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Case Report Open Access

Inferior Oblique Anterior Transposition in the Treatment of Upshoot in Duane Syndrome

Chunhua Sun and Ze Wang[2*]

[1]*Tianjin Eye Hospital, Clinical College of Ophthalmology, Tianjin Medical University, Tianjin Key Lab of Ophthalmology and Visual Science, Tianjin Eye Institute, Tianjin 300020, P. R. China*

[2]*Department of Strabismus and Pediatric Ophthalmology, Nanjing South East Eye Hospital, Nanjing 210007, P. R. China*

***Corresponding author:** Ze Wang, Department of Strabismus and Pediatric Ophthalmology, Nanjing South East Eye Hospital, Nanjing 210007, P. R. China, Tel: +8613905173656; E-mail: wangzedoctor@sina.com

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Abstract

Purpose: We report the procedure of inferior oblique anterior transposition (IOAT) in the treatment of upshoot in patients with Duane retraction syndrome (DRS).

Methods: Two patients with DRS underwent surgery for severe up-shoot. For both patients, the inferior oblique (IO) was transposed to the temporal border of IO insertion. Approximately 64 months of periodic follow-ups for Case 1 and 7 months of periodic follow-ups for Case 2 were conducted.

Results: After surgery, both patients showed a marked decrease in upshoot without noticeable anti-elevation syndrome.

Conclusions: IOAT is an effective procedure in the treatment of significant upshoot in DRS.

Introduction

The classical Duane retraction syndrome (DRS) is characterized by limitation of abduction, defective adduction, narrowing of the palpebral fissure and retraction on adduction, widening of the palpebral fissure on attempted abduction, and sometimes retraction accompanied by upshoot or downshoot. Symptoms indicating the need for surgery to treat DRS include significant deviation in the primary position, unacceptable abnormal head position, significant globe retraction, noticeable narrowing of the palpebral fissure, and significant upshoot or downshoot [1-5]. In the present study, we report two cases with upshoot, but no significant deviation was observed in the primary position or the abnormal head posture. We employed the procedure called inferior oblique anterior transposition (IOAT) to treat the upshoot in DRS.

Case 1

The parents of a19-year-old male patient noted that, since his birth, his left eye ran upward when looking to the right. He had no other health problems.

The visual acuity for both his eyes was 20/20. Anterior segments and fundi were normal. Both eyes were basic orthotropic in the primary position. The limitation of left eye abduction was−3 grade, whereas the limitation of adduction was −2 grade. The left eye upshot with adduction and fell behind on right downgaze.

The palpebral fissure and eyeball retraction narrowed on adduction. The palpebral fissure widened on attempted abduction in the left eye. The diagnosis was DRS with upshoot in the left eye (Figures 1 and 2).

The IOAT operation was performed on December 25, 1991. A conjunctival incision was made 8 mm away from the limbus in the inferotemporal region. Inferior oblique (IO) was identified and isolated to the insertion under direct visualization. The tendon was totally clipped with an artery clip, and a 6-0 polyglactin suture was passed through the front border of the muscle temporal to the clip. IO was cut from its attachment point. Then, the anterior border of the cut IO was reattached to the temporal insertion of the inferior rectus. Then, the posterior border was fixed 3mm lateral to its anterior border.

Left	ET22 LHT		XT16 LHT20	Right
	ET25 LHT2	XT8 LHT3	XT16 LHT14	
	ET20 LHT2	REF	XT18 LHT8	

Table 1: The deviation (prism diopter, PD) for case 1 before surgery.

Left	ET25 LHT2		XT16 LHT5	Right
	ET16 LHT2	XT6	XT18 LHT2	
	ET20 LHT1	REF	XT18 LHT1	

Table 2: The deviation (prism diopter, PD) for case 1 after surgery.

When the patient sat up for inspection at the operation bed, the upshoot was noticeably improved. After 64 months of follow-up appointments, his ocular movement was stable without evident upshoot. The patient was satisfied (Tables 1 and 2).

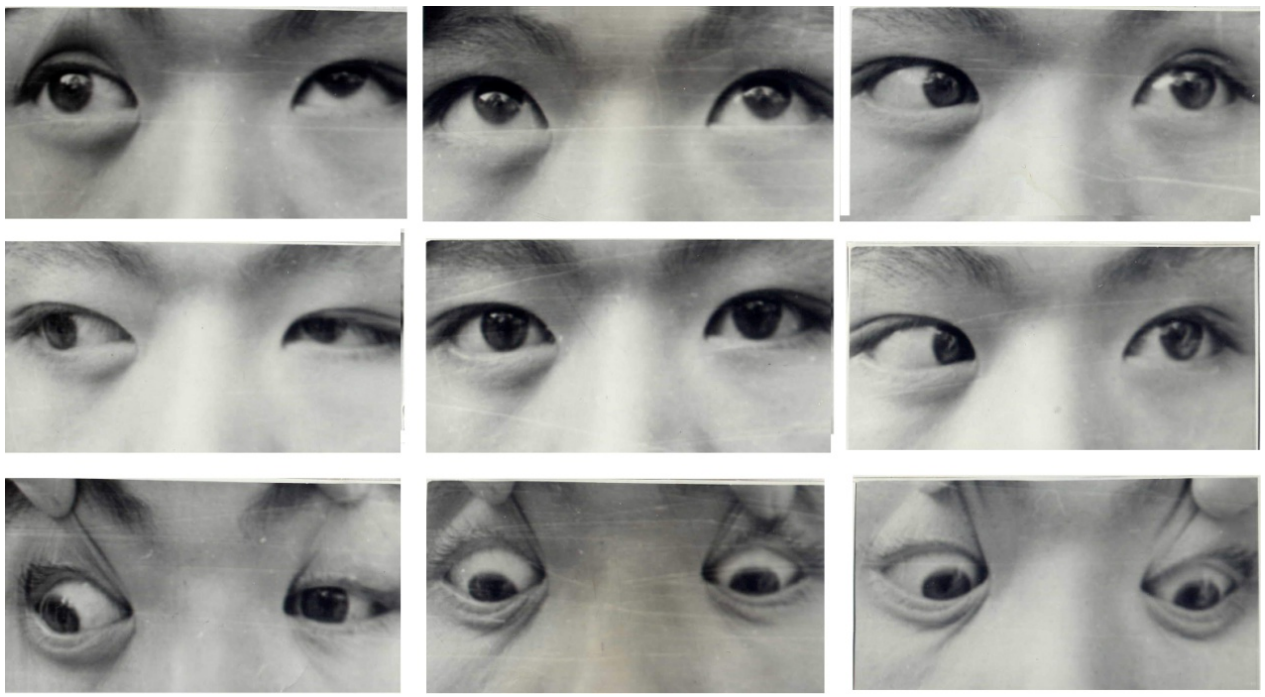

Figure 1: Eye alignments before surgery in Case 1. The left eye upshot as the eyes shifted from the primary position to the right gaze and to the right upgaze.

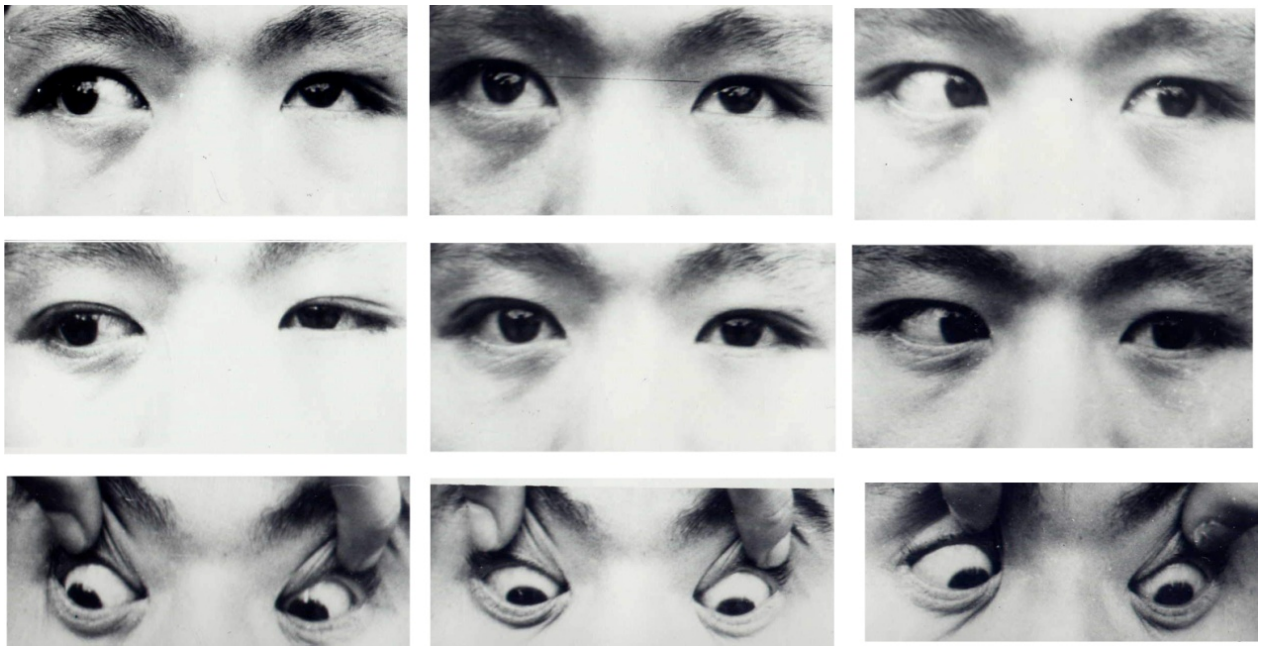

Figure 2: Eye alignments after surgery in Case 1. The upshoot on the right disappeared.

Case 2

A 23-year-old female sought treatment for an intermittent upward deviation of her left eye, which had existed since birth. She had no prior strabismus surgery. She denied any eye injury and she was otherwise in good health (Tables 3 and 4).

The best corrected vision was 20/20 in the right eye and 20/25 in the left eye. Anterior segments and fundi were normal. The left eye upshot on the right gaze and was limited on both adduction (−4 grade) and abduction (−3 grade). The palpebral fissure widened on attempted abduction but narrowed on adduction with eye retracted in the left eye. The head posture was unremarkable. She was diagnosed with DRS with upshoot in the left eye (Figure 3).

The operation was performed on July 9, 2010. IO was disinserted from its attachment point. The anterior border of the unattached IO was also reattached to the temporal insertion of the inferior rectus, and the posterior border of the muscle was fixed 3mm temporal to its anterior border, same as that in Case 1. When the procedure was finished in the operating room, the ocular movement was tested to verify that the upshoot was gone. After 7 months of follow-up appointments, upshoot was remarkably improved (Figure 4). The patient was satisfied.

Left	ET20 LHT6		XT26 LHT24	Right
	ET20 LHT6	XT10 LHT8	XT18 LHT2	
	ET20 LHT6	REF	XT26 LHT16	

Table 3: The deviation (prism diopter, PD) for case 2 before surgery.

Left	ET20 LHT2		XT20 LHT8	Right
	ET20 LHT2	XT8 LHT2	XT18 LHT2	
	ET20 LHT2	REF	XT22 LHT2	

Table 4: The deviation (prism diopter, PD) for case 2 after surgery.

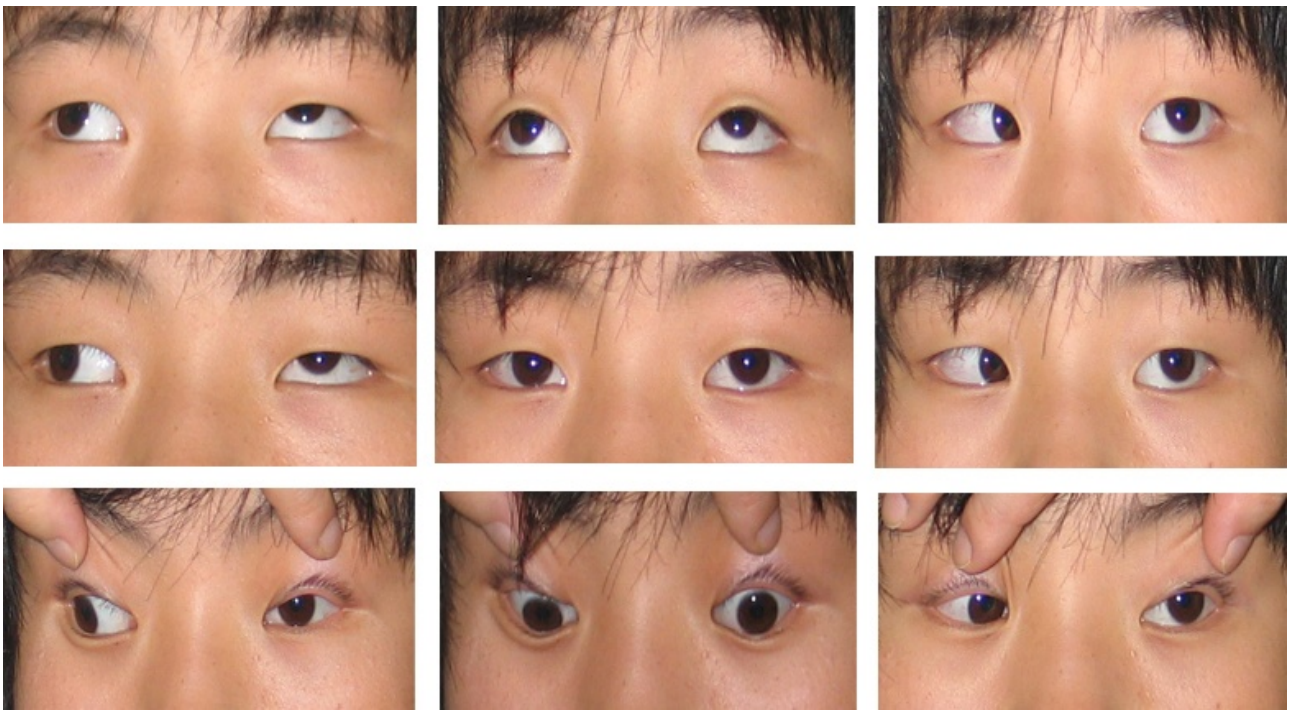

Figure 3: Eye alignments before surgery. The left eye has hypertropia in the primary position and upshoot on right gaze.

Discussion

On the basis of the clinical characteristics described by Kraft [6], upshoots and downshoots in DRS were classified as mechanical, innervational, or both. The mechanical type showed abrupt upshoot and downshoot, and minimal hypertropia in the primary position. The innervational type showed only gradual upshoot or downshoot and greater hypertropia in the primary position. Thus, both patients in this case study had innervational upshoot.

In many cases of DRS, upshoot is associated with globe retraction and narrowing of the palpebral fissure on attempted abduction. Y-splitting of the lateral rectus muscle and recession of the horizontal rectus muscles are extremely effective in the treatment of significant upshoot and primary strabismus associated with globe retraction in DRS [6,7]. However, in our cases, the patients had no significant horizontal deviation in the primary position. We planned recessing both horizontal rectus muscles and Y-splitting of the lateral rectus if

IOAT had no effect on the upshoot. However, transposition inspection during operation showed that the upshoot was markedly improved, which indicated that IO played a role in upshoot. At the same time, weakening the IO has only a slight effect on the horizontal deviation in the primary position [8], as observed in these two patients.

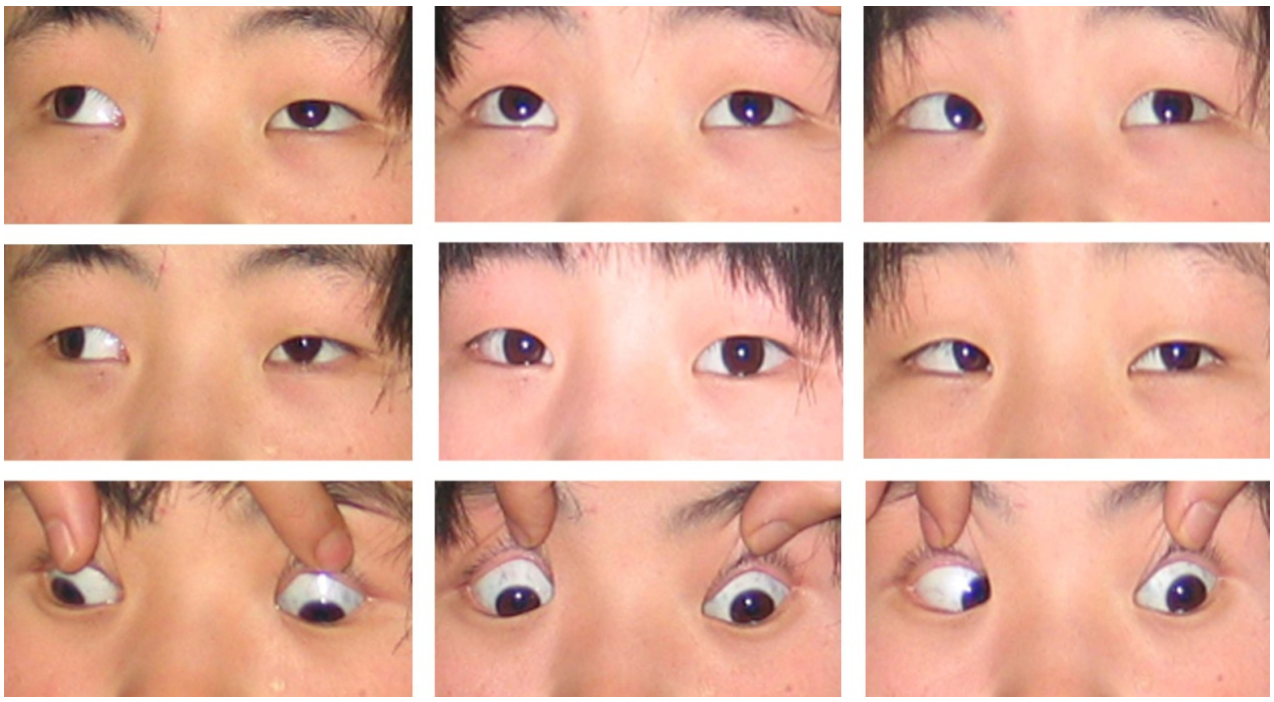

Figure 4: Eye alignments after surgery. The upshoot was noticeably improved. No significant deviation in the primary position.

Anterior and nasal transposition (ANT) [9] of IO was reported to be effective in treating upshoot in DRS. In ANT, the IO was transposed to the nasal and posterior to the nasal border of IR to avoid anti-elevation syndrome. However, for one case with downshoot, ANT made downshoot worse [9]. Anti-elevation syndrome is a recognized risk of IO anteriorization [9]. Kushner concluded that elevation during abduction might be limited if the anteriorization is more than 1 mm away from the inferior rectus insertion and if the new insertion spreads out laterally [9]. This limitation occurs less frequently if the IO muscle is reinserted close to the temporal border of the insertion of the inferior rectus [10,11]. We transposed the IO just to the temporal of the inferior rectus insertion, placing the anterior and posterior borders 3 mm apart, and did not find limitation of elevation. However, the follow up period of case 2 was only 7 months. A longer term still is needed for the evaluation. By transposing the IO temporal to the inferior rectus insertion and placing the anterior and posterior borders 3 mm apart, the depressor effect of the IO in the primary position may be reduced. However, the follow-up time of Case 2 was only 7 months. A longer term is still needed for the evaluation. As a result, after the operation, no hypotropia in the primary position nor significant deficiency in ipsilateral elevation is observed [12,13]. The IO was reattached in the same location for both patients in our report and they did not show downshoot, primary position hypotropia, or noticeable anti-elevation syndrome after surgery.

In summary, we described how IOAT can treat the DRS with upshoot in patients without evident horizontal deviation in the primary position. A larger sample with longer follow-up period can be designed in the future to observe the benefits of the procedure.

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