The Journal of Laryngology & Otology (2010), ***124***, *23–25.*

doi:10.1017/S0022215109991344

Main Article

Facial reanimation with end-to-end hypoglossofacial anastomosis: 20 years' experience

T Catli, Y A Bayazit, O Gokdogan, N Goksu

Abstract

Objective: This study aimed to evaluate retrospectively the results of experience with end-to-end anastomosis of cranial nerves VII and XII, performed due to transection of the facial nerve during acoustic neuroma removal.

Methods: We assessed the facial reanimation results of 33 patients whose facial nerves had been transected during acoustic neuroma excision via a retrosigmoid approach, between 1985 and 2006, and who underwent end-to-end hypoglossofacial anastomosis. We compared the facial nerve functions of patients receiving short term (two to three years) and long term (more than three years) follow up, and we assessed any complications of the anastomosis.

Results: A House–Brackmann grade III facial function was achieved in 46.2 and 86.4 per cent of the patients in the short and long term, respectively. House–Brackmann grade IV facial function was achieved in 53.8 and 13.6 per cent of the patients in the short and long term, respectively. There was a statistically significant difference between the facial recovery results, comparing the short and long term follow-up periods ($p = 0.03$). Disarticulation was the most common complication, seen in 19 (57.6 per cent) patients; numbness of the tongue was the next commonest (10 (30.3 per cent) patients). None of the patients developed dysphagia.

Conclusion: Despite such morbidities as disarticulation and tongue numbness, end-to-end hypoglossofacial anastomosis is still an effective procedure for the surgical rehabilitation of static and dynamic facial nerve functions. Significant improvement in facial nerve function can occur more than three years post-operatively.

Key words: Facial Paralysis; Hypoglossal Nerve; Anastomosis

Introduction

Despite advances in facial nerve monitoring technology and microsurgical techniques, cerebellopontine angle surgery can still result in varying degrees of facial nerve injury.[1,2] This can be attributed either to direct nerve trauma during surgery or to the histopathological nature of the lesion. In order to rehabilitate facial nerve function, several surgical techniques have been developed.

Anastomosis of the hypoglossal and facial nerves (i.e. cranial nerves VII and XII) is the treatment of choice for facial reanimation in patients whose facial nerve has been transected in the cerebellopontine angle, and in whom end-to-end anastomosis of the facial nerve is not possible. Anastomosis of cranial nerves VII and XII is considered to achieve a dynamic result, which at best enables static facial symmetry and closure of the eyelid. Thus, both static and dynamic facial functions can be restored.

The aim of this study was to evaluate retrospectively the results of our experience with end-to-end anastomosis of cranial nerves VII and XII, performed due to transection of the facial nerve during acoustic neuroma removal.

Methods

Archival medical records were searched to identify patients who had suffered facial nerve transection during acoustic neuroma excision via a retrosigmoid approach, between 1985 and 2006, and who had subsequently undergone hypoglossofacial end-to-end anastomosis. Forty-three patients were identified. For those patients with adequate follow-up data, details were recorded from the medical record. The remaining patients were contacted via telephone and recalled for an otolaryngological examination. Of the 43 patients identified, eight were lost to follow up, and two had a follow-up period of less than two

From the Department of Otorhinolaryngology, Faculty of Medicine, Gazi University, Ankara, Turkey.
Accepted for publication: 10 June 2009. First published online 29 September 2009.

years. Therefore, 33 patients were included in the study. These patients comprised 24 men and nine women, with ages ranging from 21 to 71 years (mean age 45 years).

Facial function was evaluated according to the House–Brackmann scale.[3] All patients had House–Brackmann grade VI facial weakness after retrosigmoid acoustic neuroma removal. Hypoglossofacial anastomoses were performed one to three months after the posterior fossa surgery, and post-operative facial nerve function was assessed more than 24 months after this surgery. The facial function of patients after short term (i.e. two to three years) and long term (i.e. more than three years) follow up was compared statistically using Fisher's exact test. Patients were also questioned about other possible complications of the anastomosis, i.e. dysarthria, dysphagia and numbness of the tongue.

Results

No patient had a lower cranial nerve deficit after acoustic neuroma removal. House–Brackmann grade III facial function was achieved in 46.2 and 86.4 per cent of the patients after short and long term follow up, respectively. House–Brackmann grade IV facial function was achieved in 53.8 and 13.6 per cent of the patients after short and long term follow up, respectively. The difference between facial recovery results after short and long term follow up was statistically significant ($p = 0.03$) (Table I).

Dysarthria was the commonest complication of hypoglossofacial end-to-end anastomosis, being seen in 19 (57.6 per cent) patients; this was described by the patients as 'difficulty in pronouncing some letters'. The second most common complication was numbness of the tongue, seen in 10 (30.3 per cent) patients. Numbness was described by some patients as a 'loss of sensitivity' of the ipsilateral side of the tongue. None of the patients had dysphagia. (difficulty in swallowing).

Discussion

Disruption of the anatomical continuity of the facial nerve beyond its intracranial portion can be treated using a variety of described techniques.[4–10] If a central stump of the facial nerve is available, it may be possible to achieve nerve continuity with intracranial–extracranial or intracranial–extratemporal nerve grafting. The functional outcomes of these procedures vary from House–Brackmann grade III to IV.[11] Favourable results were reported in a series of 26 patients undergoing hypoglossofacial anastomosis with a modified May technique; House–Brackmann grade II was achieved in 19.2 per cent of patients, while 73.1 per cent had grade IV and 7.7 per cent had grade V facial function at 18 months.[12] In our series: House–Brackmann grades III and IV were achieved in 71.4 and 28.6 per cent of our patients, respectively, after three years' follow up.

Malik *et al.* studied 13 patients, and reported that classical hypoglossofacial end-to-end anastomosis resulted in a House–Brackmann grade of III or less in 25 per cent of patients at 24 months post-operatively; however, some patients showed further improvement in facial function beyond this time period.[13] Similarly, our results also supported the argument that progressive improvement of facial function occurs after facial reanimation. A House–Brackmann grade III was encountered in 46.2 per cent of our patients at two to three years' follow up, and in 86.4 per cent of patients at more than three years' follow up; this indicates a significantly better outcome in the long term (i.e. beyond three years post-operatively), compared with earlier assessments.

TABLE I

PATIENTS' FACIAL REANIMATION RESULTS FOR HYPOGLOSSOFACIAL ANASTOMOSIS

HB grade	Post-op follow up (*n* (%))		Total (*n* (%))
	2–3 yrs	>3 yrs	
III	6 (46.2)	19 (86.4)	25 (71.4)
IV	7 (53.8)	3 (13.6)	10 (28.6)

$p = 0.03$, Fisher's exact test, comparing results for short and long term follow up. HB = House–Brackmann; post-op = post-operative; yrs = years

- **Despite technological advances in facial nerve monitoring and microsurgical techniques, cerebellopontine angle surgery can still result in varying degrees of facial nerve injury**
- **Hypoglossal–facial nerve anastomosis has been the treatment of choice for facial reanimation, when the facial nerve has been transected in the cerebellopontine angle**
- **Sectioning of the hypoglossal nerve can result in atrophy of the ipsilateral tongue, with swallowing and speech articulation problems**
- **Significant improvement in facial function can occur more than three years after hypoglossofacial anastomosis**

The major drawback of anastomosis of the facial nerve with other cranial nerves (such as the hypoglossal or accessory nerve) is the loss of function of these latter nerves. Sectioning of the hypoglossal nerve can result in atrophy of the ipsilateral tongue and problems with swallowing and speech articulation. In a previous study of hypoglossofacial anastomosis after acoustic neuroma resection, difficulties in articulation and swallowing were noted in 69.6 and 58.7 per cent of patients, respectively.[14] In our study, 57 per cent of patients had speech articulation problems and 29 per cent had numbness of the ipsilateral tongue, although none had swallowing problems. Disarticulation generally begins immediately after the operation, and is related to motor denervation of the ipsilateral tongue. This denervation results in atrophy of the tongue muscles, which leads

https://doi.org/10.1017/S0022215109991344 Published online by Cambridge University Press

to decreased tongue volume ipsilaterally. Thus, patients may complain of numbness of the tongue.

The oral phase of swallowing may be affected following hypoglossofacial anastomosis. Swallowing problems can decrease patients' quality of life. However, none of our patients suffered swallowing disorders or dysphagia; this can be attributed to the presence of functioning vagus and glossopharyngeal nerves bilaterally.

In an attempt to preserve tongue function, different anastomosis techniques have been proposed. In a series of 13 patients undergoing end-to-side hypoglossofacial anastomosis using a split hypoglossal nerve technique, Rochkind *et al.* reported that satisfactory improvement in facial nerve function could be achieved while preserving tongue function.[15] However, according to a recent meta-analysis, modification of the anastomosis technique seems to avoid the complications of end-to-end anastomosis, although the effect of modified techniques on facial reanimation is still unclear.[16]

Conclusion

Despite morbidities such as disarticulation and tongue numbness, end-to-end hypoglossofacial anastomosis is still an effective procedure for the surgical rehabilitation of static and dynamic facial nerve functions. A significant improvement in facial nerve function can occur more than three years after the reanimation procedure.

References

1 Harner SG, Daube JR, Beatty CW, Ebersold MJ. Intraoperative monitoring of the facial nerve. *Laryngoscope* 1988;**98**:209–12
2 Prass RL, Kinney SE, Hardy RW Jr, Hahn JF, Lüders H. Acoustic (loudspeaker) facial EMG monitoring: II. Use of evoked EMG activity during acoustic neuroma resection. *Otolaryngol Head Neck Surg* 1987;**97**:541–51
3 House JW, Brackmann DE. Facial nerve grading system. *Otolaryngol Head Neck Surg* 1985;**93**:146–7
4 Linnet J, Madsen FF. Hypoglosso-facial nerve anastomosis. *Acta Neurochir (Wien)* 1995;**133**:112–15
5 Pellat JL, Bonnefille E, Zanaret M, Cannoni M. Hypoglossal-facial anastomosis. A report of 60 cases. *Ann Chir Plast Esthet* 1997;**42**:37–43
6 Pitty LF, Tator CH. Hypoglossal-facial nerve anastomosis for facial nerve palsy following surgery for cerebellopontine angle tumors. *J Neurosurg* 1992;**77**:724–31
7 Rosenwasser RH, Liebman E, Jiménez DF, Buchheit WA, Andrews DW. Facial reanimation after facial nerve injury. *Neurosurgery* 1991;**29**:568–74
8 Samii M, Matthies C. Indication, technique and results of facial nerve reconstruction. *Acta Neurochir (Wien)* 1994;**130**:125–39
9 Shah SB, Jackler RK. Facial nerve surgery in the 19th and early 20th centuries: the evolution from crossover anastomosis to direct nerve repair. *Am J Otol* 1998;**19**:236–45
10 Spector JG. Neural repair in facial paralysis: clinical and experimental studies. *Eur Arch Otorhinolaryngol* 1997;**254**(suppl 1):68–75
11 Papel ID. Rehabilitation of the paralyzed face. *Otolaryngol Clin North Am* 1991;**24**:727–38
12 Darrouzet V, Dutkiewicz J, Chambrin A, Stoll D, Bébéar JP. Hypoglosso-facial anastomosis: results and technical development towards end-to-side anastomosis with rerouting of the intra-temporal facial nerve (modified May technique) (in French). *Rev Laryngol Otol Rhinol (Bord)* 1997;**118**:203–10
13 Malik TH, Kelly G, Ahmed A, Saeed SR, Ramsden RT. A comparison of surgical techniques used in dynamic reanimation of the paralyzed face. *Otol Neurotol* 2005;**26**:284–91
14 Kunihiro T, Higashino K, Kanzaki J. Classic hypoglossal-facial nerve anastomosis after acoustic neuroma resection. *J Otorhinolaryngol Relat Spec* 2003;**65**:1–6
15 Rochkind S, Shafi M, Alon M, Salame K, Fliss DM. Facial nerve reconstruction using a split hypoglossal nerve with preservation of tongue function. *J Reconstr Microsurg* 2008;**24**:469–74
16 Yetiser S, Karapinar U. Hypoglossal-facial nerve anastomosis: a meta-analytic study. *Ann Otol Rhinol Laryngol* 2007;**116**:542–9

Address for correspondence:
Dr Tolgahan Catli,
Gazi Universitesi Tıp Fakültesi,
Kulak Burun Boğaz AD,
Besevler,
Ankara, Turkey.

E-mail: tcatli80@hotmail.com

Dr T Catli takes responsibility for the integrity of the content of the paper.
Competing interests: None declared