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MAIN ARTICLE

Stratifying the risk of facial nerve palsy after benign parotid surgery

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Abstract

Introduction: Post-operative facial palsy is the most important potential complication of parotid surgery for benign lesions. The published prevalence of facial weakness is up to 57 per cent for temporary weakness and up to 7 per cent for permanent weakness. We aimed to identify potential risk factors for post-operative facial palsy.

Materials and methods: One hundred and fifty patients who had undergone parotid surgery for benign disease were retrospectively reviewed. Tumour factors (size, location and histopathology), patient factors (age and sex) and operative factors (operation, surgeon grade, surgeon specialty and use of intra-operative facial nerve monitoring) were all analysed for significant associations with post-operative facial palsy.

Results and analysis: The overall incidence of facial palsy was 26.7 per cent for temporary weakness and 2.6 per cent for permanent weakness. The associations between facial palsy and all the above factors were analysed using Pearson's chi-square test and found to be non-significant.

Conclusion: These outcomes compare favourably with the literature. No significant risk factors were identified, suggesting that atraumatic, meticulous surgical technique is still the most important factor affecting post-operative facial palsy.

Key words: Parotid Diseases; Parotid Gland; Parotid Neoplasms; Facial Palsy; Risk Factors

Introduction

Parotid gland tumours represent approximately 2 per cent of all head and neck tumours and 70 to 80 per cent of all salivary gland tumours.[1,2] Parotid gland tumours are mostly benign, and have an estimated incidence of 3 to 4 per 100 000.[3] Surgical treatment of these tumours can represent a challenge for the surgeon. In some cases, the pathology is unknown and parotid surgery is performed for diagnostic purposes. In addition, parotid surgery carries a risk of facial palsy due to the proximity of the facial nerve to the tumour. This risk is one of the most important considerations and sources of anxiety for the patient undergoing parotid surgery, and their surgeon.

Facial nerve preservation during parotidectomy was first described in 1907 by Carwardine, though it was not until 1940 that Janes described routine identification of the facial nerve trunk early in the procedure.[4,5] Despite advances in operative technique, a significant proportion of patients undergoing parotid surgery still develop a post-operative facial palsy, with published prevalences of up to 57 per cent for temporary palsy and up to 7 per cent for permanent facial palsy.[6–10]

This study aimed to evaluate risk factors for developing facial palsy in patients undergoing parotidectomy for treatment of benign parotid disease.

Materials and methods

This study was registered with the Bradford Teaching Hospitals NHS Trust research and development department (audit number 1280), which confirmed that ethical approval was not required for this project. All patients who had undergone parotid surgery between September 1998 and September 2008 at Bradford Teaching Hospitals NHS Trust were identified using the Galaxy patient database system. A retrospective case-note analysis was performed and details of potential risk factors were recorded. These factors were categorised as patient demographics, operative factors and tumour factors.

Demographic data comprised the patient's age, sex and ethnicity.

The operative factors recorded comprised the type of surgery, as per Snow's classification,[11] and the primary surgeon's grade and specialty. We also recorded whether or not intra-operative electromyographic facial nerve monitoring had been used.

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The tumour factors recorded consisted of the tumour position (see Table I), histopathology details and maximum histological diameter.

Facial nerve function was recorded as per case-note documentation. In all cases, post-operative facial nerve function was classified using the House–Brackmann scale.[12] Facial nerve function was recorded immediately post-operatively in the recovery room, the day after surgery, and at each subsequent follow-up appointment until discharge. A temporary facial nerve palsy was defined as any facial nerve weakness from which the patient was reported to have made a full recovery. A permanent facial nerve palsy was defined as any facial nerve palsy from which the patient did not recover fully, within a minimum follow-up period of one year.

A univariate analysis of each of the above variables was performed using Pearson's chi-square test. *P* values of less than 0.05 were taken to indicate statistical significance. Multivariate analysis was reserved for any variables shown to be significant based on the univariate analysis.

Results and analysis

A total of 191 patients were identified as having undergone parotid surgery in Bradford Teaching Hospitals NHS Trust between September 1998 and September 2008. Of these, 22 patients had malignant disease and were excluded from the study. A further 19 sets of medical records were either unavailable or incomplete. Therefore, for the purposes of this study there were 150 patients identified as having undergone parotid surgery for benign disease over the 10-year study period. There were 72 male patients (48 per cent) and 78 female patients (52 per cent), with a mean age of 53 years (range, 15–80 years). With regards to ethnicity, 124 patients were Caucasian, 24 were Asian and 2 were Afro-Caribbean.

The most common tumour histological type was pleomorphic adenoma, with 97 cases (see Table II). The mean maximum histological diameter was 3.2 cm (range, 0.4–8.5 cm). In 18 cases, the maximum diameter was not specified in the histology report. Most tumours were located in the parotid tail, the site of 102 cases (68 per cent); the next commonest position was pre-auricular, with 31 cases (21 per cent) (see Table III).

Partial superficial parotidectomy was the most frequently performed operation, accounting for 84 cases (56 per cent). Of the remaining procedures, 54 cases (36 per cent) consisted of complete superficial parotidectomy, 6 (4 per cent) total parotidectomy, 2 (1 per cent) selective deep lobe parotidectomy and 4 (3 per cent) extracapsular dissection.

A consultant was the primary surgeon in 123 cases (82 per cent), while supervised trainees performed 26 cases (17 per cent) and an associate specialist was the primary surgeon in 1 case. One hundred and twenty-one procedures (81 per cent) were performed by ENT surgeons, 17 (11 per cent) by maxillofacial surgeons, 7 (5 per cent) by plastic surgeons and 5 (3 per cent) by general surgeons. Facial nerve monitoring was documented as being used in 67 cases (44 per cent).

Post-operatively, there were 40 cases (26.7 per cent) of temporary facial palsy and 4 cases (2.6 per cent) of permanent facial palsy. The average time for full recovery in temporary palsy cases was 110 days (range, 1–360 days). The most common branch involved was the marginal mandibular nerve, affected in 28 cases (64 per cent).

Univariate analysis of the above variables (see Table IV) showed that none had any significant association with the occurrence of post-operative facial nerve palsy.

Discussion

A number of retrospective analyses have attempted to determine risk factors for post-operative facial nerve palsy. Malignancy has long been recognised to be an important factor; however, in benign disease there have been contradictory findings.[13]

Some authors have reported that increasing patient age is associated with increased risk of post-operative facial palsy. Guntinas-Lichius *et al.* reported that an age of more than 70 years was a significant risk factor for temporary facial palsy, whilst Mra *et al.* reported similar findings for an age of more than 40 years.[14,15] However, Laccourreye *et al.* found that age was not a significant risk factor.[6] Our study too

TABLE I
CLASSIFICATION OF PAROTID TUMOUR POSITION*

Tail
Pre-auricular
Deep lobe
Diffuse

*Within gland.

TABLE II
PAROTID TUMOUR HISTOPATHOLOGY

Tumour type	Pts (*n* (%))
Pleomorphic adenoma	97 (65)
Warthin's tumour	26 (17)
Sialadenitis or sialolithiasis	9 (6)
Epithelial cyst	5 (3)
Other benign tumour	13 (9)

TABLE III
PAROTID TUMOUR POSITION*

Position	Pts (*n* (%))
Tail	102 (68)
Pre-auricular	31 (21)
Diffuse	5 (3)
Deep	3 (2)
Not specified	9 (6)

*Within parotid gland.

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TABLE IV
ANALYSIS OF RISK FACTORS FOR POST-OPERATIVE FACIAL NERVE PALSY

Factor	Temporary FP*		Permanent FP†	
	Pts (*n* (%)‡)	*p*	Pts (*n* (%)‡)	*p*
Age				
– ≤50 y	16 (22)	0.24	2 (3)	1.00
– >50 y	24 (32)		2 (3)	
Sex				
– Male	17 (24)	0.49	1 (1)	0.37
– Female	23 (29)		3 (4)	
Surgery type				
– PSP	27 (32)	0.14	2 (2)	0.84
– Other	13 (20)		2 (3)	
Surgeon grade				
– Consultant	31 (25)	0.46	4 (3)	0.36
– Reg or SAS	9 (33)		0 (0)	
Surgeon specialty				
– ENT	34 (28)	0.50	3 (2)	0.80
– Other	6 (21)		1 (3)	
Facial nerve monitor use?				
– Yes	17 (25)	0.77	3 (4)	0.22
– No	23 (28)		1 (1)	
Tumour histopathology				
– PSA	26 (27)	0.97	2 (2)	1.4
– Other	14 (26)		2 (4)	
Tumour max diameter**				
– ≤3 cm	19 (25)	0.84	1 (1)	0.19
– >3 cm	15 (27)		3 (5)	
Tumour position§				
– Tail	27 (26)	0.72	3 (3)	0.98
– Pre-auricular	7 (23)		1 (3)	
– Diffuse	2 (40)		0 (0)	
– Deep	0 (0)		0 (0)	

*$n = 150$; †$n = 150$. ‡Of palsy type subgroup. **$n = 132$; §$n = 141$. FP = facial palsy; Pts = patients; y = years; PSP = partial superficial parotidectomy; Reg = registrar; SAS = Staff grade or Associate Specialist; PSA = pleomorphic salivary adenoma; max = maximum

found that age was not a significant risk factor, though there were slightly fewer patients in their eighth and ninth decades in our group (see Figure 1).

Our study contained similar numbers of male and female patients, and we found no significant association between sex and post-operative facial palsy, in agreement with previous series.[10]

As expected, the most common tumour type in our study was pleomorphic adenoma, followed by Warthin's tumour. We found no difference in the prevalence of post-operative facial palsy between patients with different types of benign tumour. There were of course fewer parotidectomies performed for inflammatory or infective reasons such as sialadenitis (7 per cent of parotidectomies were performed for these reasons). The performance of parotidectomy for these indications (versus other parotidectomy indications) was not found to be a risk factor. This is in keeping with other published studies; Dulguerov *et al*. and Yuan *et al*. reported that only 3 and 4 per cent of parotidectomies in their respective series were performed for inflammatory or infective conditions.[8,10] However, this is a finding which may conflict with many surgeons' personal views based on anecdotal evidence.

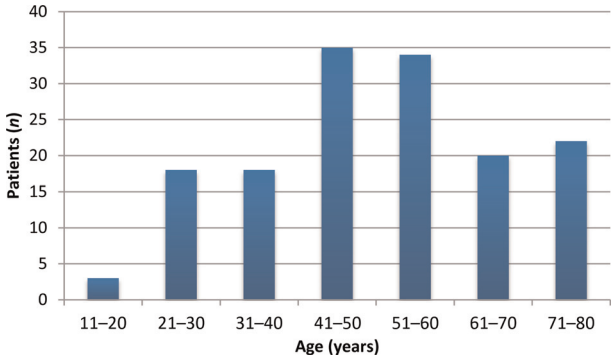

FIG. 1
Patients' age distribution by decade.

In the present study, the maximum histological diameter of the lesion had no effect on the risk of post-operative facial palsy. Previous findings have been contradictory. The findings of Mra *et al*. agree with our own; however, Dulguerov *et al*. found increasing size to be a significant risk factor for post-operative facial weakness.[8,15] Both of these series were less than half the size of our study population.

Our study found that general tumour location was not significantly associated with post-operative facial palsy risk. Gaillard *et al*. found that close contact between the tumour and the facial nerve closely correlated with post-operative facial nerve dysfunction.[16] This probably reflects the fact that nerve stretch injuries are more likely when the nerve runs directly under or over a tumour. Broad classification of tumour location does not accurately indicate this level of proximity to the facial nerve.

Partial superficial parotidectomy was not associated with significantly different rates of post-operative facial palsy, compared with other types of parotid surgery. This may be due to lower numbers of total ($n = 6$) and selective deep lobe ($n = 2$) parotidectomies in our series, compared with partial superficial parotidectomy. Upton *et al*. found that more extensive operations were associated with a 2.7 times greater incidence of post-operative facial weakness.[17]

- **Facial nerve palsy is the best recognised complication of parotid surgery**
- **The biggest risk factors are malignancy and close tumour–nerve contact**
- **In this study, age, sex, and tumour size, location and histopathology had no effect on post-operative facial palsy rates**
- **This suggests that careful surgical technique is the most important factor**

Neither primary surgeon grade nor primary surgeon specialty was shown to be a significant risk factor for post-operative facial palsy. It is reassuring for both

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patients and surgeons that surgeon grade did not affect outcomes, and hopefully reflects standards of training within our teaching hospital trust. Eng and colleagues' findings regarding surgeon specialty concur with our own.[9]

Where it is available, continuous intra-operative electromyographic nerve monitoring has become something of a medicolegal necessity. However, Grosheva *et al*. demonstrated in a prospective trial that intra-operative nerve monitoring did not decrease the incidence of post-operative facial nerve palsy.[18] Our results agreed with these findings.

Conclusion

In this study of benign parotid surgery, the overall incidence of post-operative facial palsy was 26.7 per cent for temporary weakness and 2.6 per cent for permanent weakness. None of the clinical or pathological variables analysed in this study were found to be significant risk factors for post-operative facial palsy. This may well simply reflect the fact that, in parotid surgery, the most important influence on post-operative facial palsy is careful surgical technique with meticulously atraumatic handling of and dissection around the facial nerve.

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