Comparison of the Results of Medial Rectus Recession with Posterior Fixation Sutures versus Slanted Recession in the Treatment of Convergence Excess Esotropia

Thesis

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ABSTRACT

Convergence excess esotropia is a condition characterized by an esotropia which is greater for near than for distance fixation. Many surgical approaches were described to treat it including unilateral or bilateral medial rectus recession, augmented recession, posterior fixation sutures, marginal myotomy, slanted recession or various combinations of them. **The aim of study** was to evaluate the efficacy on the postoperative angle for far and for near and the use of bifocals as well as evaluating the stability of postoperative results over follow up period of 6 months. Patients were divided into Group A (10) patients underwent posterior fixation sutures (Faden procedure) at 12-14 mm with or without bilateral symmetrical medial rectus recession. And Group B (10) patients underwent bilateral symmetrical slanted recession of the medial rectus muscles. At the last follow up 6 months post-operative the results of group A were better, with 100% showing satisfactory alignment for near and distance. On the other hand group B 80% of cases successful for far and only 60% successful for near with 10% exotropic for near

In conclusion, the results of both groups in our study were satisfactory. Patients who had posterior fixation sutures had a higher success rate and were more stable.

Key words: esotropia, convergence excess, Faden sutures, slanted recession, surgeries for esotropia.

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List of Abbreviations

AC/A	:	accommodative convergence/ accommodation ratio
AET	:	accommodative esotropia
BCVA	:	best corrected visual aquity
CT	:	computed tomography
ET	:	esotropia
LR	:	lateral rectus
MA	:	meter angle
MR	:	medial rectus
MRI	:	magnetic resonance imaging
NRAET	:	non refractive accommodative esotropia
Ortho	:	orthotropia
PAET	:	partially accommodative esotropia
PD	:	prism diopter
RAET	:	refractive accommodative esotropia
SE	:	spherical equivalent
Sph	:	sphere

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INTRODUCTION

Convergence excess esotropia is a condition characterized by an esotropia which is greater for near than for distance fixation. It was first described by ***Donders in 1864***. The amount of distance/near disparity required for inclusion into the various studies has varied from greater than 8Δ ***(Sevel, 1986)*** to 20Δ. ***(Von Noorden et al, 2002)*** Most of them consider that, to be significant, the difference between near and distance fixation should be greater than 8Δ and that the difference remains after full hypermetropic correction with single focus lenses. ***(Lang et al, 1980)***

Bifocals have been used to control the near deviation in convergence excess esotropia since the 19th century. ***(Javal, 1896)*** Nevertheless, the literatures concerning bifocals are often ambiguous and there is little agreement regarding outcome criteria. ***(Lang et al, 1980)*** ***Arnoldi et al, 1999*** reported that only 20% of those initially treated with bifocals were successful. In the other 80% bifocals were discontinued in favor of surgery a mean of 2.4 years after initial therapy for the following reasons: deteriorated esotropia at near through bifocal and/or distance segment in 45%, bifocal intolerance in 20%, and inability to reduce the bifocal (after mean of 8.3 years of use) in 15%.

A number of different surgical approaches described in patients with near esotropia. These include unilateral or bilateral medial rectus recession, augmented recession, posterior fixation sutures, marginal myotomy, slanted recession or various combinations of them. ***(Clark et al, 1997)***

Historically, the surgical management of partially accommodative esotropia has been based on the recession of the medial rectus muscles according to the amount of deviation, measured at distance fixation while the patient wearing his or her full cyclopegic refractive correction. It has been known for many years, however, that in patients with high AC/A whose near deviation exceeds the distance deviation by 10Δ or more, surgery based on the amount of misalignment at distance fixation will often result in unacceptably high degrees of undercorrection. ***(Clark et al, 1999).***

AIM OF THE WORK

The aim of this study is to compare the results of the surgical management using slanted recession and posterior fixation sutures with or without medial rectus muscles recession with satisfactory alignment in near and distance fixation in the management of convergence excess esotropia.

CHAPTER I

Anatomy

In humans there are three pairs of extraocular muscles in each orbit: a pair of horizontal rectus muscles (medial and lateral), a pair of vertical rectus muscles (superior and inferior), and a pair of oblique muscles (superior and inferior). The four rectus muscles come from the depth of the orbit and are attached to the sclera anterior to the equator near the cornea. The two oblique muscles approach the globe from in front, at the medial side of the orbit, and continue obliquely and laterally to insert on the sclera posterior to the equator on the temporal part of the globe. ***(Zoth, 1905)***

Anatomy of rectus muscles:

The *origins* of the rectus muscles, the superior oblique muscle, and the levator muscle of the upper lid are at the tip of the orbital pyramid. There the origins of the muscles are arranged in a more or less circular fashion (*the annulus of Zinn*), surrounding the optic canal and in part the superior orbital fissure. Through this oval opening created by the origins of the muscles, the optic nerve, the ophthalmic artery, and parts of cranial nerves III and VI enter the *muscle cone* formed by the body of the rectus muscles. The interlocking of muscle and tendon fibers at the site of origin creates an extremely strong anchoring of the extraocular muscles. Avulsion of a muscle at the origin is rare even in cases where traction or trauma is sufficiently severe to cause avulsion of the optic nerve. Attachments exist between the origins of the medial and superior recti

and the dura of the optic nerve. This explains the pain occurring on eye movements in patients with optic neuritis. ***(Sevel, 1986)***

The insertions of the rectus muscles are not equidistant from the corneal limbus, they do not lie on a circle that is concentric with it but rather on a spiral (*the spiral of Tillaux*). The insertion of the medial rectus muscle is closest to the corneal limbus, followed by the inferior, lateral, and superior rectus insertions, with the superior rectus insertion being the most distant. ***(Von Noorden et al, 2002)*** (Figure 1)

The normal distance between muscle insertion and limbus is of importance during operations and reoperations on the extraocular muscles. ***(Lang et al, 1980)***

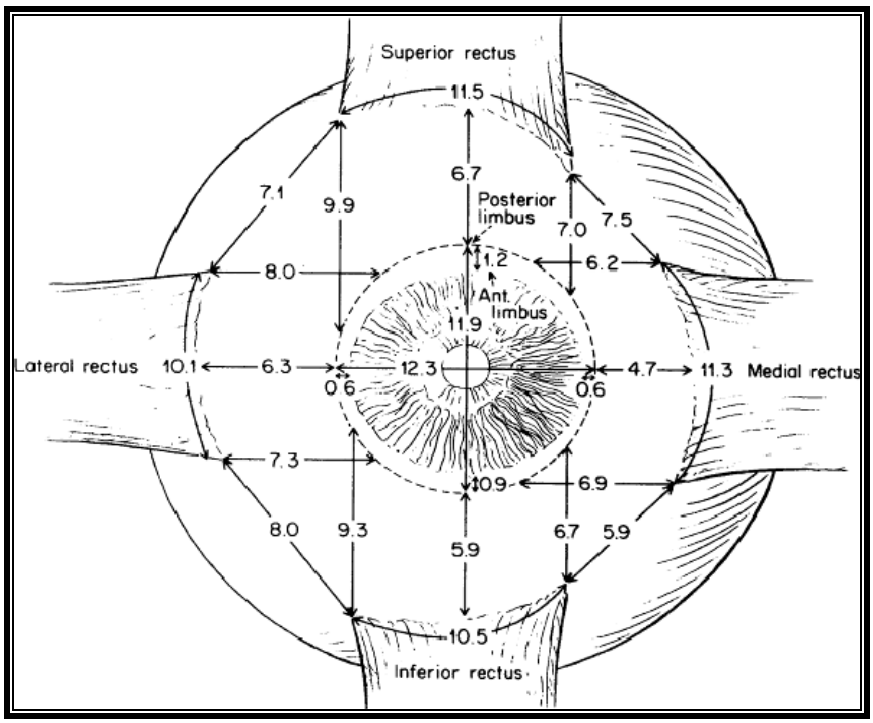

Figure 1: Insertions of rectus muscles. Average measurements are in millimeters. ***(Javal, 1896)***

Muscle Pulleys

Modern imaging techniques such as computed tomography (CT) scanning and magnetic resonance imaging (MRI) have revealed that the paths of the rectus muscles remain fixed relative to the orbital wall during excursions of the globe and even after large surgical transpositions. Only the anterior aspect of the muscle moves with the globe relative to the orbit, as it must on account of its scleral attachment. Subsequent studies with high-resolution MRI confirmed this motion by demonstrating retro-equatorial inflections of the rectus muscle paths caused by musculo-orbital tissue connections in the form of fibroelastic sleeves that consist of smooth muscle, collagen, and elastin. During contraction the muscles travel through these sleeves which act as *pulleys* by restraining the muscle paths. The *orbital layer* of the rectus muscle inserts directly on the pulley, whereas the *global layer* continues anteriorly to insert into the sclera. These pulleys are located in a coronal plane anterior to the muscle bellies and about 5 to 6 mm posterior to the equator. ***(Demer, 1999)*** (Figure 2)

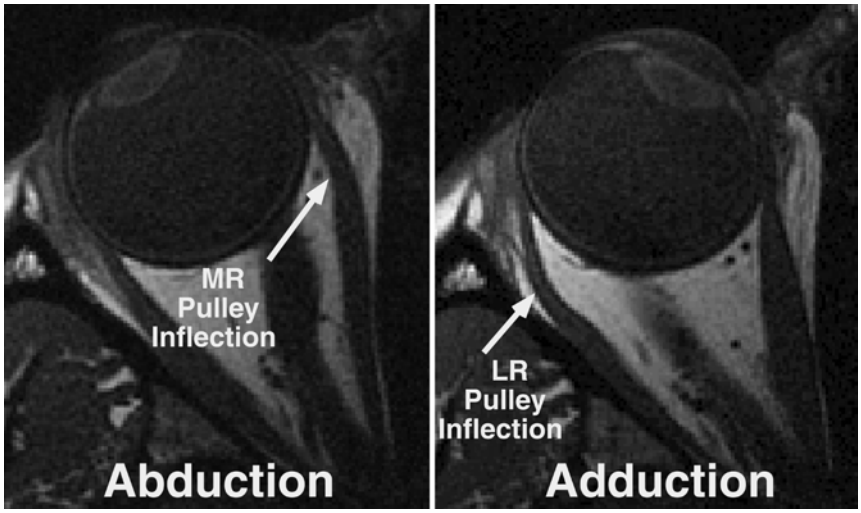

Figure 2: Two-mm-thick, 320-_m resolution axial MRI scan of a normal left orbit showing the inflection of the horizontal rectus muscles as they pass through their respective pulleys during abduction and adduction. MR: medial rectus; LR; lateral rectus. ***(Demer, 1999)***

Muscle Sheaths and Their Extensions

The extrinsic ocular muscles pierce Tenon's capsule, enter the subcapsular space, and insert into the sclera. Therefore, one can distinguish an *extracapsular* and an *intracapsular portion* of each muscle.

In their extracapsular portions, the extrinsic eye muscles are enveloped by a *muscle sheath*. This sheath is a reflection of Tenon's capsule and runs backward from the entrance of the muscles into the subcapsular space for a distance of 10 to 12 mm. The muscle sheaths of the four rectus muscles are connected by a formation known as the *intermuscular membrane*, which closely relates these muscles to each other. In addition, there are numerous extensions from all the sheaths of the extraocular muscles, which form an intricate system of fibrous attachments interconnecting the muscles, attaching them to the orbit, supporting the globe, and checking the ocular movements. ***(Von Noorden et al, 2002)***

Check Ligaments

The medial and lateral rectus muscles possess well-developed fibrous membranes that extend from the outer aspect of the muscles to the corresponding orbital wall. The check ligament of the *lateral rectus muscle* sheath pierces Tenon's capsule, then it goes forward and slightly laterally, fanning out to attach to the zygomatic tubercle, the posterior aspect of the lateral palpebral ligament, and the lateral conjunctival fornix. The check ligament of the *medial rectus muscle* extends from the sheath of the muscle, attaching to the lacrimal bone behind the posterior lacrimal crest and to the orbital septum behind. The other extraocular muscles do not have clearly distinct check ligaments such as those of the