

Case report

Dynamic Magnetic Resonance Imaging– a sensitive tool in managing consecutive exotropia

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Abstract

Background: Proper evaluation and accurate diagnosis are crucial in managing a case of strabismus. **Objective:** Report a case of prolonged large angle complicated consecutive exotropia where dynamic Magnetic Resonance Imaging helped us to diagnose and simplify the management plan. **Case:** A 19-year-old male presented with outward deviation of both eyes for last 16 years with right face turn, without diplopia and trauma. However, he had history of two consecutive squint surgeries, a month apart, at the age of 3 years. **Observation:** Visual acuity (best corrected) in the right and left eye was 6/36 and 6/6 respectively. Extraocular movements revealed minus (-) 4 adduction deficits in the left eye with right eye suppression. Prism Alternate Cover Test (PACT) showed 65 prism diopter (PD) base in (BI), for primary and near gazes with lateral incomitance and without any pattern. Forced Duction Test (FDT) showed restriction of the left lateral rectus. Dynamic Magnetic Resonance Imaging revealed posterior insertion of the left medial rectus with thinning of the tendinous insertion of the left lateral and medial rectus in neutral position. On adduction of left eye, there was slight increased bulk of the left medial rectus. Medial Rectus (MR) advancement 5.5 mm and Lateral Rectus (LR) recession 9mm was done. Repeat FDT showed improvement in resistance. After 3 month, the patient had excellent outcome with 5 PD primary position exotropia and 2 units of improvement in left eye adduction. **Conclusion:** Precise workup and appropriate investigation decreases the undue interventions with excellent outcome in a case of large angle consecutive XT.

Keywords: Consecutive exotropia; dynamic MRI; esotropia; medial rectus advancement; slipped muscle

Background

Integrity and normal functioning of the EOMs are indispensable. Strabismus surgery, retinal surgery or trauma to extraocular muscles may sometime lead to slipped or lost muscle which causes diagnostic dilemma (Shin GS et al, 1996). The consequences of misdiagnosis

can lead to inappropriate reoperations with increased risk of anterior segment ischemia in complicated strabismus (Chen SI et al, 2005). Studies show Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) have been used in evaluating the extraocular muscles after trauma or inadvertently damaging surgery (Gilbard SM et al, 1985; Ticho BH et al, 1993). However, during diagnostic predicament where conventional clinical tests are questionable

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high resolution dynamic MRI may yield some critical information about orbital and extraocular muscle anatomy and function. Dynamic imaging refers to viewing extraocular muscles during different maintained gaze positions (Shin GS et al, 1996).

Case Report

A 19-year-old male presented with outward deviation of both eyes (Figure-1A) for last 16 years with face turn towards the right side (Figure-1B) and no diplopia. He had history of two consecutive squint surgeries, a month apart, at the age of 3 years, initially, bilateral medial rectus recession and later on bilateral lateral rectus resection was done (details of surgery not available). On examination, his best corrected visual acuity in the right and left eye was 6/36 and 6/6 respectively. Extraocular movements revealed minus (-) 4 adduction deficits in the left eye (Figure-2) while that of right eye was normal. Sensory status showed right eye suppression both for near and distance. Prism Alternate Cover Test (PACT) measured 65 prism diopter (PD) base in (BI), 65 PD BI, 65 PD BI, 50PD BI, 60 PD BI and 65 PD BI for primary, up, down, right side, left side and near gazes respectively.

Forehead, eyelids were normal. There was no change in palpebral fissure height on horizontal gazes. Perilimbal scar mark was present nasally and temporally in both eyes. The remaining anterior segment and posterior segment findings were within normal limit. Forced Duction Test (FDT) showed restriction of the left lateral rectus. Under indistinct circumstances for diagnosis, dynamic MRI was advised which astonishingly showed posterior insertion of the left medial rectus with thinning of the tendinous insertion of the left lateral and medial rectus in neutral position (T2 weighted

axial scan, Figure- 3A). On adduction of left eye, there was slight increased bulk of the left medial rectus representing retained contractility of the muscle (T2 weighted axial scan, Figure-3B). These reporting along with clinical findings excluded slipped (Medial Rectus) MR muscle and lost MR muscle in the left eye. Based on these clinical and radiological evaluation surgical plan was drawn. On operation table MR was found 10mm from the limbus and there was extensive fibrosis of the (Lateral Rectus) LR muscle in the left eye. 5.5mm MR advancement and 9mm LR recession after releasing the fibrosis was done. Repeat FDT showed comparative improvement in resistance. On 3 month post operative follow up patient was 5 PD exotropia with improvement of on adduction plus (+) 2 (Figure- 4A and 4B).

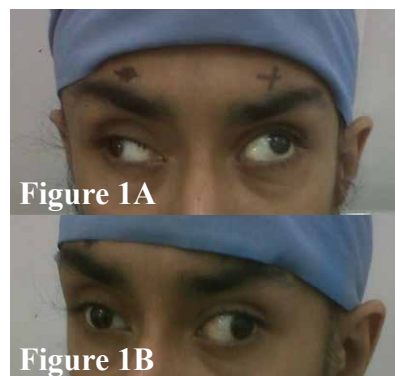


Figure 1A and B: Image of patient in primary position and with face turn towards right side



Figure 2: Image of patient on left adduction

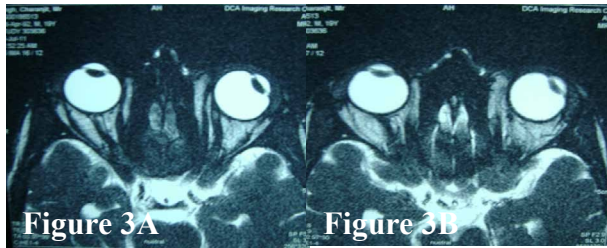


Figure 3A and 3B are the T2 weighted dynamic MRI axial scan images in neutral and attempted left eye adducted positions. Figure -3A showing posterior insertion of the left medial rectus with thinning of the tendinous insertion of the left lateral and medial rectus in neutral position. On attempted adduction of left eye, there is slight increased bulk of the left medial rectus representing retained contractility of the muscle (Figure-3B).



Figure 4A and 4B are images of the patient in primary position and improved left adduction on post-operative follow up.

Discussion

Strabismus cases, especially after previous surgery or trauma to extraocular muscles, often present diagnostic challenges (GS Shin et al, 1996). Conventional clinical tests are helpful in some cases but may be open to doubt. There are various tests suggested for detecting slipped muscle: >1mm widening of the vertical palpebral fissure height on moving affected eye

towards the direction of the affected muscle, reduced ocular rotation of the affected muscle, reduced saccadic velocity of the affected muscle, direct visualization of the muscle intraoperatively, imaging, forced duction testing, generated muscle force and differential intraocular pressure (Chen SI et al, 2005). In addition, sometimes different imaging tests too can be done to conclude in doubtful cases.

Simonsz HJ et al (1985) first used CT to study normal rectus muscle paths in different gaze positions. Because MRI avoids ionizing radiations exposure and provides tissue contrast in the orbit, it has supplanted CT as the preferred imaging technique for studying the anatomy and actions of extraocular muscles. When clinical tests were indecisive, the localization and functioning of muscle on dynamic MRI during adducted and normal position made us to rule out slipped and lost muscles that helped us enormously in drawing the treatment plan in this patient.

Consecutive exotropia may occur many years, even decades, after esotropia surgery. Large angle consecutive exotropia is rare and if occur then various etiological factors needs to be ruled out: lost muscle, slipped muscle, fibrosis etc. Lost or slipped rectus muscles are rare complications of strabismus surgery (Murray ADN, 1998). It is likely that slipped muscles and even some lost muscles are underdiagnosed and represent a significant cause of unexpected overcorrection or undercorrection (Murray ADN, 1998). Conversely, unexpected undercorrection or overcorrection sometimes may not be due to slipped or lost muscles as in this case.

Most of the cases of consecutive exotropia (XT) are treated with either LR recession and or MR advancement (Santiago PA et al, 1999). A suitable ocular alignment immediately after surgery for consecutive exotropia is a small-angle esotropia of 5 to 10 PD (Donaldson MJ et

al, 2006). It is usually within the first 6 weeks after surgery that exotropic drift can occur (Donaldson MJ et al, 2006). Multiple surgeries and presence of postoperative adduction deficit were the most important factors influencing the incidence of consecutive XT after surgery. Presence of uncorrected amblyopia did not alter the prognosis for long-term development of consecutive XT (Ganesh A et al, 2011).

Conclusion

Large angle consecutive XT, less common, though can occur any time after surgery without presence of any slipped or lost muscles. Extensive scarring around the lateral rectus muscle should be kept in mind in cases where this muscle has been operated earlier. Precise workup and appropriate investigation like dynamic MRI decreases the chance of undue interventions and its consequences with excellent outcome.

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