growth of iris nevi into melanomas, including blue vs brown iris color and iris stromal seeding, both of which were present in our case, in addition to the multivariate risk features of young age and feathery tumor margins.[3]

In an analysis of 44 patients with suspicious iris melanocytic lesions, Giuliari and colleagues[8] found that 10 (23%) exhibited growth, with none developing metastases by 21 months' follow-up. They identified large tumor basal diameter ($P = 0.004$) and inferior tumor location ($P = 0.004$) as risk factors for growth.[8] They also demonstrated ultrasound biomicroscopy features associated with growth, including greater tumor baseline thickness ($P = 0.01$), endothelial touch ($P = 0.007$), irregular intralesional internal structure ($P = 0.0001$), and intralesional dots and linear streaks ($P < 0.0001$).[8]

Iris melanoma is managed by local resection, plaque radiotherapy, or enucleation.[9] Smaller tumors can be managed by resection, whereas plaque radiotherapy is employed for larger tumors and those with more extensive seeding and angle involvement, even if there is mild glaucoma.[9] Enucleation is generally reserved for cases with large tumors and uncontrolled secondary glaucoma.[9] In a long-term analysis of 144 patients with iris melanoma treated by plaque radiotherapy, Shields and colleagues[9] noted that glaucoma was present at initial visit in 40% of cases, and the main indications for plaque radiotherapy included large tumor base (51%), glaucoma (19%), diffuse multifocal involvement (4%), localized extraocular extension (3%), and residual/recurrent tumor following surgical resection (8%/14%). By Kaplan Meier estimate at 7 years, tumor control was achieved in 86%, enucleation was necessary in 12% and metastasis occurred in 1%.[9]

The prognosis of iris melanoma in children is generally satisfactory.[1,4,6] Shields and colleagues[4] reported that only 4% of 317 patients with iris melanoma developed metastasis; only 1 was a child.[4] Factors predictive of metastasis included extraocular extension ($P = 0.0037$) and high IOP ($P = 0.0032$).[4] In a recent report on outcomes of iris melanomas based on American Joint Committee on Cancer tumor category, metastasis was found in 3% of patients, all of whom demonstrated tumor extension into the ciliary body/choroid.[10]

References

1. Shields CL, Kaliki S, Furuta M, Mashayekhi A, Shields JA. Clinical spectrum and prognosis of uveal melanoma based on age at presentation in 8,033 cases. Retina 2012;32:1363-72.
2. Shields CL, Kancherla S, Patel J, et al. Clinical survey of 3680 iris tumors based on patient age at presentation. Ophthalmology 2012;119:407-14.
3. Shields CL, Kaliki S, Hutchinson A, et al. Iris nevus growth into melanoma: analysis of 1611consecutive eyes: the ABCDEF guide. Ophthalmology 2013;120:766-72.
4. Shields CL, Kaliki S, Shah SU, Luo W, Furuta M, Shields JA. Iris melanoma: features and prognosis in 317 children and adults. J AAPOS 2012;16:10-16.
5. Singh AD, Topham A. Incidence of uveal melanoma in the United States: 1973-1997. Ophthalmology 2003;110:956-61.
6. Shields CL, Shields JA, Materin M, et al. Iris melanoma: risk factors for metastasis in 169 consecutive patients. Ophthalmology 2001;8:172-8.
7. Shields CL, Kaliki S, Arepalli S, et al. Uveal melanoma in children and teenagers. Saudi J Ophthalmol 2013;27:197-201.
8. Giuliari GP, Krema H, McGowan HD, Pavlin CJ, Simpson ER. Clinical and ultrasound biomicroscopy features associated with growth in iris melanocytic lesions. Am J Ophthalmol 2012;153:1043-9.
9. Shields CL, Shah SU, Bianciotto CG, Emrich J, Komarnicky L, Shields JA. Iris melanoma management with iodine-125 plaque radiotherapy in 144 patients: impact of melanoma-related glaucoma on outcomes. Ophthalmology 2013;120:55-61.
10. AJCC Ophthalmic Oncology Task Force. International Validation of the American Joint Committee on Cancer's 7th Edition Classification of Uveal Melanoma. JAMA Ophthalmol 2015;133:376-83.

Conjunctival granuloma post pulley fixation suture

Anu A. Mathew, MBChB, MD (Ophthal), FRANZCO,[a] and Lionel Kowal, MBBS, FRANZCO[b]

Pulley fixation sutures to the medial rectus muscles have been used to manage variable-angle esotropia and convergence excess esotropia. Most techniques use a nonabsorbable suture. The posterior location of the sutures usually minimizes complications. We report a case of chronic conjunctival granuloma occurring after pulley fixation suture to the medial rectus muscle.

Case Report

A 10-year old girl presented to the Royal Victorian Eye and Ear Hospital, Melbourne, with convergence excess esotropia. Prior to surgery, she had a left esotropia measuring 40^{Δ} at near and 20^{Δ} at distance with spectacle correction for hypermetropia and astigmatism. She had undergone treatment for amblyopia. Her visual acuity was 20/20 in the right eye and 20/30 in the left eye. She underwent bilateral medial rectus recession with bilateral pulley fixation sutures. The surgery was performed by a surgeon who had performed this technique more than 70 times.

Using a fornix incision, the medial rectus was isolated, hooked, and recessed to 5 mm from the insertion on the right and 4.5 mm from the insertion on the left with fixed scleral 6-0 polyglactin 910 sutures. A hook was placed alongside the medial rectus muscle approximately 10 mm posterior to the original insertion to engage the medial rectus pulley, as described elsewhere.[1-3] A 6-0 braided polyester suture was passed through the pulley and subsequently through the posterior medial rectus muscle belly. Once

Author affiliations: [a]Department of Ophthalmology, Royal Children's Hospital, Melbourne, Australia; [b]Ocular Motility Unit, Royal Victorian Eye and Ear Hospital, Melbourne, Australia

Submitted December 4, 2016.
Revision accepted March 24, 2017.
Published online July 5, 2017.

Correspondence: Lionel Kowal, MBBS, FRANZCO, 3/182 Victoria Pde, East Melbourne, 3002 VIC, Australia (email: strabism@netspace.net.au).

J AAPOS 2017;21:342-343.

1091-8531/$36.00
http://dx.doi.org/10.1016/j.jaapos.2017.03.012

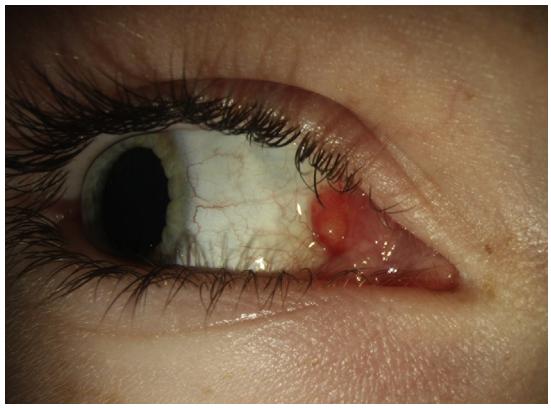

FIG 1. Photograph of patient's right eye in right gaze showing nasal conjunctival granuloma.

the suture was tied, a forced duction test in adduction was performed to confirm that a moderate mechanical restriction had been created. The conjunctival wound was closed with a 8-0 polyglactin 910 suture.

Topical prednisolone acetate, chloramphenicol, and diclofenac eyedrops were used 4 times daily in each eye for 1 week postoperatively. Examination findings at the 1-week follow-up examination showed good alignment (esotropia measuring 6^{Δ} at near and 4^{Δ} at distance with hypermetropic correction) and were otherwise unremarkable.

Fifteen months postoperatively, the patient presented to the emergency department complaining of a red lump in her right eye that was noticeable only on extreme right gaze (Figure 1). On slit-lamp examination, a 2–3mm raised, inflamed conjunctival lesion was noted close to the plica in the right eye, that is, nasal to the site of the fornix incision. The esotropia was stable, measuring 10^{Δ} at near and 2^{Δ} at distance with hypermetropic correction.

The lesion was presumed to be a granuloma secondary to the nonabsorbable suture used for the pulley fixation suture. The differential diagnosis of an inclusion cyst and pyogenic granuloma were considered. However, the posterior location of the lesion (away from the conjunctival incision site) and the formed, solid nature of the mass, without a stalk and with lack of bleeding, made those two diagnoses unlikely. The patient was treated with a course of topical fluorometholone for 3 months, with minimal improvement. The granuloma was still evident at the last review, 3 years after surgery. The patient had no symptoms of ocular discomfort and was not significantly concerned about cosmesis. The patient and family declined further surgery to remove the granuloma. Thus histopathological correlation was not possible.

Discussion

In the ophthalmic literature, granulomas have been reported in association with nonabsorbable sutures used in eyelid, pterygium, and strabismus surgery.[4-6] To our knowledge, suture granuloma associated specifically with use of pulley fixation sutures has not been reported previously.[1-3,7]

Braided polyester is a commonly used nonabsorbable suture that has shown to have the lowest long-term inflammatory reaction compared to blended polyester and polyethylene sutures and monofilament polypropylene sutures in a rabbit model.[8] In our case, the braided polyester suture was used bilaterally, but the patient only developed a unilateral conjunctival granuloma. We hypothesize that the cut end of the suture may not have been adequately buried and incited an inflammatory reaction.

The differential diagnosis of a conjunctival suture granuloma includes epithelial inclusion cyst and pyogenic granuloma. An acquired epithelial inclusion cyst occurs when the epithelial cells are displaced into the substantia propria, where they proliferate to form a cystic cavity.[9] Any surgery involving the conjunctiva can be at risk of developing an epithelial inclusion cyst. The noncystic nature of the lesion in our case excluded this diagnosis. Pyogenic granuloma was the second most common vascular conjunctival tumor described in a series from Wills Eye Hospital.[10] The condition usually followed an ocular insult and presented as a "slowly, enlarging fleshy vascular mass." The lesion was often pedunculated, with a stalk of feeder blood vessels and connective tissue. In our case, the lesion was not pedunculated and did not have a tendency to bleed, thus making this diagnosis less likely.

Literature Search

Web of Science and PubMed databases were searched in February 2017 without date restriction using the following terms: *polyester suture*, *granuloma*, *strabismus surgery*, and *ocular*.

References

1. Fouad HM, Abdelhakim MA, Awadein A, Elhilai H. Comparison between medial rectus pulley fixation and augmented recession in children with convergence excess and variable angle infantile esotropia. J AAPOS 2016;20:405-9.
2. Clark RA, Ariyasu R, Demer J. Medial rectus pulley posterior fixation is as effective as scleral posterior fixation for acquired esotropia with a high AC/A ratio. Am J Ophthalmol 2004;137:1026-33.
3. Mitchell L, Kowal L. Medial rectus muscle pulley posterior fixation sutures in accommodative and partially accommodative esotropia with convergence excess. J AAPOS 2012;16:125-30.
4. Soll SM, Lisman RD, Charles NC, Palu RN. Pyogenic granuloma after transconjunctival blepharoplasty. Ophthal Plast Recons 1993;9:298-301.
5. Romano V, Cruciani M, Conti L, Fontana L. Fibrin glue versus sutures for conjunctival autografting in primary pterygium surgery. Cochrane Database Syst Rev 2016;12:1-20.
6. Gal A, France TD. Granuloma formation as a complication of the posterior fixation suture operation. Arch Ophthalmol 1986;104:1755.
7. Choi HY, Jung JH. Bilateral lateral rectus muscle recession with medial rectus pulley fixation for divergence excess intermittent exotropia with high AC/A ratio. J AAPOS 2013;17:266-8.
8. Esenyel CZ, Demirhan M, Kiliçoğlu O, et al. Evaluation of soft tissue reactions to three nonabsorbable suture materials in a rabbit model [in Turkish]. Acta Orthop Traumatol Turc 2009;43:366-72.
9. Pereira LS, Hwang TN, McCulley TJ. Marsupialization of orbital conjunctival inclusion cysts related to strabismus surgery. J Pediat Ophth Strab 2009;46:180-81.
10. Shields JA, Mashayekhi A, Kilgman BS, et al. Vascular tumors of the conjunctiva in 140 cases. Ophthalmology 2011;118:1747-53.