

# Adjustable Superior Oblique Hang-Back Recession for A-pattern Exotropia

### C. Vidhya, Tarika Perikal, Amr Mohamed

Department Pediatric Ophthalmology and Strabismus, Sankara Eye Hospitals, Bengaluru, Karnataka, India

#### ABSTRACT

Superior oblique surgical procedures are highly unpredictable. Here we have done superior oblique recession in a case of A-pattern exotropia, adjusted intraoperatively to make it more predictable.

Key words: A-pattern exotropia, superior oblique, superior oblique hang-back recession, superior oblique overaction

## BACKGROUND

There is evidence that superior oblique overaction (SOOA) can induce A-pattern strabismus, which can affect an individual's reading position and impact patient's quality of life.<sup>[1-3]</sup> A-pattern strabismus can be corrected by superior oblique (SO) weakening procedures. The surgeon's armamentarium for SO weakening procedures is many but these procedures are known to have uncontrolled, unpredictable surgical outcomes, and variable results. However, this challenging surgical procedure has lead strabismologists to quest for better weakening procedure with fewer complications. Hence, as in our case, intraoperative adjustable SO hang-back recession gives us a better chance to get a more controlled and a predictable surgical outcome.

## **CASE REPORT**

An 8-year-old boy presented to us with a history of squinting since birth. Child's medical history and birth history were normal.

On examination, his best-corrected visual acuity was 6/6, N6 in both eyes. He had a central and unmaintained fixation in the right eye. Ocular movements showed SOOA of +3 in the right eye and +2 in the left eye.

Alternate prism cover test (APCT) showed 45 prism diopter (PD) exotropia (XT) in primary gaze for distance and near, 35 PD XT in upgaze, and 50–55 PD XT in downgaze suggesting a significant A-pattern [Figure 1a]. Anterior segment examination was within normal limits. Fundus examination showed intorsion in both eyes.

A clinical diagnosis of A-pattern XT with SOOA was made.

Surgical plan of the right eye lateral rectus recession 8 mm and medial rectus resection of 4 mm, along with both eyes SO Hang-back recession was planned depending on forced duction test (FDT) intraoperatively.

#### **Operative procedure**

Exaggerated FDT revealed tight SO muscle more in the right eye than in the left eye. Limbal-based conjunctival flap raised in the right eye between 10 and 7 o'clock position.

Superior rectus muscle was isolated and hooked. Now, the SO muscle was traced in the superotemporal quadrant, hooked, and cleared from its intermuscular and tenon's tissue (classic temporal approach) [Figure 2]. Non-absorbable 5-0 Ethibond (polyester) suture was used to secure the SO muscle at the insertion; muscle was disinserted [Figure 3a and b]. Hang-back recession of 7 mm was done and bow tie knot was secured [Figure 3c-e]. Exaggerated FDT was done, SO was not taut,

#### Address for correspondence:

Dr. C. Vidhya, Consultant, Department Pediatric Ophthalmology and Strabismus, Sankara Eye Hospitals, Bengaluru, Karnataka, India.

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and hence the hang-back recession was advanced by 1 mm after releasing the bow tie knot [Figure 3f and g]. Now, intraoperative FDT was repeated, to confirm the tautness of the SO tendon [Figure 3h]. At this point, the bow tie knot was replaced with a secure knot [Figure 3i]. Then, lateral rectus recession of 8.0 mm and medial rectus resection at 4.0 mm were done.

Conjunctiva closed with 8–0 polyglactin sutures. Similarly, the left eye SO hang-back recession of 5 mm was done depending on the tautness of the muscle intraoperatively.

One week postoperatively, APCT showed flick exophoria for near and distance and the collapse of A-pattern, which is maintained even after 8 months postoperatively [Figure 1b].

# DISCUSSION

A-pattern XT can be corrected by weakening the SO muscles. However, this is a challenging surgical procedure, requiring a thorough knowledge of anatomy, extensive experience, and appropriate preoperative decisions, and also its outcome can be unpredictable. SO surgery can sometimes result in vertical and torsional deviation, particularly in the downgaze, which can be resistant to therapy.



**Figure 1:** (a) Pre-operative 9-gaze image showing superior oblique overaction in both eyes. (b) Post-operative image showing the collapse of A-pattern

Surgical procedures to weaken the SO tendon complex include SO tenotomy, tenectomy, recession, Z-lengthening, split tendon lengthening, posterior partial tenectomy, hangback recession, and using a silicone expander.

Wright first reported elongation of the SO tendon using silicon expanders in 1989. This technique maintains the normal physiological action of the SO muscles by preserving the original form and insertion of the tendon. This procedure could correct A-pattern of 29.3 PD on average and had a similar effect on the reduction of SOOA compared with SO tenotomy. None had consecutive SO palsies.<sup>[4]</sup> However, silicone extrusion and foreign body sensation have been reported.<sup>[5]</sup> Iatrogenic Brown syndrome may also be caused by too long silicone expander, as well as by induced scarring/ extrusion.<sup>[6]</sup>

Bilateral SO translation recession could correct A-pattern of 20–35 PD but it had the disadvantages of limitation of depression in abduction and overconvergence.<sup>[7]</sup>

Li *et al.*<sup>[8]</sup> investigated the efficacy and safety of bilateral hang-back recession of SO muscles in the treatment of A-pattern strabismus with SOOA. This procedure could fully correct mild-to-moderate SOOA but slightly undercorrected the severe SOOA. Romano reported a good correlation between the amount of SO hang-back recession performed and reduction in the A-pattern.<sup>[7]</sup>

However, the effect of SO weakening procedures cannot be controlled, resulting in a variable and an unpredictable surgical outcome.

In our case, we based the graduation of SO hang-back recession on the measurements stated by Zhonghua Yan Ke, wherein hang-back recession of 8–10 mm done for SOOA+4, 6–8 mm for SOOA+3, 5–6 mm for SOOA+2, and 4 mm for SOOA+1.<sup>[1]</sup>



Figure 2: Intraoperative image showing isolation of superior oblique muscle, temporal to superior rectus



**Figure 3:** (a-i) The steps of the procedure in an intraoperative adjustable superior oblique (SO) hang-back recession procedure (right eye). (a) SO isolated and hooked. (b) SO non-absorbable muscle sutures taken. (c and d) SO hang-back recession – 7 mm done. (e) Adjustable bow tie knot tied. (f) Exaggerated forced duction test (FDT) repeated. (g) Adjustable bow tie knot released and advanced by 1 mm. (h) Exaggerated FDT repeated, SO tautness confirmed. (i) SO hang-back recession secured with a final knot

The effects of SO hang-back recession on reducing SOOA and A-pattern was adjusted intraoperatively using nonabsorbable adjustable bow tie suture, which enabled us to confirm the tautness of the SO muscle before we finally secured the knot. Thus, a controlled SO weakening can be achieved, along with a predictable surgical outcomes and results. The only limitation being the surgeon's experience in identifying the exact tautness of the SO muscle.

Adjustable SO hang-back recession is a safe and efficient option for A-pattern XT caused by SOOA.

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