PRACTICE GUIDELINES AND STANDARDS OF CARE FOR PTERYGIUM

I. Definition

a. Triangular, fleshy, fibrovascular sheet originating from the conjunctiva and extending to corneal limbus and beyond.

b. Typically located in the horizontal meridian along the interpalpebral fissure.

II. Description

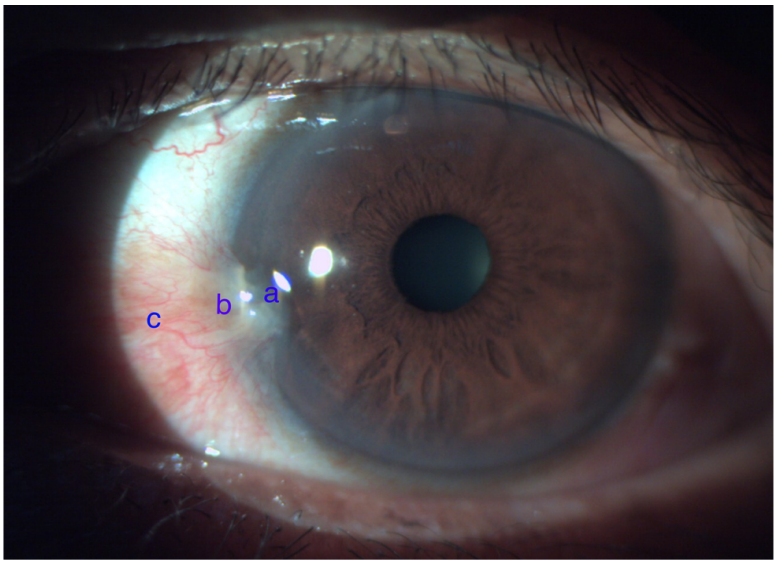
a. Cap – leading edge; flat, gray zone infiltrating the cornea consisting of fibroblasts that invade and destroy Bowman's membrane.

i. Stocker's line – Iron deposition anterior to the cap

ii. Dellen – areas of drying anterior to the cap

b. Head – vascular area that lies immediately behind the cap and is firmly attached to the cornea.

c. Body/Tail – fleshy, vascular, mobile areas of the bulbar conjunctiva that can be easily dissected from underlying tissue.



III. Pathogenesis – definite etiology has yet to be determined but prevailing theory is:

a. Damaging effects of ultraviolet radiation (UV-B) hence increased prevalence in equatorial countries

b. Radiation causes mutations in p53 tumor suppressor gene

c. Facilitates abnormal proliferation of limbal epithelium

IV. Histopathology

a. Elastotic degeneration of the substantia propia with abnormal collagen fibers

b. Dissolution of Bowman's membrane and invasion of superficial cornea

c. Pterygium epithelial cells show uniquely positive immunohistochemically staining for different types of matrix metalloproteinases

V. Course

a. May be quiescent with little vascularity and no observed growth

b. Can be active with hyperemia and fairly rapid growth

c. Early phase patients may be asymptomatic

d. Commonly, there are signs of dry eye due to irregular wetting of the ocular surface

i. Irritation

ii. Foreign body sensation

iii. Burning
iv. Itching
v. Tearing

e. Progression is denoted by increase in size, becomes more apparent to the naked eye and cosmetically unpleasant.

f. Further growth can cause visual symptoms due to induced astigmatism or encroachment on the visual axis.

VI. Diagnosis

a. Clinical appearance by penlight.

b. Slit-lamp biomicroscopy for more objective evaluation and grading; determine unusual features that may be indicative of other diagnoses.

c. Differential Diagnosis

i. Pseudopterygium

1. Usually occurs after trauma
2. Probe can be passed at the limbus under the body
3. Can be found anywhere on the cornea, usually found obliquely rather than horizontally

ii. Conjunctival papilloma

iii. Intraepithelial neoplasia

iv. Squamous cell carcinoma

- Conjunctival biopsy may be indicated

VII. Treatment Options – lack of consensus regarding optimal medical and surgical management

a. Early phase – conservative approach

i. Small atrophic pterygium

1. Observe periodically
2. Lubricant drops

ii. Active pterygium

1. Vasoconstrictors
2. NSAIDs
3. Steroid drops
4. Protective eyewear

b. Active growth – surgical intervention is likely

i. Surgery - challenge is prevention of recurrence

1. First Step involves excision of the pterygium
2. Head is avulsed from underlying cornea
   - Quicker epithelialization
   - Minimal scarring
   - Smooth corneal surface

ii. Techniques

1. Bare Sclera
2. Excision with simple closure or transposition
3. Excision with conjunctival autograft
4. Excision with amniotic membrane transplantation

c. Recurrence – continues to be a problem; prevented by adjunctive medical therapies but may be accompanied by their own complications

1. Mitomycin-C (MMC) – inhibits fibroblastic proliferation but minimal, safe and effective dosage levels not established

- Intraoperative – direct application of MMC at concentrations ranging from 0.01% to 0.04% for 3-5 minutes on the scleral bed after excision
- Postoperative -MMC drops for several days after surgery
    - Several studies now advocate the use of only intraoperative MMC to reduce toxicity. Adverse effects of MMC include iritis, limbal avascularity, scleral melting or calcific plaques, corneal decompensation, scleral or corneal perforations, secondary glaucoma, and cataract.

VIII. Monitoring and Follow-up

a. Small atrophic pterygia may be observed annually.

b. Growing lesions, surgical intervention becomes more compelling especially if aggressive growth is common in the patient's area of residence.

c. Pterygium larger than 3 mm may induce some astigmatism, and intervention may be warranted in such a case. Lesions larger than 3.5 mm are likely to be associated with more than 1 diopter of astigmatism and often cause blurring of uncorrected vision.

IX. Documentation

a. A complete history and ophthalmologic examination is important.

b. Sketches or drawings of the pterygium with emphasis on the size and extent of corneal involvement should be recorded.

c. Slit-lamp photos may be more helpful if available.

X. Surgical Techniques

a. Bare Sclera - involves excising the head and body of the pterygium while allowing the bare scleral bed to re-epithelialize. This technique is the quickest with least surgical manipulation. The pterygium from cap to tail is excised leaving a conjunctival defect. The edges may be left to adhere to the sclera or sutured to the underlying sclera. The defect then is allowed to heal.

    i. High recurrence rates, between 35 % and 91 %, have been documented in various reports.

    ii. Addition of adjunctive Mitomycin has somewhat decreased the rate of recurrence [1].

    iii. However, this procedure is discouraged because of the very high recurrence rates even for small primary lesions.

b. Excision with conjunctival closure or transposition - method includes excision of the pterygium followed by closure of the edges of the conjunctiva with sutures allowing no or minimal bare sclera.

    i. Recurrence rates are still high and the procedure is strongly discouraged without adjuvant therapy such as MMC.[2]

c. Pterygium excision with adjunctive therapy such as Mitomycin-C - MMC may be used intra-operatively or postoperatively to reduce the chances of recurrence. Studies on intra-oprerative Mitomycin with direct conjunctival closure showed recurrence rates ranging from 4.7% to 15.9%.[3]

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[1] A prospective randomized controlled study by Gupta and Saxena in 2003 compared the bare sclera pterygium excision with pteygium excision plus adjunct of Mitomycin regimens. The study showed a significant difference in recurrence rates of the bare sclera alone and with addition of MMC of 70% and 15-20% respectively.

[2] In a retrospective study by Dela Hoz, pterygium excision with Direct Conjunctival Closure (DCC) was compared to adjuvant Mitomycin and to Sliding Conjunctival Graft (SCG) with and without adjuvant Mitomycin. The recurrence rate for DCC without mitomycin was 7.7% with minor complications of mucous and watery discharge, mild pain, hyperemia and foreign body sensation. In comparison to DCC with Mitomycin, there was no significant decrease in the recurrence of pterygium. The technique DCC without Mitomycin when compared to SCG with and without mitomycin, a statistically significant decrease in recurrence rate was demonstrated in the SCG group. The study by Dela Hoz concluded that although this technique is simple and useful, it is still insufficient in the treatment of pterygium.

[3] A prospective randomized comparative study by Young on the direct conjunctival closure technique with adjunct intraoperative Mitomycin demonstrated a recurrence rate of 15.9%. Complications from these studies were minimal including conjunctival cyst, symblepharon formation, granuloma, and dellen. In a retrospective study by Amano, Mitomycin was applied intraoperatively to the

i. The studies involving postoperative application of Mitomycin showed a mean recurrence rate of 13.27%, ranging as low as 3.7% to as high as 20%.

ii. Complications include mild stinging sensation upon application and scleral thinning seen in 20%.[4]

d. Pterygium excision with conjunctival autograft - the bare sclera following the excision of the pterygium is covered by a free conjunctiva from a different location on the ocular surface, usually from the superotemporal bulbar conjunctiva, and sutured to the edges of the conjunctiva.

i. Longer surgical time and more conjunctival manipulation.

ii. More cosmetically acceptable outcome is seen because the result closely follows the normal anatomy of the limbus in terms of vascularization.

iii. Complications are infrequent.[5] Minimal minor complications such as granuloma formation, increased intraocular pressure, and conjunctival thickening. Recurrence rates reported are as low as 1.10% to as high as 25.9%.[6]

iv. Adjuvant treatment to conjunctival autograft may include mitomycin, 5-fluorouracil or daunorubicin.

v. Compared to intraoperative Mitomycin, no significant difference in recurrence rates between conjunctival autograft versus bare scleral technique with intraoperative Mitomycin application. However, a significant decrease in recurrence rate when conjunctival autograft is combined with intra-operative mitomycin compared to the autograft alone.

vi. Considered as the procedure of choice for pterygium and represent the "gold standard" by many corneal and anterior segment surgeons to which other procedures may be compared.

vii. Fibrin glue has been used as alternative to sutures for securing grafts, as its use significantly reduces operating time, and is associated with less postoperative discomfort and higher overall patient satisfaction. However, the main issues of concern with fibrin adhesives are the increased cost compared to sutures and the potential to transmit infection.

e. Amniotic membrane grafting - surgical technique is similar to conjunctival autograft wherein the pterygium is excised leaving a bare scleral bed. This area of conjunctival defect is then reconstructed with a section of amniotic membrane.

i. Although the exact mechanism by which the amniotic membrane confers its beneficial effect has not yet been identified, most researchers have suggested that it is the basement membrane that contains factors important for inhibiting inflammation and fibrosis and promoting epithelialization.

ii. Recurrence rates vary widely among the studies that exist, somewhere between 2.6 % and 10.7 % for primary pterygia and as high as 37.5 % for recurrent pterygia.

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sliding conjunctival graft. It showed a recurrence rate of 8.74%. On the other hand, a retrospective study by La Hoz compared the recurrence rates of intraoperative application of Mitomycin on the direct conjunctival closure and sliding conjunctival graft showed no significant decrease of the recurrence rates upon application of Mitomycin. There were minimal complications such as mild pain, aqueous discharge and conjunctival hyperaemia.

[4] In the prospective randomized study by Gupta, Mitomycin applied postoperatively to the bare sclera technique was compared to bare sclera technique alone. Mitomycin was applied as a single drop immediately after surgery in one group of eyes. In the other group, Mitomycin was applied twice a day for 5 days postoperatively. The study showed a significant decrease in recurrence rates for both Mitomycin groups compared to the bare sclera technique alone. The prospective randomized study by Mahar, on the other hand, compared postoperative Mitomycin combined with bare sclera technique to conjunctival autograft, which showed no significant difference in recurrence rates. In another study by Hui-Kang Ma, postoperative mitomycin was combined with the bare scleral technique and compared with conjunctival autograft and amniotic membrane transplantation. The resulting recurrence rates are 3.7%, 5.4% and 3.8% respectively, demonstrating no significant differences.

[5] Stark and associates stress the importance of careful dissection of Tenon's tissue from the conjunctival graft and recipient bed, minimal manipulation of tissue and accurate orientation of the graft for optimal results.

[6] In a prospective randomized study by Tananuvat, conjunctival autograft was compared to amniotic membrane transplantation wherein a section of amniotic membrane is used to reconstruct the defect after pterygium excision instead of conjunctiva. The study showed a significant difference in recurrence rates between conjunctival autograft and amniotic membrane transplantation, 4.76% and 40.9% respectively.

iii. A distinct advantage of this technique is the preservation of bulbar conjunctiva. Amniotic membrane is typically placed over the bare sclera, with the basement membrane facing up and the stroma facing down. However, due to its variable recurrence rates, conjunctival autograft appears to be the better option. Additionally, availability and cost of amniotic membrane should be considered.

iv. Fibrin glue may also be used to help the amniotic membrane graft adhere to the underlying episcleral tissue.

XI. Indications for Surgery

a. Visually significant induced error of refraction (hyperopia, astigmatism)
b. Threat of involvement of the visual axis (more than 3 mm from limbus)
c. Severe, frequent symptoms of irritation
d. Cosmesis, and,
e. If the pterygium will interfere and affect the performance and outcome of another ophthalmic procedure or surgery.

XII. Risks and Complications

a. Pterygium excision is generally considered a safe procedure, as no sight-threatening complications are associated.
b. Recurrence is the single most common cause of failure of pterygium surgery.
c. Intraoperatively, there may be excessive bleeding especially if the pterygium is very vascular.
d. The medial rectus may be injured during removal of the pterygium body leading to restriction of ocular motility and diplopia.
e. A more serious complication is corneal perforation due to aggressive dissection on the corneal plane.
f. Postoperatively, surgeons should watch out for corneal scarring, granuloma formation, infection, scleral melting and necrosis (especially for those using MMC).
g. In conjunctival autografting,
    i. Early postoperative complications of include graft edema, graft hemorrhage, graft retraction/suture breakage, graft inversion and necrosis, and corneoscleral dellen.
    ii. Late postoperative complications include epithelial inclusion cysts, conjunctival scarring or fibrosis at the donor site, and steroid-induced ocular hypertension.

XIII. Treatment Goals and Desired Outcomes

a. Focused on surgical excision of the lesion.
b. Issues concerning pterygium surgery involve minimizing recurrence and complications arising from the treatment.
c. Recurrence is still the most common cause of failure in pterygium surgery with recurrence rates still varying widely from 0 to 89%.
d. Potentially blinding complications arising from adjunctive therapy.

XIV. Postoperative Follow-up

a. Minimum of two, scheduled follow-up check ups in the first two weeks.
b. If non-absorbable sutures are used, removal at 3-4 weeks post-operatively is advised.
c. An optional follow-up within 3-6 months postoperatively to monitor recurrence.
d. Ideally, a follow-up check up 1 year postoperatively with refraction is also recommended.

XV. Summary

a. Surgical intervention is warranted if there is:
    i. Visually significant induced error of refraction (hyperopia, astigmatism)
    ii. A threat of involvement of the visual axis (more than 3 mm from limbus)
    iii. Severe, frequent symptoms of irritation

iv. A problem with cosmesis,

v. A potential to interfere and affect the performance and outcome of another ophthalmic procedure or surgery.

b. If these indications are not seen on patients, they may opt for

i. Periodic observation

ii. Ultraviolet radiation protection

iii. Topical medications such as lubricants, decongestants, non-steroidal anti-inflammatory drugs, steroids.

c. Recommended Surgical Techniques

i. Excision with conjunctival autograft is highly recommended due to their efficacy, safety, low recurrence rates and better cosmetic appearance.

ii. Owing to the high recurrence rates, pterygium excision with bare sclera, simple conjunctival closure or flap transposition are strongly discouraged.

iii. Excision with Mitomycin-C may be performed at the very least due to the less chances of recurrence compared to bare sclera and direct conjunctival closure if conjunctival autograft is not possible.

iv. Amniotic membrane transplantation is an alternative to conjunctival autograft especially if preservation of superotemporal bulbar conjunctiva is necessary.

XVI. References

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