

Complications of strabismus surgery

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Complications of strabismus surgery are uncommon but when they occur can be devastating. Many complications require urgent treatment and although problems are often detected intraoperatively, it is important all ophthalmologists are aware of the possibility of such complications occurring. This article discusses the frequency and management of severe complications that may be encountered.

Incidence

The incidence and outcomes described are largely from a 2-year prospective survey of severe complications of strabismus surgery carried out by the author through the British Ophthalmic Surveillance Unit (BOSU).¹ Approximately 12,000 strabismus procedures are performed annually in the UK. The BOSU survey revealed an incidence of severe complications of strabismus surgery of 1 per 400 operations, with equal frequency in adults and children (Figure 1). Outcomes were graded by severity from good to very poor, with the definitions for each category shown in Figure 1. Overall, 16% of patients experiencing a complication (1 in 2,400 of total operations) had a poor or very poor outcome, defined as diplopia in the primary position or loss of at least one line of Snellen acuity.

Grade 1	Good outcome
Grade 2	Surgical or medical intervention good outcome
Grade 3	Surgical or medical intervention asymptomatic but compromised outcome
Grade 4	Surgical or medical intervention but poor outcome e.g. double vision or up to 2 lines of loss of vision on a Snellen chart
Grade 5	Very poor outcome, greater than 2 lines of visual loss on a Snellen chart

Figure 1. Severity of outcomes reported in the BOSU survey

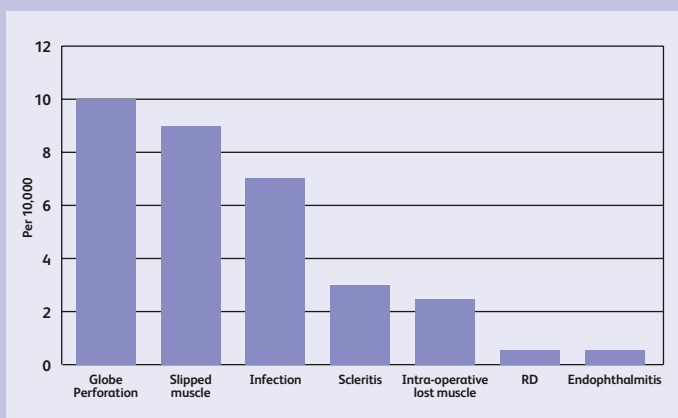


Figure 2. Frequency of severe complications

Globe perforation was the most common complication with an incidence of almost 1:1,000, followed by slipped muscle with an incidence of 9 in 10,000. Retinal detachment and endophthalmitis were

the least common reported complications (Figure 2). Anterior segment ischaemia was not reported in the BOSU study, but has previously been reported to occur in approximately 1:13,000 operations.² Each complication is discussed in more detail below.

1. Globe perforation

Globe perforation is the commonest severe complication of strabismus surgery, reported in 0.13% to 1% of cases. In the BOSU study, the incidence was 1:1,000. Globe perforation appears to be more common in children, perhaps due to difficult surgical access. Although globe perforation is not infrequent, a poor or very poor outcome is extremely rare. 18 of 19 patients with globe perforation in the BOSU survey had a good outcome (grade one or two) with only one patient suffering a very poor outcome. This patient developed endophthalmitis and eventually needed evisceration. Complex surgery, e.g. Faden procedures, may have a higher incidence of globe perforation.

In the BOSU study, globe perforation sometimes occurred when placing a traction suture. This resulted in penetration into the anterior chamber and a soft eye making strabismus surgery difficult. Most cases of posterior segment perforation were identified preoperative and treated, usually with cryotherapy or laser. There was one case of retinal detachment in a high myope who had bilateral globe perforation from bilateral Harada-Ito procedures.

Management of globe perforation is not evidence based. Ninety percent of cases are treated with cryotherapy and/or laser.⁷ In children, where globe perforation is more likely, retinal detachment is unlikely as they have formed vitreous. If globe perforation is suspected during surgery, we perform a dilated fundus examination to confirm the diagnosis and seek a vitreo-retinal opinion, if available, before considering treatment. In adults, we perform a fundus examination and, in patients with a high risk of retinal detachment (i.e. high myopes), perform preoperative treatment of the hole and then seek vitreo-retinal opinion. We do not treat those at low risk, but would seek a later vitreo-retinal opinion. All patients have systemic antibiotics to reduce the risk of endophthalmitis. Rathod et al, reported two cases of endophthalmitis, two retinal detachments, one suprachoroidal haemorrhage, and one choroidal scar following globe perforation.³

Strategies to prevent globe perforation include:

1. Avoiding suturing in areas with scleral thinning.
2. Techniques (i.e. hang-back procedures) that do not involve direct scleral suturing in thinner areas or where access is difficult.

2. Slipped muscle

In the BOSU study, slipped muscle was defined as the patient presenting with an overcorrection and 50% or more reduction in movement in the action of a previously operated muscle. There were 18 cases, and it was slightly more common in children. In three of these, the slipped muscle resulted from a muscle insertion infection. Three of 18 had a poor or very poor outcome; all were children.

Slipped muscles take two main forms. A true slipped muscle is similar to a lost muscle and is usually due to a problem with the sutures or insertion soon after the operation. The suture fails and the muscle slips. One deals with this like with a lost muscle. The more common presentation occurs many weeks to even years later, with a gross limitation of action of the muscle that has slipped. Exploration often finds the muscle on a large pseudotendon. The pseudotendon is

removed and the muscle re-attached to the globe. Shortening of the antagonist may require recession of it and the conjunctiva.

3. Orbital infection

Orbital infection following strabismus surgery tends to be equally either diffuse orbital cellulitis or an abscess at the muscle insertion. In the BOSU study there were 14 cases, with only 3 cases reported in adults. Three muscle insertion abscesses developed a slipped muscle requiring surgical exploration. Management depends on whether the infection is diffuse orbital infection, in which systemic antibiotics are usually curative, or a muscle insertion abscess with a slipped muscle, which requires surgical exploration, drainage and systemic antibiotics. Histology of endophthalmitis cases following strabismus surgery has shown that infection can gain access to the eye from a postoperative muscle insertion infection, suggesting an aggressive approach to postoperative muscle insertion infections is warranted.

4. Surgically induced necrotizing scleritis

Surgically induced necrotizing scleritis (SINS) is a rare but serious complication of strabismus surgery. SINS is exceptionally rare in children, with only one reported case in the literature, however in the BOSU study six adult cases were reported, presenting 1–6 weeks postoperatively, usually with ocular pain. They were treated usually with topical and systemic non-steroidal anti-inflammatory drugs (NSAIDs) or steroids. One severe case required treatment with cyclophosphamide and developed posterior synechiae and a cataract reducing the vision to log MAR 0.60 (6/24, 20/80, 0.25) another patient, who presented 14 days following surgery, had a corneal melt and required a conjunctival auto graft nearly 2 years later with good visual acuity. Fifty percent of cases had a poor or very poor outcome. Most patients were elderly but two were in their 20s.

Presentation of postoperative scleritis can be delayed (up to 40 years). As the BOSU study follow up period was only 6 months the incidence reported may represent an underestimation. Also, although we did not collect information on pre-existing conditions that might predispose to scleritis such as systemic autoimmune conditions and ischaemia, O'Donoghue et al.⁴ reported a high prevalence of collagen vascular disease in postoperative scleritis. This, together with the poor prognosis, suggests patients with SINS may best be seen by an inflammatory disease specialist.

Mild scleritis may be common following strabismus surgery, presenting with pain, more severe and deep-seated than normal, with diffuse scleral inflammation requiring oral NSAIDs. Risk factors include older age, poor circulation, scleral diathermy, and ischaemia.

5. Lost muscle

In the BOSU study, lost muscle was defined as a muscle lost peroperatively. There were six lost muscles, five in adults. Most were in elderly patients, four of whom had had previous strabismus surgery. Four were medial recti, two were lateral recti. Medial recti are the most common muscles lost during surgery. This may relate to how frequently the muscle is operated on, or to its anatomy. The other recti have attachments to the oblique which prevent the muscle retracting into the orbit. All patients in the BOSU study had the muscles found peroperatively: only one had a poor or very poor outcome.

Should a muscle be lost peroperatively it is best to find the muscle immediately. A common mistake is to look for the muscle around the globe when in fact the recti muscles lie slightly away from the globe. Seek help from an experienced surgeon, use suitable retractors for exposure, and control haemostasis. Careful exploration usually finds the muscle sheath and the muscle within. Some authors have suggested using the oculo-cardiac reflex as a way of finding the muscle as pulling on the muscle would slow the heart rate but this is only partially useful. If the muscle cannot be found, suture the check ligaments and Tenon's surrounding the muscle to the original muscle insertion as some muscle action may be transferred through these tissues to the eye. A muscle transposition could be performed, however,

beware of anterior segment ischaemia in adults. A more experienced strabismus surgeon may be able to find the muscle at a subsequent exploration. Postoperative investigations may include MRI or CT scans. An orbital approach may help with a posteriorly situated muscle.

6. Endophthalmitis

There was one case of endophthalmitis in the 2 years of the BOSU giving an incidence of 1:24,000 cases.

7. Other complications

Adherence syndrome

This is a restrictive condition, often progressive, caused by orbital fat coming through a surgical disruption of posterior Tenon's, as a result of strabismus surgery, commonly to the inferior oblique. Occasionally it is caused by trauma or lid surgery. To prevent adherence syndrome, care must be made to visualise the posterior edge of the inferior oblique so only the muscle (and not posterior Tenon's) is hooked. Sometimes excessive bleeding leads to poor visualisation and contributes to the scarring process. If orbital fat prolapses at surgery the fat can be excised and the posterior Tenon's repaired. Often, however, the problem is found postoperatively as the patient develops progressive hypertropia and limitation of elevation. Surgical options are to explore the inferior fornix, excise any orbital fat, repair the posterior Tenon's capsule defect, and then recess the inferior rectus, Tenon's, and conjunctiva followed by an amniotic membrane graft.

Anterior segment ischaemia

Two anterior ciliary arteries (branches of the ophthalmic artery) supply each rectus muscle apart from the lateral rectus which has only one: the obliques have no anterior ciliary arteries. The incidence of significant anterior segment ischaemia (ASI) is around 1:13,000 cases.² It was not surveyed in the BOSU study because ASI would be grossly underreported especially in children where postoperative slit-lamp examination is not normally performed. Severe outcomes are rare although there is a report of phthisis bulbi. Risk factors for ASI include increasing age, previous rectus surgery, operations on multiple muscles (especially recti) in the same eye, circulation problems (i.e. hypertension or diabetes), similar surgery on adjacent rectus muscles, surgery on vertical rectus muscles, and a limbal incision.

In children, although it may be safe to operate on more than two recti muscles at once: most surgeons avoid operating on all four recti muscles simultaneously. If it is necessary to operate on more than two recti muscles in an adult or if the patient has a very high risk of developing ASI, ciliary artery sparing surgery can be performed by dissecting out one of the anterior ciliary arteries. Symptoms and signs of ASI can vary from mild uveitis and reduced iris perfusion to corneal clouding.

Grade 1 ASI can only be detected by iris angiography.

Grade 2 ASI is associated with areas of iris hypoperfusion, and sometimes an abnormally shaped pupil. It rarely requires treatment.

Grades 3 and 4 ASI usually require treatment with topical or systemic corticosteroids. Unusual treatments include hyperbaric oxygen. The vast majority recover with only minor sequelae including iris atrophy, corectopia, or a poorly reacting pupil.

Summary

Although severe complications occur more frequently than was thought (1 in 400 cases), few have poor or very poor outcome (1 in 2,400 cases). If a strabismus surgeon performs 150 operations per year for 30 years he/she would expect to see about 11 cases of severe complications of which one, or if unlucky two, may have a poor or very outcome.

Andrew Tatham, Editor, Focus

References can be accessed via the online copy of College News in the members' area of the website
www.rcophth.ac.uk/standards-publications-research/focus-articles/