Research Article

Equatorial Scleral Anchor for the Weakening of the Inferior Oblique Muscle

Sabetti L†, Tomarchio S‡, Piozzi E§ and Magli A¶

Abstract

Objective: The study was conducted to evaluate the mid-term effectiveness of a new surgical approach in the reduction of overaction of the inferior oblique muscle.

Methods: A new surgical treatment was developed consisting of suturing the muscle to the sclera at the Gobin’s point with tendon sparing by way of a micro-incision to reduce any tissue damage during the surgical procedure and to enhance the healing process. The treatment was evaluated postoperative in a group of 150 patients with primary or secondary inferior oblique overaction.

Results: All patients experienced a complete resolution of the elevation in adduction, no residual vertical imbalance, lateral incomitance was improved.

Conclusion: The outcome of the new equatorial scleral anchor surgical treatment has been generally accepted as favourable in our study, also if compared with the results yielded by the most frequently used anterior transposition of the inferior oblique muscle. The new surgical treatment appears to be a relatively a less invasive, safe, reversible technique, including the potential to perform the procedure with an adjustable suture.

Keywords

Equatorial scleral anchor; Inferior oblique overaction; Strabismus surgery; Hypertropia; Gobin’s point; Inferior oblique weakening; Tendon sparing

Introduction

The aim of the study was to determine the efficacy of a new surgical approach called "equatorial scleral anchor" aimed at reducing overaction of the inferior oblique (IO) muscle. Horizontal strabismus may commonly develop with either primary (commonly occurring with horizontal strabismus) or secondary (usually due to ipsilateral superior oblique paresis) inferior oblique overaction. A previous report of the incidence of hypertropia in pediatric population (younger than 19 years of age) was carried out by Tollefson et al. where the higher rate of hypertropia was associated with the higher prevalence (71.4% of children) of fourth cranial nerve palsy and with primary inferior oblique overaction [1]. Hyperfunction of the IO may predict a potential consecutive exotropia postsurgical procedure for esotropia [2]. The surgical treatment consists of sewing the muscle to the sclera at the Gobin’s point with tendon sparing and also performing a micro-incision to limit local tissue trauma and to induce a faster recovery [3,4].

Methods

A total of 150 patients with overactive inferior oblique muscle were enrolled between March 2012 and March 2015 to receive randomly the Tomarchio-Sabetti procedure or surgical treatment of strabismus with the inferior oblique anterior transposition (IOAT). Patients were divided into two groups: Group I consisted of 82 patients aged 5-51 years (median age 25.6 years) whose entire body of the muscle was sutured onto the sclera in correspondence with the Gobin’s point (anteroposition of the inferior oblique muscle with the bulbar insertion to the equator) using a non-absorbable 5-0 Gore-TEX suture with tendon sparing; Group II (control) of 68 patients aged 6-52 years (median age 26.3 years) (IOAT) using an absorbable 6-0 Vycril suture. Subjects underwent a comprehensive ophthalmological and orthoptic examination. Follow-ups were carried out at 1, 3, 6, 12 and 24 months postoperatively. The results we hereby present are at a 24-month follow-up are Tables 1 and 2 report the detailed description of the clinical cases and the angular deviations.

Results

Twenty-one patients (25.6 %) from Group I Vs 18 (26.4%) from Group II reported pain in ocular motility (due to suture fixation), in all cases solved in 14 days. One case of subjective intorsion from Group I was spontaneously solved after 30 days, with no angular modification in primary position. Six patients (7.3%) from Group I showed a milder hypofunction than 8 cases (11.76%) in Group II. In 11 subjects (13.4%) from Group I a mild hyperfunction was observed compared to 11 patients (16.17%) from Group II. No overcorrection and antievolution syndrome was diagnosed following surgery of patients in Group I. In contrast, a hypercorrection along with the presence of the antievolution syndrome was observed in 3 patients (4.41%) from Group II.

All patients recorded a significant reduction in the hyperfunction of inferior oblique muscle. The results in terms of correction in the deviation angle appear to be similar. The only relevant difference observed was the absence of the antievolution syndrome when using the new surgical technique. The deviation results are illustrated in Tables 3 and 4.

Discussion

Recession of the inferior oblique muscle (IO) was indicated by Parks as the most effective and longer lasting procedure for IO weakening [5]. However in the 1970s, anatomical studies introduced new tables for graded muscle recession [8-10 mm IOR corrects 9–15 prism dioptres central gaze hypertropia] [6]. Recently, Metten et al. published a new dose-response study having performed 0.5°/mm up to 1.4°/mm inferior oblique recession procedures [7]. We observed one case of subjective transient intorsion, the randomness of the observation is supported by the numerous studies underlining how the inferior oblique anterior transposition techniques do not determine a potential increase in incyclotorsion [3,5,8-10]. Several studies have been carried out in order to assess the efficacy of inferior oblique surgery in the management of patients with hypertropia [3,6,11,12]. The recession of the inferior oblique muscle showed favourable results in patients with superior oblique palsy exhibiting overelevation in

*Corresponding author: Lelio Sabetti, MD, Via Euriaio 7, 00181 Rome, Italy, Tel: +39 331 43 83 795; E-mail: studiosabetti@yahoo.it

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adduction [12]. Moreover, Parks reported lower recurrence rates of overaction following inferior oblique muscle recession [5]. Due to its anatomical position, IO works as an extorter and elevator muscle, in order to make our recession with anterior Gobin’s position procedure effective in reducing the IO overaction, it was necessary that all posterior body fibers were fully hooked. We must suture the muscle closer to the inferior rectus in order to increase the depression. The insertion of the IO near the lateral rectus increases the action of abduction with an effective action of depression. The obtained IO muscle weakening is effective in reducing the IO overaction, it was necessary that all anatomical result of an 11 mm IO muscle resection but with the benefit of not having to cut the muscle and it provides also a considerably greater improvement compared with the well-known recession shifted forward procedure.

**Conclusion**

Whilst the technique could still be improved and refined, it offers additional benefits such as no or minimal risk of developing vorticose haemorrhage, of hooking the muscle with the lateral rectus muscle, of post-surgical adherence and no risk of anti elevation syndrome. The new technique offers the advantages of being simple, safe, reversible and modular in terms of suturing. The classic inferior oblique anterior transposition technique provides a similar outcome but with the limited risk of antielevation syndrome. The equatorial scleral anchor procedure can be also performed through micro-incision, minimizing related tissue trauma, inducing a faster recovery and reducing the risks of a postoperative adherence syndrome.

**References**


Author Affiliation

1Department of Biotechnological and Applied Clinical Sciences, University of L’Aquila, L’Aquila, Italy
2Studio Tomarchio, Private Practice, Catania, Italy
3Department of Paediatric Ophthalmology, Niguarda Hospital, Milan, Italy
4Department of Medicine and Surgery, University of Salerno, Salerno, Italy

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