World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-38, September 2024
ISSN: 2749-3644

INDICATIONS AND TIMING OF SURGICAL TREATMENT OF VERTICAL STRABISMUS CAUSED BY HYPERFUNCTION OF THE INFERIOR OBLIQUE MUSCLE

Abdullaeva Dilorom Rustamovna
Samarkand State Medical University
Oblokulova Jasmina Muminjonovna
Samarkand State Medical University

Article history:

Received: April 26th 2024
Accepted: May 24th 2024

Abstract:

Strabismus is not only a severe functional disease with the presence of gross cosmetic defects, but also, as a consequence, affects the patient's psyche. Physical appearance is an important aspect of the socialization process. Another study found subnormal quality of life in parents of children with strabismus. There are reports that eliminating strabismus as a cosmetic flaw significantly improves patients' self-esteem and socialization. Another study has shown that the removal of strabismus improves health-related quality of life in both children and their parents.

Keywords: Surgical treatments, vertical strabismus, hyperfunction of the inferior oblique muscle

INTRODUCTION. The presence of forced head position leads to the development of facial asymmetry. Facial asymmetry can probably be eliminated or even prevented by early treatment of the underlying condition. Another reason for the need for early and complete treatment of strabismus is that secondary scoliosis and neck muscle contracture may develop as a result of abnormal head posture. In such cases, torticollis may persist even after the strabismus has been completely resolved. In addition to cosmetic problems, vertical strabismus due to hyperfunction of the inferior oblique muscle is accompanied by serious functional deficiencies, visual impairment. Conservative and surgical methods are used to treat strabismus, which ensure the formation of optimal conditions for the development of normal binocular vision. The possibilities of conservative treatment of vertical strabismus are very limited due to small physiologic vertical and cyclofusion reserves[1].

Vertical strabismus with hyperfunction of the inferior oblique muscle is characterized by changes in the angle of deviation with changes in gaze position, which makes the use of prismatic correction ineffective, since prisms compensate only for a certain fixed angle of deviation of the eye. Hypertropia in the adduction of the eye, limiting the use of prismatic correction, weakness of vertical fusion make conservative methods of treatment ineffective, and the presence of forced head position, vertical and torsional diplopia is an indication for early surgical correction of hyperfunction of the inferior oblique muscle[2].

Development and improvement of methods of surgical treatment of vertical strabismus caused by hyperfunction of the inferior oblique muscle

Surgical treatment of hyperfunction of the inferior oblique muscle is based on weakening or changing the function of the muscle. Currently, there are many techniques to weaken the inferior oblique muscle.

The very first surgical method of treatment of vertical strabismus with hyperfunction of the inferior oblique muscle can be considered the tenectomy of the inferior oblique muscle at its origin, proposed by b. landolt back in 1885. landolt as early as 1885. However, this method of treatment was popularized thanks to the works of A. Duane in 1906. The tenectomy procedure was performed through the skin of the lower eyelid and, according to various authors, was unsafe and had unpredictable results. The operation of complete myotomy of the inferior oblique muscle, proposed by J. Dunnington (1923), as well as complete tenotomy of the inferior oblique muscle at the place of its attachment to the sclera[3].

The main indication for these interventions was the presence of torticollis. The tenotomy and complete myotomy were replaced by myoectomy at the beginning of the last century. It consisted in excision of a part of this muscle along the inferior oblique muscle 4-8 mm between its beginning and the nasal border of the inferior rectus muscle (IRM). According to various authors, this procedure effectively eliminated hyperdeviation in adduction, as well as significantly reduced hypertropia in the primary gaze position, was quick, technically easy to perform, and remained the operation of choice for a long time to attenuate the action . Currently, the lateral myoectomy technique is used, in which a section of the inferior oblique muscle is excised from its attachment to the sclera to the lateral edge of the LMP. This modification of myoectomy allows to eliminate the expressed hyperfunction of the inferior

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-38, September 2024
ISSN: 2749-3644

oblique muscle, but does not allow to perform additional interventions on the inferior oblique muscle. In addition, the described methods of muscle weakening may be accompanied by a number of serious complications and undesirable phenomena: postoperative hypofunction of the inferior oblique muscle, the development of the "sticking" syndrome, in which the severed inferior oblique muscle is attached to the fatty tissue or tenon capsule, as a result of which the eye in the primary position is deviated downward, there is a limitation of elevation and especially deviation of the operated eye[4].

In 1990, I.I. Kalachev and co-authors proposed a method of partial lateral myoectomy of the inferior oblique muscle, which, in the authors' opinion, is devoid of these disadvantages. During the operation the external half of the inferior oblique muscle is dissected between the external edge of the NPM and the lower edge of the external rectus muscle with preservation of the neurovascular bundle located in the medial part of the thickening of the inferior oblique muscle accordingly to the zone of its intersection with the NPM. It is reported that the positive effect of the method consists in preserving the neurovascular bundle of the inferior oblique muscle and thus preventing the possibility of developing internal ophthalmoplegia and paralysis of the inferior oblique muscle. In addition, preservation of anatomical connection of the sheaths of the inferior oblique muscle and NPM provides preservation of sufficient function of the inferior oblique muscle. This provides an increase in the effectiveness of surgical treatment of hyperfunction of the inferior oblique muscle [5].

In 1943, J. White described dosed recession of the inferior oblique muscle.Until now, this operation is the most frequently used in the practice of Russian and foreign strabismus surgeons, being considered the most physiologic intervention.The basic principle of the operation is to transfer the place of muscle attachment to the sclera without changing the plane of its action, but not further than the equator line. The recession of the muscle is carried out within 6-12 mm depending on the magnitude of hypertropia and the degree of hyperfunction of the inferior oblique muscle.

In our country, recession of the inferior oblique muscle is widely used in case of its secondary hyperfunction; the dosing of the operation is performed according to the scheme proposed in 1990 by A. Alazme, E.S. Avetisov, and T.P. Kashchenko. The authors in their numerous works showed high efficiency of using this operation.

Along with high efficiency, the operation of inferior oblique muscle recession has significant disadvantages, such as high traumatism, difficulty of technical performance, the need to manipulate in a difficultly accessible area of the eye near the optic nerve, large vessels, long duration of the operation. During the operation there is a threat of perforation of the sclera in close proximity to the macula during the muscle piercing. To reduce the risk of this complication, Y.N. Antipova and E.I. Volik (2002) suggested cutting the inferior oblique muscle from its anatomical place of attachment to the sclera without preliminary stitching. In case of 12 mm recession, the new place of muscle attachment is only 1 mm away from the lateral border of the LMP, so a greater degree of recession of the inferior oblique muscle is impossible, which significantly reduces the functional results of treatment, making this method ineffective for correction of large angles of vertical deviation[6].

In 1950. H. Brown suggested weakening the action of the inferior oblique muscle by its marginal myotomy. The disadvantage of this method is the unreliability of the effect achieved by the operation, which is associated with regeneration of the excised section of the muscle and restoration of its excessive function. To date, there are a number of modifications of this operation. When treating patients with mild hyperfunction of the inferior oblique muscle, double marginal myotomy is used.

There are reports on the combined use of this operation with recession or myoectomy for the treatment of asymmetric bilateral secondary hyperfunction of the inferior oblique muscle, which allowed the authors to reduce or eliminate hypertropia in the primary gaze position.

The authors developed techniques of triple marginal myotomy of the inferior oblique muscle in the treatment of its hyperfunction from +1 to +4 degree. During the operation, the authors proposed to make marginal incisions using an electric knife. The width of the incision was 2/3 of the muscle width, two incisions were made from the anterior edge of the muscle, and the third was made from the posterior edge in the gap between the first two[7].

In 2013. I.L. Plisov et al. proposed a method of dosing the operation of marginal myotomy. In this case, marginal Z- or W-shaped incisions perpendicular to its axis are performed on the inferior oblique muscle, at 1/2-2/3 of the muscle width, using an electrocoagulator or scissors, after preliminary electrocoagulation of vessels along the lines of the planned incisions, the width of which depends on the magnitude of hypertropia of the eye at its adduction, with the distance between the incisions equal to 2-5 mm.

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-38, September 2024
ISSN: 2749-3644

According to the methodology, at the value of hypertropia up to 7°, a Z-shaped marginal myotomy of the inferior oblique muscle at 1/2 of the muscle width is performed; at the value of hypertropia 8-12°, a Z-shaped marginal myotomy of the inferior oblique muscle at 2/3 of the muscle width is performed; at a hypertropy value of 13-15° perform W-shaped marginal myotomy of the inferior oblique muscle at 1/2 of its width; at a hypertropy value of 16-20° perform w-shaped marginal myotomy of the inferior oblique muscle at ⅔ of its width[1].

V.P. Fokin and V.M. Gorbenko in 2013 to perform Z-shaped myotomy of the inferior oblique muscle at its secondary hypertrophy proposed to use radio wave technology - a non-contact method of incision and coagulation of soft tissues using high frequency radio waves (3.8-4.0 MHz). The incision effect is achieved due to the heat generated by the resistance of tissues due to the penetration of directed high-frequency waves into them.The authors proposed to dose the width of the incision according to the scheme, depending on the degree of the upper oblique muscle defect. At the 1st degree of the upper oblique muscle insufficiency the marginal incisions of the inferior oblique muscle were performed at 1/2 of its width, at the 2nd degree - at 2/3, and at the 3rd degree - at 3/4 of the muscle width.

Anterior transposition of the inferior oblique muscle. The first studies on the effects of weakening the inferior oblique muscle by transposing it were published in 1940. However, the term "transposition" was widely used at that time to refer to traditional recession techniques for large degrees of hyperfunction of the inferior oblique muscle[3].

In 1981, R. Elliot and S. Nankin proposed a radically different approach to eliminate large degrees of bilateral hyperfunction of the inferior oblique muscle - anterior transposition (anteriorization). The principle of the operation is reduced to the fact that the natural place of muscle attachment to the sclera is transferred from the posterior pole of the eye to the anterior segment. Thus, the plane of action of the operated muscle is changed, and the inferior oblique muscle itself takes the form of the English letter J. The axis of muscle rotation in this case is the Lockwood's ligament and the neurofibrovascular bundle .

It has been established that the weakening effect observed after anterior transposition of the inferior oblique muscle is the result of the transformation of the muscle from an elevator to a descender, which allows to correct ocular hypertropia to a greater extent compared to other methods of surgical treatment. At present, there is an unambiguous explanation of the mechanism of this transformation. It is known that fixation of the inferior oblique muscle with the LMP is realized by means of the neurofibrovascular bundle, which is a dense fibrous structure formed by the connection of fascial sheaths. The neurofibrovascular bundle 14 mm posterior to the place of attachment of the NPM to the sclera connects the middle of the distance between the beginning of the inferior oblique muscle and 2 mm temporal to the place of its fixation to the NPM. After anterior transposition of the inferior oblique muscle, the neurofibrovascular bundle will automatically act as a new place of muscle force application, and the muscle contraction will lead to the eyeball lowering[5].

The disadvantage of the proposed method of transposition is the impossibility of dosing the desired result at different types and degrees of manifestation of hyperfunction of the inferior oblique muscle. It can lead to hypercorrection of the planned result of the operation, in which there is excessive strengthening of the action of the inferior oblique muscle in the function of the lowerer, which entails the occurrence of hypotropia of the eyeball. This will require additional surgical intervention to correct the consequences of the surgery.

K. Wright and P. Spiegel (1999, 2003) proposed their surgical strategy to weaken the inferior oblique muscle. However, the authors used anterior transposition surgery with J-deformation only in cases of +4 degree hyperfunction of the inferior oblique muscle, and dosed recession was still performed for lower degrees.

In 2006, V.M. Gorbenko proposed a method of partial transposition of the inferior oblique muscle depending on the amount of deviation. According to the proposed method, a part of the inferior oblique muscle from the attachment site to the lateral part of the LMP is delaminated and isolated. At an angle of deviation up to 15° upwards at adduction, the width of the isolated part of the inferior oblique muscle is 1/3 of the total width of the muscle; at an angle of deviation from 15° to 25° - 1/2 of the total width of the muscle and at an angle of deviation from 25° to 35° - 2/3 of the total width of the muscle. When the deviation angle exceeds 35°, the whole width of the inferior oblique muscle is isolated[6]. The isolated part of the muscle is stitched at the place of attachment and cut off, then it is moved to the place of NPM attachment and sutured. However, this method is very labor-intensive and is not without the possibility of developing severe complications typical for operations on the inferior oblique muscle. Some authors do not recommend anterior transposition in monolateral hyperfunction of the inferior oblique muscle, considering that after such an operation there is a possibility of development of limitation of elevation in

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-38, September 2024
ISSN: 2749-3644

the abduction and, as a result, the occurrence of hyperfunction of the inferior oblique muscle of the opposite eye. In 2001, a new method of weakening the function of the inferior oblique muscle was described - anterior nasal transposition. In this case, the attachment site of the inferior oblique muscle is moved to the area 2 mm nasal to the nasal border of the LMP and 2 mm posterior to the LMP attachment site.The inferior oblique muscle is thus transformed from an extorter to an intorter and from an elevator to a tonic depressor[7].

Anterior nasal transposition of the inferior oblique muscle can be used to eliminate or reduce severe excyclotorsion. In addition, this procedure appears to be particularly effective in patients with severe or recurrent congenital and acquired paralysis of the superior oblique muscle, especially as a secondary procedure to weaken the inferior oblique muscle. However, the described technique is capable of inducing the development of exotropia in the primary gaze position and may not be the method of choice in the surgical treatment of hyperfunction of the inferior oblique muscle. The mechanism of inferior oblique muscle function after anterior transposition surgery can be explained in terms of the geometry of its new location and attachment. This, in turn, means that further studies of muscle response after transposition surgery of the inferior oblique muscle are needed. Complications and adverse events of surgical treatment of vertical strabismus with hyperfunction of the inferior oblique muscle[6]. Some serious adverse events may develop as a result of surgical weakening of the inferior oblique muscle. The most common ones include recurrence of hyperfunction of the inferior oblique muscle, which requires mandatory secondary surgical relaxation.

When transposition of the inferior oblique muscle is performed, due to the lack of dosing techniques, the authors most often note the development of hypercorrection of hypertropia of the operated eye, while recession or any other techniques of weakening the inferior oblique muscle give, on the contrary, insufficient corrective deviation effect.

It is believed that the hyperfunction of the inferior oblique muscle that persists immediately after surgery may be due to fibers missed at the time of muscle isolation at the site of its attachment to the sclera. Most often, this occurs because the muscle attachment site is too wide. The literature describes cases of attachment of the inferior oblique muscle in the form of two or even three separate muscle bundles. Insufficient attention of surgeons to such an anatomical anomaly leads to ineffective surgery.The complexity of the topography of the inferior oblique muscle and the risk of damage to the vorticose vein during recession or transposition at the moment of stitching the muscle explains the frequency of such a complication as profuse bleeding[7].

There are reports of the development of serious retrobulbar hemorrhages threatening visual function.

When performing manipulations in a hard-to-reach area - the posterior pole of the eye - at the moment of muscle release, there is a threat of damage to the tenon capsule, which inevitably leads to the release of orbital fatty tissue, its invasion into the operation zone, its attachment to the tissues surrounding the muscle and, as a consequence, the development of restriction of eye mobility.

Recurrence of hypertropia is often observed after successful transposition of the inferior oblique muscle. It is explained by the fact that as a result of transposition of the inferior oblique muscle the posterior temporal muscle fibers are stretched from the location of the neurofibrovascular bundle to the new place of attachment to the sclera. As a result, chronic tension develops on these fibers and after resorption of the suture material, this can lead to "retraction" of the temporal segments from the site of the new attachment to the sclera to the posterior pole of the eye and weaken the effect of surgery[3]. There is also an opinion that the slippage of this muscle is possible in case of crushing of its fibers by a clamp applied when cutting off the muscle from the natural place of attachment. A formidable complication of inferior oblique transposition surgery is the development of the syndrome of anti-lifting of the eye, in which there is a restriction of lifting of the operated eye in withdrawal and hyperlifting of the contralateral eye in reduction. Many researchers associate the development of this syndrome primarily with overstretching of the distal part of the muscle from the neurofibrovascular bundle at the moment of transferring its attachment site to the anterior segment of the eye. In addition, overstretching of the neurofibrovascular bundle leads to partial paresis of the fibers of the oculomotor nerve, which is manifested clinically by transient (temporary) pupil dilation in the postoperative period[2].

CONCLUSIONS: Thus, despite the numerous reports on operations on the inferior oblique muscle , none of them is the method of choice for surgical correction of its hyperfunction. Adaptation of cyclodeviation assessment system using modern diagnostic programs, mathematical modeling taking into account the mechanism of the inferior oblique muscle functioning before and after its anterior transposition surgery,

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-38, September 2024
ISSN: 2749-3644

subsequent development of a new technique of its degree dosing, which would not be inferior in efficiency to the existing techniques and at the same time would be accompanied by less damaging effect on the eye structures and better functional results, are the actual direction.

LIST OF LITERATURE

1. Avetisov E.S., Kashchenko T.P., Smolyaninova I.L., Mats K.A., Lokhtina N.I. Clinical features and tactics of treatment of patients with vertical strabismus // Ophthalmologic Journal, 1990, No. 4, pp. 193-197.
2. Zhukova O.V., Markova T.A., Zolotarev A.V. To the question of dosing the effect of the operation at surgical treatment of convergent strabismus in children // Proceedings of the All-Russian conference devoted to the 105th anniversary of T.I. Eroshevsky. Samara, 2007, pp. 644-647.
3. Zhukova O.V. To the question about the choice of surgical intervention on the inferior oblique muscle at elimination of its hyperfunction in children // Collection of theses of VII All-Russian conference with international participation "Fedorovskie readings 2008". Moscow, 2008, pp. 314-315.
4. Zubarev, S.F. Diagnostics and surgical treatment of congenital congenital congruent convergent strabismus with vertical component (in Russian) // Ophthalmologic Journal, 1990, No. 4, pp. 209-212.
5. Popova N.A., Svirina A.S., Mavloni R.A., Keikina L.K. Anterior transposition of the inferior oblique muscle // Proceedings of the All-Russian Conference "Gerontological Aspects of Ophthalmology" and VI International Seminar on the Elderly, dedicated to the 100th anniversary of T.I. Eroshevsky. Samara, 2002, pp. 502-502.
6. Serdyuchenko V.I. Clinic and treatment of dissociated vertical strabismus //Ophthalmologic Journal, 1990, No. 4, pp. 216-221.
7. Good W.V., Hoyt C.S. Strabismus management. 1995, p. 139-153.