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Masseteric Nerve Transfer for Facial Nerve Paralysis
A Systematic Review and Meta-analysis

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IMPORTANCE A review of the role of masseteric nerve transfer is needed to guide its use in facial reanimation.

OBJECTIVE To systematically review the available literature, and, when applicable, analyze the combined outcomes of masseteric nerve transfer to better define its role in reanimation and to guide further research.

DATA SOURCES Two independent researchers conducted the review using PubMed-NCBI and Scopus literature databases for studies on masseteric nerve transfer for facial nerve paralysis.

STUDY SELECTION Studies that examined masseter nerve transfer with additional cranial nerve transposition/coaptation or muscle flap were excluded.

DATA EXTRACTION AND SYNTHESIS Literature review and data extraction followed established PRISMA guidelines. Two researchers extracted data independently.

MAIN OUTCOMES AND MEASURES The main planned outcomes for the study were quantitative results of facial nerve movement after nerve transfer including oral commissure movement and time to nerve recovery.

RESULTS A total of 13 articles met inclusion criteria with a total of 183 patients undergoing masseteric nerve transfer. From those studies, there were a total of 183 patients who underwent masseteric nerve transfer. There were 85 men and 98 women with a mean (SD) age of 43 (12.2) years and mean (SD) follow up examination after surgery of 22 (7.6) months. Mean (SD) duration of nerve paralysis was 14 (6) months. Most common cause of paralysis was cerebellopontine angle tumors (81%). Six studies coapted the masseteric nerve to the main facial nerve trunk, whereas 7 used distal branches (buccal or zygomatic). Four studies used interposition nerve grafts with great auricular nerve. Two measures, improvement in oral commissure excursion and length from reanimation to facial movement, were measured consistently across the studies. Pooled analysis showed time from surgery to first facial movement, described in 10 studies, to be 4.95 months (95% CI, 3.66 to 6.24). Distal branch coaptation improved time to recovery vs main branch coaptation, 3.76 vs 5.76 months (95% CI, −0.33 to 4.32), but mean difference was not significant. The use of interposition graft significantly delayed time of nerve recovery, 6.24 vs 4.06 months (95% CI, 0.20 to 4.16). When controlled for main trunk coaptation only, interposition nerve graft delayed recovery but difference was no longer statistically significant, 6.24 vs 4.75 months (95% CI, −0.94 to 3.92). Reported complications were minor and rare occurring in only 6.5% (12 of 183) of patients.

CONCLUSIONS AND RELEVANCE The masseteric nerve was found to be a good option for nerve transfer in this patient population, and showed favorable results in both time to nerve recovery and improvement in oral commissure excursion.

LEVEL OF EVIDENCE NA.

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Supplemental content

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Facial paralysis is a devastating disease and presents a formidable challenge for treatment. Variable in etiology, presentation, and severity, it can lead to sequelae such as corneal ulceration, visual loss, oral incompetence, and facial asymmetry. In addition to physical detriments, subsequent psychosocial stress, and depression are well documented.[1-6] In many cases, medical treatment is insufficient and surgical correction is sought.

There are a wide variety of surgical options for facial reanimation with limited empirical evidence to guide surgeons in selecting the best option for each patient scenario. In patients with intact but nonfunctional facial nerves, whether iatrogenic, traumatic, or idiopathic in etiology, the challenge lies in deciding when to intervene given the possibility of spontaneous recovery. There exists a critical time window after nerve injury during which the damaged facial nerve can be augmented through connection to another intact nerve. This allows for reinnervation of the native facial muscles but requires sacrifice of an alternate cranial nerve. Historically, the hypoglossal or accessory nerve has been used for this purpose with more recent interest in the motor division of the trigeminal nerve to the masseter.

Spira[7] first described the nerve to the masseter and its role in facial rehabilitation in 1978. Originally studied for use in neuromuscular transfers such as free gracilis grafts, it has more recently become popular for direct coaptation to branches of the paralyzed facial nerve.[8-12] Compared with other cranial nerve transfers, such as the hypoglossal nerve, it offers many advantages including its favorable proximity and limited donor site morbidity, and the masseteric nerve has shown a rapid functional recovery.[7,13,14] In addition, the use of the natural masseteric movement (jaw clench) is thought to be more natural and discrete than tongue movements.[15] The primary drawback of employing the masseteric nerve was its reported inability to produce an emotive smile when used in isolation; however, recently reports to the contrary have been published.[7,13] In addition, no single cranial nerve transfer is able to replicate the nuanced function of the native facial nerve.

Much of the published experience of direct masseteric nerve transfer is limited to case series by a handful of authors without robust clinical data to guide physician decision making related to patient outcomes. Therefore, the aim of this study was to systematically review and when appropriate analyze the currently available data regarding masseteric nerve transfer in patients with facial paralysis to describe outcomes, identify trends, and establish a guide when using the technique in future research.

Methods

Literature Search

Two independent comprehensive PubMed-NCBI and SCOPUS literature searches were performed using a combination of the following previously defined terms: "masseteric nerve," "nerve to masseter," "masseter nerve," "trigeminal nerve," or "masseter" AND "facial paralysis or paresis." Results were limited to the English language. Articles were screened according to their titles, and abstracts were chosen for review to determine eligibility for inclusion based on predetermined criteria. Any studies that examined masseter nerve transfer with additional cranial nerve transposition and/or coaptation or muscle flap were excluded. Studies that included interposition nerve grafts between masseter and facial nerve transfer were originally excluded, but on review by the senior author were included for analysis and intergroup comparison. The reference lists of all identified articles were examined for additional studies. The literature search strategy and results can be found in the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) compliant literature review diagram (**Figure**).[16] Study design was a retrospective literature review; therefore, institutional review board approval was not necessary for this study.

Inclusion Criteria

1. Masseter nerve transfer to facial nerve without muscle flap or other cranial nerve transposition.
2. Facial paresis and paralysis in human patients regardless of the cause or severity.
3. Study included 4 or more total patients.

Key Points

Question What is the role of masseteric nerve transfer in facial nerve reanimation and what are factors that influence time to paralyzed facial nerve recovery?

Findings In this meta-analysis, masseteric nerve transfer showed favorable results in both time to nerve recovery and improvement in oral commissure excursion. Masseteric nerve coaptation to distal branches of the facial nerve showed improved time to recovery vs main facial nerve branch coaptation, while the use of interposition nerve graft was shown to significantly affect length of nerve recovery.

Meaning The masseteric nerve is a good option for nerve transfer in patients with facial nerve paralysis.

Figure. PRISMA Diagram

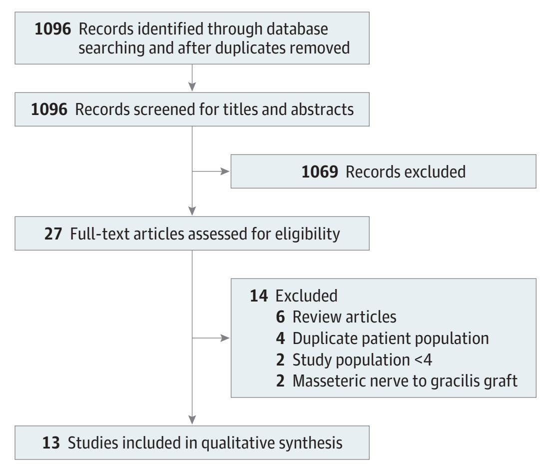

Table 1. Articles Satisfying Inclusion Criteria

Source	Participants, No.	Facial Nerve Target	Interposition Graft	Level of Evidence
Pavese et al,[18] 2016	11	Main	Yes	4
Albathi et al,[19] 2016	14	Main	No	3b
Biglioli et al,[15] 2017	20	Main	Yes	4
Sforza et al,[2] 2014	14	Main	Yes	4
Bianchi et al,[20] 2014	4	Main	No	4
Sforza et al,[21] 2012	7	Main	Yes	4
Wang et al,[22] 2014	16	Zygomatic/buccal	No	4
Hontanilla et al,[23] 2014	23	Zygomatic/buccal	No	4
Klebuc,[24] 2011	10	Zygomatic/buccal	No	4
Faria et al,[10] 2010	10	Zygomatic/buccal	No	4
Hontanilla et al,[25] 2015	9	Zygomatic/buccal	No	4
Socolovsky et al,[26] 2016	15	Zygomatic/buccal	No	4
Hontanilla et al,[27] 2016	30	Zygomatic/buccal	No	4

Data Extraction

Data from studies meeting inclusion criteria was extracted using a standardized form and verified by a second author (W.B.C.) and again by the senior author (S.L.O.). The form was generated prior to article review. The primary outcomes of interest included both qualitative and quantitative outcomes of masseteric nerve transfer. Other study data collected included demographics and complications.

Statistical Section

Statistical calculations were made using both GraphPad statistical software (Prism 7, GraphPad Software Inc) as well as MIX meta-analysis software (version 2.0, BiostatXL).[17] When data were not available, means and standard deviations (SD) were calculated using full data from the article if available. If full data were not available, SD was calculated by taking a weighted average of the other SD of the same outcome. If time to recovery was reported using days instead of months, we divided values by 30 to obtain the same units of measure across studies. Descriptive statistics of both outcome values and demographics were calculated using GraphPad including means and SD of individual studies.

Meta-analysis calculations were made using MIX meta-analysis software (version 2.0, BiostatXL). Pooled analysis was performed on time to facial nerve recovery on available studies. Time to recovery was measured in months from day of surgery (control) until facial movement was seen and each patient served as their own control. Outcomes were calculated as mean difference (MD), which was defined as the difference between time of nerve recovery and control (0). Random effects model of meta-analysis was chosen for this review. The decision to use this model was based on the known heterogeneity of the studies in review including author, participants, and especially measures of outcomes and reporting methods. In addition, calculation of heterogeneity (I^2) for the data set was more than 95%. Participants were then broken into groups, main vs zygomatic/buccal branch and use of interposition graft, and subgroup analysis was performed using Mix meta-analysis software (version 2.0). When appropriate, indicators of uncertainty were used such as SD and 95% CIs. Values were only considered statistically significant if 95% CIs did not cross zero.

Results

The literature search resulted in a total of 1096 manuscripts once duplicates were removed. Of those, 13 met inclusion and exclusion criteria and were selected for full review and analysis (**Table 1**).[2,10,15,18-27] From those studies, there were a total of 183 patients who underwent masseteric nerve transfer. There were 85 men and 98 women with a mean (SD) age of 43 (12.2) years and mean (SD) follow up examination after surgery of 22 (7.6) months. Most patients presented for surgery with complete, unilateral facial nerve paralysis; however, 2 studies included patients with incomplete paralysis, which was defined as hemifacial weakness with evidence of partial facial movement and asymmetry.[24,25] Mean (SD) duration of paralysis before nerve transfer was 14 (6) months. The most common cause of paralysis was tumors of cerebellopontine angle, either from mass effect or after removal, listed in 107 of 132 cases (81%). Six studies coapted the masseteric nerve to the main facial nerve trunk, whereas 7 used distal branches, usually the buccal or zygomatic. Four studies used interposition nerve grafts and in all cases the great auricular nerve was used. Both facial nerve target and use of nerve graft are shown in Table 1. Outcomes were broken into qualitative and quantitative measures. Quantitative outcomes included time from surgery to first facial movement, oral commissure excursion, velocity, and symmetry. Qualitative outcomes varied widely and are listed in **Table 2** with results. For quantitative results, 2 measures, length from reanimation to facial nerve recovery and improvement in oral commissure excursion, were measured consistently across most of the studies. Improvement in oral commissure excursion or position, which compared preoperative and postoperative values of the paralyzed side, was reported in 4 studies with results listed in **Table 3.** Time from surgery to first facial movement was described in 10 studies with 129 patients. Pooled analysis showed mean nerve recovery, measured in months, to be 4.95 (95% CI, 3.66 to 6.24) (eTable

Table 2. Qualitative Measures and Results by Study[a]

Source	Qualitative Scale	Scoring System	Results (SD/R)
Albathi et al,[18] 2016	Smile Recovery Score	1 (poor) to 5 (excellent)	3.2 (0.6)
	House Brackmann	1 to 6 (complete paralysis)	2.9 (0.7)
Wang et al,[27] 2014	Terzis Smile Function	1 (no contraction) to 5 (full contraction, symmetric smile)	3.8 (1.1)
Sforza et al,[2] 2014	Modified House Brackmann	1 to 6 (no movement/disfiguring synkinesis)	2.4 (1.5)
Bianchi et al,[19] 2014	Terzis Smile Function	1 (no contraction) to 5 (full contraction, symmetric smile)	3 (1)
Biglioli et al,[15] 2017	Modified House Brackmann	1 to 6 (no movement/disfiguring synkinesis)	2.5 (1.1)
Socolovsky et al,[26] 2016	House Brackmann	1 to 6 (complete paralysis)	3.9
	POFRA	0 to 12 (normal movement/no synkinesis)	6.55
Pavese et al,[24] 2016	Facial Disability Index	0 to 100 (complete physical function or social well-being)	P -70, S -76
	Sunnybrook Facial	0 to 100 (normal facial function)	54 (46-59)

Abbreviations: P, physical; POFRA, Postoperative Facial Reanimation Scale; S, social; SD, standard deviation.

[a] The qualitative scales used by each study with their results are listed. For reference, brief explanation for each scoring system is provided. Further information about each study and qualitative scale are listed in the listed article. Facial disability index includes both a physical (P) and social (S) score, range (R) listed when available.

Table 3. Paralyzed Oral Commissure Excursion Improvement[a]

Source	Patients, No.	Measurement Scale	Oral Commissure Improvement Mean, (SD), mm
Sforza et al,[21] 2012	7	Intensity of 3D vector of maximal displacement for specific facial markers for smile.	7.2
Sforza et al,[2] 2014	14	Intensity of 3D vector of maximal displacement for specific facial markers for smile (clenching).	8.5
Hontanilla et al,[23] 2014	23	Difference between max and minimum oral commissure displacement.	7.9 (3.8)
Klebuc,[24] 2011	10	Difference between max and minimum oral commissure displacement in mm.	12.4 (2.2)

Abbreviations: 3D, 3-dimensional; mm, millimeter.

[a] Mean improvement in oral commissure excursion of the paralyzed face. Brief explanation of how commissure excursion was calculated for each study. Further information about each study and qualitative scale are listed in the listed article.

in the Supplement). We then performed subgroup analysis of facial nerve branch targets, main trunk vs zygomatic/buccal, as well by use of interposition nerve graft (**Table 4**). Nerve recovery in main trunk subgroup was 5.76 compared with 3.76 months for zygomatic/buccal, however the MD between subgroups, 1.99 (95% CI, −0.33 to 4.32), was not found to be significant. Interposition nerve graft was shown to delay recovery time, 6.24 vs 4.06 months, with mean difference of 2.18 (95% CI, 0.20 to 4.16). Looking only at main trunk coaptation, interposition nerve graft delayed recovery but difference was no longer statistically significant, 6.24 vs 4.75 months, with MD 1.49 (95% CI, −0.94 to 3.92). Spontaneous smile was reported in 7 studies and found to be present in 23% (25 of 108) of patients. Reported complications were minor and rare occurring in only 6.5% (12 of 183) of patients.

Discussion

Facial reanimation is and will always be a challenging topic. As previously stated, there are many options for nerve transfer including cross-facial, hypoglossal, and masseteric nerve grafts among others. Most of the current literature available examines either the masseteric nerve as a baby sitter or its role innervating free muscle transfers, such as gracilis flaps.[8,12,28,29] Compared with other direct nerve anastomosis, there is considerably less published literature reporting outcomes with masseter to facial nerve coaptation. This study sought to review the available literature, and, when applicable, analyze the combined outcomes of masseteric nerve transfer in hopes of better defining its role in reanimation and guiding further research.

There were 13 papers included overall from 10 separate authors. Outcome measures varied widely across the studies with similar outcomes usually only found in articles authored by the same person or group. There were 7 different scales used to measure qualitative results and 3 different scales to measure quantitative results. The 2 outcomes most consistently reported were quantitative results, time to first facial movement and commissure excursion, which varied in definition and instruments of measurement between studies. This points to a reoccurring problem found in facial reanimation when evaluating facial paralysis and reanimation techniques. A recent review found 28 different patients reported satisfaction and quality of life measures.[30] Multiple attempts have been made recently to develop a standardized scale to evaluate facial paralysis, but to date no single scale has become a standardized reporting measure.[31-35] Without standardization, extrapolation of data across multiple studies is nearly impossible, and has led to recent calls for the unification of facial paralysis outcomes reporting.[36]

The negative social perception of facial paralysis has been well documented in previous literature.[4,37] Humans can perceive 3 mm of asymmetry at the oral commissure and brow.[38] Therefore, the ability of procedures to reestablish symmetry be-

Table 4. Intergroup Analysis of Time to Facial Nerve Recovery[a]

Facial Nerve Branch	Patients, No.	Time to Movement (95% CI), Months	Mean Difference (95% CI)
Main	70	5.76 (4.94 to 6.58)	1.99 (−0.33 to 4.32)
Zygomatic/buccal	59	3.76 (2.25 to 5.26)	
Interposition graft			
Yes	52	6.24 (5.57 to 6.91)	2.18 (0.2 to 4.16)
No	77	4.06 (2.74 to 5.38)	
Interposition graft, main			
Yes	52	6.24 (5.57 to 6.91)	1.49 (−0.94 to 3.92)
No	18	4.75 (2.99 to 6.51)	

[a] Time from surgery to signs of movement from paralyzed facial nerve listed and broken down by subgroups. First comparison involves branch of facial nerve to which masseteric nerve was coapted, main facial nerve trunk vs zygomatic/buccal. Second comparison includes use of interposition nerve graft on time to recovery. Third comparison evaluates use of interposition nerve graft within the main facial nerve coaptation only.

tween the paretic and healthy sides of the face, both at rest and smiling, has long been one of the most important primary outcome measures in facial paralysis treatment. Three studies in our cohort used similarly graded qualitative scales to measure symmetry, Smile Recovery Score (Albathi[19]) and Terzis Smile Function (Bianchi et al,[20] Wang et al[22]) Score. Both are observer graded, 5-point scales focusing on smile function in regard to symmetry. Scores were similar, ranging from 3 to 3.8 correlating with moderate to full symmetry. Albathi also measured symmetry using the Facial Asymmetry Index, which measured the difference in distance between the medial canthus and the oral commissure of the healthy and paralyzed sides. They found a mean (SD) position difference of only 1.7 (1.4) mm at rest and 10.6 (5) mm during smile with masseteric transfer. Both values were significantly improved relative to patients who underwent hypoglossal transfer. Pavese used the Sunnybrook Facial Grading System and Facial Disability Index (FDI) to analyze both symmetry and social disability.[32,39,40] Sunnybrook Facial Grading System and FDI were measured on 2 visits. First, just after onset of muscle movement when facial training exercises were started and the second visit occurred 18 months after surgery. Both social scores of the FDI and SFSG scores showed improvement between the first and second visit. Interestingly though, when not performing jaw clench, SFSG scores were lower at the first visit and did not show any improvement at the second visit. This study shows not only the importance of masseteric activation, but also the vital role of facial training exercises in symmetry outcomes. Facial symmetry can improve not only through augmenting movement on the paralyzed side, but also by dampening movement on the healthy side. Sforza et al[2,21] used an optoelectric motion analyzer to determine net vector movements of key areas of facial expression. Comparing movement before and after surgery, he found in 2 separate studies that facial movements in the healthy, nonparalyzed face actually decreased from preoperative measurements. This drop contributed significantly to the increase in symmetry from 52% to 87% during smile with jaw clench. These results showed that there was some compensation taking place, conscious or unconscious, which restricted the movement of the healthy, nonparalyzed face and improved asymmetry. It should also be noted that the preoperative and postoperative cohorts in the 2012 study by Sforza and colleagues[21] were different participants.

Time to nerve recovery was the most consistently reported measure in this review. The definition of nerve recovery included facial musculature showing "signs of recovery" (Albathi et al[19]), "first contraction" (Hontanilla et al,[23] Wang et al[22]), or "clinically regain facial mimicry" (Sforza et al[2,21]). Overall, time to nerve recovery was around 5 months (range, 2-7 months), and was shown to vary based on the facial nerve branch targeted. Nerve coaptation to the zygomatic/buccal branch recovered much faster than coaptation to the main trunk (3.76 vs 5.76 months) in this combined cohort. Although comparison between the groups was found to not be statistically significant, we believe the improvement in recovery time for zygomatic/buccal coaptation should not be overlooked. This is physiologically intuitive because anastomosis at the main trunk is much further away from facial musculature resulting in longer distances across which nerve recovery has to travel and regenerate. This rapid reinnervation time also underscores the rationale for using the masseteric nerve as a baby sitter nerve in conjunction with cross-facial nerve grafting, and the recent popularity with direct facial nerve coaptation.[10,23,41] Whereas this review did not seek to compare masseteric transfer to other cranial nerve transfers, 2 of the included studies did. Masseteric nerve was shown to have a faster rate of recovery than hypoglossal nerve transfers in 2 studies, those of Albathi et al[19] (5.6 vs 10.8 months) and Hontanilla and colleagues[1] (62 vs 136 days). Time to nerve recovery was not only linked to facial nerve branch, but also age of the patient. Wang et al[22] looked at nerve recovery time in regard to age group and found that although overall smile scores were the same, there were longer recovery times in patients older than 40 years (80.5 vs 150.4 days) with the longest recovery (365 days) coming in the oldest patient (aged 70 years).

The oral commissure is not only an important landmark in analyzing symmetry, but has roles in oral competency, speech, and emotional responses, as well. Oral commissure movement is one of the few facial movements consistently measured across facial reanimation studies. However, as with other outcomes in facial reanimation, definition of excursion and instruments of measure vary widely, including in this review. Four studies described commissure excursion. Owing to the low number of studies and incomplete data, pooled analysis could not be performed. In these 4 studies, weighted mean was around 9 mm of commissure excursion improvement in the paralyzed side from baseline. Klebuc[24] recorded the highest amount of excursion at 12.4 mm of improvement. The Facial CLIMA system used by Hontanilla et al[23,25] evaluates commissure excursion, commissure contraction velocity (CCV), and percent recovery of each. In both studies, the recovery percentage of commissure excursion was higher than CCV. These outcomes suggest that whereas total excursion can return to near baseline values, contraction velocity is slower to improve and may never reach baseline levels.

Cross-facial nerve graft has traditionally been used to provide spontaneous smile owing to its ability to provide synchronous activation of facial movement on both the healthy and paralyzed sides.[42] Although it was originally thought that masseteric or other trigeminal-based nerve transfers rendered patients incapable of spontaneous smile, more recent studies have shown the opposite.[2,12,27,43] In this review, spontaneous smile was seen in 25 of 108 reported patients. Most of those patients came from a recent study by Hontanilla et al.[27] When measured as “the presence of an effortless smile in response to funny comment or video,” they found spontaneity in 17 of 30 patients (56%). This was similar to spontaneity found in patients who underwent gracilis flap neurotized with masseteric nerve. Compared with men, women had significantly higher rates (72% vs 44%) and shorter time of onset (329 vs 623 days) of spontaneous smile. This correlates with Sforza et al,[2] who found spontaneous smile in 5 of 14 patients, with 4 of those 5 being women. These results could represent true spontaneous smile; however, the masseter muscle is commonly activated during spontaneous smile. The masseter muscle was found to contract 40% of the time on EMG during a natural, spontaneous smile which is similar to the rate of spontaneous smile recovery found in this review.[44]

The use of an interposition nerve graft provides additional length and a tension-free neurorrhaphy. In this review, interposition grafts were used in 4 studies. All studies interposed the great auricular nerve, although, both the sural and great auricular nerves are common donors. Subgroup analysis for time to facial movement showed that interposition graft delayed recovery time, 6.24 vs 4.06 months. It is not clear whether the interposition graft itself delayed return of facial movement, or if coaptation to the main facial trunk was leading this result. This group was further broken down to only main trunk. In this group, interposition graft delayed recovery time, 6.24 vs 4.75 months, though results were no longer statistically significant. This could show a true negative effect of interposition grafting, but also could be owing to the small sample size of the noninterposition group, 2 studies and 18 patients, left after removing zygomatic/buccal transfer studies. Nevertheless, the addition of not 1, but 2 coaptation sites when using interposition grafts adds another barrier to nerve regeneration. Socolovsky et al[26] examined the results after direct masseteric, direct hemihypoglossal, and hemihypoglossal with interposition graft transfers, and found that hemihypoglossal with graft was clearly inferior to either of the other 2 techniques.

One of the main benefits of masseteric nerve transfer is its low morbidity and relative ease of surgery compared with the other nerve transfers. In this review, there were only 12 reported complications in 183 patients. Four patients had masseter atrophy, 2 complained of ocular discomfort with chewing, 2 had surgical site infections, and 1 each of hematoma, postoperative bleed, sialocele, and otitis externa. As opposed to hypoglossal transfer, the risk for donor morbidity is low because the nerve is sectioned distal to major motor components. The risk of synkinesis is also lower with masseteric nerve than hypoglossal.[45,46] This is multifactorial. First, based on its location the hypoglossal is most commonly coapted directly to the main facial trunk vs more distal branches like the masseteric nerve. This along with its higher axon counts results in higher nerve dispersion and increased synkinesis and mass facial movements.[44,45]

Limitations

This study has some important limitations. As stated earlier, the reported outcomes in this review varied widely, both in definition and tools of measure across included studies, with similar outcomes usually found only in studies authored by the same person or group. This is a considerable problem found commonly in review of treatments for facial paralysis, and limits the ability to extrapolate date across multiple studies. In addition, owing to its relatively recent use as a stand-alone procedure there is a lack of quality research involving direct masseteric nerve transfer with most available published data drawn from small, case-series without control arms. Facial rehabilitation, when reported, was not standardized and studies differed on when exercises were initiated. Thus, the results and pooled analysis presented in this review should be taken with these factors in mind.

Conclusions

The masseteric nerve has advantages compared with other cranial nerves in facial reanimation, including its ease of dissection, proximity to the facial nerve, and low morbidity. The masseteric nerve was found to be a very good option for nerve transfer in this patient population, and showed favorable results in both time to nerve recovery and improvement in oral commissure excursion. In this review, time to nerve recovery was influenced by both location of coaptation and use of interposition graft, although no difference in interposition grafting was found once location of nerve transfer was standardized. One of the disadvantages of the masseteric nerve is its low reported rates of spontaneous smile recovery. Although spontaneous smile recovery is possible, this was achieved in only a quarter of reported patients in this study. Overall, masseteric nerve transfer presents a good option for treatment for patients with facial nerve paralysis. Future directions for research include further evaluation into spontaneous smile recovery as well as continued work toward standardized scales and outcomes for facial reanimation. In addition, further review to compare the masseteric nerve with other available cranial nerve transfers, such as hypoglossal and cross facial nerve grafts is warranted.

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Study concept and design: Murphey, Oyer.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: Murphey, Clinkscales.
Critical revision of the manuscript for important intellectual content: All authors.

Statistical analysis: All authors.
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