

The value of intraoperative facial nerve monitoring and preoperative FNAC in superficial parotidectomy: facial nerve morbidity outcome

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Intraoperative use of nerve integrity monitors has been advocated to enhance nerve identification. We evaluate the impact of two controversial procedures used in surgical management of parotid tumors on postoperative facial nerve morbidity in University Kebangsaan Medical Centre, Malaysia: fine needle aspiration cytology and continuous facial monitoring using a nerve integrity monitor (NIM). This is a retrospective study on 15 cases of superficial parotidectomy performed during a 2-year period (2008–2010). In our opinion, using an NIM is optional for parotid tumors of the superficial lobe; however, performing preoperative fine needle aspiration cytology and using an NIM may help operative planning and improve medical education in a teaching hospital.

Keywords:

facial nerve morbidity, fine needle aspiration cytology, intraoperative facial nerve integrity monitors, superficial parotidectomy

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Introduction

Facial nerve paralysis is a potential devastating complication of parotid surgery and is widely reported because of the close approximation of the parotid tumor size and configuration with the facial nerve. Paralysis of the muscles responsible for facial expression has a negative influence on the patient, with tragic medical, social, and economic impact on them in addition to medicolegal implications for the surgeon. Recent reports indicate that the incidence of permanent facial nerve paralysis or paresis and transient facial nerve dysfunction after surgery for benign parotid tumors is between 3 and 5% and 8.2 and 65%, respectively [1]. For safe and effective surgical intervention in the region of the parotid gland, surgeons must know the key anatomical landmarks from the main trunk of the facial nerve to the peripheral branches or vice versa. As the risk for iatrogenic facial nerve palsy in parotid gland surgery depends mainly on the experience of the surgeon, continuous facial monitoring using a nerve integrity monitor (NIM) could be helpful in avoiding facial complications. Nevertheless, its role in routine superficial parotidectomy is still controversial. Several authors have compared results in monitored and unmonitored patients undergoing parotid surgery and have succeeded in demonstrating a reduced incidence of short-term postoperative facial palsy in the monitored group. In addition, early detection of malignancy allows improvement of surgical planning and information given to the patients [2]. The aims of our retrospective study were to analyze the impact of continuous intraoperative facial nerve monitoring and histological prediagnosis obtained from FNAC on postoperative

facial nerve morbidity in patients treated by superficial parotidectomy for benign lesions.

Materials and methods

Data were obtained through a systematic review of medical records of 15 patients who had undergone monitored superficial parotidectomy at the University Kebangsaan Medical Centre, Malaysia, between June 2008 and 1 May 2010. The patient population included nine men and six women (mean age 45 years, range 27–63 years). During this period, FNAC was performed before surgery for all 15 patients. The cytological findings were compared with the final histological results for precision of the tumor diagnosis. For detecting malignancy, FNAC findings were classified into the following categories: diagnostic failure, true positive (presence of malignancy correctly diagnosed), true negative (absence of malignancy correctly diagnosed), false negative (cytological study failed to diagnose malignancy), and false positive (cytological study incorrectly considered for malignancy). Operative management performed by a single senior surgeon consisted of 15 superficial parotidectomies. Anatomical and physiological preservation of the facial nerve were achieved in all patients under the guidance of a nerve integrity monitoring device. The device has two channels and a loudspeaker, allowing a surgeon to get ongoing feedback. Patients were assessed for the impact of preoperative cytological evaluation of the parotid tumor and intraoperative facial nerve monitoring on early postoperative facial nerve morbidity, as gauged using the House–Brackmann scale during hospitalization and

3 months after surgery. Paresis was defined as any objective facial muscular weakness in the frontal, zygomatic, and marginal mandibular areas of the facial nerve. Paralysis was defined as a complete lack of discernible facial movement in at least one of these areas.

Results

Predictive value of FNAC showed no specific complication after FNAC, which was performed on 15 patients. Definitive histological diagnosis of all surgical specimens revealed 13 benign lesions (five pleomorphic adenomas, five Warthin’s tumors, and three others benign conditions) and two malignant tumors (one acinic cell carcinoma and one mucoepidermoid carcinoma; Table 1).

Comparison between the definitive histological results and those of FNAC are presented in Tables 2–6. For predicting correct diagnosis, 1/1 of the true-positive tumors and 9/11 of the true-negative tumors were correctly diagnosed using FNAC, which represents 83.3% of correct initial histological diagnosis with the FNAC. Diagnostic failure and false-positive results were observed in 6.67 and 6.67%, respectively. Assessment of the impact of facial monitoring on facial nerve morbidity revealed that four patients in monitored group suffered from early post-operative facial dysfunction. All of the patients showed spontaneous improvement during the 3 months follow-up period after surgery. Preoperative facial nerve function was normal in all individuals in the FNAC group, and there were no operative facial nerve injuries in the monitored groups. Normal facial function was noticed in 11 patients (73.4%) on postoperative hospitalization (Table 7).

Postoperatively, the patients were assessed clinically for any signs of facial palsy, and they showed no permanent facial paresis or paralysis (Table 8). No statistically significant incidence of permanent facial morbidity was detected in both FNAC and NIM patients as all cases of facial nerve paresis (26.6%) resolved within 3 months postoperatively (Table 9).

Discussion

The aim of surgical treatment for parotid tumors is complete excision, with preservation of facial nerve integrity and prevention of tumor recurrence. In most cases, when the facial nerve is saved macroscopically during parotidectomy, paralysis is temporary and caused by ischemic, thermal, or blunt surgical trauma. The main objective of early cytological diagnosis of parotid tumors is the differential diagnosis between benign and malignant tumors. Accurate tumor typing remains less important and is deferred to the definitive histological examination. FNAC is a safe, minimally invasive, and an almost inexpensive procedure. Nevertheless, this technique remains controversial because of varying specificities and sensitivity, depending mainly on the experience of both the clinician performing the sampling and the pathologist analyzing the cytological material. False-positive findings

Table 1 Histological finding in monitored patients

Histological finding	Number of patients
Pleomorphic adenoma	5
Warthin’s tumor	5
Branchial cleft cyst	1
Lymphoepithelial sialadenitis	1
Benign lymphoepithelial cyst	1
Acinic cell carcinoma	1
Low grade mucoepidermoid carcinoma	1

Table 2 True-positive details for fine needle aspiration cytology

True positive (N)	FNAC result	Final histological diagnosis
1	Acinic cell carcinoma	Acinic cell carcinoma

FNAC, fine needle aspiration cytology; N, number of cases.

Table 3 True-negative details for fine needle aspiration cytology

True negative (N)	FNAC result	Final histological diagnosis
5	Pleomorphic adenoma	Pleomorphic adenoma
4	Warthin’s tumor	Warthin’s tumor
1	Parotid abscess	Warthin’s tumor
1	Benign cyst	Branchial cleft cyst

FNAC, fine needle aspiration cytology; N, number of cases.

Table 4 False-negative details for fine needle aspiration cytology

False negative (N)	FNAC result	Final histological diagnosis
1	Chronic granulomatous disease	Low grade mucoepidermoid carcinoma

FNAC, fine needle aspiration cytology; N, number of cases.

Table 5 Diagnostic failure details for fine needle aspiration cytology

Diagnostic failure (N)	FNAC result	Final histological diagnosis
1	Inconclusive	Lymphoepithelial sialadenitis

FNAC, fine needle aspiration cytology; N, number of cases.

Table 6 False-positive details for fine needle aspiration cytology

False positive (N)	FNAC result	Final histological diagnosis
1	Hodgkin’s lymphoma	Benign lymphoepithelial cyst

FNAC, fine needle aspiration cytology; N, number of cases.

are rare in the literature and ranges from 0 to 7% [3]. The rate of false-negative results in our study is low. FNAC appears to be an accurate adjunct for preoperative evaluations, allowing improvement in the therapeutic planning for parotid tumors; however, it cannot be relied on to prevent patients from undergoing surgery for nonmalignant conditions. With regard to postoperative facial disorders, the main concern in parotid surgery is to limit their incidence and severity. The main purpose of using an NIM device is for facial nerve detection and dissection of its branches, as it helps surgeons to be more careful in their dissection. Most common surgical nerve

Table 7 Facial disorders following the surgical procedures

Sex, age	Surgical act type	NIM	Area/facial disorder	Recovery duration (month)
F, 55	Superficial	Yes	Mandibular/paralysis	1
F, 27	Superficial	Yes	Frontal/paralysis	2
M, 31	Superficial	Yes	Mandibular/paralysis	1
F, 54	Superficial	Yes	Mandibular/paralysis	1

Table 8 Impact of the fine needle aspiration cytology and facial nerve monitoring on postoperative facial nerve morbidity

Postoperative facial nerve morbidity House–Brackmann grade	FNAC (n=15)	With NIM (n=15)
1 Normal	15	11
2 Mild dysfunction	0	4
3 Moderate dysfunction	0	0
4 Moderately severe dysfunction	0	0
5 Severe dysfunction	0	0
6 Total paralysis	0	0
Total	15	15

FNAC, fine needle aspiration cytology; NIM, nerve integrity monitor.

lesions are compression, stretching, crushing, and electrocoagulation heat damage, all usually detected by NIM devices. However, the beneficial effect of its routine use in parotid surgery is still controversial. Although surgical technique remains the most important factor in nerve preservation, using an NIM is beneficial in teaching hospitals, enabling residents to handle the facial nerve more 'gently' [4].

In addition, the facial nerve monitor can be used during the course of dissection to identify the facial nerve, map its course, identify potential injurious stimuli, and obtain prognostic information on postoperative facial nerve function. This study demonstrated that the nerve monitor can reduce facial nerve complications after parotid surgery as no cases of permanent facial nerve paralysis occurred in the patients who were monitored intraoperatively; however, no statistically significant incidence of postoperative transient facial nerve dysfunction was detected in both the monitored group and FNAC group. Accordingly, it can be concluded that patients with tumors of the superficial lobe of the parotid gland do not routinely require intraoperative facial nerve monitoring, although it has been reported to be useful in revision parotidectomy [5].

Conclusion

Using NIM is beneficial in teaching hospitals, enabling resident surgeons to be more gentle in handling the facial nerve, and it is more appropriate for revision parotidectomy

Table 9 Number of transient and permanent facial nerve paresis in superficial parotidectomy in relation to histopathology

Benign/malignant	N	Postoperative facial nerve morbidity	Transient facial palsy	Permanent facial palsy
Pleomorphic adenoma	5	1	1 HB grade II	0
Warthin's tumors	5	1	1 HB grade II	0
Branchial cleft cyst	1	0	HB grade I	0
Lymphoepithelial sialadenitis	1	0	HB grade I	0
Benign lymphoepithelial cyst	1	0	HB grade I	0
Acinic cell carcinoma	1	1	1 HB grade II	0
Low grade mucoepidermoid carcinoma	1	1	1 HB grade II	0

FNP, facial nerve palsy; HB, House–Brackmann.

and fixed parotid masses of the deep lobe, as intraoperative facial nerve monitoring provides feedback with regard to the location, extent, and ongoing functional status of the facial nerve during the surgical management of infiltrating benign lesions. In our opinion, surgical technique remains the most important factor in nerve preservation and using this technology is no substitute for good anatomic knowledge. However, the NIM probably helps senior surgeons assist young fellows, making them more familiar and confident with the technique, and thus enabling them to perform the parotidectomy with shorter operative time.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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