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The management of dysphagia in jugular foramen surgery

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Abstract

From 1985–1994, the Skull Base Unit at St. Vincent's Hospital, Sydney, operated on 61 patients with tumours involving the jugular foramen. Pre-operative assessment by a Speech Pathologist and the institution of swallowing techniques prior to surgery have improved post-operative morbidity. Ancillary procedures at the time of surgery were not required in the majority of cases. An individual assessment of each patient early in the postoperative period was found to be more important with regard to the benefits of supplementary surgery. The majority of patients with dysphagia settled with conservative management and only a few underwent ancillary surgery. It is perceived that the cortical and subcortical control of swallowing is a major factor in the rehabilitation of these patients.

Key words: Dysphagia; Jugular foramen; Surgery

Introduction

The surgical removal of major skull base lesions continues to be a major technical challenge. Detachable balloon occlusion of the internal carotid artery has improved access to lesions of the petrous apex and clivus (Fisch *et al.*, 1984). Many lesions in these areas, previously thought to be inoperable, have become curable. The improvement in pre-operative assessment, surgical technique and post-operative rehabilitation during the past decade has markedly reduced the morbidity in surgery of the jugular foramen.

Functional problems associated with section of previously normal lower cranial nerves (glossopharyngeal, vagus, accessory and hypoglossal) continue to present major problems in the post-operative period. There have been a number of reports in the literature advocating the immediate use of ancillary procedures such as cricopharyngeal myotomy, vocal fold augmentation, thyroplasty and tracheostomy during jugular foramen surgery, in order to reduce post-operative morbidity (Levine, 1988; Biller *et al.* 1989; Netterville and Civantos 1993). Recent studies have led to a better understanding of the pathophysiology of dysphagia and aspiration and these combined with our personal experience in the management of jugular foramen tumours have resulted in a protocol that requires minimal post-operative intervention with associated surgical procedures (Mendelsohn, 1993). This paper presents a clinical review of the patients with these tumours treated by St Vincent's Hospital, Sydney, between 1985 and 1994. The rehabilitative measures utilized and the reasons for the approach to associated surgical procedures are discussed.

Materials and methods

A retrospective study was performed of all the tumours involving the jugular foramen, that were managed surgically with a Fisch Type A approach (Fisch *et al.* 1984), at the Otology/Base of Skull Surgery Unit of St. Vincent's Hospital, Sydney between 1985 and 1994. All operations were performed either by the senior author P.A.F. and since 1991, M.D.A. Information was obtained from both the patients' medical and speech pathology records. The extent of dysphagia was evaluated by the patient's ultimate ability to swallow a semi-solid or normal diet. Swallowing was assessed clinically by the Senior Author (P.A.F.) and Speech Pathologist (H.B.) at each post-operative visit and by modified barium swallow where indicated. Follow-up ranged from six months to six years. Sixty-one patients have had surgery of the jugular foramen performed comprising 26 males and 35 females. The age range was six to 74 years with a mean of 45.6 years.

Results

Sixteen patients had a facial nerve palsy at presentation and 10 of these were in association with other nerve deficits. The pre-operative abnor-

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TABLE I
PATHOLOGICAL DIAGNOSIS

Glomus jugulare	28
Glomus vagale faciale	1 (of each)
Meningioma	4
Clivus chordoma	4
Papillary middle ear carcinoma	4
Cholesteatoma	3
Chondromyxoid fibroma	2
Schwannoma VII/VIII/X	2 (of each)
Schwannoma V/IX/XII	1 (of each)
Cholesterol granuloma	1
Chondrosarcoma	1
Pleomorphic adenoma	1
Adenoid cystic carcinoma	1
Cavernous haemangioma	1

malities of the lower cranial nerves VIII–XII varied from a single palsy in 16 cases to a complete loss of all of these nerves in one patient. The most common single deficit was that of the VIIIth nerve with nine cases and there was only one case of a true, isolated jugular foramen syndrome (IX–XI). The combination of vagal and glossopharyngeal nerve deficits either together, or with other cranial nerves, occurred in 14 patients. The pathological entities encountered are shown in Table I.

Twenty-two patients developed a permanent cranial nerve palsy after surgery including 14 vagal deficits and eight cases of hypoglossal injury. These nerves were found to be enmeshed in tumour and histology revealed neural infiltration in the glomus jugulare tumours.

All patients had moderate to severe dysphagia post-operatively but only two required permanent enteral feeding (via a gastrostomy). One patient, whose behavioural, cognitive and comprehension skills were disturbed following complications arising from a ventriculo-peritoneal shunt for pre-operative hydrocephalus performed at another hospital, six months post-jugular foramen surgery has had a pharyngostomy performed. The 57 remaining cases were managing either a semi-solid or normal diet at six-month follow-up.

Six patients required a tracheostomy and it has not been possible to decannulate the two cases that have required permanent enteral feeding. Cricopharyngeal myotomy was performed on four cases and a definite improvement was noted in only one. There were no cases of aspiration pneumonia. The vocal fold has been augmented with teflon in nine patients early in the post-operative period resulting in a better voice and cough reflex. Thyroplasty has not been performed on any patient.

The figures for local recurrence and development of multiple metastases are shown in Tables II and III respectively. There has been one peri-operative death in a case of an extensive and eventually inoperable clivus chordoma. Five patients have succumbed to their disease in the post-operative period, three from multiple metastases and two due to local recurrence. One has died from an unrelated illness.

Discussion

The current study has demonstrated that dysphagia remains a major contributor to post-operative morbidity in this type of surgery. Swallowing disorders after base of skull surgery will depend on the cranial nerves that are damaged. Makek *et al.* (1990) have demonstrated that despite being histologically benign, glomus jugulare tumours infiltrate adjacent cranial nerves. Most impairments are unilateral and the most severe problems result from combined injury to nerves IX, X and XII.

Our findings are in keeping with Sataloff *et al.* (1993) who reported that existing cranial nerve deficits do not improve in the majority of patients following base of skull surgery. We have found that most of the younger patients without pre-operative palsies but who developed acute surgical cranial nerve deficits had, with intensive speech and swallowing therapy, few problems initiating an oral diet early in the post-operative period. Our experience suggests that the role of the higher centres in the control of swallowing is another major factor in the post-operative rehabilitation of these patients which is in keeping with previous reports (Gay *et al.*, 1994; Poe *et al.*, 1991). The rehabilitation problems that we have encountered with the patient who developed complications from the pre-operative V-P shunt support this theory.

The types of deglutition problems encountered in patients following jugular foramen surgery have been described previously (Jennings *et al.*, 1992). The majority of these can be managed with swallowing therapy and it is part of the protocol at our unit that the Speech Pathologist consults the patient prior to surgery. The patient's speech and swallowing status is evaluated and the patient is advised on the possible consequences of surgery. Airway protection techniques to assist in the prevention of aspiration are taught. At the first contact post-surgery, the Speech Pathologist performs a standard clinical estimation of swallowing function (Mendelsohn, 1993). If abnormal, further assessment of the swallow is indicated to identify the nature of the swallowing problem, the presence of aspiration and the effect of swallowing strategies in protecting the airway. These studies include a modified barium swallow and a video-endoscopic swallowing study (Bastian, 1993). An oral diet is introduced when the patient can effectively protect

TABLE II
LOCAL RECURRENCE

Glomus jugulare	3
Clivus chordoma	1
Cavernous haemangioma	1
Total	5

TABLE III
MULTIPLE METASTASES

Glomus jugulare	1
Clivus chordoma	1
Pleomorphic adenoma	1
Total	3

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his airway and prevent aspiration using compensatory techniques and modified food techniques. The introduction of this speech pathology protocol has resulted in a more expeditious rate of swallowing rehabilitation. This is in keeping with the findings of Woods *et al.* (1993) who have reduced patients' average length of hospital stay from 21 to 10 days by using aggressive swallowing therapy although they include thyroplasty in the equation.

Aspiration is classified as prandial, salivary or reflux and prandial is further divided into before, during, or after the pharyngeal swallow (Mendelsohn, 1993). Most cases of prandial aspiration occur before or after the pharyngeal stage of swallowing at a time when the vocal folds are not normally adducted. This form of aspiration occurs despite the presence of normal vocal fold mobility. Prandial aspiration occurring during the pharyngeal phase depends on the loss of the multi-layered laryngeal protective mechanism and not on an isolated vocal fold palsy. Closure of the laryngeal inlet by apposition of the vocal folds alone provides only one protective layer against aspiration. Therefore, vocal fold augmentation (VCA) alone would be of little benefit in the management of aspiration except to improve the cough reflex. Patients with a weak cough may be selected for VCA. Furthermore, as a result of a high vagal lesion, the paralysed vocal fold, as in these cases, lies at a lower level than the normal opposite vocal fold and although Teflon will medialize the immobile fold it will not elevate it sufficiently to meet the opposing vocal fold (Sataloff *et al.*, 1993). Jennings *et al.* (1992) reported a 28 per cent incidence of aspiration in patients after VCA following skull base surgery. We have performed VCA in eight patients between one and two weeks post-operatively to improve voice quality in those with known permanent vagal injury and to improve the cough reflex. We believe that patients should be assessed post-operatively for VCA and that there is no place for it at the time of the initial surgery as advocated by some authors (Levine, 1988).

Jackson (1993) recommends that primary thyroplasty be performed at the time of tumour resection, if the larynx is denervated, as its use will improve glottic competence. A paper from the same group (Woods *et al.*, 1993) states that medialization of the paralysed vocal fold in combination with intensive swallowing therapy has more than halved the average hospital stay of their patients. We believe that it is not necessary to include thyroplasty as a routine procedure in the management of dysphagia at the time of surgery as it does not prevent aspiration and that swallowing therapy alone will give similar results. Thyroplasty should be considered for voice rehabilitation in the post-operative management of the patient.

Cricopharyngeal myotomy (CPM) has become a routine procedure at many units for the management of dysphagia following skull base surgery and some advise that the procedure should be performed as an ancillary measure at the same time as the principal procedure (Biller *et al.*, 1989). We have performed four CPM's early in our series with only one patient showing improvement which is in keeping with the low historical success rate. Recent work by Mendelsohn (1993) has shown that the backward pressure of the cricoid cartilage on the vertebrae and loss of propulsion are the important factors in delayed passage of the bolus. Therefore it is obvious that laryngeal elevation, which pulls the cricoid forwards and opens the oesophageal lumen, should be the preferred treatment modality. Therapeutic strategies have been described for improving cricopharyngeal dysfunction and these include Mendelsohn's manoeuvre, dietary modification and exercises to improve elevation of the larynx (Mendelsohn, 1993). We suggest that there is no place for CPM in the management of dysphagia in this group of patients.

Sataloff *et al.* (1993) suggest that tracheostomy should probably be performed on patients suffering iatrogenic IX, X and XII cranial nerve palsies. Jackson (1993) since instigating the use of thyroplasty has rarely required a tacheostomy in these cases. Both of these reports concentrate on tracheostomy and thyroplasty in the management of aspiration but we have shown that with proper swallowing therapy this problem can be surmounted without operative intervention. Tracheostomy was performed as a temporary procedure during the early post-operative period in three patients for management of airway obstruction and as a permanent procedure in two patients who had bilateral Xth cranial nerve palsies. We believe that tracheostomy should not be considered routine in this type of surgery and only adds to the post-operative morbidity.

Eighty-seven per cent (53/61) of the patients included in this review are alive and disease-free demonstrating the resectability and the excellent overall cure rate of these tumours. The majority of our patients were able to manage a semi-solid or normal diet within six months of surgery without the assistance of any associated surgical procedure.

The potential morbidity in jugular foramen surgery is very high but this study reveals that it can be substantially reduced if intensive swallowing therapy is employed and if each patient is individually assessed post-operatively for any necessary adjunctive procedures. This study suggests that CPM and VCA are no longer mainstays in the treatment of deglutition problems in these patients.

References

Bastian, R. W. (1993) The videoendoscopic swallowing study: an alternative and partner to the videofluoroscopic swallowing study. *Dysphagia* **8:** 359–367.

Biller, H. F., Lawson, W., Som, P., Rosenfeld, R. (1989) Glomus vagale tumours. *Annals of Otology, Rhinology and Laryngology* **98:** 21–26.

Fisch, U., Fagan, P., Valavanis, A. (1984) The infratemporal fossa approach for the lateral skull base. *Otolaryngologic Clinics of North America* **17:** 513–552.

Gay, T., Rendall, J. K., Spiro, J. (1994) Oral and laryngeal muscle coordination during swallowing. *Laryngoscope* **104:** 341–349.

Jackson, C. G. (1993) Basic surgical principles of neurotologic skull base surgery. *Laryngoscope* **103 (suppl. 60):** 29–44.
Jennings, K. S., Sirky, D., Jackson, C. G. (1992) Swallowing problems after excision of tumours of the skull base: diagnosis and management in twelve patients. *Dysphagia* **7(1):** 40–44.
Levine, T. M. (1988) Swallowing disorders following skull base surgery. *Otolaryngologic Clinics of North America* **21(4):** 751–759.
Makek, M., Franklin, D. J., Zhao, J. C., Fisch, U. (1990) Neural infiltration of glomus temporale tumours. *American Journal of Otology* **11(1):** 1–5.
Mendelsohn, M. M. (1993) New concepts in dysphagia management. *Journal of Otolaryngology* **22 (suppl. 1):** 1–24.
Netterville, J. L., Civantos, F. J. (1993) Rehabilitation of cranial nerve deficits after neurotologic skull base surgery. *Laryngoscope* **103:** 45–54.
Poe, D. S., Jackson, C. G., Glasscock, M. E., Johnson, G. D. (1991) Long-term results after lateral cranial base surgery. *Laryngoscope* **101:** 372–378.
Sataloff, R. T., Myers, D. L., Kremer, F. B. (1993) Management of cranial nerve injury following surgery of the skull base. *Otolaryngologic Clinics of North America* **17(3):** 577–589.
Woods, C. I., Strasnick, B., Jackson, C. G. (1993) Surgery for glomus tumours: The Otology Group experience. *Laryngoscope* **103 (suppl. 60):** 65–70.

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