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Triple innervation for re-animation of recent facial paralysis

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Summary

Recent facial palsies are those in which fibrillations of the mimetic musculature remain detectable by electromyography (EMG). Such fibrillations generally cease 18 to 24 months after palsy onset. During this period, facial re-animation surgery seeks to supply new neural inputs to the facial nerve.

Neural usable sources were divided into qualitative (contralateral facial nerve) and quantitative (hypoglossus and masseteric nerve), depending on the type of stimulus provided.

To further improve the extent and quality of facial re-animation, we here describe a new surgical technique featuring triple neural inputs: the use of the masseteric nerve and 30% of the hypoglossus nerve fibres as quantitative sources was associated with the contralateral facial nerve (incorporated via two cross-face nerve grafts) as a qualitative source in order to restore facial movements in 24 consecutive patients.

The use of two quantitative motor nerve sources together with a qualitative neural source appears to improve re-animation after facial paralysis, despite earlier doubts as to whether patients could use different nerves to produce facial movements. In fact, movement was much improved. Smiling according to emotions and blinking seem to be better assured if cross-face nerve grafting is performed in two steps rather than one.

Keywords: recent facial palsy, quantitative stimulus, qualitative stimulus, masseteric nerve, hypoglossus nerve, cross-face nerve graft

INTRODUCTION

Recent facial palsies are those in which fibrillations of the mimetic musculature remain detectable by electromyography (EMG). Such fibrillations generally cease 18 to 24 months after palsy onset. During this period, facial re-animation surgery seeks to supply new neural inputs to the facial nerve (Biglioli, 2015a; Biglioli, 2015b).

Biglioli divided neural sources into qualitative and quantitative sources depending on the type of stimulus provided (Biglioli, 2015a). There are only two qualitative neural sources: the homolateral and contralateral facial nerves. These are the only nerves that consistently deliver natural stimuli to mimetic muscles, which then contract naturally, spontaneously, and according to emotions (Gousheh and Arasteh, 2011; Faria et al, 2010). If the homolateral facial nerve is not usable, the contralateral facial nerve axons may be co-opted via cross-face nerve grafting (Bianchi et al, 2013; Fisch, 1977; Owusu et al, 2016; Peng and Azizzadeh, 2015; Scaramella, 1971; Smith, 1971; Terzis and Tzafetta, 2009).

Quantitative neural sources are those that supply strong axonal inputs but, despite the suggestions of cerebral adaptation theorists, seldom trigger expressions according to emotions apart from the simple ability to smile. The literature is confusing; several authors address the spontaneity of smiling without clenching the teeth (utilizing the masseteric muscle) or smiling without conscious effort. This is certainly better than conscious smiling, but remains an automatic movement (for example, smiling when encountering a friend) (Biglioli et al, 2012a). Emotions are a completely different matter, being associated with smiling, humour and other spontaneous positive feelings. Empathy, for example, is transmitted by facial expressions such as a small or involuntary smile and slight eyelid contractions. Such stimuli are seldom triggered by nerves other than the facial nerves, and then only inconsistently.

The most popular quantitative nerve sources are the hypoglossus and masseteric nerves. Of these, the masseteric nerve seems to yield better results, associated with less donor site morbidity. Use of the hypoglossus nerve severely compromises lingual movements (Biglioli et al, 2012b; Biglioli et al, 2017; Dalla Toffola et al, 2014; Spira, 1978; Yetiser and Karapina, 2007).

In 2010, Tomita et al. introduced the concept of double innervation, enhancing facial nerve power by mixing input from that nerve with input from the hypoglossus (Tomita et al, 2010). Later authors found that re-animation was enhanced by mixing facial and masseteric nerve stimuli (Bianchi et al, 2013; Biglioli et al, 2013).

To further improve the extent and quality of facial re-animation, we here describe a new surgical technique featuring triple neural inputs: the masseteric nerve and 30% of the hypoglossus nerve fibres as quantitative sources, and the contralateral facial nerve (incorporated via two cross-face nerve grafts) as a qualitative source.

MATERIALS AND METHODS

Surgical procedure

For the surgical procedure (Fig. 1), the use of curare as either a local anaesthetic should be avoided. It is necessary to electrostimulate and assess the function of the facial nerve fibres, and the masseteric and hypoglossus nerves.

On the paralyzed side, a face-lift type of incision is extended 6 cm in both the submandibular and temporalis directions. A skin flap is then elevated in the supra-superficial musculo-aponeurotic system dissection plane, 2 cm medial to the anterior margin of the parotid gland. The trunk of the facial nerve and its main bifurcation are traced using a conventional anterograde approach. The upper branch is harvested and released from the undersurface up to the masseter, exposing the entire nerve. The branch origin at the facial nerve trunk bifurcation is cut and directed anteriorly to allow for later neurorrhaphy.

A horizontal incision is created just in front of the parotid gland, 1 cm below the zygomatic arch, while being careful to not compromise the evident white facial nerve branches running on the reddish surface of the masseter. The masseteric nerve is located 1.5–2 cm from the muscle surface and is exposed by gently dissecting the muscle fibres along their axes. A 2.5- to 3-cm-long nerve trunk segment is released after severing the small collateral branches (if necessary). The nerve is cut at this level and turned superficially prior to neurorrhaphy with the previously identified temporofacial nerve branch. Next, the hypoglossus nerve is identified and isolated in the submandibular region.

On the healthy side of the face, a face-lift type of incision is performed with a 4-cm extension into the temporalis region. A skin flap is elevated just anterior to the parotid gland to identify a facial nerve branch directed to the zygomatic muscular complex and a branch directed to the orbicularis oculi muscle. These branches are subjected to electrostimulation to verify their involvement in smiling and eye closure, respectively. At the same time, two 20- to 25-cm portions of the sural nerves are harvested by a second surgical team. These harvested nerves are reversed and pulled (using a specific hook) through the subcutaneous tissue, from one side of the face to the other, in a typical cross-facial manner. The microsurgical procedure begins on the pathological side by anastomosing end-to-end the masseteric nerve to the previously identified temporofacial nerve branch. Next, an epineural window is opened on a facial nerve branch directed to the zygomatic muscular complex, and another window is then created on a branch to the orbicularis oculi muscle. Two end-to-side neurorrhaphies with the free ends of the sural nerves are then performed. After incising 30% of the hypoglossus nerve, side-to-end neurorrhaphy is performed to join the cervicofacial branch via a short sural nerve jump graft. On the healthy side of the face, two end-to-end neurorrhaphies are created between the ends of the cross-face nerve grafts and the previously identified facial nerve branches. After careful haemostasis, a vacuum drainage tube is placed on either side and the skin sutured.

Patients

Between January 2013 and February 2016, a total of 24 consecutive patients (14 females and 10 males) with dense unilateral facial palsy (House-Brackmann [HB] grade VI) (House and Brackmann, 1985) underwent surgery at the Maxillofacial Surgery Department of San Paolo Hospital (Milan, Italy) to restore both facial movement and resting facial symmetry (Figs. 2-4; video 1)

The senior author (F.B.) performed all operations. Twenty-one patients (87.5%) also exhibited severe ptosis of the soft tissue of the middle third of the face. Six (25%) were affected by lagophthalmos associated with ectropion of the lower lid. Hyperlacrimation and various extents of corneal discomfort were reported by all patients. The aetiology of the complete facial palsy was traumatic in 1 case (4.17%), infectious in 5 patients (20.83%) and iatrogenic in 18 cases (75%). Patient age ranged from 23 to 77 years (average: 45.8 years).

All patients underwent preoperative clinical and neurophysiological assessment to obtain data on muscular trophism and residual muscle fibrillation. The neurophysiological tests included needle electromyography (EMG), which confirmed residual motor-unit, action-potential recruitment. The trigeminal motor component was tested by palpating the masseteric region during chewing and via needle EMG of the ipsilateral masseter muscle to verify that it was available as a donor motor nerve. Hypoglossus nerve function was tested by EMG, tongue inspection, and by assessing lingual movements.

In all patients, both the masseteric nerve and 30% of the hypoglossus nerve fibres were used as new motor nerve sources. Additionally, two cross-face nerve grafts were placed in 16 patients (66.67%), one to add the zygomatic muscular complex and one the orbicularis oculi muscle. A single cross-face nerve graft connecting the zygomatic muscular complex to the facial nerve was performed in five patients (20.83%), and a single cross-face nerve graft connecting the orbicularis oculi muscle in one patient (4.17%). In the remaining two patients (8.33%), the sural nerves were not available, so cross-facing was not performed. Of the 16 patients who received two cross-face nerve grafts, 13 (54.17%) underwent one-step surgical procedures. In the remaining three cases, the procedure was performed in two surgical steps to ensure adequate axonal input to the paralysed side from the free ends of the cross-face nerve grafts connecting the facial nerve branches to the zygomatic muscular complex and the orbicularis oculi muscle. All patients who received single cross-face nerve grafts did so in one surgical step.

The 21 patients (87.5%) with severe soft tissue ptosis of the middle third of the face received suspension fascia lata grafts placed between the nasolabial sulcus and the inferior orbital frame. Three 4/0 nylon stitches passing through holes drilled into the bone were used to anchor the fascia cranially. Six patients received additional fascia lata grafts to suspend the lower lids.

All patients underwent postoperative physiotherapy either via direct office-based interaction with our physiotherapist (S.C.) or, if they lived far from the hospital, via an online video chat service (Skype). For remote patients, nearby physiotherapists were engaged to implement our physiotherapist's suggestions.

Patients were asked to tell the medical team when they experienced the first mimic muscle contraction after surgery. From that moment (and not before), the patient was required to commence physiotherapeutic rehabilitation. During the first 3 weeks after the mimic muscle contracted, rehabilitation was performed three times a week, and then twice a week for the following 3 weeks, and then weekly for 48 weeks. In addition to rehabilitation supervised by a physiotherapist, patients were asked to perform daily exercises at home and to monitor even small improvements by taking photographs and videos. The rehabilitation times were usually long, characterised by stable periods between improvements. Patient encouragement was essential to maintain motivation.

A final assessment was performed 18 months after surgery by a surgeon and a physiotherapist, neither of whom had been involved in treatment. Each patient was studied, and the photographs and videos rated using the HB scale as modified by Bell's Society (Vrabec et al, 2009). We used these scores to evaluate the statistical significance of improvements in facial movement. The Wilcoxon signed-rank test for paired groups was used to compare the pre- and postoperative HB scores. All statistical analyses were performed with the aid of SPSS software (PASW Statistics for Windows, version 21.0; SPSS Inc., Chicago, IL, USA). A p-value < 0.05 was considered statistically significant.

RESULTS

Results are shown in Figs. 5-7 and videos 2-4. Facial paralysis improved in all patients, as revealed by the modified HB scale data (Table 1). Immediately after surgery, mild resting overcorrection of the soft tissue ptosis was evident in 17 patients (70.83%), but, within 3 months, all exhibited excellent resting symmetry. The first signs of facial nerve function recovery appeared 2–8 months after surgery (average, 3.7 months) and recovery then proceeded throughout the entire postoperative period. The final follow-up assessment was made 18 months after surgery, although functional recovery may continue for some years in certain cases. At a minimum follow-up period of 18 months, 11 patients (45.83%) were of grade II on the modified HB system, 11 patients (45.83%) of grade III, and 2 (8.33%) of grade IV. The median grade was III. The improvement between pre- and postoperative modified HB scores was statistically significant (Wilcoxon signed-rank test, $p < 0.001$).

After postoperative function onset, all patients had to clench their teeth while smiling for a period of 2–6 months. After this time, 19 (79.17%) patients reported that they had to consciously initiate a smile, but that clenching was no longer necessary. After another 4–10 months, smiling became automatic; it was no longer necessary to deliberately contract the middle-third mimetic musculature. The other 5 patients (20.83%) continued to need to clench their teeth both to smile and to close their eyelids.

No smiling according to emotions (e.g., while watching a funny movie), nor laughing, was evident during outpatient visits with the three patients who did not receive cross-face nerve grafts connecting the zygomatic muscular complex with the facial nerve. In all, 10 (41.67%) of 18 patients who received one-step cross-face nerve grafting connecting the zygomatic muscular complex with the facial nerve exhibited smiling according to emotions (most of the smiles were produced when watching a funny movie). All three patients (12.5%) who received two-step cross-facial nerve grafting connecting the great zygomatic muscular complex with the facial nerve recovered smiling according to emotions. In both types of patients, the extent of smiling according to emotions was always less than that produced via voluntary activation and was never completely symmetrical. However, all patients emphasised strongly that smiling according to emotions was much more pleasant than voluntary smiling, as is also the view (of course) of non-paralysed populations.

Of the 14 patients who underwent one-step cross-face nerve grafting to the orbicularis oculi muscle, only 5 (35.71%) developed detectable blinking. Of the 3 patients who received two-step cross-face nerve grafting directed to the same muscle, significant spontaneous blinking was fully restored in 2 (66.6%) and partially in 1 (33%). However, even the latter patient reported subjective eye comfort. In summary, all patients who regained smiling according to emotions and blinking exhibited movements that were less extensive than the voluntary movements.

All 8 patients who recovered blinking ability (3 who underwent two-step surgery and 5 treated via one-time surgery) (33.33%) could voluntarily close the eyelids on the pathological side after receipt of the same natural stimulus needed to close the eyelids on the healthy side. Of the 9 patients (37.5%) who did not recover blinking despite cross-face nerve grafting, all needed to produce a conscious stimulus before the eyelids closed on the pathological side, unlike the normal side. However, it was not necessary to clench the teeth.

The 3 patients (12.5%) who received double cross-face nerve grafts in two surgical steps developed spontaneous smiling and blinking that were better in terms of both quality and quantity compared with those who underwent one-step surgery.

During the follow-up period, 9 patients (37.5%) required improvement of some aspect of facial symmetry, or enhancement of lower eyelid function, and thus underwent combinations of different ancillary techniques under local anaesthesia: upper eyelid lipofilling (2 patients; 8.33%); gold lid weighting to enhance eyelid closure (2 patients; 8.33%); Kuhnt-Szymanowski blepharoplasty (3 patients; 12.5%); lateral canthoplasty (2 patients; 8.33%); auricle cartilage grafting to improve lower eyelid suspension (1 patient; 4.17%); masseteric region lipofilling (2 patients; 8.33%); lower lip lipofilling (1 patient; 4.17%); revision of the middle one-third soft tissue suspension (3 patients; 12.5%); and eyebrow suspension to improve facial symmetry (1 patient; 4.17%) (Table 2). All operations were uneventful. Neither major nor minor complications were detected. Neither swallowing nor speech impairment was reported by any patient, and none complained of lingual movement impairment. Reduced mouth-opening was evident in 16 patients (66.67%) immediately after surgery, but resolved upon minimal self-physiotherapy (the use of expansion trotters) within 2 weeks. Five patients (20.83%) complained of low-grade pain in the masseteric region during the first 10 postoperative days; this resolved rapidly using standard painkillers.

DISCUSSION

The aim of this technique is to re-innervate the injured facial nerve by anastomosing new motor nerves with the facial nerve branches, with the addition of two cross-face nerve grafts, one to the branch of the orbicularis oculi and one to the great zygomatic muscle. The new motor nerve affords strong innervation of the mimetic muscle, whereas the cross-face nerve grafts seek to restore blinking and spontaneous smiling (Biglioli, 2015a). Various motor nerves have been employed for neurorrhaphy with the facial nerve trunk to try to restore facial movements (Bianchi et al, 2013; Biglioli, 2015a; Terzis and Tzafetta, 2009). The hypoglossus and masseteric nerves are most commonly used to this end (Bianchi et al, 2013; Biglioli et al, 2012b; Biglioli et al, 2016; Biglioli et al, 2017; Dalla Toffola et al, 2014; Pavese et al, 2016; Yetiser and Karapinar, 2007). An advantage when choosing the hypoglossus nerve is the ease of harvesting, explaining why this nerve is a common choice. Use of the hypoglossus nerve is associated with good contraction of the mimetic muscles because the range of movements produced by this nerve is wide, although the coupling of lingual movements with smiling and eye closure is so unnatural (and difficult to perform) that patients often give up trying. High rates of hemilingual paralysis indeed impair all of chewing, swallowing, and speech (Yetiser and Karapinar, 2007). Physiotherapy after surgery may only partially improve facial movement while reducing some lingual deficits (Dalla Toffola et al, 2014). To reduce donor site morbidity, some authors prefer to co-opt only some of the hypoglossus fibres via side-to-end neurorrhaphy (Arai et al, 1995; Biglioli, 2015a). This reduces not only the extent of lingual deficits but also the efficacy of mimetic muscle contraction. The reduced muscular contraction associated with side-to-end neurorrhaphy is not problematic in the present technique. In fact, motility of the lower lip region is extremely complex (including, for example, chewing and talking) compared with smiling or closing the eyelids. Ultimately, any attempt to trigger movement will be frustrated, other than an attempt to reveal the lower teeth. Fortunately, such movement is rarely used by the non-paralysed, except for the few who wish to present full-dental smiles (Rubin et al, 1984). Thus, we use the hypoglossus nerve only to restore appropriate resting tone to the lower third of the face; we make no attempt to have significant movements utilizing this nerve trigger. The 30% diversion simply seeks to increase the muscle tone at rest, and was generally successful in our present case series.

The masseteric nerve has been widely used to trigger mimetic movements since the first case series of masseteric to facial nerve anastomosis was presented (Biglioli et al, 2012b). Muscle contraction is excellent, and the power thereof is comparable to that provided by the hypoglossus nerve (Biglioli, 2015a; Biglioli et al, 2017; Coomb et al, 2009; Sforza et al, 2014). Unlike the situation when the hypoglossus nerve is harvested, harvesting of the masseteric nerve is associated with negligible morbidity of the donor site, and production of facial movement is much easier. Variable hypotrophy of the masseter is often evident, attributable to denervation.

Surgery should always be followed by individualised physical therapy to obtain the best results (Biglioli et al, 2017; Pavese et al, 2016). Our physical rehabilitation program is versatile, including exercises to restore smiling and eyelid closure via teeth clenching, exercises pushing the tongue against the teeth to restore good muscular tone, functional exercises affording excellent co-ordination between eye and mouth movements to achieve a specific function without activating undesired muscles, and education to allow patients to perform all exercises at home (Lotter and Quinci, 2012). Patients are educated to reproduce the final movements using a motor imagery technique (Vanswearingen, 2008; Lotter and Quinci, 2012); they are asked to visualise the movement and then evoke the somaesthetic sensation that they actually feel when reproducing the action.

Many authors have used cross-face nerve grafting to restore both blinking and spontaneous smiling (Biglioli et al, 2012a; Biglioli, 2015a; Peng and Azizzadeh, 2015; Scaramella, 1975; Smith, 1971; Sforza et al, 2008; Terzis and Tzafetta, 2009). End-to-side distal neurorrhaphy of cross-face nerve grafts avoids damage to the facial nerve branches of the pathological side, which will later receive masseteric axonal inputs (Stipp-Brambilla et al, 2012; Viterbo et al, 2009). This ensures that residual voluntary movements will not be impaired if the expected smiling according to emotions and blinking are not in fact achieved via cross-face nerve grafting.

Our preliminary results with 3 patients who underwent double cross-face nerve grafting in two surgical steps, compared with 19 patients undergoing one time-procedures (13 double nerve grafts, 5 single nerve grafts to the zygomatic muscular complex and 1 to the orbicularis oculi muscle), showed that restoration of smiling according to emotions and blinking was much more reliable using the two-step procedure [100% vs. 55.56% (cross-face nerve grafts to the zygomatic muscular complex) and 100% vs. 35.71% (cross-face nerve grafts to the orbicularis oculi muscle)]. Our results are consistent with those of others, who suggested that two-step cross-face nerve grafting was optimal during several re-animation procedures (Biglioli, 2015a; Biglioli, 2015b; Frey et al, 2010; Kumar and Hassan, 2002; Vedung et al, 1984). This is explained by the fact that a scar forms at the distal neurorrhaphy site during the time in which axonal ingrowth is in play in the cross-face nerve graft; the scar obviously prevents axonal passage to the pathological facial nerve branch.

CONCLUSION

The use of two quantitative motor nerve sources, the entire masseteric nerve and 30% of the hypoglossus nerve fibres, together with a qualitative neural source (the contralateral facial nerve connected via two cross-face nerve grafts), appears to improve re-animation after facial paralysis, despite earlier doubts as to whether patients could use different nerves to produce facial movements. In fact, movement was much improved. Smiling according to emotions and blinking seem to be much better assured if cross-face nerve grafting is performed in two steps rather than one.

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Fig. 1. Schematic picture showing the neurorrhaphy (a) between the masseteric nerve (red) and the temporofacial branch of the injured facial nerve (yellow), the neurorrhaphy (b) between the 30%of hypoglossus nerve (green) and the cervicofacial branch of the injured facial nerve (yellow) through a sural nerve graft (red) and two cross-face sural nerve grafts (c).

Fig. 2. Preoperative picture showing asymmetry of the face at rest.

Fig. 3. Preoperative picture showing asymmetry of the face during smiling.

Fig. 4. Preoperative picture showing incomplete eye closure.

Fig. 5. Postoperative picture showing good symmetry of the face at rest.

Fig. 6. Postoperative picture showing good ability to smile 18 months after surgery.

Fig. 7. Postoperative picture showing good ability to close the eyes 18 months after surgery.

Video 1. Preoperative video showing asymmetry of the face at rest associated with asymmetry during smile and eye closure.

Video 2. Voluntary smiling 18 months postoperatively.

Video 3. Spontaneous eyelids closure 18 months postoperatively.

Video 4. Spontaneous smiling 18 months postoperatively.

Table 1. Preoperative and postoperative data for all patients included in the study.

Patient	Sex	Age	Etiology	Crossface	Cross face	Smiling according to emotions	Blinking	Fascia lata graft	HB preop	HB postop
BC	F	52	traumatic	double	One step	None	restored	Sulcus	VI	III
CA	M	75	iatrogenic	double	Two steps	restored	restored	sulcus and lower eyelid	VI	II
CC	M	61	iatrogenic	double	One step	restored	restored	sulcus and lower eyelid	VI	III
CF	M	51	iatrogenic	//	//	None	none	Sulcus	VI	IV
CM	F	77	iatrogenic	central facial	One step	restored	none	sulcus and lower eyelid	VI	III
CD	M	43	bell's palsy	directed to the orbicularis	One step	None	restored	Sulcus	VI	II
DG	M	54	iatrogenic	central facial	One step	restored	none	Sulcus	VI	II
DL	F	23	bell's palsy	double	One step	restored	none	//	VI	III
FI	F	33	iatrogenic	double	One step	None	restored	Sulcus	VI	II
GR	F	60	iatrogenic	double	One step	None	restored	Sulcus	VI	II
IL	F	31	iatrogenic	double	One step	None	none	Sulcus	VI	II
MV	F	65	iatrogenic	central facial	One step	restored	none	sulcus and lower eyelid	VI	III
MM	F	46	iatrogenic	double	One step	restored	none	Sulcus	VI	II
ME	F	30	bell's palsy	double	Two steps	restored	restored	//	VI	II
NM	M	48	iatrogenic	double	One step	None	none	Sulcus	VI	II
PE	M	65	iatrogenic	central facial	One step	None	none	sulcus and lower eyelid	VI	III

RA	M	54	iatrogenic	double	One step	restored	none	Sulcus	VI	III
RS	F	49	iatrogenic	double	Two steps	restored	restored	Sulcus	VI	III
SC	F	25	bell's palsy	double	One step	restored	none	Sulcus	VI	II
SR	F	25	Bell's palsy	//	//	None	none	//	VI	III
SS	F	42	iatrogenic	double	One step	None	none	Sulcus	VI	II
TL	F	40	iatrogenic	double	One step	None	none	Sulcus	VI	IV
ZA	M	59	iatrogenic	central facial	One step	restored	none	sulcus and lower eyelid	VI	III
ZM	M	58	iatrogenic	double	One step	restored	none	Sulcus	VI	III

Modified House-Brackmann scale was used to assess preoperative and postoperative grade of facial paralysis. F, female; M, male; postop, postoperatively; preop, preoperatively.

Table 2. Ancillary procedures performed under local anaesthesia.

Procedure	% of Patients
upper eyelid lipofilling	8.33%
gold eyelid weighting	8.33%
Kuhnt-Szymanowski blepharoplasty	12.50%
lateral canthoplasty	8.33%
auricle cartilage graft	4.17%
masseteric region lipofilling	8.33%
lower lip lipofilling	4.17%
middle third soft tissue suspension revision	12.50%
eyebrow suspension	4.17%

patient	sex	age	etiology	crossface	Cross face	emotional smile	blinking	fascia lata graft	HB pre-op	HB post-op
BC	F	52	traumatic	double	One step	none	restored	sulcus	VI	III
CA	M	75	iatrogenic	double	Two steps	restored	restored	sulcus and lower eyelid	VI	II
CC	M	61	iatrogenic	double	One step	restored	restored	sulcus and lower eyelid	VI	III
CF	M	51	iatrogenic	//	//	none	none	sulcus	VI	IV
CM	F	77	iatrogenic	central facial	One step	restored	none	sulcus and lower eyelid	VI	III
CD	M	43	bell's palsy	directed to the orbicularis	One step	none	restored	sulcus	VI	II
DG	M	54	iatrogenic	central facial	One step	restored	none	sulcus	VI	II
DL	F	23	bell's palsy	double	One step	restored	none	//	VI	III
FI	F	33	iatrogenic	double	One step	none	restored	sulcus	VI	II
GR	F	60	iatrogenic	double	One step	none	restored	sulcus	VI	II
IL	F	31	iatrogenic	double	One step	none	none	sulcus	VI	II
MV	F	65	iatrogenic	central facial	One step	restored	none	sulcus and lower eyelid	VI	III
MM	F	46	iatrogenic	double	One step	restored	none	sulcus	VI	II
ME	F	30	bell's palsy	double	Two steps	restored	restored	//	VI	II
NM	M	48	iatrogenic	double	One step	none	none	sulcus	VI	II
PE	M	65	iatrogenic	central facial	One step	none	none	sulcus and lower eyelid	VI	III
RA	M	54	iatrogenic	double	One step	restored	none	sulcus	VI	III
RS	F	49	iatrogenic	double	Two steps	restored	restored	sulcus	VI	III
SC	F	25	bell's palsy	double	One step	restored	none	sulcus	VI	II
SR	F	25	congenital	//	//	none	none	//	VI	III
SS	F	42	iatrogenic	double	One step	none	none	sulcus	VI	II
TL	F	40	iatrogenic	double	One step	none	none	sulcus	VI	IV
ZA	M	59	iatrogenic	central facial	One step	restored	none	sulcus and lower eyelid	VI	III
ZM	M	58	iatrogenic	double	One step	restored	none	sulcus	VI	III

PROCEDURE	PATIENTS
upper eyelid lipofilling	8.33%
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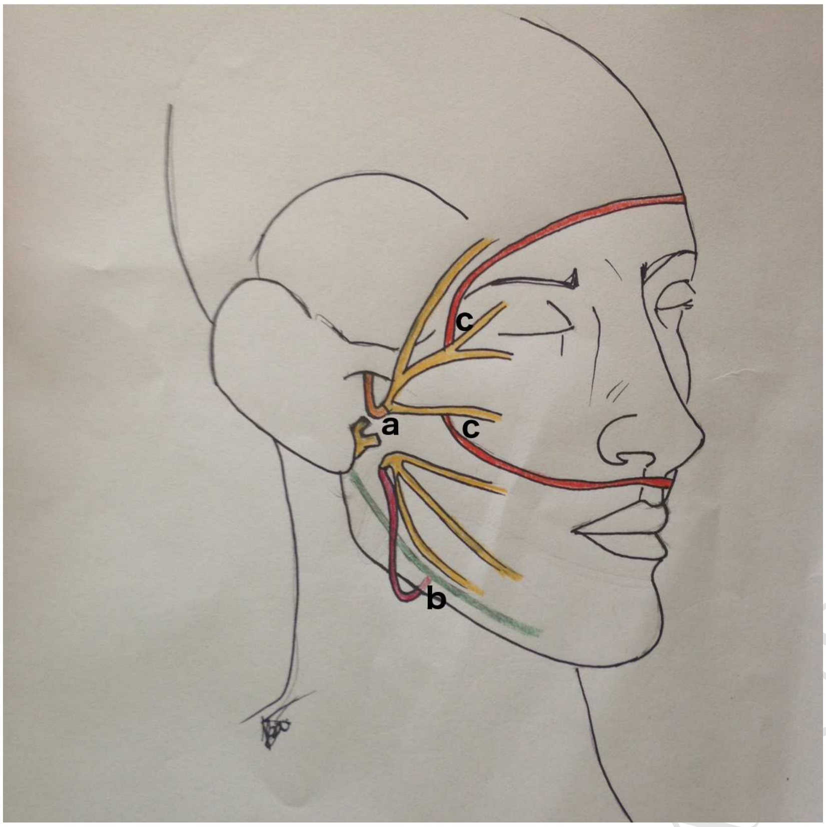
x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