CASE REPORT

Long-Term Outcomes of Three Cases That Underwent a Muscle Transposition Procedure Without Tenotomy Caused by Abducens Palsy

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ABSTRACT

Few reports have discussed long-term outcomes of muscle transposition procedures. In this study, cases with abducens palsy treated with a muscle transposition procedure were followed for 12, 25, or 26 years. The preoperative alignments were esotropia of 65 degrees, 47 prism dioptres (PD), and 24 PD, respectively. Orthophoria was postoperatively achieved in all cases. The postoperative alignment in one case deteriorated at 8 years postoperatively, although orthophoria were maintained in the other two cases. These findings indicate that it is possible that esotropia can recur even though orthophoria was maintained for several years postoperatively in some cases that underwent a muscle transposition procedure.

Keywords: Abducens palsy; esotropia; long-term outcomes; muscle transposition procedure; recurrence

INTRODUCTION

Muscle transposition of the healthy superior and inferior recti is commonly performed in the case of severe abducens palsy. Many previous papers have reported that a muscle transposition procedure was effective for abducens palsy.^{1–8} However, the stability of the effectiveness long term has not been revealed because few reports have discussed follow-up for 10 years after a muscle transposition procedure for abducens palsy.^{5–7} Therefore, we report long-term outcomes (>10 years) of three cases that underwent a muscle transposition procedure due to abducens palsy.

MATERIAL AND METHODS

The Institutional Review Board of Shiga University of Medical Science approved this study, which was

conducted in accordance with the tenets of the Declaration of Helsinki. All patients provided written informed consent. A muscle transposition procedure without tenotomy, which we previously reported, was performed in two cases (Case 1 and Case 2), which were followed for 26 and 25 years, respectively (Figure 1a).¹ In this procedure, a suture was secured at the lateral margin of each split vertical rectus muscle and each sclera beside the superior or inferior margin of the lateral rectus (LR) muscle. The lateral half of each vertical rectus muscle belly was transposed and anchored to the sclera. In the other case (Case 3), which was followed for 12 years, a muscle transposition procedure without tenotomy or muscle splitting, which we also reported, was performed (Figure 1b).^{2,3} In the procedure, a suture was secured at the temporal margin of both the vertical rectus muscle and each sclera at the superotemporal or inferotemporal quadrant. Each vertical rectus muscle was transposed and anchored to the sclera.

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RESULTS

Case 1

A 48-year-old woman had bilateral abducens palsy caused by a traffic accident 2 years previously, and her preoperative alignment was 65 degrees esotropia at distance. Both eyes could not abduct to the midline (Figure 2a). She adopted a large face turn because she could not fix with the dominant eye in the straight ahead position. She underwent a muscle transposition

FIGURE 1 Diagrams showing the muscle transposition procedures. The eye that underwent surgery in each figure is the left eye. (a) A muscle transposition procedure without tenotomy. The lateral half of each split vertical rectus muscle belly was transposed and anchored to the sclera beside the superior or inferior margin of the LR without tenotomy. (b) A muscle transposition procedure without tenotomy or muscle splitting. Each vertical rectus muscle was transposed and anchored to the sclera at the superotemporal or inferotemporal quadrant. MR=medial rectus; LR=lateral rectus; SR=superior rectus; IR=inferior rectus.

procedure with a 5-mm recession of the medial rectus (MR) in both eyes. The immediate postoperative alignment was orthophoria, and both eyes became able to abduct beyond the midline (Figure 2b). However, the alignment started deteriorating gradually at 8 years postoperatively. The alignment was 16 prism dioptres (PD) esotropia at distance and 6 PD at near 15 years postoperatively (Figure 2c) and was 30 PD esotropia at distance and 4 PD at near 26 years postoperatively (Figure 2d). Both eyes could abduct beyond the midline during the follow-up period.

Case 2

A 25-year-old woman had right abducens palsy caused by a traffic accident 2 years previously, and her preoperative alignment was 47 PD esotropia at distance. Her right eye could not abduct to midline (Figure 3a). She underwent a muscle transposition procedure in her right eye. Orthophoria was postoperatively achieved, and her right eye became able to abduct to the midline (Figure 3b). Orthophoria was maintained, and her right eye could abduct to the midline for 25 years (Figure 3c and d).

Case 3

A 21-year-old woman had left abducens palsy since childhood owing to an unknown cause. She

FIGURE 2 Preoperative and postoperative photos of Case 1 with bilateral abducens palsy. (a) Preoperatively, the alignment was esotropia of 65 degrees at distance and her both eyes could not abduct. (b) Postoperatively, the alignment was orthophoria and the abduction disturbance improved after surgery. (c) At 15 years postoperatively, the alignment was esotropia of 16 PD at distance and 6 PD at near vision. Both eyes could abduct. (d) At 26 years postoperatively, the alignment was esotropia of 30 PD at distance and 4 PD at near vision. Both eyes could abduct. PD=prism dioptres.

FIGURE 3 Preoperative and postoperative photos of Case 2 with left abducens palsy. (a) Preoperatively, the alignment was esotropia of 47 PD and her right eye could not abduct. (b) Postoperatively, the alignment was orthophoria and the abducental disturbance improved after surgery. (c) At 15 years postoperatively, orthophoria was maintained and her right eye could abduct. (d) At 25 years postoperatively, orthophoria was maintained and her right eye could abduct. PD = prism dioptres.

FIGURE 4 Preoperative and postoperative photos of Case 3 with left abducens palsy. (a) Preoperatively, the alignment was esotropia of 24 PD and her left eye could not abduct. (b) Postoperatively, the alignment was orthophoria and the abducental disturbance improved after surgery. (c) At 5 years postoperatively, orthophoria was maintained and her left eye could abduct. (d) At 12 years postoperatively, orthophoria was maintained and her left eye could abduct. PD = prism dioptres.

underwent a 5-mm recession of the MR and a 5-mm resection of the LR in her left eye, and the postoperative alignment was orthophoria. However, the alignment worsened to 24 PD esotropia at distance at 30 years of age. A left abducental disturbance

remained, and her left eye could not abduct to the midline (Figure 4a). Then, she underwent a muscle transposition procedure as a second surgery in her left eye at 31 years of age. Orthophoria was postoperatively achieved, and her left eye became able to abduct

beyond the midline (Figure 4b). Orthophoria was maintained, and her left eye could abduct beyond the midline for 12 years after the second surgery (Figure 4c and d).

DISCUSSION

We described long-term outcomes of three cases that underwent a muscle transposition procedure. The reported cases were followed for 12, 25, or 26 years. The postoperative alignment in Case 1 deteriorated, whereas the postoperative alignments in the other two cases were maintained long term. A possible reason why the alignment deteriorated in Case 1 was that her abducens palsy was bilateral and the esotropia was severe. Conversely, the eyes that underwent muscle transposition procedures became able to abduct to or beyond the midline in all cases. In many other reports, the duration of the follow-up after muscle transposition procedures for abducens palsy were within several years.⁵⁻⁷ Because the long-term outcomes of the muscle transposition procedures were not reported, our report could be useful to clarify the long-term effectiveness of this surgery.

The alignment started deteriorating at 8 years postoperatively in Case 1, whereas orthophoria was maintained until then. Leiba et al. reported the long-term follow-up of muscle transposition procedures with botulinum toxin of 22 cases after a mean follow-up of 44.2 months.⁸ Although the effects of the treatment slightly deteriorated during the first year after surgery, results were subsequently maintained. In all cases of our current report, orthophoria was maintained until 8 years postoperatively. However, the postoperative alignment in one of three cases started deteriorating during longer-term follow-up. Therefore, it is possible that esotropia can recur after a long time even though orthophoria was maintained for several years postoperatively in some cases that underwent a muscle transposition procedure, although the report of a larger number of cases is needed to assess the rate exactly.

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