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Bidirectional/double fascia grafting for simple and semi-dynamic reconstruction of lower lip deformity in facial paralysis☆

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KEYWORDS
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Summary *Background:* For the total aesthetic reconstruction of facial paralysis, treatment of lower lip deformity as "a neglected target in facial reanimation" is important. Although various dynamic reconstruction approaches have been reported for lower lip deformity, these have not been popularly performed due to aggressive surgical invasiveness, long recovery time for reinnervation, and unstable outcomes. To reconstruct the lower lip deformity more simply but semi-dynamically, we modified bidirectional/double fascia grafting methods that have been established as simple and minimally invasive treatments for pediatric congenital lower lip paralysis.
Methods: Between 2009 and 2011, nine patients were treated using this procedure alone or with combinations of other procedures of facial reanimation such as one-stage free muscle transfer. For outcome assessment, patients were evaluated using a lower lip paralysis grading system, including the objective aesthetics and functional results of the lower lip at rest (score range, 0–1), during smiling (score range, 0–4), and during mouth opening (score range, 0–2).
Results: The mean total scores improved from 1.43 (poor) preoperatively to 5.71 (excellent) postoperatively. In all evaluation items, the postoperative scores improved significantly compared to the preoperative scores ($p < 0.01$) with no severe complications.
Conclusions: The procedure is simply applied to various types of extensive facial paralysis, as well as congenital lower lip paralysis in combination with other static and dynamic reconstruction methods for facial paralysis, and it is suggested that this approach significantly and semi-

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dynamically improves the aesthetic function of the lower lip at rest, during smiling, and during mouth opening.

Introduction

The main goal of reconstructive surgery for facial paralysis is restoration of the expression of smile and the function of eye closure. Patients with reversible facial paralysis are treated with facial nerve reconstruction by nerve transplantation,[1] and patients with irreversible and long-standing facial paralysis are treated with neurovascular free muscle transfer[2–4] or temporalis myoplasty.[5]

When total aesthetic facial balance is considered, reconstructive treatment of lower lip deformity in facial paralysis, termed "a neglected target in facial reanimation" by Terzis et al.,[6] is also necessary. In lower lip deformity associated with paralysis of the marginal mandibular branch, ptosis of the corner of the mouth on the paralyzed side at rest, the vermilion is everted, and the whole lip is pulled toward the healthy side, appearing deviated. These deformities appear markedly in the elderly, but they are not noticeable in children and young patients because the tension of the skin is maintained.

However, during smiling, the lower lip on the paralyzed side is pulled inward and in an upward direction, lifting the corner of the mouth, and opening the mouth, revealing the deformity even in children and young subjects, even more markedly than at rest.[7] Moreover, in extensive facial paralysis, even though favorable dynamic reconstruction is performed to improve smiling and lifting of the corner of the mouth, lower lip deformity becomes noticeable during smiling and lifting the corner of the mouth. Therefore, treatment of lower lip deformity is an important issue.

Although various dynamic reconstruction approaches have been reported for lower lip deformity, these have not been popularly or positively performed because of their disadvantages, such as aggressive surgical invasiveness, required muscle and nerve grafting, long recovery time for reinnervation, and unstable outcomes.

To reconstruct the lower lip deformity more simply but semi-dynamically, we modified two fascia grafting methods (the bidirectional fascia graft reported by Udagawa et al.[7] and the double fascia graft reported by Yamamoto et al.[8]) that have been established as simple and relatively minimally invasive treatments for pediatric congenital lower lip paralysis-associated lower lip deformity, and we investigated their application in adult patients. We treated adult patients of congenital lower lip paralysis with this procedure alone, and more extensive facial paralysis with this procedure in combination with facial reanimation by neurovascular free muscle transfer[4] or surgical rehabilitation with reconstruction of the facial-hypoglossal network system[1] to investigate this procedure as a simple and semi-dynamic reconstruction method that improves the aesthetics and function of the lower lip during smiling, lifting the corner of the mouth, and opening the mouth, in addition to acquisition of lower lip symmetry at rest, which has previously been considered difficult.

Patients and methods

Between 2009 and 2011, nine patients underwent semi-dynamic reconstruction of lower lip deformity associated with lower lip paralysis at our department using this procedure and were able to be followed up for $\geq$6 months. The etiology of paralysis, postoperative complications, and the aesthetics and function of the lower lip were investigated retrospectively from their medical records. The present study was approved by the institutional review board and it complied with the Helsinki Declaration.

Surgical procedures of bidirectional/double fascia grafting

Surgery was performed under general anesthesia with basically nasotracheal intubation.

First, two fascia strips (7-mm width $\times$ 12-cm length) were excised from the lateral thigh for transplantation.

Fascia graft in the horizontal direction

The deviation of the center of the lower lip toward the healthy side was marked. Incisions (1 cm in length) were made at three sites: the marked center of the lower lip, the middle point between the corner of the mouth on the paralyzed side and the marked center of the lower lip, and the labial mucosal side of the corner of the mouth on the paralyzed side (Figure 1A). The anterior surface of the orbicularis oris muscle on the caudal side of the lower lip was dissected from each incision and a subcutaneous pocket was prepared by joining the dissections. The subcutaneous pocket was expanded about 1.5 cm from the center of the lower lip toward the healthy side.

At the corner of the mouth on the paralyzed side, the subcutaneous pocket was expanded close to the zygomatic and orbicularis oris muscle attachment sites, that is, the muscle condensation site at the corner of the mouth (modiolus). When neurovascular free muscle transfer was applied for facial reanimation and elevation of the corner of the mouth, the subcutaneous pocket was expanded to the muscle graft stump-fixed site near the corner of the mouth (Figure 1B).

Femoral fascia strips were subsequently grafted to the horizontal lower lip subcutaneous pocket anterior to the orbicularis oris muscle, after preparation as described above (Figure 1B).