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SHORT SCIENTIFIC COMMUNICATION

Bilateral simultaneous free gracilis muscle transfer: A realistic option in management of bilateral facial paralysis

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ABSTRACT

OBJECTIVES: Bilateral facial paralysis patients have oral incompetence, poor articulation, and dental caries. This problem is frequently addressed by performing staged gracilis transplants without specific oral sphincter reconstruction. The purpose of this study is to describe the technique of bilateral simultaneous free gracilis muscle transfer with oral sphincter reconstruction, for one-stage facial reanimation in patients with bilateral facial paralysis.

STUDY DESIGN: Case series.

METHODS/RESULTS: One-stage bilateral gracilis transfer was performed in three patients with bilateral facial paralysis. Muscle transplants produced a meaningful smile in all transferred muscles. All patients reported improved speech and decreased drooling.

CONCLUSIONS: Bilateral gracilis transplants with reconstruction of the oral commissure is a realistic option in management of the bilaterally paralyzed face. In this small series, it appears to improve oral competence, restore smiling, and contribute favorably to lower lip support. This technique has been made more feasible because the operative time for free tissue transfer has continuously declined with the use of two-team surgery, improved microsurgical techniques, and the advent of venous coupling devices.

Patients with bilateral facial paralysis may experience oral incompetence, poor articulation, dental caries, and low self-esteem. When reconstruction is performed for oral incompetence, it may be addressed by performing staged gracilis transplants, without specific oral sphincter reconstruction.[1] In the past, the treatment plan for these patients encompassed a two-staged approach due to the length of surgery and the concern for the health of the first microvascular anastomosis during repositioning for the second muscle transfer. With improvement in technical skills, a two-team approach and the advent of venous coupling devices,[2] it is now realistic to perform simultaneous bilateral free gracilis muscle transfer (BFGT), thus eliminating a second surgical procedure and improving oral sphincter reconstruction.

The purpose of this communication is to describe the technique of simultaneous BFGT with oral sphincter reconstruction, for one-stage bilateral facial reanimation. Simultaneous BFGT driven by the masseteric branches of the trigeminal nerves was performed in three patients with bilateral facial paralysis. Two patients had Mobius syndrome and one patient developed facial paralysis after cavernous brain stem malformation resection. The muscle transplants produced a meaningful smile in all six transplanted muscles, and all three patients reported significantly improved speech, decreased drooling, and improved self-esteem. This study was approved by the institutional review board at the Massachusetts Eye and Ear Infirmary.

A 28-year-old man presented with Mobius syndrome. In childhood, he had undergone multiple otologic procedures with temporalis fascia grafts, putting the viability of his temporalis muscles into question. He underwent BFGT, and after six months physical examination revealed excellent excursion of both oral commissures. Speech and oral competence dramatically improved after surgery and have remained stable for over several years.

A 39-year-old woman presented with dense bilateral facial paralysis that resulted from resection of a cavernous malformation in the brain stem. She experienced significant lower lip ptosis with exposed inferior dentition. A year after the resection, EMG confirmed the absence of functioning facial musculature and she underwent BFGT. After four months, static position of the lips and commissure were excellent, and there was near-complete closure of the oral cavity at rest. Dynamically, there was 1.5 cm symmetric excursion of both oral commissures (Fig 1) with intentional efforts to smile.

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Figure 1 Thirty-nine year-old female 3 months after BFGT. Note the excellent position of the lower lip and the symmetric excursion of both oral commissures with intentional effort to smile.

A 10-year-old boy presented with classic Mobius syndrome, bilateral dense facial paralysis, trace lower lip depressor action with effort, incomplete eye closure, and bilateral abducens paralysis. He underwent BFGT and noted almost immediate improvement in speech and oral competence, with oral commissure movement noted at two months.

SURGICAL TECHNIQUE

After nasal intubation, one team harvests the first gracilis muscle, while the second team elevates the facial flap, isolates the facial vessels, and places the inset sutures. The masseter muscle is partially removed from the zygomatic arch, and the donor nerve is identified entering the masseter muscle and is tagged. Dissection extends from the true temporalis fascia to the midline of the upper and lower lips to allow direct coaptation of both gracili in the lips.

The muscle harvest team harvests 14 to 16 cm of gracilis muscle through an extended incision. A 2-cm segment of the muscle at one end is bivalved and passed into the upper and lower lips. The vascular anastomoses are performed in standard fashion, with a venous coupling device, when possible for the venous anastomosis (vein diameter greater than 1.5 mm).

While muscle inset and neurorrhaphy are performed on the first muscle, the muscle transplant team harvests the second muscle. Inset of the second muscle is performed in identical fashion. After passage of the bivalved portion of each muscle into the lips, coaptation of the left and right gracili is performed through vertical incisions made in the midline of the upper and lower lip vermilion (Fig 2).

DISCUSSION

Free gracilis muscle transplantation has been used by facial reanimation surgeons for over 30 years. Recently, the motor nerve to the masseter muscle was shown to provide commissure excursion in the range of normal.[3] Classically, patients with bilateral facial paralysis are offered staged unilateral free gracilis muscle transplantation, spaced at least three months apart.[1]

However, with the use of two-team surgery, improved microsurgical techniques, and the advent of venous coupling devices, which have been reported to decrease operative time,[2] a one-staged procedure has become a reasonable option. Though not rigorously tracked in the reported cases, a one-staged procedure is likely to decrease cumulative operative time compared with metachronous free gracilis transfer and simplifies recovery time and days of hospitalization to a single convalescence.[4] Most importantly, it also may permit more effective oral sphincter restoration[5] by providing much needed lip bulk and a continuous muscle sling in both the upper and lower lips.

Bilateral facial paralysis patients are significantly affected by poor speech and lower lip incompetence. Improved oral sphincter reestablishment would represent a major advance in their surgical management. Lower lip ptosis, a relatively common finding, was successfully corrected in this small series. In addition, dental health is improved by covering exposed gingiva, reducing dental caries. Speech and oral competence improved in this series; however, closer prospective evaluation of speech and swallowing outcomes is required in the future.

In summary, simultaneous bilateral free gracilis transplantation with reconstruction of the oral commissure is now a viable option in the management of the bilaterally

Figure 2 Intraoperative view of the bivalved portion of each muscle passed through a tunnel in the upper and lowers lips. The vertical midlines incisions in the vermilion of the upper and lower lips allows for direct coaptation of the left and right gracili and provides a continuous muscular sling.

paralyzed face. In this small series, it appears to improve oral competence, restore smiling, contribute favorably to lower lip support, and to increase lip volume. This technique has been made more feasible because the operative time for free tissue transfer has continuously declined based on the use of two-team surgery, improved microsurgical techniques, and the advent of venous coupling devices.

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AUTHOR CONTRIBUTIONS

Robin W. Lindsay, data collection, writer; **Tessa A. Hadlock,** data collection, reviewer; **Mack L. Cheney,** study design, data collection, reviewer.

DISCLOSURES

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