

# SILICONE BAND EXPANDER AS A WEAKENING PROCEDURE FOR BROWN S YNDROME AND SUPERIOR OBLIQUE OVERACTION

Iraj Ahadzadegan, MD

*Department of Ophthalmology, Tehran Medical Sciences  
University, Farabi Eye Hospital.*

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## SUMMARY

This article presents a new technique for weakening the superior oblique muscle by lengthening its tendon. Lengthening is accomplished by a nasal superior oblique tenotomy, and by inserting a segment of silicone band 240 between the cut ends of the tendon.

This technique is useful for the treatment of Brown syndrome and cases with superior oblique overaction.

## INTRODUCTION

Brown syndrome is characterized by absence or severe limitation of elevation in adduction, minimal elevation deficit or normal elevation in abduction, divergence in upgaze, and a positive forced duction test on testing elevation in adduction. (1) Brown attributed this to a

shortened sheath of the superior oblique tendon but later reported a variety of mechanical factors including short tendon, misplaced tendon, and iatrogenic and acquired factors.

Helveston have suggested that fluid accumulation, concretion in the bursalike space,

or vascular distension in the sheath might cause limitation of superior oblique tendon motion through the trochlea and bring about an acquired Brown syndrome. (2)

Unilateral overaction of the superior oblique muscle produces a vertical deviation in the primary position. This condition may be due to congenital paralysis of the inferior oblique muscle with a congenitally short superior oblique tendon sheath. (3) Bilateral overacting superior oblique muscles usually have little vertical deviation in the primary position, unless the overaction is more prominent in one eye than in the other one. (3) Overacting superior oblique muscles are usually acquired since they are not seen in infants.

The management of superior oblique overaction and Brown syndrome is based on surgical procedures that slacken the muscle tendon. Superior oblique tenotomy, tenectomy, recession, split tendon lengthening, and Z-lengthening all slacken the superior oblique muscle tendon complex. (4) These procedures, however, are often associated with inconsistent results including consecutive superior oblique palsy. Superior oblique tenotomy performed along the nasal border of the superior rectus muscle is one of the most popular weakening procedures. But it does not control the amount of post operative tendon separation. A large separation will lead to a superior oblique palsy while immediate reuniting of the tendon ends

results in undercorrection. (5) In fusing patients with superior oblique overaction, bilateral superior oblique tenotomies may result in bilateral superior oblique paresis and intractable cyclovertical diplopia.

In the case of Brown syndrome, post tenotomy superior oblique palsy is so common that Parks advocates simultaneous inferior oblique weakening procedure. (2)

Superior oblique recession, on the other hand, has the theoretical advantage of producing a graded weakening. Unfortunately, the recession procedure collapses the normally broad posterior insertion to an anterior nasal position. So the recession procedure changes the superior oblique muscle function from a depressor into an elevator, thus resulting in limited depression.

Split lengthening procedure and the Z-Tenotomy attempt to achieve controlled tendon lengthening. But these lengthening procedures are less effective than simple tenotomy. (4)

The need for a graded superior oblique weakening procedure, which truly lengthens the superior oblique tendon without altering tendon mechanics, prompted the development of the silicone expander technique. (4)

## **MATERIALS and METHOD**

A 15 years old girl presented with bilateral Brown syndrome. She felt some kind of eye strain in reading and watching TV. She felt

some vague strain at looking upward and some times she was diplopic.

Preoperative motility evaluation included visual acuity, ductions, versions, sensorial tests and measurment of deviation in primary and down position of gazes.

20/25 RE= +1.5 × .45°

VA cc

20/25 LE= +1.5 × 160°

Stero Acuity= 140' arc Bagolini= instable  
Woth 4 dot test in near and distance= Fusion & suppression os.

Ortho in primary position.

8<sup>Δ</sup> Alternative ET in down gaze V pattern

Right superior oblique had +2 and left one had +3 overaction. There was severe limitation of up gaze in adduction in both eyes. Mild V pattern and head posture were other findings of her examinations.

## OPERATIVE PROCEDURE

The surgical approach was the same as described by Parks for superior oblique tenotomy, (6) which is presented in detail.

A superior temporal fornix incision is made through the conjunctiva, and a separate incision is made through intermuscular septum. The superior rectus muscle is hooked from the temporal side and the eye is pulled inferiorly. A careful posterior dissection is made over the nasal aspect of the superior rectus muscle to remove check ligaments. It is important to leave

the nasal intermuscular septum intact. The posterior dessection extends for approximately 12mm. A Desmarres retractor is placed along the nasal aspect of the superior rectus muscle and drawn posterioly to expose the nasal broder of the superior rectus and superior oblique tendon. Once the tendon is indentified, a small incision is made through the fascial capsule overlying the tendon. The tendon is hooked through this small hole in the tendon capsule, then eleveted in to the surgical field. A 5-0 Mersilene suture with a double armed spatulated needle is passed 3mm nasal to the superior rectus border, fullthickness through the superior oblique tendon, and then two locking bites are placed on each edge of the tendon: a square knot is made to tie the ends of the double armed suture together. A second suture is tied in a similar fashion around the superior oblique tendon, displaced 1.5mm nasal to the first suture. The tendon is then transected between the two preplaced 5-0.

Mersilene sutures with Westcott scissors. A medical grade silicone 240 retinal band, presoaked in gentamicin solution, is then cut to the desired length, ranging between 3 and 7mm, and sewn between the cut ends of the tendon. The needles are passed side by side through half thicknes of the silicone band, the double armed sutures are tied together, thus securing each end of the cut tendon to the silicone band. (4) At the end of the procedure, tenon's capsule and

conjunctiva are closed in separate layers with 7-0 Vicryl suture. A steroid antibiotic ointment is placed in the eye immediately after surgery and then two times a day for 4 days. No systemic antibiotics are given.

### **DETERMINATION OF LENGTH OF SILICONE EXPANDER**

The 6mm length of silicone band is the starting point for management of both Brown syndrome and superior oblique overaction. (4) Comparison of forced ductions before and after in this patient a 7mm band for the right eye and a 9mm one for the left eye was inserted between the cut ends of the tendons.

### **RESULTS**

After operation she no longer felt any eye strain in reading and at looking up ward. She has no discomfort in excursion of her eyes. The foreign body was tolerated well and patient did not complain of a foreign body sensation.

With worth 4 dot test she has fusion in near and distance. Bagolini test showed fusion and stereoacuity was 140" arc. She is orthopic in primary and down figures.

### **DISCUSSION**

An advantage of the silicone expander is that the cut ends of the tendon are secured, so they

can be retrieved if necessary.

The ends of the tendon are easily identifiable and we are able to elongate or shorten the silicone band. Silicone Band 240 is biocompatible and flexible, yet rigid enough to hold cut ends apart so they do not scar back together. Unlike previous superior oblique weakening techniques, the silicone expander induces tendon slack in a graded fashion, without changing the insertion characteristic. (4) Parks has suggested performing an inferior oblique weakening procedure in conjunction with superior oblique tenotomy in cases of Brown syndrome to avoid consecutive superior oblique palsy and inferior oblique overaction (2): while it seems to be unnecessary when using the silicone expander procedure.

The silicone maintains superior oblique function, thus preventing consecutive superior oblique palsy.

Wright suggests the following graded lengths of expander for superior oblique overaction: +1 = 4mm; +2 = 5mm; +3 = 6mm; and +4 = 7mm. (4)

Because the silicone expander provides a controlled elongation of the superior oblique tendon, it has a distinct advantage over tenotomy, and is especially useful in patients with preoperative fusion and stereopsis. (5)

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