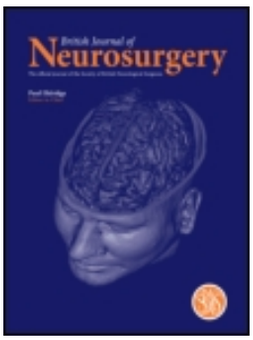

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ORIGINAL ARTICLE

Reanimation of the face after facial nerve palsy resulting from resection of a cerebellopontine angle tumour

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Abstract

Twenty-three patients with facial nerve paralysis following surgery for a cerebellopontine angle tumour had a facial-hypoglossal anastomosis and simultaneous anastomosis of the cervical ansa with the distal stump of the hypoglossal nerve. In 18 patients, simultaneously with the neural anastomoses, additional transpositions of the temporalis and masseter muscles were performed. At follow-up examination 3–87 months after reconstructive surgery, eight patients had House grade II, ten grade III and five grade IV outcome. The EMG evidence of reinnervation was observed 5–11 months after anastomosis. Combination of the facial-hypoglossal anastomosis with simultaneous myoplasty and with anastomosis of the distal hypoglossal nerve stump to the ansa cervicalis provides the advantage of immediate protection against ophthalmic complications, prevents hemiatrophy of the tongue and gives good functional results when reinnervation of the facial muscles takes place.

Key words: *Cerebello-pontine angle tumour, facial palsy, facial-hypoglossal anastomosis, myoplasty, cervical ansa.*

Introduction

Despite improvements in diagnosis and surgical techniques, 70–80% of acoustic neurinomas are large tumours when operated upon.[1] Intraoperative damage to the facial nerve still occurs in 6–16% of cases.[2] Moreover, in some tumours the nerve is involved in the tumour capsule and either the integrity of the nerve or the completeness of the tumour removal have to be sacrificed. Facial nerve reconstruction and adequate management of the paralysed face, is still very important. Both the psychological burden of the deformity of the face and the risk of keratitis call for early restoration of symmetry of the face, as well as for efficient protection of the eye. Among a variety of methods used for reconstruction of the damaged facial nerve,[1–8] anastomosis of the hypoglossal nerve with the distal, extracranial facial nerve stump is a relatively simple procedure which gives good functional results.[4,5,6,9] Hemiatrophy of the tongue is an undesirable side-effect of this procedure. When reinnervation of the facial muscles is insufficient or impossible, plastic surgery—transposition of the temporalis and masseter muscles in particular—is helpful.[10] We present results of treatment in 23 patients in whom we combined nerve anastomoses with myoplasty in order to provide early protection against ophthalmic complications, satisfactory rein-

TABLE I. Details of patients and treatment

Number	Age	Sex	Time to reconstructive surgery (months)	Additional myoplasty	Result (House–Portman)
1	45	f	1	no	III
2	36	f	3	no	II
3	32	f	18	no	III
4	26	f	4	no	III
5	37	f	8	yes	III
6	39	m	1	no	II
7	33	f	2	yes	II
8	32	f	9	yes	III
9	34	f	3	yes	II
10	47	f	13	yes	III
11	27	f	5	yes	II
12	41	f	21	yes	III
13	48	m	2	yes	II
14	27	f	6	yes	III
15	32	m	6	yes	II
16	67	m	5	yes	III
17	59	m	5	yes	III
18	23	f	11	yes	II
19	63	f	38	yes	IV
20	28	f	52	yes	IV
21	49	f	3	yes	IV
22	32	f	3	yes	IV
23	48	m	5	yes	IV

nervation of the facial muscles and protection against hemiatrophy of the tongue.

Materials and methods

The clinical material includes 23 patients who were operated on for cerebellopontine angle tumours and in whom the procedure was complicated by facial nerve paralysis. Table I shows the clinical data. All the tumours were removed via the suboccipital approach, totally in 19 and subtotally in four patients. Clinical examination on admission for reconstructive surgery showed a complete paralysis of the facial nerve in each case. An EMG study confirmed the clinical assessment. The time between resection of the tumour and reconstructive surgery ranged from 1 to 52 months, with a median time of 5 months.

Technique of the facial-hypoglossal anastomosis

Preauricular skin incision, as done for a parotidectomy, was curved down into the upper neck. The facial nerve was identified in the stylo-mastoid region and dissected to its first division. The hypoglossal nerve was exposed, dissected and mobilized along its cervical course up to the anterior margins of the mylohyoid muscle. Then, the cervical ansa was identified and carefully dissected to the length that was needed to anastomose it with the distal stump of the hypoglossal nerve. The facial nerve was cut at the stylomastoid foramen and its distal trunk was sutured to the proximal end of the hypoglossal nerve. The cervical ansa was cut obliquely and an anastomosis was performed between the ramus descendens of the cervical ansa and the distal stump of hypoglossal nerve. The nerves were sutured using epineural 10/0 monofilament stitches.

Muscle transposition

In 18 of our patients, with long-lasting facial palsies and significant atrophy of the facial

muscles, we chose to perform transposition of the temporal muscle, masseter or both, in addition to the neural anastomoses described above. Bundles of fibres from the temporal muscle were separated together with the fascia and periosteum and inserted into both palpebral parts of the orbicularis oculi muscle. In nine cases we reinforced the zygomatic and risorius muscles using temporal or masseter muscle fibres implanted into the naso-labial and the angular region.

Results

The follow-up period is 3–87 months after anastomosis (average 32, median 33). Assessment of the results includes facial nerve function determined on the basis of clinical examination according to the classification proposed by House[11] and EMG studies. Among 23 patients there were eight cases with almost normal facial movements (grade II, Fig. 1), 10 were classified grade III, and five grade IV. In all of the 18 patients with muscle transposition closure of the eye was satisfactory immediately after operation (Fig. 2). The assessment of the first clinical effect of the neural anastomosis in these patients (usually seen in orbicularis oculi) was difficult. First signs of reinnervation in the naso-labial region were observed 4–6 months after reconstructive surgery. In one case with the anastomosis performed 4 weeks after tumour removal without muscle transposition, the first facial movements appeared 2 months after reconstruction. All the patients with the anastomosis between cervical ansa and distal stump of XI-Ith nerve had satisfactory tongue movements during speech, swallowing and chewing. However, a mild degree of ipsilateral tongue atrophy was always present.

EMG studies

The signs of denervation (fibrillations and positive sharp waves) were detected in all the patients before the anastomosis. A complete facial nerve lesion was further confirmed by the absence of evoked muscle action potentials (MAP) in response to the supramaximal facial nerve stimulation.

Postoperative EMG control was obtained in 18 patients. The first signs of reinnervation in the orbicularis oris muscles were seen 5 months after anastomosis (Fig. 3). Good firing of motor unit potentials from this muscle was recorded, while the fibrillation potentials and no volitional EMG activity in the frontal muscle were still present. The EMG evidence of reinnervation of paralysed facial muscles was unequivocal 6–11 months following the anastomosis. In six cases we recorded a blink reflex from previously denervated orbicularis oculi muscle 10 months after the surgery.

EMG recordings from the tongue on the side of anastomosis in 16 patients, indicated partial denervation. The stimulation of the hypoglossal nerve anastomosed with ansa cervicalis elicited MAP in the tongue with re-

FIG. 1. Patient 15, 20 months after anastomosis. Excellent facial symmetry and muscle tone at rest with good eye closure.

FIG. 2. Patient 5, one day after anastomosis with transposition of temporalis muscle. Good closure of the eye.

duced amplitude and prolonged latency when compared with the response on the opposite side (Fig. 4).

Discussion

Among numerous methods of facial reanimation, facio-hypoglossal anastomosis is the most popular and acceptable. The efficacy of this method in restoration of the facial function is well documented.[4,5,6,9] However, morbidity including tongue hemiatrophy is not negligible, particularly in patients with other cranial nerves deficits. In order to diminish these disturbances, supplementary innervation of the tongue muscles is desirable.[9] The cervical ansa is highly suitable for this purpose. Neurons of both the hypoglossal and cervical ansa nerves have a common origin and, hence, the function of the hypoglossal nerve should be easily supported.[12] Other cervical nerves have been used.[7,8] Results of the EMG examinations show that reinnervation of the tongue is incomplete, but nevertheless functionally satisfactory.

Timing of reconstructive surgery is reported to be the most important factor for a satisfactory result.[13] This observation is confirmed in our material. A long-standing facial paralysis with atrophy of facial muscles should reduce

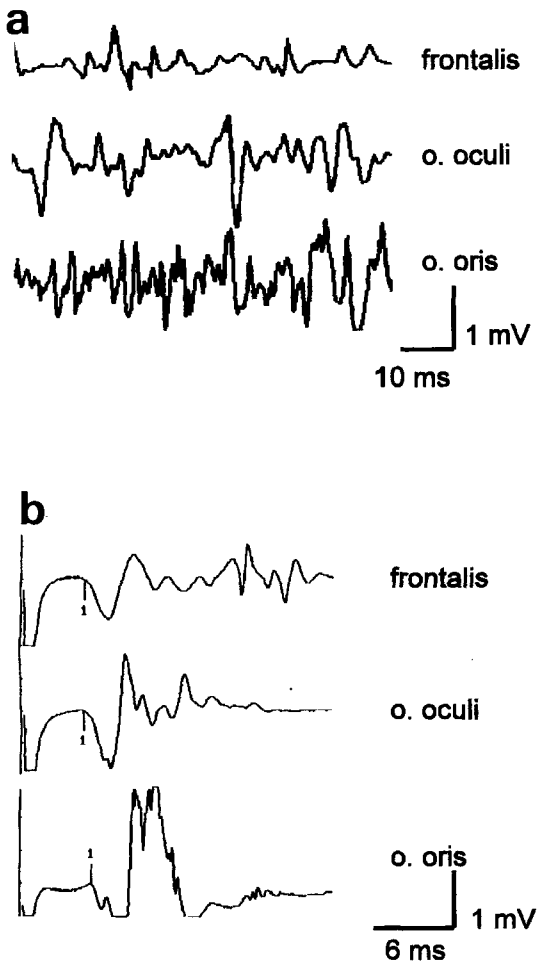

FIG. 3. (a) Volitional activity of left frontal, orbicularis oculi and orbicularis oris muscles 14 months after reconstruction. Reduced maximal voluntary effort traces from frontal and orbicularis oculi. (b) MAP evoked by supramaximal stimulation of anastomosis (1 cm medial and 1 cm anterior to the angle of the jaw). Latency within normal limits.

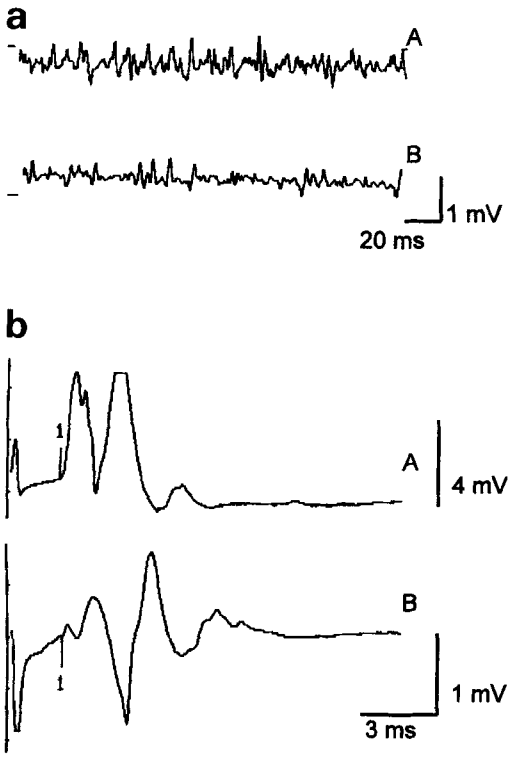

FIG. 4. (a) EMG volitional activity of tongue musculature 14 months after reconstruction. (A) Healthy; (B) operated side. (b) MAP evoked from both (A) healthy and (B) operated sides of the tongue, by hypoglossal nerves stimulation. Note longer latency and decreased amplitude on the operated side.

the chances of recovery, although Conley presented good results in patients operated upon 10 years after facial paralysis.[5] All the patients reported in this series were operated upon for a tumour in other departments and were referred for reconstruction relatively late. While early repair gives the best results, combined neural anastomosis and myoplasty can give useful improvement even in long-standing paralysis.

Even though the shortest time from the operation to the first evidence of active contraction of the orbicularis oculi muscle was 2 months in one of our patients, the period of risk of ophthalmic complications is still quite long. Should the anastomosis fail, it will be even longer. Therefore, after a short initial experience, we decided to perform simultaneously neural anastomoses and transposition of the temporalis muscle. This additional procedure might be redundant in view of the overall very good result of anastomosis, but it gives immediate protection to the eye and additionally supports function of the reinnervated orbicularis oculi muscle. We have not observed any complications or disturbing side-effects resulting from temporalis muscle transposition.

EMG studies and electroneurography are very helpful in preoperative assessment and in early assessment of the anastomosis.[14] Particularly useful for us was the EMG evidence of reinnervation of the tongue muscles through the anastomosis with the cervical ansa. Reappearance of the blink reflex can be interpreted as both proof of sufficient reinnervation and evidence of central nervous system plasticity.

Conclusion

We are of the opinion that after the facial nerve is severed, electively or accidentally, during surgery for cerebellopontine angle tumour, it should be repaired either with an end-to-end anastomosis or with a cable graft.[2,15] However, in many instances, such immediate repair will not be undertaken. These patients are usually referred for facial reanimation with some delay caused by a protracted postoperative course. A repeated intracranial procedure is technically very difficult for the surgeon and is not easily accepted by the patient. In such a situation the above-described approach gives immediate protection against keratitis, limits the degree of the tongue atrophy and dysfunction, and ultimately, when reinnervation of the facial muscles takes place, provides a good functional result.

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