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Comunicación corta

A new fixation technique for paralytic strabismus

Una nueva técnica de fijación para el estrabismo paralítico

Lucrecia Berganza Canales[1], Oscar Albis-Donado[3],
Maria Estela Arroyo Yllanes[2]
Instituto de Oftalmología «Fundación Conde de la Valenciana»
I.A.P. Ciudad de México

Abstract

Introduction: We report a case of severe exotropia from a complete third-nerve palsy that was improved using the paretic medial rectus as a tether. **Methods:** A 21-year-old male patient with a left exotropia greater than 100 prismatic diopters underwent lateral rectus recession combined with the use of his own paretic medial rectus, cut posteriorly and preserving the muscle insertion at the sclera, as a tether that was fixated to the periosteum of the medial canthal area. **Results:** Following surgery the patient had less than 10 prismatic diopters of residual exotropia and an excellent cosmetic aspect. **Conclusions:** The new fixation technique reduces the use of extraneous materials and the use of a second surgical site, away from the eye, to remove autogenous tissue. It markedly improves the position of the paretic eye.
Key words: *complete third nerve palsy; medial rectus fixated to periosteum; medial canthal area.*

Resumen

Introducción: Reportamos un caso de exotropia severa secundaria a una parálisis completa del tercer nervio craneal que mejoró usando al recto medial como cuerda de fijación. **Métodos:** Un paciente varón de 21 años con una exotropia izquierda de más de 100 dioptrías prismáticas fue sometido a una reseción del recto lateral combinada con el uso de su propio recto medial parético, cortado en su porción posterior, preservando su inserción anterior a la esclera, y luego fijando el extremo posterior al periosteo del canto medial. **Resultados:** Después de la cirugía el paciente tenía menos de 10 dioptrías prismáticas de exotropia residual y un excelente aspecto cosmético. **Conclusiones:** La nueva técnica de fijación disminuye el uso de materiales extraños y la necesidad de un segundo lugar quirúrgico, lejano al ojo, para extraer tejido autógeno. La técnica mejora mucho la posición del ojo parético.
Palabras clave: *parálisis completa del III nervio; fijación del recto medio al periostio; canto medial*

[1] Médico Adscrita servicio de estrabismo. Instituto de Oftalmología «Fundación Conde de la Valenciana» I.A.P. Ciudad de México.
[2] Maria Estela Arroyo es Médico adjunto al Servicio de Estrabismo. Asociación para Evitar la Ceguera en Mexico. IAP.
[3] Oscar Albis-Donado. Especialista en Glaucoma Práctica privada, Ciudad de México.

Standard strabismus techniques usually involve strengthening and weakening procedures that aim to change the position of the eyes using the extraocular muscles. When incomitant or restrictive strabismus are present, additional transposition and Jensen procedures become useful. But for some cases with complicated strabismus, where muscle function is inexistent, or previous multiple strabismus procedures have been performed, fixation techniques to the orbital periosteum with different exogenous, endogenous materials and autologous tissues, combined with debilitation techniques for the antagonic muscle become an indispensable tool for re-aligning the eyes in primary position.

The idea is to use a tether that is tightened and fixed at the desired position of the eye. The material or tissue is fixed to the globe at the insertion of the affected muscle, and from there to the periosteum at one of the orbital borders. Another technique involves disinserting an overacting muscle from the globe and fixing it to the orbit, producing a profound, but reversible inactivation (1).

The materials that have been used include elastic silicone tubes (2,3), silk (4), non-elastic silicone bands (5,6), titanium plates (as an artificial pulley for non-absorbable sutures) (7), and the tissues include fascia lata (8), fascia temporalis, periosteal flaps (9,10) and the superior oblique tendon (11), amongst others. The site of fixation has also had different approaches, using the periosteum in the medial orbital wall (10,12), a T or Y-shaped titanium plate screwed into the medial wall (7,13), the

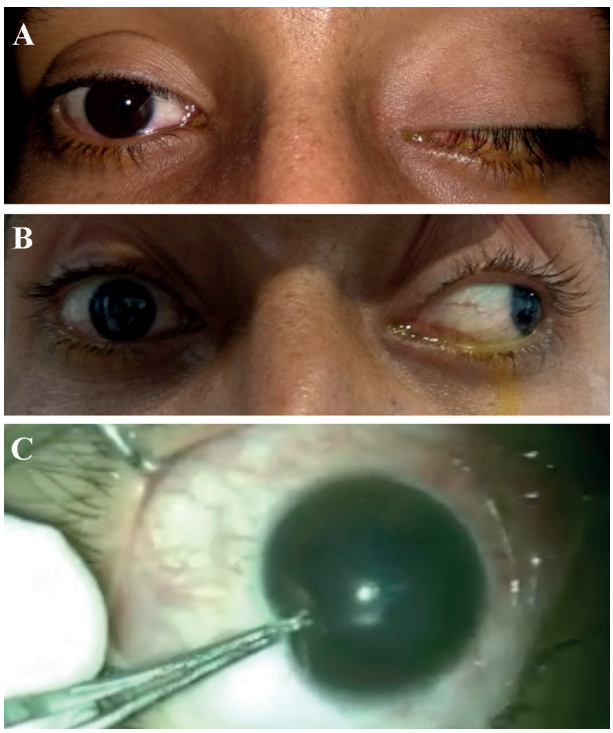

Figure 1. A. Complete paralysis of the third nerve with marked ptosis and exotropia, that can be better appreciated in B. Large left exotropia in primary gaze, no adduction at all on right gaze (not shown). C. Passive forced duction test markedly positive for restriction of adduction.

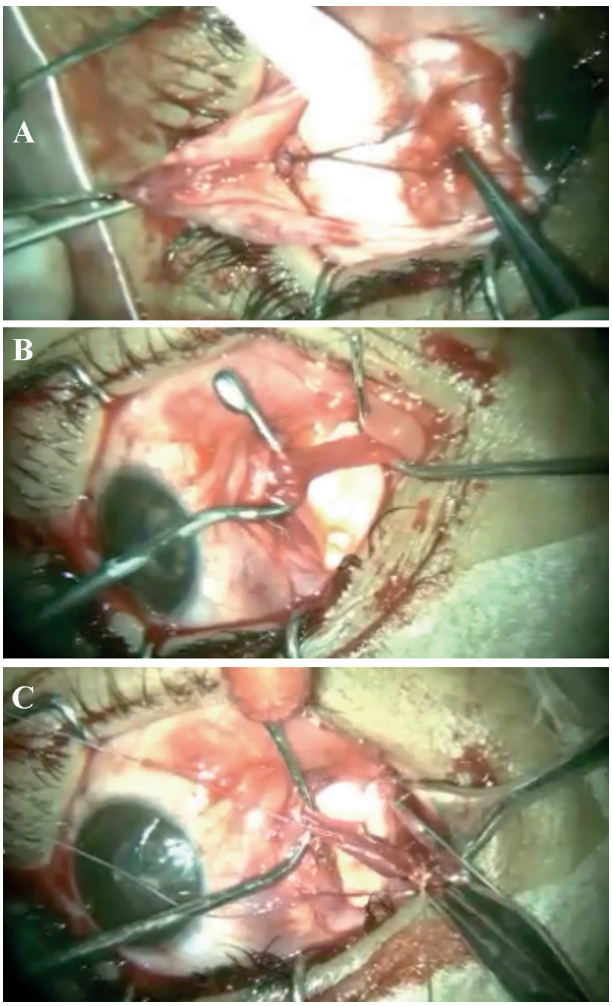

Figure 2. A. The lateral rectus muscle is recessed with hang-back sutures to the retro-equatorial area. B. The medial rectus muscle is markedly atrophic, thinner than the lateral rectus muscle due to absent neural stimulation. C. A non-absorbable braided suture is carefully placed at about 14 mm from the muscle insertion on the globe and the muscle is cut behind this suture.

posterior and anterior lacrimal crests (14) and the medial palpebral ligament (15).

We present a novel technique that uses the patient's own paretic medial rectus as a tether anchored to the periosteum of the frontal process of the maxilla and nasal bone.

CASE PRESENTATION

Male, aged 21 years, left exotropia of > 100Δ, non-reactive mydriasis and ptosis since early childhood, history from parents not available, but probable congenital left third nerve lesion (figs. 1A and 1B). Uncorrected visual acuity OD 20/20, OS Hand motions. Fundus examination unremarkable, IOP 12 mmHg. Passive forced duction test under general anesthesia was positive, with marked restriction of adduction (fig. 1C). Patient written consent was obtained before the surgery, and we adhered to the tenants of the declaration of Helsinki.

Operation: Left lateral rectus post-equatorial recession using hang-back sutures, until restriction was eliminated, was performed first (fig. 2A). The medial rectus muscle is found to be markedly thin (fig. 2B). A 5-0 Mersilene® suture is preplaced at approximately 14 mm behind the muscle insertion, cautery is applied posterior to the suture and the muscle is cut behind the suture at this position (fig. 2C).

A skin incision in the nasal canthal area is made until exposing the periosteum of the maxilla and nasal bones. Then, an artery forceps is used to make a tunnel from this area, under the lacrimal ducts and the medial canthal tendon, until reaching the subconjunctival space near the medial rectus and grabbing the non-absorbable braided suture (fig. 3A). The Mersilene® suture is pulled and progressively tightened until the eye is in the desired, slightly over-corrected position (fig. 3B). The suture is then fixed to the periosteum (fig. 3C), the skin incision is closed

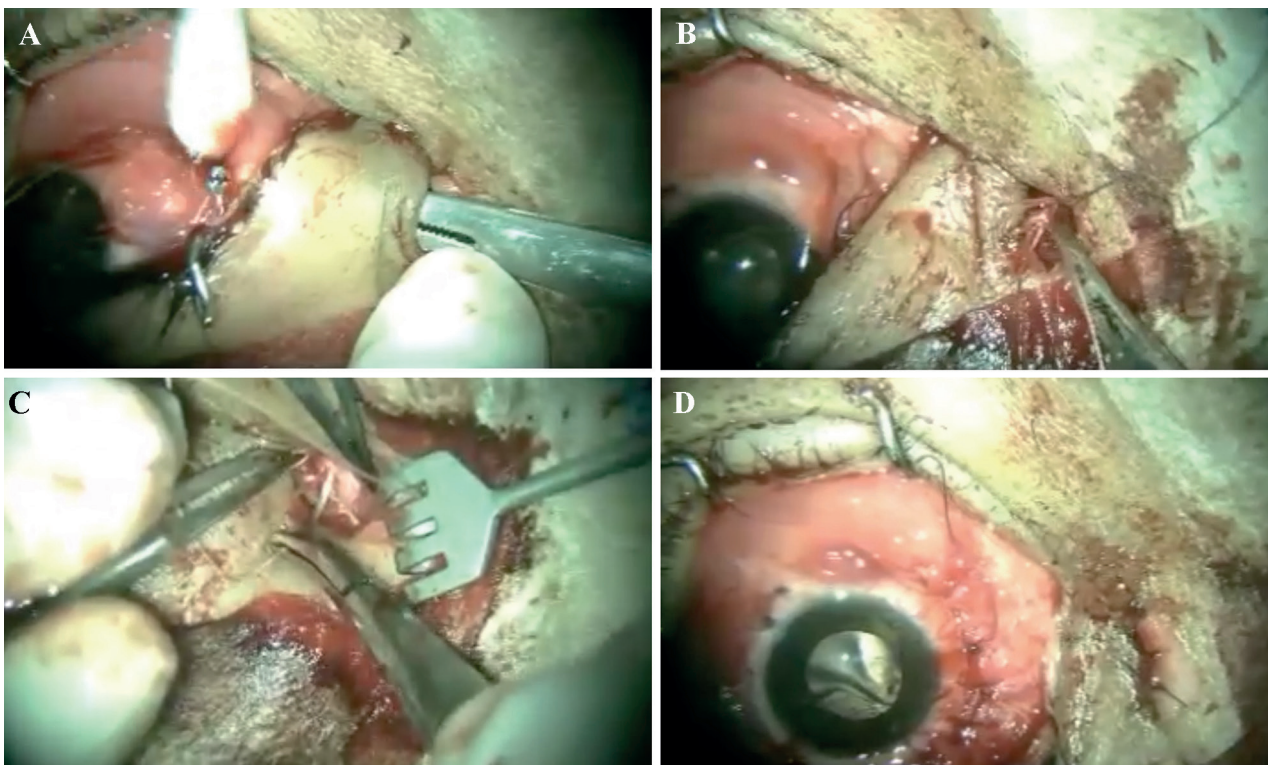

Figure 3. A. A tunnel is constructed from the periosteal to the subconjunctival space, passing under the superior portion of the medial canthal tendon, also avoiding the lacrimal ducts. B. The sutures and the medial rectus muscle are pulled towards the nasal area, aiming to over-correct the position once the muscle is fixated. C. The braided suture is used to fix the muscle to the strong periosteum covering the frontal process of the maxilla and nasal bones. D. Immediate postoperative aspect with the patient still under general anesthesia.

Figure 4. First postoperative day, less than 10° of residual exotropia and excellent cosmetic aspect.

by planes using absorbable 7-0 Vicryl®, then the conjunctiva (fig. 3D).

The immediate aspect on postoperative day 1 is satisfactory, with a very small residual exotropia (fig. 4).

DISCUSSION

The typical patient with oculomotor palsy has the following clinical characteristics: compensatory head tilt, diplopia, exodeviation, limitation of movements, slow saccadic movements, and a negative passive forced duction test that becomes positive with time, when the antagonist becomes contractured.

The objective of surgery is to keep the eye in the front position, eliminating the deviation and avoiding diplopia in primary position; when there is complete paralysis no technique is able to restore movements.

In cases where there is absence of muscle function and marked restriction, the surgical plan must include first the elimination of restriction, which in this case was by debilitating the lateral rectus muscle. An opposing force to avoid movement in the direction of the previously restricted muscle must be also be sought.

Three treatment options can be used: innervational surgery, muscle transpositions or fixation procedures. Innervational surgery works best for sixth nerve palsy and results for third nerve palsy are usually insufficient. Muscle transposition surgery needs that the superior and inferior rectus are not affected, and this is almost never the case in complete third nerve palsy, so the best therapeutic option for these cases are fixation techniques.

In the present case we used the patient's own medial rectus, by using a novel technique that involved preserving the muscle's original insertion to the globe and making a posterior cutting of the muscle. The posterior end of this portion of the muscle was then attached to the medial orbital periostium, so it could serve as a tether and anchor, preventing abduction of the globe. The technique is similar to that reported by Lee and Chang (12) in the use of the medial paretic muscle, but it is different because we do not re-attach the posterior free portion of the rectus muscle to the globe, reducing the risk of chemosis and congestion. We also debilitated the lateral rectus, but we did not attach it to the orbital wall. Instead, we sutured it to the equator.

Avoiding inert materials (2-7) reduces the risk of extrusion, exposure, granulomas and infections. The use of the paretic muscle as a tether avoids a second place of dissection for obtaining autografts, or the use of donor tissues (8-15), which are not always available or affordable, allowing for faster recovery. The care of an additional surgical site, close to the first, also reduces the risks of graft rejection, reabsorption or prion transmission. Admittedly, the use of a non-absorbable braided polyester suture can be considered as foreign material, but we believe the depth at which it was placed and the rich vascularization of the medial canthus can prevent extrusions.

A possible shortcoming of the procedure is the possibility of recurrence of the exodeviation. This can be improved by the use of conjunctival resection in the nasal area and/or medial rectus plication. The risk of damaging the lacrimal ducts is reduced with dissection with the blunt tip of the arterial forceps close to the bone and under the medial canthal tendon.

This is a first case with short follow-up. A larger number of cases and longer follow-up are needed to validate the efficiency of the technique.

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