

Rectus muscle trauma complicating sub-Tenon's local anaesthesia

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Abstract

Purpose To describe three cases of rectus muscle trauma in patients undergoing phacoemulsification cataract extraction and intraocular lens implantation under sub-Tenon's local anaesthesia via the inferonasal quadrant.

Methods Retrospective review was carried out of 3 cases from 1080 patients who underwent phacoemulsification cataract extraction and intraocular lens implantation under sub-Tenon's local anaesthesia in our unit over a 3 year period up to April 2000.

Results Two patients complained post-operatively of vertical diplopia and were shown to have restriction of elevation of the eye, which was found at surgical exploration to be due to inferior rectus muscle restriction. One patient had post-operative horizontal diplopia due restriction of abduction and exploration of the medial rectus muscle was planned.

Conclusion Rectus muscle trauma is proposed as a complication of sub-Tenon's local anaesthesia and caution is advised to operators to clearly identify the sub-Tenon's space for injection of local anaesthetic.

Key words Complications, Diplopia, Phacoemulsification, Rectus muscle trauma, Sub-Tenon's local anaesthesia.

Sub-Tenon's local anaesthesia (STLA) is a popular, safe and effective technique for ocular surgery, providing excellent anaesthesia and akinesia of the eye.¹⁻⁴ The technique has been used for cataract extraction, glaucoma filtration surgery, vitreoretinal surgery,⁵ strabismus and strabismus surgery,⁶ and pan-retinal photocoagulation.⁷ Although reported complications are rare,^{8,9} we describe three cases of post-operative diplopia which we believe resulted from inadvertent muscle trauma during STLA.

Patients and methods

All 3 patients reported subjective diplopia immediately after surgery and retrospective

reviews of the case notes for the surgical procedures and subsequent treatments were carried out. Each patient underwent phacoemulsification cataract extraction and posterior chamber intraocular lens implantation under STLA, administered by Stevens' canula, between April 1998 and January 2000.⁹ A retrospective audit of the 1080 cataract cases using this method of anaesthesia failed to elicit any further patients referred to the orthoptics department for assessment of diplopia during the period March 1997 to April 2000.

Data recorded included relevant pre-operative findings, all details relating to perioperative anaesthesia and surgery and post-operative assessment, including orthoptic findings. All patients had a detailed ophthalmic examination including refraction and slitlamp biomicroscopy after surgery. Ocular motility assessment included the prism cover test at 6 m in nine positions of gaze, range of ocular movements testing, Hess chart examination in all cases and a forced duction test in 2 patients.

Details of post-operative management and subsequent surgery were recorded.

Case reports

Case 1

A 78-year-old woman underwent local anaesthetic cataract extraction in April 1998. There was no previous ophthalmic history and she received STLA administered via a Stevens' canula (Visitec), consisting of 2 ml of 4% lignocaine and 1 ml of 0.75% bupivacaine with hyalase. The anaesthetist made a record of 'no complications' on the anaesthetic chart and she did not admit to pain. Peri-operatively she was noted to have peri-orbital bruising and marked subconjunctival haemorrhage but this did not affect the phacoemulsification procedure.

Five weeks later at the first outpatient review she complained of marked vertical diplopia since the immediate post-operative period. Examination showed a marked right hypotropia that measured 20 prism dioptres in the primary position. She was unable to elevate the right eye

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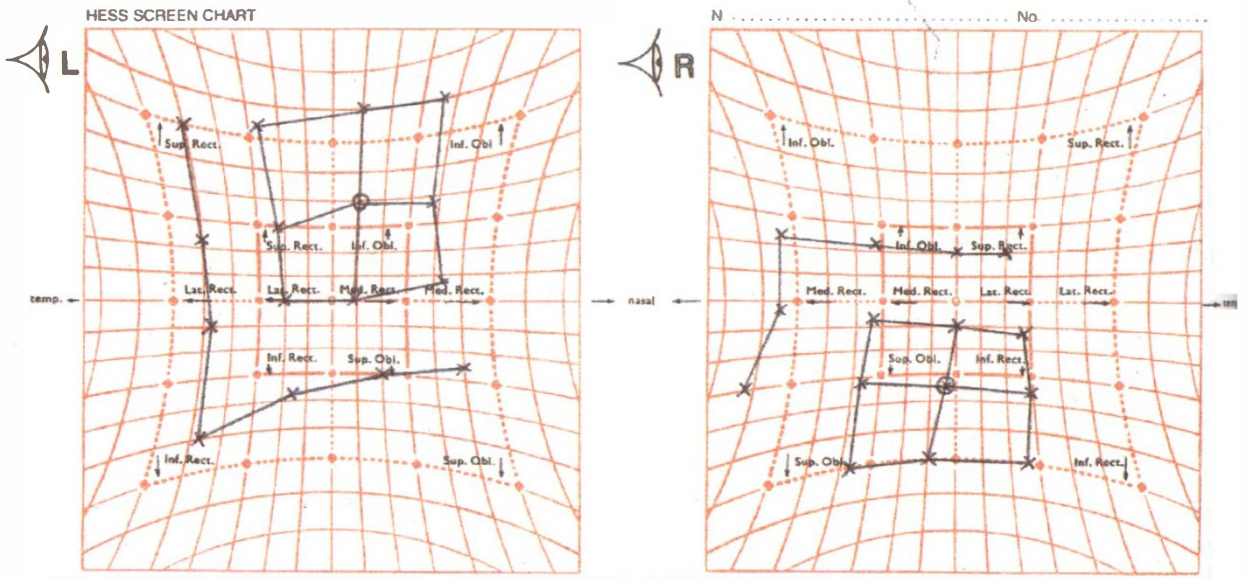


Fig. 1. Case 1. Hess chart before inferior rectus exploration showing a large vertical deviation with right hypotropia and a restrictive pattern of ocular motility in the right eye.

from the primary position. The Hess chart showed a restrictive pattern of ocular movements (Fig. 1). There was no torsional component or ptosis. The clinical findings were unchanged after 4 months of observation and surgical exploration of the right inferior rectus was carried out.

Restriction of the inferior rectus muscle was confirmed by forced duction testing. At surgery a 4–5 mm conjunctival scar was noted overlying the medial end of the inferior rectus muscle insertion, and there was tethering and fibrosis of conjunctiva at this site. The inferior rectus was recessed by 4 mm on an adjustable 6.0 vicryl suture. No post-operative adjustment was required. The post-operative deviation improved to 5 prism dioptres of right hypotropia in the primary position and remained stable after 7 months of follow-up. The Hess chart following strabismus surgery is

shown in Fig. 2. Incorporation of a 5 dioptre prism into her spectacle correction restored a central field of binocular single vision.

Case 2

A 78-year-old woman with no significant previous ophthalmic history underwent cataract extraction in July 1998. The STLA consisted of 4 ml 2% lignocaine without hyalase and a further 2 ml 2% lignocaine top-up 10 min later administered via a Stevens' cannula to the sub-Tenon's space. The anaesthetist made a record of an 'uneventful' procedure. Immediately post-operatively peri-orbital bruising was noted.

At first review on the fourth post-operative day the patient complained of vertical diplopia. Initial examination showed a right hypertropia of 7 prism

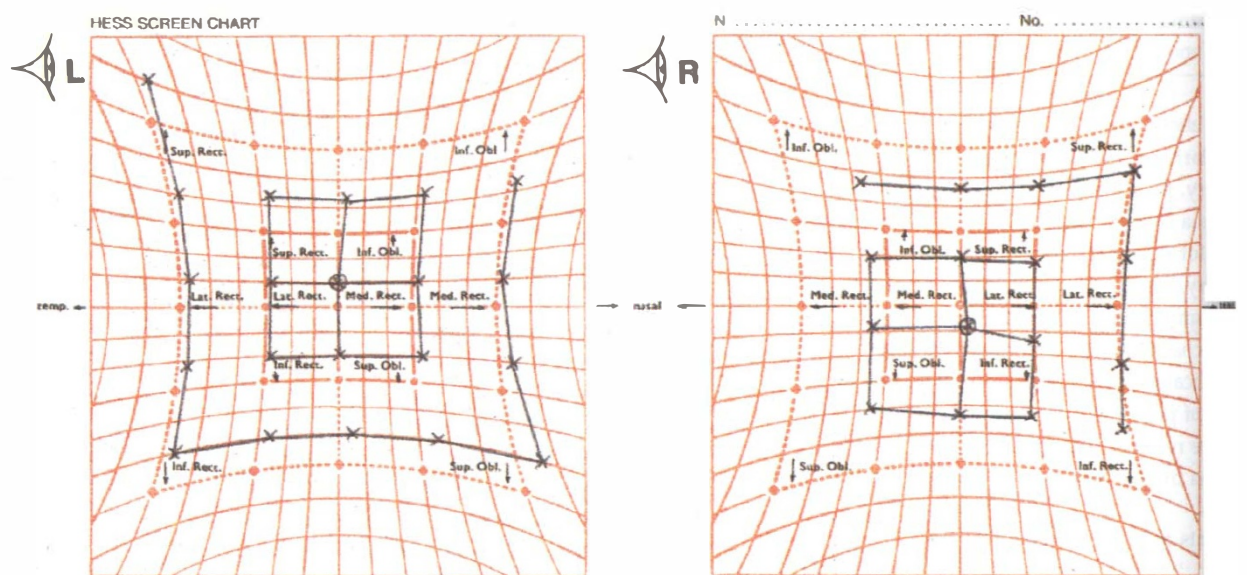


Fig. 2. Case 1. Hess chart after inferior rectus recession showing an improved pattern of ocular motility.

dioptries in the primary position. One week later this had improved to 3 dioptries of right hypertropia. At 3 weeks post-operatively her diplopia deteriorated and she was noted to have 6 dioptries of right hypotropia. Diplopia increased over a 4 month follow-up period to measure 18 prism dioptries of right hypotropia with restriction of elevation of the right eye. Again no torsional abnormality or ptosis was noted.

Four months after cataract extraction surgical exploration of the right inferior rectus muscle was undertaken at another unit. Examination under anaesthesia showed a positive forced duction test confirming inferior rectus muscle restriction, and the inferior rectus was recessed by 4 mm on a non-adjustable suture. Four months post-operatively the patient was able to achieve binocular single vision with the aid of a 2 dioptre base-up prism in right spectacle lens.

Case 3

An 87-year-old woman was scheduled for phacoemulsification cataract extraction in January 2000. She received STLA using 3 ml of 3% lignocaine without hyalase. After the anaesthesia, surgery was postponed due to technical failure of the operating microscope. No diplopia was noted at this stage. Two weeks later a second STLA was administered in the same quadrant using 2 ml of 4% lignocaine and 2 ml of 0.75% bupivacaine without hyalase, and cataract surgery went ahead. The anaesthetist noted 'difficult access and haemorrhage formation' in the theatre record but there was no record of discomfort. During surgery marked haemorrhage and swelling of the medial bulbar conjunctiva was noted and the intraocular pressure was raised with shallowing of the anterior chamber. Phacoemulsification cataract extraction was completed successfully.

On the first post-operative day there was bruising of the lower lid and diplopia. Cover test showed a right exotropia measuring 4 dioptries, no adduction beyond the midline and significantly reduced abduction of the right eye. At 2 weeks post-operatively there was an esotropia of 20 dioptries, the adduction deficit had almost completely resolved, but abduction showed marked limitation. Ptosis or torsional abnormalities were not present. Exploration of the medial rectus muscle was planned at 3 months post-operatively but the patient died before further treatment.

Discussion

Sub-Tenon's local anaesthesia (STLA) can be carried out with a plastic flexible Greenbaum canula or the rigid Stevens' canula, infiltrating local anaesthetic directly into the sub-Tenon's space of the inferonasal quadrant adjacent to the globe.^{9,10} By avoiding the introduction of a sharp canula into the orbit as used in peribulbar and retrobulbar anaesthesia, the risks of globe perforation and severe orbital haemorrhage are minimised.^{8,11} In addition, rare instances of optic nerve damage and sub-

arachnoid space injection leading to respiratory arrest have been described with sharp needle techniques.⁸ The technique of STLA may be safer for the patient and for prolonged surgery additional anaesthetic may be added with ease.¹²

Described complications of STLA are rare but include orbital haemorrhage¹³ and superior oblique muscle paralysis.¹⁴ Rectus muscle trauma has not previously been reported. We have described 2 cases of inferior rectus muscle restriction and a further case of medial rectus muscle restriction which presented in our unit from a total of approximately 1080 cases in 3 years. The features of immediate peri-orbital bruising (all cases), initial muscle paresis (cases 2 and 3, and unknown in case 1) and subsequent muscle restriction (all cases) have led us to believe that direct trauma to the rectus muscle with haemorrhage formation occurred at the time of STLA. Subsequent contracture of the affected muscle would explain the development of a restrictive pattern of ocular movements, supported by the finding of positive forced duction tests during inferior rectus recession in cases 1 and 2. A similar mechanism of rectus muscle damage has been proposed in patients with diplopia after sharp needle anaesthetic techniques.¹⁵⁻¹⁷ An alternative possibility to explain rectus muscle dysfunction is the risk of myotoxicity of the local anaesthetic agent.¹⁵⁻¹⁷ Agents including lignocaine (2% and 4%) and bupivacaine 0.75% have been shown to have a myotoxic effect when injected in or close to rectus muscles in large volume.^{18,19} There are data from animal studies to support this view and the pattern of strabismus after myotoxicity is suggested to show initial muscle paresis and late secondary contracture.^{19,20} Although this pattern of motility abnormality was present in our series, the consistent finding of orbital haemorrhage would suggest that direct trauma played the greater part in the subsequent development of diplopia.

All local anaesthetics in this series were administered by one of two consultant anaesthetists who had achieved a significant level of experience before the first described case of ocular motility abnormality (over 300 cases). Both consultants used the same technique, that is, an initial conjunctival opening 2-3 mm from the limbus and blunt dissection with Westcott scissors to expose the sub-Tenon's space. Care was taken to try to ensure that the rigid Stevens' canula passed back radially along a path equidistant between the horizontal and vertical meridia. At the time of the recorded cases both anaesthetists felt that minimal resistance to passage of the canula was acceptable but they have since reviewed this aspect of their technique and now do not exert counter-traction on the conjunctiva during passage of the sub-Tenon's canula. This should prevent contact with adjacent rectus muscles.

In conclusion it would appear that rectus muscle trauma is a possible complication of STLA and further reports to quantify the incidence and severity of any ocular motility disturbance would be beneficial. Care

should be taken by operators to ensure that any possibility of rectus muscle involvement during STLA is avoided by close attention to detail during the procedure.

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