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Case Report

Masseter to Facial Nerve Transfer: Case, Procedure Report and 2 Years Follow Up in a Girl with Iatrogenic Facial Palsy Following an Internal Ear Hydatid Cyst Resection

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Abstract

Background: Re-animation of paralyzed facial nerve using nerve transfer from other craniocervical motor nerves has been suggested by surgeons as a way of solving these issue. A coined method for facial nerve re-animation is using masseter branch of trigeminal nerve as the donor nerve. This procedure is a suitable solution even for the patients having paralysis longer than 12 months.

Case Presentation: We report our experience with a 16-year-old girl whose right internal ear hydatid cyst was operated 4 years ago. During the operation, her right facial nerve was damaged. She was selected for masseter to facial nerve transfer. During the two year follow-up, facial expressions of the patient got significantly better.

Conclusion: This method is suitable choice for patients with iatrogenic facial palsy who sought medical attention after 12 months since the damage.

Keywords: *Facial Palsy; Nerve Transfer; Masseter; Iatrogenic Injury*

Abbreviation

SCM: Sternocleidomastoid Muscle

Introduction

Facial nerve paralysis, as a result of trauma, inflammation, or tumors, has a great influence on patients physically, cosmetically and psychologically. Beside, difficulty in eating, speech, blinking, smiling, depression, and social isolation are troublesome. Re-animation of paralyzed facial nerve using nerve transfer from other craniocervical motor nerves has been suggested by surgeons as a way of solving these issue. In this approach, two main challenges stand out, timing and donor-nerve selection [1,2]. Accessory, phrenic, hypoglossal, and

trigeminal nerve has been used as donor-nerve so far [3]. Hypoglossal nerve, as the most common donor nerve, has its own donor site complications such as hemi-lingual paralysis and subsequent verbal, swallowing, and mastication difficulties [4]. Cross-facial nerve grafting has limitations like timing (less than 3 months) and possible morbidities of the opposite site [5]. A coined method for facial nerve reanimation is using masseter branch of trigeminal nerve as the donor nerve. This procedure has been reported as a suitable solution even for the patients having paralysis longer than 12 months. Moreover, donor site complications have been less likely and well compensated [2,5,6].

Case Presentation

A 16-year-old girl whose right internal ear hydatid cyst was operated 4 years ago. During the operation, her right facial nerve was damaged. She was under follow-up for right facial palsy over a two year course which did show any improvement. The patient had facial palsy grade 3/6 House-Brackmann which mainly involved her mid face especially her smile (Figure 1).

Figure 1: *Pre-operative photos taken to evaluate the facial expressions.*

Following a thorough review of the available literature she was selected for masseter to facial nerve transfer. We planned the operation and prepared the patient with complete explanation of circumstances and probable side-effects.

Stage 1

After preparation, draping was done wide enough to have 2 cm above zygoma superiorly, 3 cm anterior to anterior border of mandible, ear and retro auricular are posteriorly and 3 cm below inferior border of mandible in the field. A superficial parotidectomy skin incision was made from anterosuperior margin of right external ear passing posterior of tragus, circulating around inferior border of external ear with extension on sternocleidomastoid muscle (SCM) in a C-shape manner (Figure 2).

Figure 2: *Intra-operative image from prepared and draped site of surgery. Note the superficial parotidectomy skin incision designation.*

Stage 2

After dissection of skin and subcutaneous fat, superficial parotidectomy flap was dissected from parotid gland till anterior border of mandible was easily palpated and keeping its anterior border attached.

Stage 3

A line was drawn from mid portion of a drawn line between mandibular angle and tragus toward right oral commissure as the assumed path of facial nerve and its buccal branch. Parotid gland was dissected anterior to anterior border of mandible in a parallel orientation to nerve path (posteroanteriorly) till buccal nerve was found. Facial nerve was the explored and released from distal to proximal with preservation of its branches (Figure 3A).

Stage 4

Parotid gland was dissected and elevated from the angle between zygoma and external acoustic meatus anterior and inferiorly till superficial fascia of masseter muscle was exposed. About 1 cm below zygoma and 3 cm anterior to tragus was assumed as masseter nerve position deep in masseter muscle and was the point that we dissected the muscle layer by layer till detecting the masseter nerve. Then the masseter nerve was explored and released distally about 3 cm and cut and brought up to touch buccal branch of facial nerve (Figure 3B).

Stage 5

After opening of epineurium of buccal nerve microscopically, masseter nerve was anastomosed to it with an End-to-side anastomosis pattern and both epineurium were sutured with 7-0 prolene (Figure 3C).

Stage 6

Parotid capsule, subcutaneous tissue and skin was closed layer by layer in anatomic fashion.

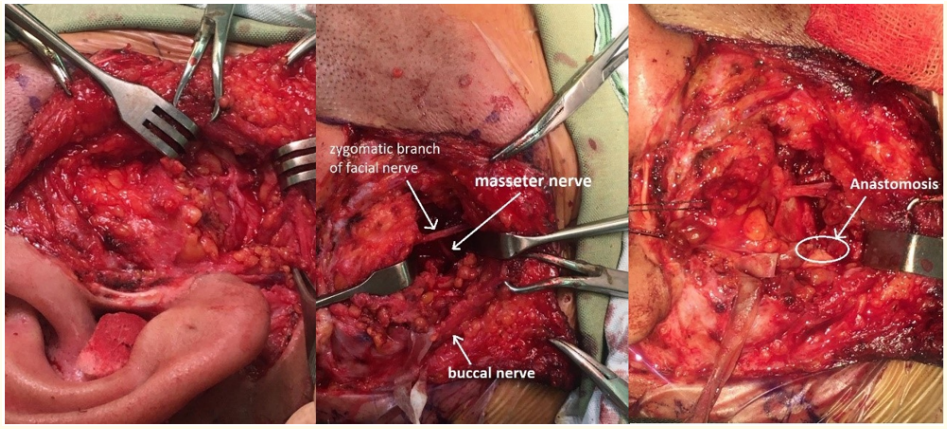

Figure 3: *Intra-operative stage by stage images. A: Facial nerve was the explored and released from distal to proximal with preservation of its branches. B: The masseter nerve was explored and released distally about 3 cm and cut and brought up to touch buccal branch of facial nerve. C: An End-to-side anastomosis pattern.*

During her 2 year follow up period, our patient underwent vigorous and effective facial physiotherapy. She had experienced less shyness when appearing in social gatherings (Figure 4).

Figure 4: *Photos from patient about 2 years after the re-animation surgery.*

Discussion

Facial nerve paralysis is one of the most devastating and challenging defects that may occur as a result of trauma, inflammation, tumors and iatrogenic injuries. It may contribute to profound functional, aesthetic and psychosocial sequelae such as, difficulty in non-verbal communication and emotional expression, speech, eye closure, eating, and a range of psychosocial problems like depression, social isola-

tion and suicide that necessitates facial nerve reanimation [1,7-10]. Facial nerve rehabilitation has been the field of interest among many surgeons and choosing the right technique for the right patient remains a great challenge. There are several options for facial nerve reanimation, using different cranial nerves, amongst which hypoglossal and masseter nerve are the most popular direct nerve transfer and interposition graft are possible ways of facial reanimation [11,12]. Facial palsy is a limiting and disturbing complication of many craniofacial surgeries and conditions. It effects the patients' social life and psychology conditions in many aspects [2]. Thus, it has been a while as physicians emphasize on procedures and modalities to reanimate facial expressions by either reactivation of the affected side or depression of the opposite side [7,11]. Many procedures with different outcomes has been introducing since years ago amongst muscle flap transfer from temporalis muscle had fewer favorable results and more donor-site complications than nerve transfers. Therefore, motor nerve transfer procedures has become more popular among surgeons. In 1879 Dorbnik first described accessory to facial nerve transfer, in 1903 first hypoglossal to facial nerve transfer was exhibited by Balance and Terzis described the "Baby sitter procedure" for facial reanimation using masseter nerve and cross facial nerve grafting in combination for facial reanimation [3,10]. Cross facial nerve grafting has moderate favorable results especially on smile but has some limitations like a two-stage surgery, need for an interposition nerve graft, which limits the number of viable and functional neurons by axon "drop-off" and prolongs neuronal growth time, and opposite site complications [13]. Hypoglossal nerve, another donor motor nerve, has been the most popular for years. It has been associated with various rates of success ranging from 64% to 100% and some disturbing donor site complications like hemi lingual atrophy and paralysis leading to swallowing and chewing problems [3,6,10,11,13-15]. Masseter nerve, first used by Spira in 1987, has an especial anatomy that has made it a good option for facial reanimation mostly in cases with mid face facial palsy. First it has enough motor axons compare to other options, beside its proximity to buccal branch of facial nerve which makes it possible for direct anastomosis and lessening some complications such as synkinesia and tongue atrophy [3,5,8,16].

We decided to use the nerve to masseter muscle to catch a meaningful, symmetrical spontaneous smile. Our patient had acceptable periorbital and zygomatic muscle contractions with maximal efforts and mainly paralysis in perioral muscles that made us choose this anastomosis between masseter nerve and buccal branch of facial nerve. As it had passed 2 years of her facial palsy, we decided not to sacrifice frontal, zygomatic and other branches of facial nerve.

Conclusion

Masseter to facial nerve transfer have the potential to restore the innervation and function of the native facial musculature. This procedure is suitable solution even for the patients having paralysis longer than 12 months.

Ethical Approval and Consent to Participate

This study was approved by the local institutional Board Review and consent for participation was collected when the operations were conducted.

Consent for Publication

Consent for publication of the data and images (including those with identifiable features) was obtained from the participant.

Availability of Data and Material

All data generated or analyzed during this study are included in the final published article.

Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

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Authors' Contributions

This study was designed by MSM, AL, and RT. The data was collected by MHASM and BH. The final manuscript was written and edited by SZ, MSM, and RT. All contributing authors approved the final manuscript.

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