was 11 months (range, 4-18 months). There were 68 primary and 1 recurrent pterygium. There were four recurrences (5, 7% recurrence rate), 3 occurring at 6 months and the 2 other occurring at 3 months after surgery. Among complications there was one case of graft necrosis and one case of granuloma, the later resolving spontaneously.
Donald T. H. Tan, Soon-Phaik Chee, Keith B. G. Dear, Arthur S. M. Lim (1997) conducted a study to compare success rates of conjunctival autografting and bare sclera excision for primary and recurrent pterygium in the tropics and to evaluate risk factors for pterygium recurrence. A prospective, controlled clinical trial was performed in which 123 primary and 34 recurrent pterygia, matched for age and pterygium morphology, were randomized in 2 separate studies to receive either bare sclera excision or conjunctival autograft and were reviewed at 1, 3, 6, and 12 months after surgery. Pterygium morphology was clinically graded as atrophic, intermediate, or fleshy according to an assessment of pterygium translucency. In the group with primary pterygium (mean follow-up, 15.1 months), 38 (61%) of the 62 cases of bare sclera excision had pterygium recurrence in contrast with 1 (2%) of the 61 cases of conjunctival autograft. Nontranslucency or fleshiness of the pterygium, and not age was a significant risk factor for recurrence in the conjunctival bare sclera group. In the group with recurrent pterygium (mean follow-up, 13.2 months), 14 (82%) of the 17 bare sclera group had pterygium recurrence, while no recurrences occurred among 17 cases in the conjunctival autograft group. Nontranslucency was again a highly significant factor for recurrence. They concluded that pterygium recurrence is related to pterygium morphology and fleshiness of the pterygium is a significant risk factor for recurrence if bare sclera excision is performed. Conjunctival autografting for primary and recurrent pterygium is effective in reducing pterygium recurrence compared with bare sclera excision

Mutlu FM, Sobaci G, Tatar T, Yildirim E. (1999) conducted a study to evaluate the recurrence after treatment of pterygia using one of two techniques-limbal conjunctival autograft transplantation versus low-dose intraoperative mitomycin C (0.2 mg/ml) combined with conjunctival flap
closure. Eighty-one patients with recurrent pterygia treated by limbal conjunctival autograft transplantation (n= 41) or mitomycin C combined with conjunctival flap (n= 40) participated. Limbal conjunctival autograft transplantation or low-dose intraoperative mitomycin C application with conjunctival flap technique was performed on recurrent pterygium cases. During mean follow-up periods of 16+/−1.9 and 15.5+/−1.5 months, six recurrences (14.6%) in the limbal conjunctival autograft transplantation group and five recurrences (12.5%) in the mitomycin C group were observed. The difference between the mean ages of recurrent (26.4+/−8.0 years) and nonrecurrent (35.8+/−11.9 years) cases for all patients was statistically significant (P=0.014). Technically, limbal conjunctival autograft transplantation seemed to be more difficult. The most frequent complication in limbal conjunctival autograft transplantation was graft edema, whereas that in the mitomycin C group was superficial keratitis. They concluded that both techniques showed similar recurrence rates in the treatment of recurrent pterygia. Although technically easier to perform, further follow-up is necessary to determine the long-term safety of low-dose intraoperative mitomycin C with conjunctival flap closure.

A. P. Moriarty, G. J. Crawford, I. L. McAllister and I. J. Constable (1993) conducted a study to assess the precipitating factors, clinical course, and treatment of 11 cases of severe intraocular infections of radionecrosis after pterygium excision in an attempt to minimize the devastating ocular sequelae. From the database of cases of radionecrosis at Royal Perth Hospital and Lions Eye Institute, Perth, Australia, they identified 11 cases of severe intraocular infection complicating radionecrosis & reviewed the case notes and the available radiotherapy records (n = 8). Mean (+/- SD) dose of radiotherapy
was 22.7 +/- 1.0 Gy and mean latency period, 14.45 +/- 2.5 years. Among the six proven bacterial cases, Pseudomonas was identified in four, Staphylococcus aureus in one, and Streptococcus pneumoniae was involved in one bilateral case. Among the four fungal cases, Scoterellidium boydii was indicated in two, and Fusarium and Scedosporium inflatum in one each. The condition may remain undiagnosed for some time and mimic a posterior scleritis, serous retinal detachment, or pseudotumor. Interventions included early debridement and culture; close microbiological assistance; and systemic antimicrobials for a prolonged period. Perforation or incipient perforation necessitated penetrating keratoplasties in seven patients and repeated keratoplasties in three. They concluded that the use of radiotherapy following pterygium excision should be limited and only low doses used. Ulcer beds and calcific plaques at sites of radionecrosis should not be directly covered without first performing adequate sterilization. Removal of plaques may precipitate sepsis; ulcer beds and plaques harbor infective agents. Severe radionecrosis may expose a patient to a lifelong risk of intraocular sepsis and profound visual morbidity. Conjunctival autografting is a safer method to reduce recurrence rate after pterygium excision.

**Jun Shimazaki, Hao-Yung Yang, Kazuo Tsubota (1996)** conducted a study to examine the usefulness of limbal autograft transplantation in the treatment of recurrent and advanced pterygia. Eleven patients with recurrent and 16 with advanced pterygia (a total of 27 pterygia) were treated with limbal autograft transplantation. Once a pterygium had been excised, superior limbal tissue was taken with conjunctival flap and transferred to the excised area. All the grafts were planted promptly, and donor sites were re-epithelialized with no excessive scar tissue formation. Although slight
recurrence was noted in 2 eyes (7.4%), subconjunctival tissue invasions were limited to less than 1 mm, and no further surgical interventions were needed. They concluded that these results indicate that limbal autograft transplantation may be effective for the treatment of recurrent and advanced pterygia.

Dekaris I, Gabric N, Karaman Z, Mravicic I, Kastelan S, Spoljaric N (2001) conducted a study to examine the usefulness of limbal autograft transplantation (LCAT) in the treatment of recurrent pterygium. Eleven eyes with advanced recurrent pterygium underwent LCAT. All eyes were previously treated at least two times either by simple excision (10) or conjunctival rotation autograft (1). In two eyes (18.18%) symblepharon was present at the time of surgery; therefore LCAT was combined with amniotic membrane transplantation. Limbal-conjunctival autograft was taken from supero-lateral part of the same eye and transferred to the area where pterygium was excised. No intraoperative complications occurred. In ten eyes (90.9%) no pterygium recurrence was recorded during the follow-up time, and one (9.1%) recurrence was recorded after 5 months. In two eyes with combined symblepharon formation remission of both pterygium and symblepharon growth was obtained. LCAT proved to be a promising and safe procedure in recurrent pterygium treatment.

Jap A, Chan C, Lim L, Tan DT (1996) conducted a study to determine the safety and efficacy of conjunctival rotation autografting (CRA) as an alternative to conventional conjunctival autograft after pterygium excision. Consecutive patients seen at the Pterygium Clinic of the Singapore National Eye Centre who were thought to be unsuitable for conventional conjunctival autografting underwent a modified surgical procedure, described as CRA. There were 51 rotation autografts performed on 45 eyes of 43 patients. In this procedure, the underlying fibrovascular pterygium tissue was
removed and the original epithelium (with minimal subepithelial tissue included) replaced over the bare sclera with a 180 degrees rotation from April 1995 to May 1996. Pterygium recurrence and complications of CRA were measured. The mean follow-up time was 12 months (range, 2-22 months). There were 46 primary and 5 recurrent pterygia. The indications for CRA were combined cataract and pterygium surgery (39.2%), double pterygia (31.4%), the need to preserve the superior conjunctiva (21.6%), and superior conjunctival scarring (7.8%). There were two recurrences (4% recurrence rate), one occurring at 4 months and the other occurring at 7 months after surgery. No significant complications were encountered. However, 50% of the grafts remained mildly injected for more than 3 months, and some remained injected for up to 13 months after surgery (average of 4 months). They concluded that Conjunctival rotation autografting is a useful technique of conjunctival grafting in cases in which it is not possible or desirable to use the superior conjunctiva as a donor source.

Dekaris I, Gabric N, Karaman Z, Mravicic I, Kastelan S (2002) conducted a study to assess the usefulness of limbal-conjunctival autograft transplantation (LCAT) for the treatment of recurrent pterygium. Seventeen eyes with advanced recurrent pterygium underwent LCAT. All had already been treated at least twice either by simple excision (n=15) or by conjunctival rotation autograft (n=2). Three eyes (17.65%) had symblepharon at the time of surgery, so LCAT was combined with amniotic membrane transplantation. The autograft was taken from the supero-lateral part of the same eye and transferred to the area where the pterygium had been excised. During 6-18 months of follow-up no postoperative complications occurred. In 15 eyes (88.24%) no pterygium recurrence was recorded; recurrence occurred in two eyes (11.76%) after 8 and 5 months. In three eyes with a combined
symblepharon formation, remission of both pterygium and symblepharon growth was obtained. They concluded that LCAT seems to be a promising and safe procedure for recurrent pterygium.

Gris O, Guell JL, del Campo Z (2000) examined the usefulness of limbal-conjunctival autograft transplantation for the treatment of advanced recurrent pterygium. They selected seven patients with advanced recurrent pterygium. All had previously been treated a minimum of two times by simple excision (two of them with intraoperative mitomycin C). Limbal-conjunctival autograft transplantation after pterygium excision was performed in all cases, with a minimal follow-up period of 14 months. There were no recurrences of pterygial growth beyond the limbal edge. In addition, no significant complications were noted. Only one case of limited pseudopterygium in the donor site and one case of graft retraction were recorded. No further surgical interventions were needed in any case. They concluded that Limbal-conjunctival autograft transplantation is a promising technique for the treatment of advanced recurrent pterygium.

Starc S, Knorr M, Steuhl KP, Rohrbach JM, Thiel HJ(1996) conducted a study for evaluation of the efficiency of limbal autograft transplantation for primary and recurrent pterygia. The results of limbal autograft transplantation for advanced and recurrent pterygia are presented for 58 eyes of 50 patients. The pterygia were primary in 40 eyes and recurrent in 18 eyes. Free grafts from the superotemporal limbus of the same eye were used to cover the exposed sclera. Postoperative followup ranged from 2 to 26 months, with a mean of 13 months. The overall recurrence rate was 31% (22.5% in primary pterygia and 50% in recurrent pterygia). Recurrence rates were significantly higher in patients from southern Europe than in patients from northern Europe. Analysis of patients with recurrences (n = 18) revealed
severe tear film abnormalities in eight cases. Seven patients were found to have transplants of insufficient size. Additionally, 15 patients who developed recurrent pterygium had returned to unfavourable working conditions (e.g. dust, heat). Three of the 18 recurrences underwent repeated limbal transplantation and in one of these there was a further recurrence.

*Koch JM, Mellin KB, Waubke TN* (1992) conducted a study based on a new concept of the limbus as a junctional zone for separating the vascularized conjunctiva from the avascular cornea, and presented conjunctival/limbal autograft transplantation for 22 cases of pterygium. The pterygia were primary in 17 eyes, cicatricial in 1 and recurrent in 4. In all cases a free transplant of the superotemporal limbus with an adjacent piece of thin conjunctiva was placed in the excision area. Postoperative follow-up ranged from 1 1/2 to 17 months, with a mean of 8.7 months. Only two pterygia recurred. In all other cases ideal anatomic reconstruction was achieved without any side effects. The authors believe that conjunctival limbal transplantation is an encouraging technique for treating a pterygium surgically.

*Prabhasawat P, Barton K, Burkett G, Tseng SC* (1997) conducted a study to determine whether amniotic membrane can be used as an alternative to conjunctival autograft after pterygium excision. A prospective study of amniotic membrane grafts (group A) and primary closure (group B) was compared retrospectively with conjunctival autografts (group C) in patients with pterygia. Group A included 46 eyes with primary pterygia and 8 eyes with recurrent pterygia, group B had 20 eyes with primary pterygia, and group C consisted of 78 eyes with primary and 44 eyes with recurrent pterygia. For the above three different surgeries, the amount of tissue removed was estimated from histopathologic analysis, and the result was evaluated by
clinical examination. Recurrence, survival analysis, and final appearance were compared. In group A, the recurrence rate was 10.9%, 37.5%, and 14.8% for primary, recurrent, and all pterygia, respectively (mean follow-up, 11 months). These three rates were significantly higher than 2.6%, 9.1%, and 4.9% noted in group C (mean follow-up, 23 months). However, the latter recurrence rate was significantly lower than 45% (mean follow-up, 5.2 months) in group B for primary pterygia (P < 0.001). The onset of recurrence was delayed significantly in group C as compared with that of groups A and B. They concluded that the relatively low recurrence rate for primary pterygia allows one to use amniotic membrane transplantation as an alternative first choice, especially for advanced cases with bilateral heads or those who might need glaucoma surgery later.

**Pulte P, Heiligenhaus A, Koch J, Steuhl KP, Waubke T (1998)** conducted a study to investigate the long-term efficacy of conjunctiva-limbus autografts to prevent pterygium recurrence. Conjunctiva-limbus transplants for primary (n = 62) or recurrent (n = 8) pterygia were reevaluated 11 to 83 months after surgery (mean: 44.97 months). Corneal pterygium recurrence was observed in 2 cases. Fibrovascular tissue was found at the peripheral transplant-margin in 15 cases, and transplant compression towards the limbal margins was detected in further 7 patients. These conjunctival changes have not been observed during the first postoperative months. They concluded that Conjunctiva-limbus autografts in pterygium have excellent efficacy against recurrence within the first few years. The transplant compression and fibrovascular changes within the peripheral conjunctiva seen in this study suggest that recurrences might, however, develop on the long-term.

**Singh G, Wilson MR, Foster CS (1988)** observed 48 patients for 7-21 months (mean, 18 months) after pterygium excision and 2 weeks of placebo or
mitomycin topical therapy to evaluate whether or not the short-term efficacy of mitomycin in preventing pterygium recurrence would be reflected in long-lasting efficacy as well. Placebo-treated pterygia showed a 73% recurrence rate. One of 58 (1.7%) mitomycin-treated pterygia recurred. They also performed a pilot study comparing pterygia treated with excision followed by 0.4 mg/ml of mitomycin to pterygia treated with excision coupled with conjunctival autograft transplantation. Thirteen primary and two recurrent pterygia were treated with mitomycin, while 14 primary and 1 recurrent pterygia were treated with conjunctival autograft transplantation. With mean follow-up times of 4 and 6 months, respectively, no recurrences were noted in the mitomycin-treated group, while the conjunctival autograft transplantation group had one recurrence (6.6%). They concluded that the vastly less expensive, simple therapy of mitomycin eye drops is the more appropriate treatment.

*Figueiredo RS, Cohen EJ, Gomes JA, Rapuano CJ, Laibson PR (1993)* evaluated the efficacy of the surgical management of pterygium with conjunctival autografts. In a retrospective survey, the records of 94 consecutive patients who underwent surgery for pterygium between 1984 and 1993 were reviewed. Only the first pterygium procedure for each patient was included. Thirty-one patients with primary pterygium underwent simple excision. Forty patients had conjunctival autografts. The recurrence rates estimated at 1 year were 40% and 16%, respectively. In both groups, patients who were 50 years old or younger were more likely to have a recurrence. All 23 patients with recurrent pterygium had conjunctival grafts, and the estimation of recurrence at 1 year was 25%. No serious complications occurred in any group. They concluded that Conjunctival autograft decreases the recurrence rate for primary pterygium compared with simple excision.
Du Z, Jiang D, Nie A (2002) conducted a study to observe the therapeutic effects of limbal epithelial autograft transplantation and pterygium excision in the treatment of pterygium. A prospective randomized paired-eye trial was studied. There were 208 patients (229 eyes) with initial pterygium, and they were allocated to two groups: excision of pterygium with limbal epithelial autograft transplantation surgery (A group, 106 cases and 124 eyes) and simple pterygium excision (B group, 102 cases and 105 eyes). The post-operative follow-up periods ranged from 18 approximately 28 (22.4 +/- 4.9) months. 5 of 112 eyes (4.5%) in A group and 41 of 96 eyes (42.7%) in B group were recurred, the difference being very significant (P < 0.001). They concluded that to provide a new stem cell source, limbal epithelial autograft transplantation, for an injured limbus is a reasonable therapeutic method for the treatment of pterygium.

Starck T, Kenyon KR, Serrano F (1991) conducted a study in which the surgical technique and postoperative problem management of conjunctival autograft transplantation for advanced primary and recurrent pterygium were reviewed. Problems such as graft edema, corneoscleral dellen, and epithelial inclusion cysts infrequently occur. Corneal astigmatism, Tenon's granuloma, retraction and/or necrosis of the graft, and muscular disinsertion are even less frequently encountered. They recommended the use of Limbal-conjunctival autograft for recalcitrant recurrent cases.

Mahar PS (1997) conducted a study to assess the recurrence rate of pterygium with conjunctival autograft versus the use of topical mitomycin C. In 27 eyes undergoing pterygium excision with conjunctival autograft, the recurrence rate was found to be 25.9% after 1 year mean follow-up. In the second group of 32 eyes, pterygium was removed using the bare sclera method. All these patients received post-operatively 0.2 mg/ml (0.02%)
topical mitomycin C twice a day for 5 days. At 1 year mean follow-up, the recurrence rate in this group was 9.4%. Although the difference was not statistically significant, the number of recurrences was lower in the mitomycin-C-treated group than in patients undergoing conjunctival autograft.

**Dadeya S, Kamlesh, Khurana C, Fatima S (2002)** conducted a study to evaluate the safety and efficacy of intraoperative daunorubicin to compare the recurrence rate following treatment of pterygium with daunorubicin during a bare sclera procedure in primary pterygium surgery and to compare with conjunctival autograft. The data for 84 patients were analyzed retrospectively. The patients were divided into two groups: group A, those who underwent bare sclera excision along with conjunctival autograft, and group B, those who underwent bare sclera excision with intraoperative daunorubicin (0.02%) for 3 minutes. They evaluated pterygium recurrence and postoperative complications for both groups. Recurrence of pterygium was defined as growth of 2 mm of fibrovascular tissue over the corneoscleral limbus into the clear cornea in the area of previous pterygium excision. Follow-up ranged from 18 to 37 months (mean, 27). Recurrence rates of 8.33% (three of 36) and 7.14% (three of 42) were found in groups A and B, respectively. When compared statistically, the difference was not significant. All the recurrences occurred in patients younger than 30 years of age. Pyogenic granuloma, graft edema, loose graft, and dellen formation were seen, respectively, in 5.5% (two of 36), 2.77% (one of 36), 2.77% (one of 36), and 2.77% (one of 36) patients in group A. Nine of 42 (21.42%) patients in group B had chemosis of the conjunctiva and two of 42 (4.76%) had delayed epithelization. They concluded that intraoperative daunorubicin (0.02%) and conjunctival autograft are both equally effective adjuncts to pterygium surgery.
Ti SE, Chee SP, Dear KB, Tan DT (2000) conducted a study to evaluate the success rates of conjunctival autografting for primary and recurrent pterygium performed in a tertiary ophthalmic centre. The outcome of 139 cases with primary pterygia and 64 cases with recurrent pterygia who underwent excision with conjunctival autografting was retrospectively reviewed. Mean follow up was 8.4 months in the primary group, and 9.5 months for the recurrent group. 29 out of 139 cases of primary pterygia recurred (20.8%) while 20 out of 64 cases in the recurrent group (31.2%) recurred. Recurrence rates varied widely among surgeons, ranging from 5% to 82%. Recurrence rates were inversely related to previous experience in performing conjunctival grafting. The recurrence free probability was 84% at 3 months, 73% at 1 year for primary pterygia, and 80% at 3 months, 67% at 1 year for recurrent pterygia. There was no statistical difference in recurrence rates between primary and recurrent groups (p= 0.80). They concluded that the success of conjunctival autografting for pterygium in this series varied widely, and may be related to a significant learning curve or differing surgical techniques for this procedure. This may account for the wide variation in reported success of this procedure in the ophthalmic literature.

Hille K, Hoh H, Gross A, Ruprecht KW (1996) reported the outcome after pterygium excision with bare-sclera technique compared with free transplantation of limbal conjunctiva. They used the bare-sclera technique in 21 eyes and performed free transplantation of conjunctiva in 34 eyes. The duration of follow-up was 14 months. In patients operated with the bare-sclera technique there were significantly more recurrences (eight vs four). In patients with primary surgery and free limbal transplant they found no case of recurrence, but the bare-sclera technique was associated with a recurrence rate
of 35.5%. They recommended free limbal conjunctival transplantation even in patients with primary surgery of a pterygium.

*Dowlut MS, Laflamme MY (1981)* conducted a study in which out of 91 pterygia treated by simple excision followed by beta-irradiation 7 recurred. Of 15 recurrent pterygia treated by complete excision by the bare-sclera technique associated with a conjunctival autograft only 1 recurred again. They concluded that conjunctival autografting is simple and efficacious, and gives very good esthetic results in cases of recurrent pterygium.

*Guler M, Sobaci G, Ilker S, Ozturk F, Mutlu FM, Yildirim E (1994)* conducted a study to evaluate limbal conjunctival autotransplantation in the management of cases with recurrent pterygium. At present, new surgical techniques to prevent pterygium recurrence following surgery are in investigation. In recent years, it has been postulated that pterygium is due to hypofunction of limbal stem cells. Thirty-one out of 49 patients with recurrent pterygium were treated by limbal-conjunctival autograft transplantation and the other 18 treated by Czermak technique, including two line of limbal cauterization intraoperatively, and used as a control group. During a mean follow-up period of 10 months (ranging 3-18 months), 4 recurrences (13.3%) in the limbal-conjunctival autograft transplantation group and 9 recurrences (50%) in the control group were observed. They concluded that this is a successful method to prevent secondary recurrence in the management of recurrent pterygium patients under 40 years of age.

*Shimazaki J, Yang HY, Tsubota K (1996)* conducted a study to examine the usefulness of limbal autograft transplantation in the treatment of recurrent and advanced pterygia. Eleven patients with recurrent and 16 with advanced pterygia were treated with limbal autograft transplantation. Once a pterygium had been excised, superior limbal tissue was taken with
conjunctival flap and transferred to the excised area. All the grafts were planted promptly, and donor sites were re-epithelialized with no excessive scar tissue formation. Although slight recurrence was noted in 2 eyes (7.4%), subconjunctival tissue invasions were limited to less than 1 mm, and no further surgical interventions were needed. These results indicate that limbal autograft transplantation is very effective for the treatment of recurrent and advanced pterygia.

_Kniha N, Kamoun B, Trigu A, Jelliti B, Fourati M, Chaabouni M (2001)_ conducted a prospective study of 52 eyes treated by limbal conjunctival autograft for primary and recurrent pterygium compared their results with the technique of simple excision performed in 111 cases of pterygium (3 being a recurrent pterygium). The mean age of the patients was 45 years. 30 cases of pterygium were primary (57.7%) and 22 were recurrent (42.3%). After an average follow-up of 14 months, the incidence of recurrence was 10%. Only 2 of these recurrent cases of pterygium were primary. They concluded that the introduction of limbal conjunctival autograft for the treatment of pterygium meets three main goals: safety, good optical outcome and a lower rate of recurrence. This procedure could be accepted as a successful technique for cases with recurrent pterygium especially in younger patients and when the environmental factors lower the development of recurrent pterygium.

_H S Dua, J S Saini, A Azuara-Blanco, P Gupta (2000)_ presented the Concept, Etiology, Clinical Presentation, Diagnosis and Management of Limbal Stem Cell Deficiency. Defects in renewal and repair of ocular surface as a result of limbal stem cell deficiency are now known to cause varying ocular surface morbidity including persistent photophobia, repeated and persistent surface breakdown and overt conjunctivalisation of the cornea. Ocular conditions with abnormalities of ocular surface repair include
pterygium, limbal tumours, aniridia, severe scarring following burns, cicatricial pemphigoid and Stevens-Johnson Syndrome etc. The corneal epithelium undergoes a constant process of cell renewal and regeneration. Cells in its uppermost layer are continuously desquamated and lost into the tear film, and must be replaced by cell proliferation. Therefore it is endowed with a proliferative reserve in the form of multipotent stem cells located in the basal limbal epithelium. The limbal stem cells serve as a proliferative barrier between corneal and conjunctival epithelia. Conditions that significantly damage the limbal stem cells can result in an invasion of conjunctival epithelium on to the corneal surface (conjunctivalisation). This process of conjunctivalisation results in a thickened, irregular, unstable epithelium, often with secondary neovascularisation and inflammatory cell infiltration. Epithelial defects are common in the conjunctivalised corneal surface and may lead to corneal ulceration, scarring, and loss of vision. Defects in renewal and repair of ocular surface as a result of limbal stem cell deficiency are now known to cause varying ocular surface morbidity including persistent photophobia, repeated and persistent surface breakdown and overt conjunctivalisation of the cornea in conditions like pterygium.

Rao SK, Lekha T, Mukesh BN, Sitalakshmi G, Padmanabhan P (1994) described their technique of pterygium excision with conjunctival-limbal autografting and analyzed the safety and efficacy of the procedure in India. Case records of 51 consecutive patients (53 eyes) who underwent surgery between November 1992 and September 1994 were retrospectively analyzed. Recurrence was defined as fibrovascular tissue crossing the corneoscleral limbus onto clear cornea in the area of previous pterygium excision. 2 (3.8%) of the 53 pterygia (primary 36; recurrent 17) recurred, after a mean follow up of 18.9 +/- 12.1 months (range: 1.5-43 months). Both
recurrences occurred within a year of follow up, in patients who were < or = 40 years of age. No major operative or postoperative complications were encountered. The inclusion of limbal tissue in conjunctival autografts following pterygium excision appears to be essential to ensure low recurrence rates. They concluded that the technique is safe, simple and inexpensive and is recommended for the management of both primary and recurrent pterygia in Indian eyes.

Ayman A. Alkawas, Wael Osman El-Haig, Bahgat Awad (2002) conducted a study to evaluate the effectiveness of limbal conjunctival autograft transplantation versus intraoperative mitomycin C combined with conjunctival flap rotation in the treatment of recurrent pterygia. This study included 43 eyes of 43 patients. Limbal conjunctival autograft transplantation was carried out for 19 eyes (group 1) and intraoperative mitomycin C combined with conjunctival flap rotation in 24 eyes (group 2). During a mean follow-up period of 8.3 months, pterygium recurrence developed in 3 eyes (15.8%) in group 1 and in 4 eyes (16.7%) in group 2. Most recurrences occurred in patients younger than 40 years old. No intraoperative complications were encountered in both groups. Postoperative complications in group 1 included Tenon’s granuloma in 3 eyes (15.8%), graft failure in 1 eye (5.3%), graft retraction in 1 eye (5.3%), and subconjunctival hematoma in 2 eyes (10.5%). Postoperative complications in group 2 included, flap retraction in 2 eyes (8.3%) and superficial keratitis in 5 eyes (20.8%). They concluded that both limbal conjunctival autograft transplantation and conjunctival flap rotation with intraoperative mitomycin C application are effective in managing recurrent pterygia. The recurrence rate is similar for both techniques. The inclusion of limbal tissue in conjunctival autografts
replaces the deficient limbal stem cells in the area of the pterygium and ensures low recurrence rates. Intraoperative mitomycin C with conjunctival flap rotation is, however, easier to perform, but the long-term safety of mitomycin C needs further study.

**K. Dutschke, J. Willner, H. Siebenbürger, M. Flentje (2001)** conducted a study to observe the results of pre- and postoperative treatment of recurrent pterygium with radiotherapy. 16 patients with recurrent pterygia were treated with radiotherapy. Out of those patients 12 (2 women, 10 men) with a minimum follow-up of one year were included in this study. A total dose of 27 Gy was applied with a 20 KV contact x-ray unit. The first radiation was given within 2-5 hours with 7 Gy before microsurgical excision and conjunctival autograft transplantation. During the following 4-9 days 4 fractions with 5 Gy each were applied. After a median follow-up of 15 months 8 out of 12 patients had no recurrence of pterygium at all. Four patients developed a recurrent pterygium with no need for surgery. Compared to a historical collective with only postoperative radiotherapy, recurrence rate was clearly reduced. Serious complications like wound healing disturbances, scleral necrosis, and infection did not occur. They concluded that pre- and postoperative radiotherapy of recurrent pterygium in combination with microsurgical excision and conjunctival autograft transplantation is an effective therapeutic option with so far good long-term results.

**Neußer, U. Gronemeyer (1999)** conducted a study to receive long-term results (mean follow-up: 2 years) regarding the recurrence rate and the morphological characteristics of recurrent pterygia in order to improve the surgical technique of pterygium excision combined with conjunctival autografting. From 1995 to 1997 pterygium excision was performed with free
conjunctival autograft in 51 eyes out of 46 patients. Recurrence rate was 19.5%
Analysis of morphologic characteristics of recurrent pterygia revealed that
transplants had been either too small or not thin enough. There were no
serious complications. They concluded that pterygium excision with
conjunctival autografting is safe and effective. To avoid recurrence the
transplant should be extremely thin, large enough and sutured to the sclera.

Regis S. Figueiredo; Elisabeth J. Cohen; Jose A. P. Gomes;
Christopher J. Rapuano; Peter R. Laibson(1997) conducted a study to
evaluate the efficacy of the surgical management of pterygium with
conjunctival autograft was evaluated. In a retrospective survey, the records of
94 consecutive patients who underwent surgery for pterygium between 1984
and 1993 were reviewed. Only the first pterygium procedure for each patient
was included. Thirty-one patients with primary pterygium underwent simple
excision. Forty patients had conjunctival autografts. The recurrence rates
estimated at 1 year were 40% and 16%, respectively ($P = .031$). In both
groups, patients who were 50 years old or younger were more likely to have a
recurrence ($P = .029$). All 23 patients with recurrent pterygium had
conjunctival grafts, and the estimation of recurrence at 1 year was 25%. No
serious complications occurred in any group. They concluded that
Conjunctival autograft decreases the recurrence rate for primary pterygium
compared with simple excision.

Manolette Roque; Ruben Limbongsiong, conducted a study to
investigate the rate of recurrence and the complications after resection of
primary and recurrent pterygia using bare sclera with conjunctival autograft,
and to find out if the results mirror that in Western studies. Thirteen patients
underwent pterygium excision onto bare sclera with conjunctival autograft.
The recurrence rate after conjunctival autograft was 8.3% after mean follow-up of 5.2 months. Increasing age was associated with significantly fewer recurrences after controlling for pterygium type (atrophic, noninflamed, or inflamed). The recurrent case was noted on the 7th month. Complications included a loose autograft (1) and subconjunctival (below the graft) hemorrhage (1). They concluded that Pterygium excision with conjunctival autograft promises to be a better procedure for the prevention of recurrence compared to simple bare sclera excision reported in literature.

The surgical problems associated with conjunctival autograft transplantation have been reviewed by *Stark T, Kenyon K R, and Serrano F* (1991) as follows:

**SURGICAL COMPLICATIONS AND MANAGEMENT**

**CONJUNCTIVAL GRAFT EDEMA**

The edema of the conjunctival graft is usually within the first 10 postoperative days. The several possible causes for the conjunctival graft edema include excessive surgical manipulation, inadequate Tenon’s excision, poor graft orientation, young patients, and hematoma of the graft. Although such edema usually resolves within 2-4 weeks, severe or persistent graft edema may be reduced by performing several small, vertical puncture incisions in the graft with a scalpel blade followed by compression of the serous fluid with a cotton-tip applicator.
EXCESSIVE SURGICAL MANIPULATION

We believe that minimal surgical manipulation and avoidance of drying during surgery improves the recovery of the graft in the immediate postoperative period.

TENON’S EXCISION

Because Tenon’s capsule might enable the conjunctiva to slide over the cornea in the establishment of the pterygium, a careful excision of Tenon’s from the graft tissue and from the recipient bed should be performed. Notably, young patients have a high risk of pterygium recurrence and early postoperative conjunctival graft edema, presumably because of the presence of increased and highly reactive Tenon’s tissue, and therefore must be treated more “aggressively”. The retention of Tenon’s tissue with the concomitant vessels and collagen tissue within the graft clinically seems to increase the immediate postoperative graft edema.

GRAFT ORIENTATION

To maintain the anatomical integrity and exert a prohibitive growth pressure against conjunctival epithelial invasion, the epithelium of the graft must have the same orientation as that of the host conjunctiva, and the limbal side should correspond to the position of the limbus in the host bed.

CONJUNCTIVAL GRAFT RETRACTION

Retraction or displacement of conjunctival graft involves a partial shift of the graft with exposure of the bare scleral bed. The sutures are partially or
totally absent. The main causes for graft retraction are excessive Tenon’s tissue, inadequate graft size, and graft tissue quality.

**INADEQUATE GRAFT SIZE:**

Shrinkage of the graft can also occur when there is a disparity in size between it and the host bed. If the graft is too small to cover the recipient bed completely, the sutures are subjected to high tension, thereby cutting through the tissue and leaving the graft without support. Undersized grafts are also probably associated with pterygium recurrence, thereby allowing the residual pterygium to “outflank” the graft barrier. Because grafts as large as 15 x 15 mm can be taken without risk to either graft viability or donor site, there should be no need to undersize the graft.

**GRAFT TISSUE QUALITY**

When the donor tissue used for the graft has been involved in cicatricial processes including trauma, surgery, infection, or inflammatory reaction, there is an increased amount of fibrous and inflammatory tissue. This can promote early shrinkage of the graft. If the fellow eye is in better condition it is preferable to use its conjunctiva as donor tissue. In patients with bilateral fibroinflammatory involvement, the use of buccal mucous grafts must be considered.

**CONJUNCTIVAL GRAFT NECROSIS**

The main reasons for necrosis of the graft are incorrect placement of the graft and avascular scleral bed.
Incorrect Graft Placement

If the graft is inadvertently inverted such that the epithelium is apposed to the sclera, the graft will fail. Excessive manipulation of the graft during surgery increases the risk of an equivocal placement. Retaining the attachment of the graft at the limbus during dissection contributes to the control of orientation. Another way to avoid this “down-side risk” is to mark with cautery the conjunctival epithelial margin of the graft before excision. If these marks are preserved within the graft margins, they can be easily recognized. This marking technique is also useful to allow precise sizing of the graft before commencement of its dissection.

The first postoperative clue to suspecting inversion of the graft is an abnormal pallor, because the malpositioned graft with shrink and become necrotic within 24-48 h. In these cases, the management varies depending on the size of the scleral bed exposed and on the age of the patient. In some cases of older patients with minimal scleral bed exposure, the exposed area can be left to close by secondary intention, as has been previously practiced. In younger patients with moderate to large exposure of the sclera and high risk of recurrence, it is better to replace the graft with conjunctiva from the fellow eye or with a buccal mucous graft.

Vascular Scleral Bed

In cases in which β radiation therapy has been used in repeated courses with overlapping fields, scleral ulceration is frequent, the chronic melting, thinning, and presence of abnormal vascular pattern can be the cause of delay in graft healing. Thus, the risks of graft necrosis are increased. When the corneoscleral bed is thin and has profound disruption of the vascular pattern, a lamellar corneal or corneoscleral keratoplasty or scleral reinforcement is indicated. This can be performed simultaneously in conjunction with the
conjunctival graft. In less severe cases, the use of a conjunctival graft alone fulfills the requirements for normal healing.

CORNEOSCLERAL DELLEN

The formation of an area of desiccation over the cornea, limbus, or even the sclera is not infrequent. As mentioned previously, excessive manipulation during surgery causes conjunctival graft edema. This edema raises the lid, creating an abnormal spread of the tear film that together with an irregular surface causes an area of desiccation and dellen formation. Postoperatively, the use of frequent artificial tears and lubricating ointments, in conjunction with steroid drugs in drops three to four times a day, helps to avoid the dellen formation. Once the dellen is formed, eye patching with concomitant use of antibiotic ointment for 24-48 h usually permits the healing of the compromised area. If the dellen is associated with marked conjunctival graft edema, several vertical puncture incisions of the graft help to flatten the graft and regularize the surface, thereby improving the spread of the tear film.

EPITHELIAL CYSTS

Epithelial cysts usually appear approximately 1 or 2 months after surgery. It is important after using the diamond-burr polisher or the manual technique to flush the area abundantly with saline, because retention of some corneal epithelial cells with consequent implantation in the conjunctival tissue is the main cause of this minor problem. Such cysts are innocuous, but their recurrence is high after puncturing. Marsupialization is the treatment of choice, and involves opening the cyst with concomitant resection of the overlapping conjunctiva.
HEMATOMAS

During surgery or more often early after surgery, hemorrhage or hematomas can appear in or under the graft, causing severe edema. This is often related to poor hemostasis. The hemostasis of the episcleral and Tenon’s- conjunctival tissues must be enough but not excessive, avoiding increase of irregularities and scar formation in the receptor tissues. Hemostasis with a heated glass rod is very smooth and superficial for the bare sclera. Unipolar or bipolar thermal cautery is better for pinpoint bleeding of conjunctival or Tenon’s vessels. Small hematomas usually resolve within 3 weeks without any treatment. In the presence of a large hematoma beneath the graft, the best management consists of drainage by puncturing with a fine needle, followed by a pressure patch to prevent the possibility of rebleeding. If the hematoma is left untreated, elevation of the graft can cause surface irregularity and dellen formation. Also, it can increase the tension of the sutures, with the risk of dehiscence and possibly displacement or loss of the graft.

TENON’S GRANULOMA

The Tenon’s granuloma has a clinical picture of granuloma pyogenicum. There are several causes for Tenon’s proliferation. The abnormal exposure of Tenon’s tissue without an adequate cover by the conjunctival tissue causes a permanent irritative stimulus, leading to an overgrowth of the exposed tissues. The phenomenon occurs more frequently at the donor site, but also can occur at the recipient bed. Although the former is usually secondary to Tenon’s exposure with out adequate conjunctival covering, the
latter is mainly due to inadequate technique with the graft, such as too few or too tight sutures or inverse placement of the graft. In either case, the final result is an excessive overgrowth of Tenon’s tissue overlapping the conjunctival graft, thereby inciting the recurrence of the pterygium. Treatment usually involves surgical excision and conjunctival autograft transplantation, with excellent results. The granulomatous reaction also can occur when small particles of reactive suture material remain included under the conjunctiva, inducing a foreign-body reaction. In our experience, the least reactive material is the 10-0 nylon. Although granulomas can be treated by increasing topical steroid drugs, they usually have to be excised. Because most are pedunculated, the excision is extremely straightforward, does not compromise the underlying conjunctiva, and is not associated with graft failure.

**MUSCULAR DISINSERTION**

Disinsertion of a medial or lateral rectus muscle rarely happens. The patients at greatest risk are those with recurrent pterygia after multiple surgeries and severe scarring involving the rectus muscle resulting in extraocular movement restriction. Thus, it is mandatory to dissect and isolate the muscle carefully with a hook and/or traction suture before the Tenon’s and conjunctival excision is done. If the muscle disinsertion occurs, it should be resutured in its normal position. If adequately recognized and managed intraoperatively, there is no contraindication to proceed with the conjunctival graft.
CORNEAL THINNING

Corneal thinning is also more often encountered in recurrent pterygia. In these cases, the previous use of several keratectomies is the main cause. It is very rare to find corneal thinning induced by the diamond-burr polisher. In those cases in which it can be inferred by past history or slit-lamp examination that corneal thinning is present, we prefer first to do a tectonic lamellar corneal or corneoscleral graft. For this purpose, a donor eye should be available for potential use during surgery.

ASTIGMATISM

In general, patients with either primary or recurrent pterygia can develop astigmatism as high as 7 diopters as is evident by refraction or keratometry. This astigmatism is induced by traction of the pterygia over the cornea, and when the pterygia are excised the astigmatism usually subsides. If the cause of astigmatism is corneal tissue loss, the therapy should be directed to reinforcing the tissues by lamellar corneoscleral graft. Once this has been achieved, it is recommended to wait at least 6 months before any attempt is made to correct the residual astigmatism.

RECURRANCE

At the present time, the recurrence rate of pterygium with conjunctival autograft technique varies between 2 and 7%. This low rate of recurrence is especially noteworthy because it pertains to the pterygium endemic to tropical areas as well as to less pterygium-provocative northern latitudes. Recurrence is usually evident in the first 2 postoperative months. Reintervention for recurrent pterygium has to be delayed at least 6 months after the first surgery,
to wait for complete resolution of the inflammatory and cicatricial process. In those difficult cases in which there is no apparent reason for multiple recurrences, it can be related to permanent, abnormal derangement of the anatomical structures at the limbus with severe depletion of stem-cell reservoir.

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