

# Botulinum toxin augmentation as a sequential procedure for residual esotropia in traumatic sixth nerve palsy

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Dear Editor,

We want to describe the surgical outcome of a patient with residual esotropia due to sixth nerve palsy with re-resection of the lateral rectus combined with botulinum toxin injection to previously recessed ipsilateral medial rectus. Sixth nerve palsy may be vasculopathic, traumatic, neoplastic, idiopathic and congenital in origin. In acute traumatic cases, greater abduction deficit at onset and bilaterality may negatively contribute to recovery rate<sup>[1]</sup>. Many surgical approaches have been proposed to be effective in the treatment of chronic cases. Botulinum toxin may be used in combination to surgery in order to regain binocular single vision and to warrant good ocular alignment<sup>[2-3]</sup>. We report a case with chronic sixth nerve palsy which was successfully treated with botulinum toxin and repeated surgery.

A 45-year-old female presented with double vision after a motor vehicle accident 8y ago. On examination, visual acuity in both eyes was 6/6. The anterior and posterior segment evaluation disclosed no abnormality. She had a previous history of unilateral recession and resection surgery (left medial rectus recession of 7.5 mm and left lateral rectus resection of 9 mm) one year prior to her current presentation. She had 52 prism diopters (PD) left residual esotropia, face turn to the the left, diplopia in primary position and on the left gaze, -4 limitation in abduction on the left eye (Figure 1). Ocular movements were normal on the right eye. She had severe hypotension and bradycardia which required pacemaker application. A surgical exploration exhibited that left medial rectus insertion was at

13.5 mm from limbus and its forced duction test was strongly positive. She was submitted to ipsilateral re-resection of the lateral rectus (5 mm more) combined with 4 units of botulinum toxin A injection (Botox<sup>®</sup>, Allergan, USA) to the medial rectus under direct visualization. At first day postoperatively, the left upper eyelid was ptotic, the patient had 12 PD esotropia in primary position and -3 limitation in left abduction. Six months after the operation, marked improvement of the ocular alignment in primary position was observed (Figure 2). The patient had 12 PD left esotropia and -3 limitation in abduction on the left eye. She was still diplopic on the primary position but single vision was achieved with 10 PD prismatic spectacle correction in primary position.

The management of chronic sixth nerve palsy is challenging in terms of many contributing factors such as large angle deviation, disabling diplopia and contracture of the ipsilateral medial rectus which all complicate the treatment course individually. Various surgical procedures comprise recession-resection, augmented/unaugmented single/double vertical muscle transpositions with/without simultaneous weakening of the ipsilateral medial rectus and botulinum toxin injection to adress complete/incomplete sixth nerve palsy. Data on forced duction test and the extent of abduction deficit are among the main determinants of the type of surgery and in



**Figure 1** Preoperative nine diagnostic positions of gaze The patient has large angle left esotropia with no midline cross on attempted abduction.



**Figure 2** Postoperative nine diagnostic positions of gaze The patient has small left esotropia and mild ptosis due to botulinum toxin injection. Mild limitation in abduction and improvement of abduction can be seen on the left eye.

general, complete palsy is managed by transposition surgery whereas recession-resection is preferred in incomplete palsy<sup>[4]</sup>. These patients may still need prism, adoption of an abnormal head position, further surgery or botulinum toxin despite improvement of ocular alignment after the first intervention<sup>[5]</sup>. Initial treatment success may be as low as 10% and more than 2 surgeries may be needed<sup>[5]</sup>.

Transposition procedures may increase the risk of anterior segment ischemia, scar formation, induced vertical deviations and torsion as well as carry the risk of overcorrection<sup>[6-8]</sup>. However in the present case, a more simple procedure recession-resection combined with botulinum toxin was quite effective in relieving diplopia and in restoring ocular alignment. Intra-surgical injection of botulinum toxin helps alleviating the contraction of the medial rectus muscle in long-standing palsies which may be responsible of severe restriction in abduction in the first place. No further use of botulinum toxin was necessary in a 6-months follow-up in the present case. However, when considered the temporary effect of the botulinum toxin, there is a clear possibility of need for further intervention or at least repeated botulinum toxin injection in longterm follow-up.

Peragallo *et al*<sup>[9]</sup> suggested that outcomes of strabismus surgery in sixth nerve palsy should be emphasized in terms of motor and functional features and showed that final success rate (defined as  $\leq 10$  PD horizontal,  $\leq 2$  PD vertical deviation, no diplopia and no abnormal head position in primary position) was 59% in traumatic sixth nerve palsy. They also found that 45% of traumatic cases required more than one surgery<sup>[9]</sup>. Holmes and Leske<sup>[10]</sup> also reported that 32% of patients with chronic sixth nerve palsy due to different etiologies needed a second intervention.

In the present case, contracture of the medial rectus muscle confirmed by positive forced duction test and associated cardiovascular risk factor which implies higher risk for anterior segment ischemia, a repeated horizontal muscle surgery combined with botulinum toxin was preferred. The patient had

complete sixth nerve palsy that requires muscle transposition in the first place, however the systemic risk factors made it quite less likely due to increased risk of anterior segment ischemia. Botulinum toxin augmented horizontal muscle surgery resulted in good surgical outcome. It is noteworthy that botulinum toxin augmented the effect of previous recession and yielded favorable improvement of double vision and ocular misalignment and can also be considered in the management of chronic sixth nerve palsy when surgical options are limited.

### ACKNOWLEDGEMENTS

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