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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

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تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

بعض الوثائق الأصلية تالفة

بالرسالة صفحات لم ترد بالأصل

EVALUATION OF CORRECTION OF VERTICAL DEVIATION ASSOCIATED WITH INFANTILE ESOTROPIA

THESIS

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By

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To My Family

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Anatomical Basis of Extra Ocular muscles

Anatomy:

Fundamental to the motility of the eye is its articulation in the orbit. The manner in which muscles are connected between the eye and the orbit and the relationship of their surrounding fascia determine the mechanical features that both produce and limit the motility of the globe. Each muscle is enclosed in its capsule. The recti muscles and their fascial expansions in between (Inter muscular septa) form the muscle cone, with its apex at annulus of Zinn and its base occupied by posterior half of the eye. Stuffed into the muscle cone posterior to the eye is a cushion of fat molded to posterior surface of the eye (Parks, 1975). [1]

Full rotation of the globe requires movement of the orbital fat and movement of the globe and extra ocular muscles within the subTenon's space. The sclera, muscle capsules inter muscular septum, and internal surface of Tenon's capsule provide the smooth slippery surface for movement of the globe within Tenon's capsule. Scarring of any of these structures results in limited movements (Schnall, 1992).[2]

Anatomy of the fascia surrounding the extraocular muscles

The muscle capsule:

Surrounding each extraocular muscle and tendon is an avascular connective tissue capsule. This muscle capsule provides a smooth surface to extraocular muscle. Its internal surface is associated intimately with the vascular muscle fibres. Damage to the muscle capsule during strabismus can occur if the muscle is incompletely hooked or split by muscle hook. In addition it can be incised

inadvertently during dissection of check ligaments and intermuscular septum (Park, 1975).[3]

Opening the muscle capsule may result in hemorrhage onto the surgical field or within the muscle capsule.The capsule opening also would leave an exposed muscle surface that could result in adherence of the muscle to the sclera or overlying Tenon's capsule. (Schnall, 1992).[2]

There are attachments from the muscle and tendon capsules of the oblique muscles to the rectus muscles. There is a variable attachment between the inferior rectus and inferior oblique muscles. This is called the suspensory ligament of Lockwood, which acts as a hammock supporting the globe. (Helveston, 1993).[4]

If a rectus muscle is lost after disinsertion, it often can be found at its capsule attachment to oblique muscle or tendon. The exception to this is medical rectus, which is not attached to an oblique muscle or tendon and therefore is likely to retract through its penetration slit in Tenon's capsule into the posterior orbit. This is one of the most serious complication of strabismus surgery known as the lost muscle (Parks, 1976).[5]

The attachment of Lockwood ligament to lower lid may affect the position of lower lid when either inferior rectus recession or resection is done. To avoid this bothersome complication a careful freeing of the muscle from Lockwood ligament is mandatory (Von Noorden, 1980).[6]

The posterior 1/3 of each extraocular muscle except the inferior oblique muscle has a very attenuated or deficient capsule; therefore, the orbit fat cushion appear firmly attached to muscle fibres. On the opposite; the connection between the muscle capsules and the surrounding fat cushion is loose throughout the anterior 2/3 of these muscles.This arrangement permits maximal movements of the insertional ends of these muscles, in contrast to relative absence of movement of the posterior ends which originate from fixed immobile sites (Parks, 1975).[7]

A potential space exists between the muscle and its capsule. Therefore it is possible for a muscle to slip within its own capsule if a superficial pass of the needle, engaging only the capsule rather than tendon, was taken during suture placement prior to muscle disinsertion (Fig 1). As result of this slippage a consecutive deviation in a direction opposite to that which the surgery was in tended to correct will result. This complication can be prevented by careful placement of suture into the substance of the tendon and placing the locking bites perpendicular to the body of the tendon rather than tangential to it (Bloom and Parks, 1981).[8]

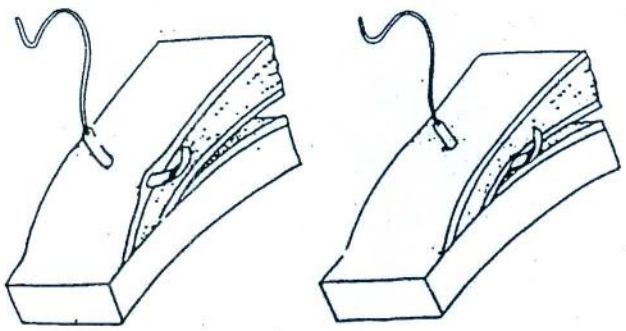

Fig. 1: When making a lock bite, superficial passage of the needle through the thin capsular tissue rather than through the full thickness of the tendon will predispose to a slipped muscle (bloom and Park, 1981)

Intermuscular Septum (Membrane):

All the extraocular muscles are joined together by fascial plane, the intermuscular septum. It is a sheet of thin, avascular tissue extending from a muscle capsule to the adjacent extraocular muscle capsule (Parks, 1975). The intermuscular septum fuses with the anterior Tenon's capsule into one fascial plane approximately 3mm from the limbus. This combined fascial plane then fuses with conjuntiva approximately 1mm from the limbus. This has several implications in strabismus surgery. Fusion of intermuscular septum with anterior Tenon's capsule is important in strabismus surgery in; when testing forced ductions, the conjunctiva should be grasped near the limbus where a stronger structure exists. This decreases the chance of tearing of the conjunctive during traction. In addition, when hooking

the muscle during surgery, a limbus incision will immediately expose the sclera and the correct plane for passage of the hook. In fornix incision, where conjunctiva, Tenon's capsule and intermuscular septum are not fused, those three structures should be incised and the hook should pass through them all to be placed in appropriate plane. (Schnall, 1992). [2]

Tenon's capsule (The fascia bulbi):

Tenon's capsule is a dense fascial layer of elastic connective tissue surrounding the eye and extraocular muscles in the anterior orbit. During surgery, it appears as dense white, avascular tissue that can be elevated from the globe to expose the underlying extraocular muscles. All six extraocular muscles penetrate Tenon's capsule prior insertion onto the globe the four rectus muscles penetrate Tenon's capsule posterior to the equator of the globe and the two oblique muscles penetrate anterior to the equator. The muscle capsule is attached by a sleeve of tissue to the inner surface of Tenon's capsule at the point of penetration, allowing backward and forward movement of the muscle through Tenon's capsule during contraction and relaxation (Parks 1976). [5]

Check ligaments:

The check ligaments appear as sheets of elastic connective tissue extending from the muscle capsule to overlying Tenon's capsule. These are easily seen during surgery when Tenon's capsule is retracted to expose a rectus muscle that has been hooked (Schnall, 1992). [2]

As the muscles contract, their actions are graduated by elasticity of their check ligament systems which ensures smooth rotations and lessens the shaking up of the contents of the globe when the eyes suddenly stop or change the direction of their movement (Von Noorden, 1980). [6]

The orbital fat:

The orbital fat comes forward around the surface of the globe, anterior to the equator, to within 10mm from limbus. Tenon's capsule separates the orbital fat from the sclera, muscle capsule, and intermusclar septum. If Tenon's capsule were inadvertently opened more than 10mm from limbus, the orbit fat would herniated through this opening and gain access to the sub Tenon's space. During strabismus surgery, this type of opening in Tenon's capsule can be produced by a deep pass with the muscle hook or when incising check ligaments more than 10mm from limbus (Fig 2).

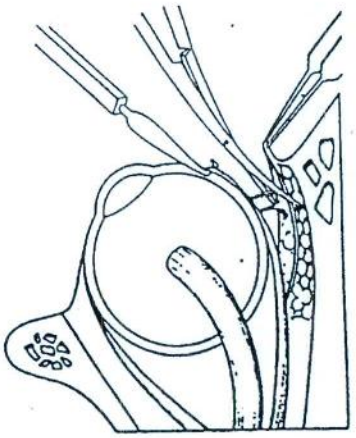

Fig. 2: A surgeon incising check ligaments adjacent to Tenon's capsule may place a rent in Tenon's capsule, predisposing to the formation of the adherence syndrome (Schnall, 1992).

This fat tends o produce an inflammatory reaction resulting in adhesions and cicatrization. The scarring of fat, sclera, and Tenon's capsule into one mass is termed the "adherence syndrome" which causes deviation of the eye with restricted motility. This complication should be prevented by avoiding the incision of Tenon's capsule 10mm or more from limbus (Parks, 1978).[9] (Fig 3).

In addition, a yellowish subconjunctival mass may appear near the limbus when the fat migrates under the conjunctiva towards limbus. This mass may be cosmetically irritating and may need to be removed. (Schnall, 1992).[2]

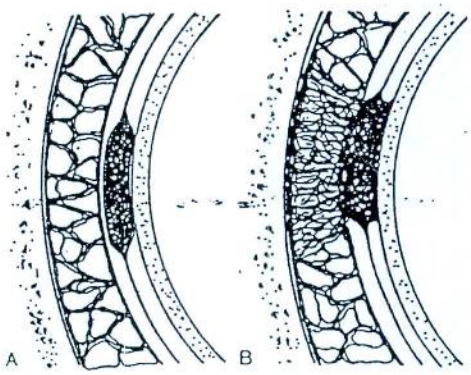

Fig. 3: A, Intact Tenon's capsule with normal connective tissue reticulum in the fat cushion. B, A defect in Tenon's capsule from strabismus surgery results in scar tissue that seals the muscle and sclera to the fat cushion (Parks, 1978).