

Do Horizontal Recti Muscles Spontaneous Reattach and Adjust After Suture Less Surgery for Huge Squint?

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Abstract

Aim: To evaluate and consider alternative surgical technique for huge horizontal strabismus of more than fifty-five prism diopter (55 > PDs) instead of the traditional technique and to improve that the muscles is spontaneous reattached without suture.

Methods and Material: A retrospective case-series on forty cases at different hospitals, non-suture surgery was done in both eyes under local anesthesia (more than 14 years old children). We documented forty cases, thirty six (36) primary strabismus patients (Exotropia-Esotropia) and only four (4) secondary cases were re-operated. All patients were evaluated after surgery clinically with good results, images were taken preoperatively and postoperatively. The follow-up visit was conducted after the first month and then every six months for up to three years.

Results: Out of 40 cases, (95%) 38 were successful (less than 10 Prism Diopters) with good ocular motility within one month, under correction only appeared in (5%) 2 of the cases. No persistent diplopia was noted in the central 30° field. One case was re-operated on, no overcorrection and no major complications were recorded during and after the surgeries. The results are supported by documents and images.

Conclusions: This technique is remarkable in our ophthalmic field because it did not interrupt the *natural integrity of the normal ocular motility*, it is simpler, with a high success rate, requires shorter time, under local anesthesia for adult, without suturing, much more efficient, with less complications, and shorter learning curve. *The horizontal muscles spontaneous reattach and adjust after surgery.*

Keywords: Horizontal Strabismus; Huge Strabismus Surgery; Non-Suture Surgery; Spontaneous Reattach Muscles; Prism Diopter

Introduction

Huge squint is a grey zone for most surgeons and there are no clear surgical rules as to which type of technique you may use for the squint surgery, and frequently re-operation is the option when operations fail many times. The protocol of the classical strabismus surgery is determined mostly by changing the mechanical actions of the horizontal muscles by resections or recessions and on how many muscles you operated. Far from this concept the check ligaments and intermuscular membrane play a role [1], or there is a neurological supranuclear pathway that control the ocular muscles movement including the pathway in the brainstem and cerebellum and their connection to utricles and saccules of the inner ear [2] and visual cortex and posterior cingulate cortex [3,4]. Evidence indicates a cause for

strabismus may lie with the input provided to the visual cortex [33]. This allows for strabismus to occur without the direct impairment of any cranial nerves or extraocular muscles.

Background

The game of all strabismus surgery is to make the eyes relative to each other by restoring the alignment of both [5] and that is may lead to restore the patients binocular vision [5,6] and to developed strabismus-specific health-related quality of life (HRQOL) both psychosocially and functionally [7] and definitely bring their confidence back [7,8] due to cosmetic realignment. The surgery is done by many ways, weakening (recession, myectomy) tightening (resection, advancement) the repositioning of the extraocular muscles depended on the individual situation of every case [9,10,11] and at the same time, one, two, three or four extraocular muscles may be operated on [10,28], the surgeon calculates where to re-attach the muscles depend on the traditional mechanical surgical rules [11]. The main complication is globe perforation and occurs between 5.1% [27] up to 8% - 12% [12] of x strabismus surgery, and the risk of happening is at highest during reattaching the muscle to the sclera and sometimes it can lead to retinal detachment [13,14], major complication like globe perforation or infection and endophthalmitis are not uncommon to occur and even retinal or optic nerve damage can happen [14,15]. Some minor complications like persistence diplopia [9], bleeding, allergy to the sutures and change in pupil sizes are also happen [13,14,15] also not to forget the complications of general anesthesia [12], besides the overcorrection or under correction are very common and expected to occur after the surgery [11,17]. The variations of the success rate for each case depends on its individual situation, and additional surgery may require [9]. Several large case series report successful surgical readjustment rates of 63% to 81% in adults up to one year after surgery [20].

Subjects and Methods

By coincidence twenty years ago I lost a patient with loose adjustable suture after recession of both medial rectus surgery for ten days and He came back with good ocular motility and there was no need to readjust the suture !!!...then. I observed ten cases of loose adjustable suture during first week of surgery (a loose adjustable suture is a loop created from the disinserted muscle to the original insertion of it out of conjunctival incision margins) (Figure 2a and 2b) and I found that the eye motility and alignment were good and improving and

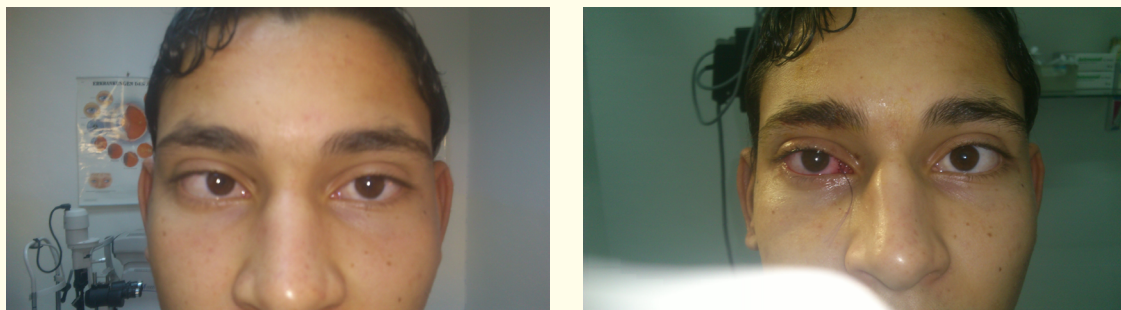


Figure-2 (a) and Figure-2 (b)

there was no need to readjust or tying the sutures and that was during recession surgery only.

A retrospective study on forty patient (eight Syrian-twenty one Libyan-twelve Saudi) cases of large angle strabismus (more than 55 PDs) between (55 - 95) prism diopter, visual acuity is equal between (6/6-6/24) and two lines difference, any type of concomitant strabismus either exotropia or esotropia unilateral or alternating and two cases of crossed restrictive esotropia (forced duction:4+ positive OD and +2 positive OS), three children under 14 years old (10-12-14) under light general anesthesia (GA), and 37 cooperative patients ages between (14-60) years old, sex was not defined, all were documented and filtered from more than 200 cases and from my previous published abstract [1], at different hospitals in Syria, Libya and Saudi Arabia in the last ten years, Full ophthalmological examination and medical history were made, and internal medicine and anesthesia consultation were done and the necessary lab tests were demanded. I operated thirty six (36) primary strabismus patients (exotropia-esotropia) and four (4) secondary residual cases using this technique. Follow-up was conducted every six month for up to three years. The study had been approved by hospitals where the surgeries were done.

All patients had oral and written agreement and the patients privacy were preserved. The surgical technique was as follows: under local anesthesia drops and subconjunctival (lidocaine 2%) injection (0.5 - 1) ml with adrenaline near the muscle, (for children light general anesthesia were also done). We injected all patients with Atropine by anesthesiologist through Intramuscular (IM) or intravenous (IV) (1 mL/0.5 mg), eight (8 mm) conjunctival and tenon's wound incision was done over the insertion of the muscle, and by muscle hook loosening the muscle was done from the eyeball carefully then by the Mosquito clamps held the muscle prior to severing to avoid bleeding, full myectomy (2) mm from insertion was done no cutting of check ligament, no suture *in situ* (Figure 3a). I asked the patient to move his eyes to left and right after every step of surgery to estimate and to see whether he need tractional suture or need some dissection (not more than two mm) (traction suture is U shape 5-0 suture from the limbus to the outer canthal area in the opposite direction of the strabismus was performed for one or two week and for one or two muscle as needed to adjust the final position of the eye), the conjunctival incision is closed by bipolar diathermy. Orbital CT scan (Figure 3b) was performed within hours after the surgery to evaluate the adjustment of the muscles and confirm that it is in place and did not slipped and that was due to saving the check ligament and the intermuscular membrane and tenon capsule, and also there was no resection to the antagonist muscles. Essentially, I used Krinsky test to calculate the degree of

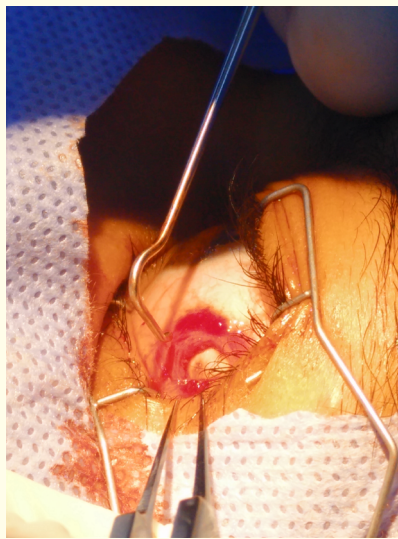


Figure 3(a): See the stump of lateral rectus in this case.



Figure 3b: Some bleeding around the both LR.in this case.

strabismus, and some extreme cases by Hirschberg test. the number of each case of those made, the type of strabismus, the preoperational degree (deviation), the procedure and other techniques, outcome, and the distance of resection if needed are shown in the table 1.


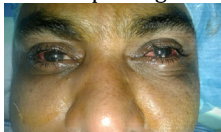
| No. of Cases | Deviation (≥, ≈ Prism Diopters) | Muscle myectomy 2 mm from insertion | Other procedure, tractional suture, dissection, | Outcome |
|--------------|---|--|--|--|
| 14 | Alternating Exotropia 55-65 | OU lateral rectus Myectomy | Traction suture 4-7 day for more deviated eye only. (7 cases) | Orthotropic |
| 10 | Alternating Exotropia 65-85 Figure-1 (a) (b)  | OU lateral rectus Myectomy | Traction suture for (5- cases) more deviated eyes only, for 7-12 day | orthotropic Figure-1(c)  Video-1(e) |
| 2 | Right secondary constant exotropia 60 | OU lateral rectus myectomy | Dissection and Tractional suture for right eye for 12 day. | Orthotropic |
| 8 | Esotropia 55-75 | OU medial rectus Myectomy | Tractional suture for 6 eyes, 4-7 days | Orthotropic |
| 1 | Alternating exotropia 95 | OU lateral rectus Myectomy | Re-myectomy for under corrected eye and Tractional suture for 10 days | orthotropic |
| 2 | <i>Restrictive</i> <i>Crossed</i> <i>Esotropia 85</i> Vid-2 (a).mp4 before surgery | OU medial rectus Myectomy Video-2 Vid -2(b).mp4 during surgery | OU Dissection (2mm) and Tractional suture 14 days for both patients. | Orthotropic Vid 2 (c).mp4 after surgery 1w |
| 1 | Alternating Esotropia 75 | OU medial rectus Myectomy | OU Tractional suture for one week. (refuse re-operation). | Right Esotropia 30 PD |
| 2 | secondary consecutive` constant Esotropia 65 | OU medial rectus Myectomy | One muscles Dissection (2 mm) and tractional suture for 7 eyes for two patients, | Orthotropic |

Table 1

Results

Out of 40 cases, 38 (95%) were successful (less than 10 PD) with good ocular motility within one month. We found that under-correction only in 2 cases (5%). No overcorrection, One case re-operated (because she lost tractional suture early) and became orthotropic. The other patient refused reoperation. The other procedure tractional suture (62%) was done, no any major complications during or after the surgeries, no persistent diplopia in central 30° field, outcomes were document by figures and video.

Discussion

The main point is to say that the ocular muscles is reattaching spontaneously after free myectomy, I found a similar like myectomy technique has been done in 1983 by Prof. Caleb Gonzalez of bilateral sixth nerve palsy with strabismus fixus, disinsertion and myectomy of OU medial rectus and released it in the orbit without sutures [21] and also many others in last two century (18th - 19th) did like this technique [26] and I found that too many American doctors were doing like this procedure in the 19-century, as Samuel David Gross, and James Bolton, and they published it with good results [27]. Also, an important study (myectomy of large-angle strabismus in patients with Graves’ ophthalmopathy) is done by dr. Liao SL and others at -Eye (Lond) Jur. 2017- and they said in conclusion that “complete rectus muscle myectomy technique is effective and predictable [30]” also don’t forget that the inferior oblique is attached again to the sclera after myectomy [31]. Also, at 9/20/2018 the “journal of pediatric ophthalmology and strabismus” published a nice original article in post-natal monkeys about “spontaneous reattachment of the medial rectus after free tenotomy” [32]. All of these studies is supporting our technique. To show that this procedure for large angle strabismus was superior than the traditional one as (Table 2), there were both better results and lesser complication and our study respect both criteria, if we considered our success rate 98% While the best rate ranges from 68% to 85% when we were using the traditional techniques [15,16], residual or recurrent strabismus was common problem found after large angle strabismus operations [26]. The incidence of under correction and recurrence after the correction of esotropia varied from 20% to 40% [25,17] and the incidence of under correction and recurrence after the correction of exotropia varied from 22% to 59% [18] while in our research the percentage is 5% under correction and no overcorrection for esotropia or exotropia. The reoperation percentage in our technique was 5%, while in the traditional technique is 7.9% [23]. Due to nonexistence of suturing during this surgery we prevented one of the worst complications which was scleral perforation that traditional techniques may cause it [13,14,15]. As it may occur and can lead to severe complications, time needed to do the surgery in this technique was not more than fifteen minute under local anesthesia. While the traditional approach with general anesthesia (GA) time ranges were at least one hours. This technique didn’t require general anesthesia, except for children under fourteen, We used light general anesthesia. Simplicity of this procedures which provided minimal surgical manipulation by respecting the muscle’s integrity and it’s connections, with short learning curve.

| | Success Rate (less than 10 PDs) | Under and Over Correction | Re-operation Percentage | Scleral Perforation | Time |
|-----------------------|------------------------------------|------------------------------|----------------------------|------------------------|-------------|
| Traditional Technique | 68% - 85% [15.16] | 20% - 59% [19.18] | 7.9% [23] | 8% - 12% [13] | 1 - 2 hours |
| Our Technique | 98% | 5% | 5% | No Perforation Scleral | 10 - 20 min |

Table 2

What was before

Huge squinte was a gray zone for surgeons and there’s no standard protocol is established for surgical style, with long time surgery under general anesthesia, either two or three or four horizontal muscles with a lotx of complications and there were variable success rates (68% - 85%).

What this study add

That the muscles is spontaneous reattached without suture after strabismus surgery and there were both better results and lesser complications, and in our study we respect both criteria with a success rate of 98% only myectomy on one muscles in every eye, minimally invasive with a very short time and alternative procedures, non-suture technique, under local anesthesia, shorter learning curve.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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