

Innovative Techniques for the Treatment Complex Strabismus

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Adjustable graded augmentation for superior rectus transposition

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Adjustable graded augmentation of superior rectus transposition (SRT) can reduce the risk of post-operative torsional or vertical misalignment and diplopia in patients being treated with SRT for 6th nerve palsy or Duane ET.

A corneal toric marker is used to note 6 and 12 o'clock on the cornea and on the drapes above and below for an anesthetized patient. The superior rectus muscle is isolated, a 6-0 polyglactin suture placed, and the muscle disinserted, separated from the frenulum attaching it to the underlying superior oblique. It is transposed along the Spiral of Tillaux to the region adjacent to the lateral rectus muscle. Any induced torsional change from the transposition alone is noted by comparing the location of the corneal markings to those on the drapes. Three augmentation sutures of 6-0 polyester are *pre-placed* through superior 1/3 of the LR and the lateral 1/3 of the SR, typically at 4,6, and 8 mm from their insertions. Torsional change is monitored, sequentially, after completing each myopexy, starting at the most proximal (4 mm). If excessive torsion is induced with more distal augmentation, the responsible augmentation suture is released intra-operatively, or can be cut post-operatively during PACU adjustment. Unintended vertical misalignment noted in the PACU can often be addressed, as well, by severing the distal-most augmentation suture.

This method facilitates maximal augmentation with reduced risk of unwanted vertical or torsional diplopia. Having multiple sutures permits at least partial augmentation (e.g. at 4 mm) rather than no augmentation in some cases. Most patients can fuse up to 7° of torsion.

Dagi LR, and Elhusseiny AM. Graded Augmentation of Superior Rectus Transposition for treatment of 6th Nerve Palsy and Duane Syndrome. J AAPOS 2020 Oct;24(5):268.e1-268.e7.doi: 10.1016/j.jaapos.2020.05.013.

Lateral Rectus Muscle Extirpation for treatment of Third Nerve Palsy Z- tenotomy of SOOA with A pattern as a weakening technique

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Lateral rectus muscle extirpation is a straight-forward method to address the large angle exotropia secondary to complete or near complete third nerve palsy. The lateral rectus is exposed and cleared of check ligaments. A 6-0 polyglactin suture is imbricated through the muscle near its insertion and the muscle is disinserted. A clamp is placed as far back on the muscle as possible, and the lateral rectus anterior to the clamp resected. The clamped end is cauterized and released. This maximal resection allows the remaining lateral rectus to retract behind the globe, into the orbit. The extirpation is most commonly accompanied by ipsilateral medial rectus resection.

In addition we will cover the technique Z tenotomy for overaction of the superior oblique with A pattern.

Shah AS, Cooley R, Donahue SP, and Dagi LR. Innovative Surgical Alternatives for the Treatment of Third Nerve Palsy: American Academy of Ophthalmology: Focal Points Volume XXXVIII (13) December 2020

Modified Superior Oblique Transposition and Caruncle Fixation to Treat 3rd Nerve Palsy

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Strabismus secondary to third nerve palsy is difficult to treat due to paralysis of multiple extraocular muscles. Established surgical techniques include supramaximal recession of the lateral rectus (LR) muscle, creation of a medial periosteal flap to tether the globe, and LR orbital wall fixation. Nasal transposition of the LR has also been reported but carries the risk of optic nerve compression, serous retinal detachment, and anomalous globe retraction.

Alternatively, the superior oblique (SO) tendon can be transposed medially to create an anchoring force. The normal location of the SO insertion, posterior to the equator, accounts for its abducting effect. In theory, anteriorizing the SO insertion should change its action from an abductor to an adductor.

ATSO combined with a large recession of the ipsilateral LR is effective in reducing exotropia in patients with a complete 3rd-nerve palsy. It is unclear whether passing the SO tendon over or under the SR changes the outcome

When compared to the sole anchoring effect of the medial SO transposition, an ATSO may also create an active adducting force while limiting abduction. This procedure carries the potential risk of creating incyclotropion, which may be prevented with a simultaneous SO anterior tenectomy.

Integrated Intraoperative Optical Coherence Tomography

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Integrated intraoperative optical coherence tomography technology is a useful tool in strabismus surgery. Some applications of integrated intraoperative optical coherence tomography in strabismus include: locating muscles prior to the start of the surgery; determining location of conjunctival incisions; confirmation of muscles hooked; and depth and safety of scleral passes.

Advantages of intraoperative optical coherence tomography in strabismus surgery include: Improved safety; potentially decreased operative time and surgical dissection; excellent teaching tool for residents, fellows, along with experienced strabismus surgeons.

Pihlblad MS, Troia A, Tibrewal S, Shah PR. Pre-, Intra-, and Post-Operative Evaluation of Extraocular Muscle Insertions Using Optical Coherence Tomography: A Comparison of Four Devices. *J Clin Med.* 2019 Oct 19;8(10).

Integrated Intraoperative Ocular Coherence Tomography for Pediatric Ocular Surgery. *Dev Ophthalmol.* Chapter: Integrated intraoperative OCT (i2OCT) in strabismus surgery. Shah P, Pihlblad MS. Basel, Karger, 2021, vol 61 (DOI:10.1159/000511819).

Pihlblad MS, Reynolds JD. Anterior Segment Optical Coherence Tomography of Previously Operated Extraocular Muscles. *Am Orthopt J.* 2017 Jan;67(1):61-66.

