Historical review of inferior oblique muscle surgery

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Abstract:
Surgery on inferior oblique muscle has a long history and various surgical techniques have been developed. The historical review of the surgery starting in 1840’s to date is performed. The surgical effectiveness between simple myectomy and recession is still controversial.

Keywords:
Dissociated vertical deviation, inferior oblique, superior oblique palsy, surgery

Introduction

Bielschowsky classified cyclovertical deviations into five groups, (1) purely comitant vertical deviations, (2) vertical deviations of paretic origin, (3) deviations with unilateral overaction of the inferior oblique (IO) muscles, (4) dissociated vertical deviations (DVD), and (5) vertical deviations combined with features of several of the other groups.[1] Currently, IO muscle surgery has been widely used for treating primary IO muscle overaction (IOOA), secondary IOOA due to superior oblique muscle palsy, DVD, V pattern strabismus and other vertical or torsional strabismus. The surgery on IO started to be described in the literature in the 1840s, and various procedures have been recognized. The historical review of the surgery on IO muscle is performed.

Literature Review

German literature, before 1900

The detailed history of strabismology from its beginning in English and German literature is written in the textbook by von Noorden.[2] In 1840, von Ammon considered subcutaneous myotomy of the lateral rectus and IO muscles but after experiments in animals and on human cadavers considered it to be not justifiable, and then he never performed the procedure.[3] The first description of IO muscle surgery was published in German[4] by PH Wolff with subcutaneous tenotomy. In 1840s, myotomy was the most popular procedure on all 6 extraocular muscles. Dieffenbach illustrated transconjunctival approach to 6 extraocular muscles although he used this technique very rarely.[5] The transcutaneous myotomy through an incision in the lateral aspect of the lower lid was the procedure of choice for weakening the IO muscle at the time of von Noorden training, and he says it occasionally resulted in a massive, subcutaneous hematoma.[2]

English literature, from 1900 to 2000

The first English literature of IO muscle surgery was written by Duane in 1906.[6] Duane recommended transcutaneous tenotomy of IO at its origin. In 1934, Smith described the indication of IO tenotomy for the ocular torticollis.[7] In 1942, White described a recession of IO muscle at the insertion site.[8] As he believed the tenotomy of IO was not a predictable procedure and recommended a recession procedure. Many other surgeons followed his idea, and the IO recession obtained popularity.[9,10] In 1962, Dyer reported the effectiveness of IO myectomy as a simple and effective procedure,[11] and then,
myectomy gained popularity as well. Costenbader compared the effectiveness of recession and myectomy of the IO,[14] and other experienced surgeons[15] started to perform myectomy. In 1972, Parks compared the different IO muscle weakening operations and concluded that the recession operation is most effective and long lasting.[16] In 1979, Toosi and von Noorden reported the average reduction of hyperdeviation by IO myectomy in the field of action of that muscle in primary position and the fields of action of a paretic superior oblique muscle is 11.5 p.d. and this effect increases with the size of the preoperative deviation.[17]

Anterior transposition of the IO was first described by Gobin[18] in 1964 as the anterior placement of the IO tendon enhances its weakening effect. The procedure is used to eliminate the severe IOOA.[19] The technique is then used for the treatment of DVD especially when IOOA coexists.[20‑22] Mims performed inferior oblique anterior transposition (IOAT) on 61 cases of infantile esotropia patients with IOOA and reported the DVD surgery was required only in 1 patient.[23] Then the IOAT is recommended on patients with a higher risk of DVD with IOOA.[24‑26] Anterior transposition of IO procedure convert the activity of the IO to antielevator, the procedure causes limitation in supraduction, and the condition is termed antielevation syndrome (AES) by Kushner.[27] Mims reported that AES may be prevented by attaching the posterior fibers of the IO muscle no more than 2 mm lateral to the inferior rectus (IR) muscle insertion site.[28]

2000 till current
Graded IO recession and anterior transposition for treatment IOOA and V pattern strabismus were evaluated its effectiveness, and satisfactory results are reported.[29,30]

Although the AES is a well-recognized complication of anterior transposition of IO, combined resection, and anterior transposition are used to treat large angle of hyper deviation in primary position with superior oblique palsy,[31] large angle of DVD,[32,33] and in cases with traumatic tear of IR muscle.[34,35]

More recently, anterior and nasal transposition of IO muscle is recognized to be effective to treat severe superior oblique palsy,[36] iatrogenic superior oblique palsy,[37] and on DVD with severe IOOA.[38]

Although the various weakening techniques on IO including myectomy, recession, and anteriorization of IO, have a long history for the treatment of superior oblique palsy, the effectiveness of these procedures are still controversial.[39‑43] Many researchers believe when vertical deviation at primary position exceeds 15 p.d., an IO muscle myectomy is not enough.[44‑46] Plager proposed to determine the surgical approach to congenital superior oblique palsy with intraoperative superior oblique tendon traction test,[47] and recommends superior oblique tendon tuck procedure when the tendon is lax. Komori et al. reported that simultaneous procedure of IO myectomy and superior oblique tendon tuck procedure on cases with lax superior oblique tendon is safe and effective.[48]

Conclusion

IO muscle has unique effects on both vertical and torsional eye movements. In addition, transposition procedure changes its action. Further study should be performed to compare the effectiveness of recession and myectomy.

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Conflicts of interest

The author has no any conflicts of interest to declare.

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