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The masseteric nerve: a versatile power source in facial animation techniques

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Abstract

The masseteric nerve has many advantages including low morbidity, its proximity to the facial nerve, the strong motor impulse, its reliability, and the fast reinnervation that is achievable in most patients. Reinnervation of a neuromuscular transplant is the main indication for its use, but it has been used for the treatment of recent facial palsies with satisfactory results. We have retrospectively evaluated 60 patients who had facial animation procedures using the masseteric nerve during the last 10 years. The patients included those with recent, and established or congenital, unilateral and bilateral palsies. The masseteric nerve was used for coaptation of the facial nerve either alone or in association with crossfacial nerve grafting, or for the reinnervation of gracilis neuromuscular transplants. Reinnervation was successful in all cases, the mean (range) time being 4 (2–5) months for facial nerve coaptation and 4 (3–7) months for neuromuscular transplants. Cosmesis was evaluated (moderate, $n = 10$, good, $n = 30$, and excellent, $n = 20$) as was functional outcome (no case of impairment of masticatory function, all patients able to smile, and achievement of a smile independent from biting). The masseteric nerve has many uses, including in both recent, and established or congenital, cases. In some conditions it is the first line of treatment. The combination of combined techniques gives excellent results in unilateral palsies and should therefore be considered a valid option.

Keywords: Masseteric nerve; Facial palsy; Facial reanimation; Smile surgery; Unilateral facial palsy; Bilateral facial palsy

Introduction

The use of the masseteric nerve in facial animation was first described by Spira in 1978,[1] and since then several similar papers have been published.[2,3] This success has been the result of the many advantages of the technique, including the low morbidity, the proximity of the masseteric nerve to the facial nerve, the strong motor impulse that it provides, its reliability, and the fast reinnervation achieved by most patients.[4]

Reinnervation of neuromuscular transplants in long-standing facial palsies has been the main indication for the use of the masseteric nerve for several years,[5,6] but only in the last few years have its indications in recent facial palsies been popularised. In particular, the use of combined techniques has been reported, such as crossfacial nerve grafting and masseteric nerve coaptation,[7] "babysitter" procedures using the masseteric nerve,[8] and direct masseteric–facial nerve coaptation.[2,9] This emphasises its great versatility in the treatment of both recent and long-standing facial palsies. Despite the great advantages and potential to adopt it for the reanimation of almost all facial palsies, careful selection is essential to achieve satisfactory results. Emotion-related contractions have not yet been reported with sufficient clinical evidence, as we know of only anecdotal cases.[10,11] It should be assumed, therefore, that spontaneous contraction cannot be guaranteed, making the use of the opposite facial nerve preferable in many patients with unilateral palsies. However, this issue remains debatable.

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The purpose of this paper was to review the indications for the use of the masseteric nerve in techniques for facial animation taking account of the patient's features, the type of palsy, and the available sources of innervation.

Patients

Sixty patients who had facial animation procedures using the masseteric nerve between 1 January 2003 and 1 January 2013 were evaluated retrospectively. All procedures were done by the first author (BB) and the rest of his team. Approval from the Institutional Review Board was not required because the study was retrospective. There were 23 male and 37 female patients, mean age 28 (range 6–73) years. Thirteen patients had recent (less than 18 months' onset) unilateral facial palsies, 21 had established or congenital unilateral palsies, and the remaining 26 had established or congenital bilateral palsies.

Recent facial palsies were related to resection of an acoustic neuroma ($n=8$) and removal of a tumour of the cerebellopontine angle in the remaining five. The masseteric nerve was used in four as the only procedure for direct facial–nerve coaptation, and in the remaining nine for coaptation of the inferior branch of the facial nerve in association with a crossfacial nerve-grafting technique.

Among the 21 patients with long-standing unilateral palsies, 15 were congenital, 11 of which were diagnosed as Moebius-like syndromes according to the classification described by Terzis and Noah.[12] Of those 11, four were treated for a previously failed crossgraft. The remaining six patients had acquired palsies caused by resection of an acoustic neuroma ($n=3$), resection of a tumour of the cerebellopontine angle ($n=2$), and resection of a neurofibroma (in a patient with type 2 neurofibromatosis).

The masseteric nerve was identified in all patients using the posterior margin of the masseter muscle and the zygomatic arch as landmarks, and we used blunt dissection to uncover the belly of the masseter muscle. We then dissected the nerve using electrostimulation under magnification, and prepared for the coaptation with the recipient nerve. We used the masseteric nerve as a unique source of power for the reinnervation of a gracilis neuromuscular transplant in 17 patients, and in the remaining four we used it in association with a crossgraft technique to achieve double innervation of the gracilis muscle transplant.

Established bilateral facial palsies were congenital in all but one patient. Twenty-one had Moebius syndrome, which in four was considered to be incomplete because they still had some remnants of movements on one side of the face.

The last patient was treated for an acquired bilateral palsy that developed after the resection of an extensive tumour of the cerebellopontine angle. In all patients the masseteric nerve was used for reinnervation of a gracilis neuromuscular transplant on the same side.

Results

Masseteric reinnervation was effective in all patients (Table 1). When we used direct masseteric–facial nerve coaptation facial contraction was restored after a mean of 4 (range 2–5) months. In patients treated with crossfacial nerve grafting and masseteric–facial nerve coaptation of the inferior

Table 1
Results.

Technique	No of patients	Diagnosis	Mean (SD) reinnervation time (months)	Synkinesia	Spontaneity	Cosmetic outcome
Masseteric–facial coaptation	4	Acoustic neuroma ($n=1$) Tumour of the cerebellopontine angle (CPA) ($n=3$)	3.75	Eye ($n=1$) Platysma ($n=1$) Eye and platysma ($n=1$)	None	Moderate ($n=3$) Good ($n=1$)
Crossfacial nerve grafting and masseteric coaptation	9	Acoustic neuroma ($n=7$) Tumour of the CPA ($n=2$)	3	None	9/9	Moderate ($n=1$) Good ($n=5$) Excellent ($n=3$)
Unilateral gracilis transplantation with double innervation	4	Acoustic neuroma ($n=3$) Tumour of the CPA	3.9	None	4/4	Good ($n=2$) Excellent ($n=2$)
Unilateral gracilis transplantation innervated by masseter alone	17	Congenital ($n=15$) (crossgraft failure $n=4$) Tumour of the CPA ($n=1$) Neurofibromatosis type 2 ($n=1$)	4.3	None	None	Moderate ($n=4$) Good ($n=8$) Excellent ($n=5$)
Bilateral gracilis transplantation	26	Moebius syndrome ($n=21$) Incomplete Moebius syndrome ($n=4$) Tumour of the CPA ($n=1$)	4.2	None	2/26	Moderate ($n=2$) Good ($n=14$) Excellent ($n=10$)