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Case report

Resection and anterior transposition of the inferior oblique muscle for treatment of inferior rectus muscle hypoplasia with esotropia

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ABSTRACT

Purpose: To report a case of inferior rectus muscle hypoplasia with esotropia, which was treated successfully by resection and anterior transposition of the inferior oblique muscle.
Observations: A 1-year-old boy presented with esotropia. He had esotropia of 15–30° and intermittent left hypertropia. At the age of 3 years, the alternate prism cover test showed esotropia of 35Δ and left hypertropia of 25Δ. Magnetic resonance imaging of the orbit revealed left inferior rectus muscle dysgenesis. Strabismus surgery was performed and a hypoplastic left inferior rectus muscle was identified. We performed bilateral medial rectus muscle recession, and resection and anterior transposition of the left inferior oblique muscle. Nine months after the surgery, the patient had esotropia of 8Δ and left hypertropia of 6Δ.
Conclusions and importance: Resection and anterior transposition of the inferior oblique muscle is useful for hypoplasia of the inferior rectus muscle accompanied by horizontal strabismus.

1. Introduction

Inferior rectus muscle aplasia or hypoplasia is a rare cause of strabismus, and commonly requires surgical intervention. Although previously reported cases have been described mainly using the superior rectus muscle-weakening procedure, or the medial and lateral rectus muscle transposition technique with or without detachment of these muscles from the sclera, the best surgical procedure for this anomaly when it is combined with horizontal strabismus has not been discussed in detail. We report a case of inferior rectus muscle hypoplasia with esotropia, which was treated successfully by surgery without using a horizontal rectus muscle transposition technique.

2. Case report

A 1-year-old boy presented with esotropia, which had been noticed since 6 months of age. His medical history was unremarkable. He had 30° of esotropia with intermittent left hypertropia. Ocular motility examination showed under-elevation in adduction of the right eye. Precise measurements inside gaze could not be obtained due to poor cooperation. The external examination was notable for a slight right head tilt. Cycloplegic refraction was +5.00 D in both eyes. Slit lamp examination and funduscopy did not detect any abnormalities. He was prescribed glasses for hyperopia, but he had residual esotropia and left hypertropia. At the age of 3 years, the best-corrected visual acuity was 0.6 (+4.75 + 0.75 × 180) in the right eye and 0.4 (+5.00) in the left eye. Ocular motility testing showed under-elevation in adduction of the right eye (Fig. 1). The alternate prism cover test showed esotropia of 35Δ and a left hypertropia of 25Δ at distant fixation. Fundus photographs revealed bilateral incyclotorsion much worse in the left eye. Magnetic resonance imaging (MRI) of the orbit revealed left inferior rectus muscle dysgenesis (Fig. 2).

Strabismus surgery was performed to correct the left hypertropia and esotropia. An intraoperative forced duction test showed tight medial rectus muscles in both eyes. Traction sutures were placed at the inferior and inferotemporal limbus. A limbal conjunctiva incision from the 4 to 7 o'clock position was created to obtain the best visualization of the inferior rectus muscle. With a careful inspection of the inferior quadrant of the sclera, a hypoplastic left inferior rectus muscle was found at a distance of 8.5 mm

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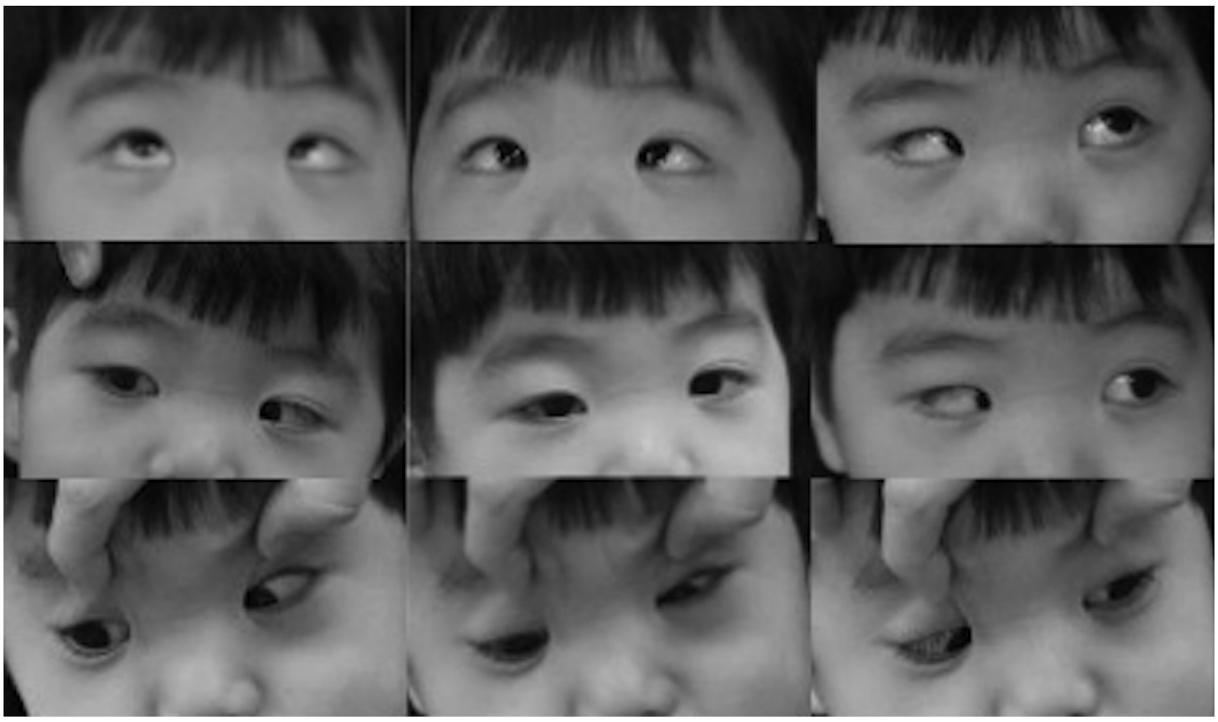

Fig. 1. Preoperative ocular motility photographs in nine positions of gaze, showing underaction of the right inferior oblique muscle.

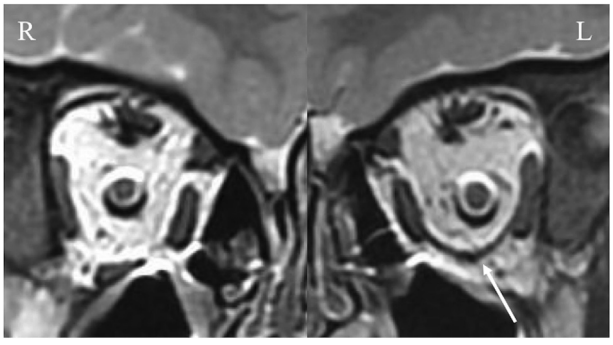

Fig. 2. T2-weighted coronal magnetic resonance images of the right (R) and the left (L) eye, showing abnormality of the left inferior rectus muscle (arrow).

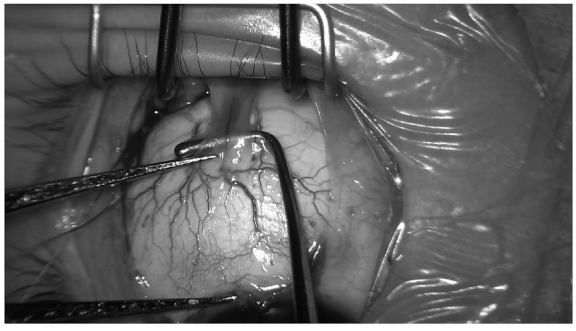

Fig. 3. Intraoperative photograph showing hypoplastic left inferior rectus muscle.

from the limbus (Fig. 3). The lateral rectus muscle was identified at the normal location. Then, the eye was rotated in the superonasal direction. The left inferior oblique muscle was encountered underneath the lateral rectus muscle insertion. When the inferior oblique muscle was identified, it was secured with two small muscle hooks and its distal end was isolated. A double-armed 6-0 polyglactin 910 suture was placed at its distal end and the inferior oblique muscle was detached from the sclera. The suture was fixed at a point 2.5 mm anterior to the inferior rectus muscle insertion, which was located at a distance of 6.0 mm from the limbus. A 5-mm bilateral medial rectus muscle recession was performed in the usual manner from a new limbal incision on the nasal site. After these procedures, the eye position was checked under general anesthesia using the spring back test, and we found that the left eye was still hypertropic. The suture on the inferior oblique muscle was released from the sclera and a new double-armed suture was placed on the left inferior oblique muscle approximately 4 mm behind the previous suture. The new suture was fixed at the same location of the sclera in a bow-tie fashion. The eye position exhibited a small amount of left hypertropia in the spring back test, which was deemed acceptable. Finally, the excess left inferior oblique muscle was resected and the suture was tied firmly.

Nine months after the surgery, the patient had esotropia of 8Δ and left hypertropia of 6Δ in the primary position. A slight right head tilt persisted. Bilateral incyclotorsion in the fundus photograph remained unchanged (Fig. 4). Versions and ductions showed only a small limitation in infraduction during abduction of the left eye (Fig. 5). The patient is currently under observation.

3. Discussion

Initially, the patient in this case showed under-elevation in adduction of the right eye because he preferred to fixate with his left eye. Moreover, he showed a right head tilt on the side opposite the hypoplastic inferior rectus muscle. MRI was indispensable for the diagnosis of this case, and allowed effective surgical planning. Kim et al. also reported a case of a patient who presented with monocular elevation deficiency and was finally found to have contralateral inferior rectus agenesis after MRI.[1] Thus, if a patient

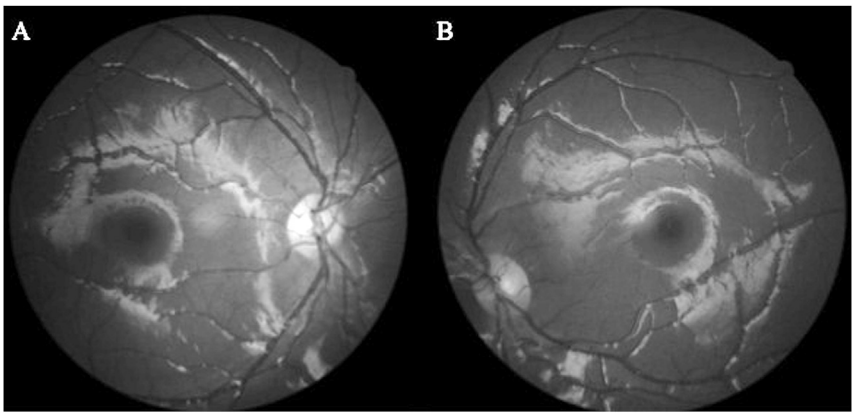

Fig. 4. Postoperative fundus photographs of the right (A) and the left (B) eye, revealing unchanged incyclotorsion.

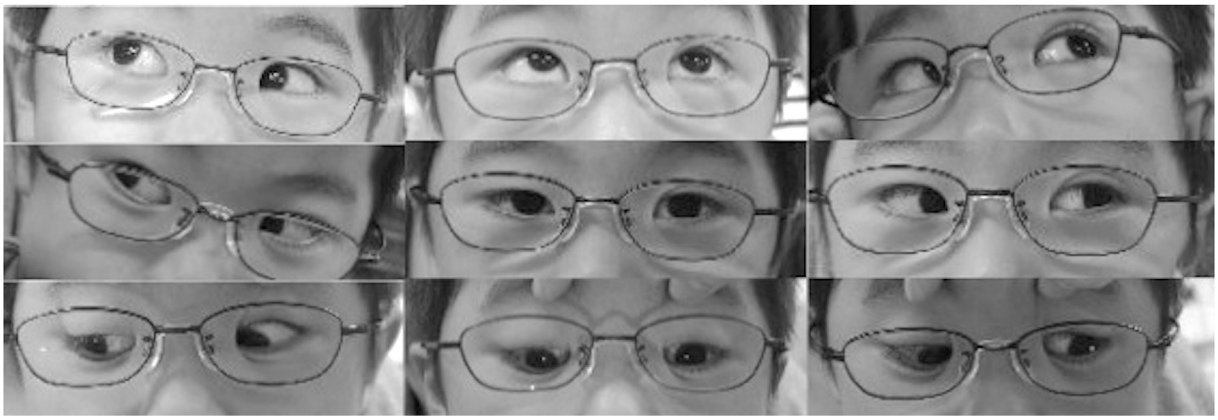

Fig. 5. Nine-month postoperative ocular motility photographs in nine positions of gaze.

responds atypically in the extraocular motility examination, an imaging study should be considered for making a diagnosis.

Cooper et al.[2] reported various surgical procedures for treating inferior rectus agenesis/hypoplasia, which included a combination of superior rectus muscle-weakening (recession or tenotomy), combined with inferior oblique muscle-weakening, or medial and lateral rectus tendon-splitting techniques, as described by Hummelsheim. Further, it was Cooper et al.[2] who performed the first successful full-muscle transposition surgery in the congenital absence of a unilateral inferior rectus muscle. Thereafter, some authors[3–5] reported cases in which surgical treatment using full-muscle transposition was performed successfully. In order to reduce the risk of anterior segment ischemia, Paysse[6] reported a modified Jensen procedure in two cases with ruptured inferior rectus muscles and Kowal L[7] described a modified inverse-Knapp procedure in three cases of snapped inferior rectus. These procedures are useful for correcting the vertical deviation caused by an absent inferior rectus, but they would not have corrected the coexisting horizontal deviation in our case.

In cases of an abnormal inferior rectus muscle accompanied by horizontal strabismus, the optimal surgical procedure has not been determined to date. There have been reports of a combination of a superior rectus weakening procedure and horizontal muscle recess–resect surgery,[8,9] the combination of muscle transposition and recess–resect surgery on the affected eye side,[4,10] and horizontal muscle surgery with a fellow eye.[10] The risk of anterior segment ischemia is a concern in multiple muscle surgery and attenuation of horizontal correction was reported in combination with muscle transposition and recess–resect surgery in the affected eye.[10]

Olitsky and Notaro,[11] and some later authors[12,13] have reported the application of anterior transposition and resection of the inferior oblique muscle for the treatment of a lost inferior rectus muscle. Parvataneni and Olitsky[13] described cases of concomitant vertical and horizontal strabismus that were treated using this procedure. There has been only one report of the application of this procedure for congenital dysgenesis of inferior rectus muscle, which was described by Gamio et al.,[14] but these 3 cases did not require horizontal muscle recess–resect surgery. We emphasize that this procedure is particularly useful when this anomaly is concomitant with horizontal strabismus, because it may decrease the risk of anterior segment ischemia by sparing vertical rectus muscle surgery. Furthermore, superior rectus muscle recession can be added as a quantitative surgery if residual hypertropia or incyclotorsional strabismus is present.

4. Conclusions

The resection and anterior transposition of the inferior oblique muscle is useful for treating patients with congenital dysgenesis and/or absent inferior rectus muscle combined with horizontal strabismus.

Patient consent

The patient's legal guardian consented orally to publication of the case.

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Authorship

All authors attest that they meet the current ICMJE Criteria for Authorship.

Conflicts of interest

The following authors have no financial disclosures: NN HI YK MS AY.

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References

1. Kim JM, Kim JH, Hwang JM. Inferior rectus aplasia simulating contralateral monocular elevation deficiency. *J Pediatr Ophthalmol Strabismus*. 2010;47:e1–3.
2. Cooper EL, Greenspan JA. Congenital absence of the inferior rectus muscle. *Arch Ophthalmol*. 1971;86:451–454.
3. Astle WF, Hill VE, Ells AL, Chi NT, Martinovic E. Congenital absence of the inferior rectus muscle—diagnosis and management. *J AAPOS*. 2003;7:339–344.
4. Guha S, Hurakadli PM, Shah SV, Shah K. Surgical treatment of familial absence of the inferior rectus muscle. *J AAPOS*. 2015;19:289–292.
5. Taylor RH, Kraft SP. Aplasia of the inferior rectus muscle. A case report and review of the literature. *Ophthalmology*. 1997;104:415–418.
6. Paysee E, Saunders RA, Coats DK. Surgical management or strabismus after rupture of the inferior rectus muscle. *J AAPOS*. 2000;4:164–167.
7. Kowal L, Wutthiphan S, McKelvie P. The snapped inferior rectus. *Aust N Z J Ophthalmol*. 1998;26:29–35.
8. Pimenides D, Young S, Minty I, Spratt J, Tiffin PA. Familial aplasia of the inferior rectus muscles. *J Pediatr Ophthalmol Strabismus*. 2005;42:222–227.
9. Bhate M, Martin FJ. Unilateral inferior rectus hypoplasia in a child with Axenfeld-Rieger syndrome. *J AAPOS*. 2012;16:304–306.
10. Matsuo T, Watanabe T, Furuse T, Hasebe S, Ohtsuki H. Case report and literature review of inferior rectus muscle aplasia in 16 Japanese patients. *Strabismus*. 2009;17:66–74.
11. Olitsky SE, Notaro S. Anterior transposition of the inferior oblique for the treatment of a lost inferior rectus muscle. *J Pediatr Ophthalmol Strabismus*. 2000;37:50–51.
12. Aguirre-Aquino BI, Riemann CD, Lewis H, Traboulsi EI. Anterior transposition of the inferior oblique muscle as the initial treatment of a snapped inferior rectus muscle. *J AAPOS*. 2001;5:52–54.
13. Parvataneni M, Olitsky SE. Unilateral anterior transposition and resection of the inferior oblique muscle for the treatment of hypertropia. *J Pediatr Ophthalmol Strabismus*. 2005;42:163–165.
14. Gamio S, Tartara A, Zelter M. Recession and anterior transposition of the inferior oblique muscle [RATIO] to treat three cases of absent inferior rectus muscle. *Binocul Vis Strabismus Q*. 2002;17:287–295.