When muscle meets bone: a technique for suturing the lateral rectus muscle to the orbital wall

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This video article may be viewed at jaapos.org.

A 9-year-old otherwise healthy girl presented at the Ophthalmology Clinic at the Hospital for Sick Children, Toronto with a congenital, long-standing left exotropia and right ptosis. She was born to non-consanguineous parents. Her birth history and family history were unremarkable. Genetic testing was inconclusive; microarray testing was normal, and mutations in *TUBB3*, *KIF21A*, and *PHOX2A* were not demonstrated. On examination, her best-corrected visual acuity was $20/160^{-2}$ in the right eye and $20/40^{-1}$ in the left eye wearing −2.00 (right eye) and −1.50 +2.50 ×90. Her diminished visual acuity was attributed mainly to ptosis and strabismic amblyopia. Preoperatively, she had a large right head turn. Ocular motility examination revealed a complete left adduction deficit, with reduced elevation and depression of this eye. Her right eye ductions were noted to be full. Prism-based alternate cover testing measured a left exotropia of 30^{Δ} in primary position with the abnormal head posture and left exotropia of $>90^{\Delta}$ in forced primary position. MRI of brain and orbits demonstrated marked thinning of the medial rectus on the left.

In order to improve her head position, she underwent left lateral rectus disinsertion and suture to the lateral orbital periosteum combined with left medial rectus plication of 7 mm. Intraoperatively, forced-duction testing confirmed not only the marked restriction of the left eye in adduction, elevation, and depression, but also a restriction in extorsion. The video shows the different phases of the left lateral rectus periosteal suture, specifying various technical pointers. Postoperatively her head turn improved dramatically. Prism alternate cover test measured a intermittent right esotropia of 20^{Δ}, with expected and variable vertical and horizontal secondary overactions in the right eye due to immobile and the now centered dominant left eye. The measurements were stable at 2.5 years' follow-up visit, and her head posture remained straight.

A combination of maximal medial rectus resections with large lateral rectus recessions may have a limited success rate in oculomotor nerve paralysis and congenital fibrosis of extraocular muscles (CFEOM) management, with many patients requiring multiple surgeries to achieve satisfactory alignment.[1,2] As a general rule, patients are undercorrected; an overcorrection is rare. The success of recession-resection procedures is limited because of continued attachment of the lateral rectus muscle to the globe and depends on degree of preserved medial rectus function, which is difficult to predict when the tight lateral rectus muscle creates a substantial restriction. Globe retraction could be a clue to a significant function in MR. A forced-generation test could also indicate some medial rectus function.

Alternatives to recession-resection procedures have been suggested, but success rates are variable and depend on the extent and distribution of extraocular muscle involvement.[3] Lateral rectus disinsertion and reattachment to the lateral orbital wall combined with supramaximal medial rectus strengthening procedure has been shown to be effective in restoring ocular alignment in patients with oculomotor nerve palsy and CFEOM.[4,5] Another surgical option for treatment of complete oculomotor nerve palsy (but not CFEOM), is splitting of the lateral rectus muscle and transposition to the medial rectus insertion.[6] However, splitting and nasally transposing a tight lateral rectus muscle may not be successful and could potentially lead to devastating results.[7] Hence, in the setting of CFEOM or longstanding complete oculomotor nerve palsy resulting in significant tightness in the lateral rectus muscle, lateral rectus disinsertion and suturing to the orbital wall should be considered as an surgical option.

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Submitted July 30, 2018.
Revision accepted January 13, 2019.
Published online September 30, 2019.

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1091-8531/$36.00
https://doi.org/10.1016/j.jaapos.2019.01.020

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Voiceover transcript

00:08	A 9-year-old otherwise healthy girl presented with a congenital, long-standing left exotropia and right ptosis. She had a fairly large right head turn.
00:21	Prism-based alternate cover testing revealed a left exotropia of 90$^{\Delta}$ in forced primary position. She had right amblyopia and previous attempts at treating her amblyopia had failed. Congenital fibrosis of extraocular muscles [CFEOM] was considered as the likely final diagnosis, but genetic testing was negative.
00:47	The 9-positions of gaze montage demonstrates a marked restriction of her left eye in adduction but also in elevation and depression. This was later confirmed by forced duction testing. Her right eye ductions were noted to be full.
01:04	Magnetic resonance imaging of the brain and orbits exhibited a thin atrophied left medial rectus.
01:13	Forced duction testing demonstrated not only the marked restriction of the left eye in adduction, elevation, and depression, but also the restriction in extorsion.
01:26	Her parents were keen on improving her abnormal head posture. She underwent left lateral rectus disinsertion and suture to the lateral orbital periosteum combined with left medial rectus plication of 7 mm.
01:42	The surgical video shows the different phases of the left lateral rectus periosteal suture, beginning after exposure of the left lateral rectus. The muscle is sutured with a 6-0 Prolene [Ethicon Inc, Somerville, NJ] with a C2 needle. The needle is passed through the muscle near the insertion in the following manner: partial thickness to the edge of the muscle and then full-thickness double lock at each end. The muscle is then cut at the insertion. Note the abnormal fibro-fatty texture of the muscle.
02:20	Blunt dissection down to the lateral orbital rim is then performed with Wescott scissors, until the periosteum is exposed. Retractors, such as the Barbie retractor, are required for exposure.
02:39	Both edges of the muscle are sutured to the periosteum. The safe passage of the Prolene needle is facilitated by a 21-gauge blunt needle, which acts as a guide and also allows the Prolene needle to be bent in a tight space for ease of handling. The two ends of the muscle are tied to the orbital rim.
03:08	Tenons is sutured with 6-0 Vicryl [Ethicon Inc, Somerville, NJ] to cover the muscle and keep the orbital fat away.
03:23	As mentioned earlier we combined the left lateral rectus disinsertion and periosteal suture with a medial rectus plication. The medial rectus also had abnormal fibro-fatty texture.
03:37	The springback test at the end of the surgery demonstrates the tendency of the eye to remain in a slightly esotropic position post-operatively.
03:46	The conjunctiva is sutured with an 8-0 Vicryl. A concomitant lateral conjunctival recession is completed together with a medial conjunctivoplasty.
03:57	Postoperatively the head position was normal and has remained so for 2 1/2 years of follow-up.