STUDY OF NERVE INJURY IN PAROTID GLAND SURGERY

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Objective:
To find out the frequency of nerve injuries after parotid surgery

Material and methods:
A Cross sectional study was done from January 2008 to December 2009, in the Department of Otolaryngology and Head Neck Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU) & Dhaka Medical College Hospital (DMCH), Dhaka. Thirty patients with parotid gland diseases underwent surgical treatment were selected for this study by convenient, purposive, none randomize sampling. The patients were followed up for one year after surgery and evaluated the status of the nerve injury (temporary or permanent).

Results:
Out of 30 cases, superficial parotidectomy was done in 23 (76.67%) patients and total conservative parotidectomy was done in 7 (23.33%) patients. In this study, 23 (76.67%) patients had benign tumours, 5 (16.67%) patients had malignant tumours and 2 patients had inflammatory disease. Most of the benign parotid tumours were pleomorphic adenoma (73.33%). Majority of the pleomorphic adenomas involved the superficial lobe (90.91%) of the gland. Immediately after operation we observed facial nerve injuries in 11 patients and great auricular nerve injuries in four patients. In this series, 26.67% developed temporary facial paresis, whereas 10% developed permanent facial palsy. Marginal mandibular branch of the facial nerve was the most commonly injured (16.33%) nerve. Temporary great auricular nerve palsy was observed in 10% where as permanent paralysis was observed in 3.33%. Frey's syndrome was found in 4.34%.

Conclusion:
Most patient regained normal facial nerve functions between one and six months after surgery. This observation has important implications for the management of post parotidectomy facial nerve palsy. Temporary facial nerve paresis is the cosmetic problem and patients should be assured that their appearance would return to normal.

Key words: parotidectomy, facial paresis, pleomorphic adenoma

INTRODUCTION:

Tumors of the parotid glands are believed to represent approximately 2% of tumors of the head and neck. Parotid gland tumors also accounts for 70% to 80% of all tumors of the salivary glands.[1] Approximately, 80% of parotid tumors are benign and 80% of benign tumours are pleomorphic adenomas and 80% arise from the superficial lobe of the parotid gland.[2] Less commonly, tumours may arise from the accessory lobe of the gland and present as a persistent swelling in the cheek. Rarely, tumours may arise from the deep lobe of the parotid gland and present as parapharyngeal masses.[3] The facial nerve is a very important nerve which exits through the skull base, below the ear lobule and travels through the parotid gland, separating the gland into superficial and deep lobes.[4] The hazardous course of the facial nerve through the parotid has evoked considerable risk of nerve injury.[2] The incidence of facial nerve paralysis is higher in total than in superficial parotidectomy, which may be related to stretch injury or as a result of surgical interference with the vasa nervosum. Among the branches of facial nerve which is the most at risk for injury during parotidectomy, is the marginal mandibular branch.[5] Parotid duct ligation increases the risk of nerve palsy in the distribution of zygomatic and buccal branches. Operations for Warthin's tumour were associated with the increased risk of dysfunction of the cervical branch of the facial nerve.[6] Advanced age, longer operation time and larger specimen will have the significant risk for transient facial palsy after conservative parotidectomy.[7]

There are two basic techniques for the identification and dissection of the facial nerve. One is the forward or antegrade dissection, where the approach to the main trunk is taken as an early step of tracing it to the bifurcation and peripheral branches. Retrograde dissection of the facial nerve is more popular in china with encouraging results.[1] Function preserving parotid surgery has relatively low complication rate like the use of a modified facelift incision, preservation of the great auricular nerve and normal parotid parenchyma. Ear sensation returned more rapidly and more completely in patients in whom the posterior branch of the great auricular nerve is preserved than in those in whom the nerve is sacrificed.[8] The auriculotemporal nerve provides both parasympathetic innervations to the parotid gland and sympathetic innervations to sweat glands and subcutaneous blood vessels. Frey's syndrome is due to regrowth of the secretomotor parasympathetic fibers into the distal cut ends of the sympathetic fibers into the skin.[9] The objective of this study is to find out the frequency of nerve injuries after parotid surgery.

MATERIAL AND METHODS:

A Cross sectional study was done from January 2008 to December 2009 in the Department of Otolaryngology and Head Neck Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU) & Dhaka Medical College Hospital (DMCH), Dhaka. Thirty patients with parotid gland diseases who underwent surgical treatment for their pathology were selected for this study by a convenient, purposive and non randomize sampling method. The patients were followed up for one year after operation and evaluated the status of the nerve injury whether it was temporary or permanent. Written informed consent was taken from the patients or attendants after discussion prior to surgery. We included all patients with parotid gland diseases who received surgical treatment and excluded those parotid gland diseases who had facial nerve palsy along with the disease. In all radical and extended radical parotidectomy cases, nerve was sacrificed purposefully. Data was analyzed by using standard statistical methods. Results were analyzed and evaluated by using proper tests of significance (Z test & χ^2 test) which were presented in following table.

RESULTS:

In this study, mean age of the patients was 40.63 years, SD= ± 16.25. Male to Female ratio was 1:1.4. Histologically, there were 22 cases of pleomorphic adenoma, five cases of mucoepidermoid carcinoma, two cases of chronic sialoadenitis and one case of Warthin's tumour. Location of benign parotid diseases among the study population (n=22) showed that out of 22 cases, 20 (90.91%) cases involved the superficial lobe where as two (9.09%) cases involved the deep lobe. Statistically pathology of superficial lobe was significantly higher than the deep lobe of the parotid gland($Z= 11.03$, $p < 0.001$). Out of 23 cases of superficial parotidectomy, facial nerve palsy was observed in six cases where as great auricular nerve palsy was observed only in two cases (Table-1). Among the facial nerve palsy group, five cases had temporary palsy and one case had permanent palsy, whereas in great auricular nerve palsy group all cases had temporary palsy (Table-1). Among seven cases of total conservative parotidectomy, facial nerve palsy was observed in five cases and great auricular nerve palsy was observed in two cases (Table-2). Among these facial nerve palsy group, three cases had temporary palsy and two cases had permanent palsy, where as in great auricular nerve palsy group only one case had both temporary and permanent palsy (Table-2). In contrast, out of five cases of mucoepidermoid carcinomas (low grade), four cases had facial nerve injury and one case had great auricular nerve injury (Table-3).

Table: 1. Study of nerve injury after superficial parotidectomy (n=23)

Nerve injury	No. of cases	Percentage
Facial palsy	6	26.08%
Temporary	5	21.73%
Permanent	1	4.34%
Great auricular nerve palsy	2	8.69%
Temporary	2	8.69%
Permanent	0	0
Frey's syndrome	1	4.34%

Table: 2. Study of nerve injury after total conservative parotidectomy (n=07)

Nerve injury	No. of cases	Percentage
Facial palsy	5	71.43%
Temporary	3	42.86%
Permanent	2	28.57%
Great auricular nerve palsy	2	28.57%
Temporary	1	14.28%
Permanent	1	14.28%
Frey's syndrome	0	0

Table: 3. Distribution of diseases in relation to nerve injury (n=30)

Nature of disease	No. of patients	No. of Facial nerve injury & relating percentages	No. of Great auricular nerve injury & relating percentages
Pleomorphic adenoma	22	6 (27.27%)	2 (9.09%)
Warthin's tumour	1	00	00
Chronic sialoadenitis	2	1 (50%)	00
Mucoepidermoid ca (low grade)	5	4 (80%)	1 (20%)
Total	30	11	3

Table: 4. Different branches of facial nerve injury following surgery

Type	Branches	No. of patients	Percentages
Single branch	Temporal	Nil	01
	Zygomatic	Nil	05
	Buccal	Nil	Nil
	Marginal mandibular	3.33	Nil
	Cervical	16.67	Nil
Multiple branches	Marginal mandibular & zygomatic	02	6.67
All branches	All	03	10.0

Out of 30 parotid surgeries, 11 patients had facial nerve injury and among them, three patients had injury of all branches. Remaining six patients had single branch injury and two patients had multiple branch injury (Table-4). Out of 23 cases of superficial parotidectomy, six patients had facial nerve injury and among these six cases, five cases had temporary palsy and one case had permanent palsy. Out of seven cases of total conservative parotidectomy, five cases had facial nerve injury and among these five, three cases had temporary palsy and two cases had permanent palsy. The difference of facial nerve injury between superficial parotidectomy and total conservative parotidectomy was statistically significant (Table-5). (Z= 2.34, p< 0.05)

Table: 5. Comparison of facial nerve injury between superficial parotidectomy and total conservative parotidectomy (n=30)

Facial nerve injury	Superficial parotidectomy (n= 23)	Total conservative parotidectomy (n= 7)	Total 30
Temporary	5 (21.73%)	3 (42.85%)	8
Permanent	1 (4.35%)	2 (28.57%)	3
Total	6 (26.08%)	5 (71.42%)	11

Table: 6. Recovery of nerve injury after surgery (n=15).

Nerve	Type	Branches	No. of patients with injury	No. & percentage of patients with recovery	No. & percentage of patients without recovery
Facial Nerve	Single	Marginal mandibular	5	4 (80%)	1 (20%)
		Zygomatic	1	1 (100%)	Nil
	Multiple	Marginal mandibular & Zygomatic	2	2 (100%)	Nil
	All	All	3	1 (33.33)	2 (66.67)
Great auricular nerve			4	3 (75%)	1 (25%)

Table: 7. Follow up patients after nerve injury

Type of parotid surgery	Total no. of treated patients	No. of facial nerve injury patients' follow up	No. of great auricular nerve injury patients' follow up	follow up period
Superficial parotidectomy	23	6 (26.08%)	2 (8.7%)	One year
Total conservative parotidectomy	7	5 (71.43)	2 (28.57%)	One year

It is evident from Table-6 that, the total number of permanent facial palsy was three. Out of these three, two cases had total paralysis and another one had single branch palsy (Marginal mandibular nerve). Total number of permanent great auricular nerve palsy was only one.

In superficial parotidectomy, facial nerve injury was observed in six patients where as the great auricular nerve injury was observed only in two cases. In total conservative parotidectomy, facial nerve injury was observed in five patients and the great auricular nerve injury was observed only in two cases (Table-7).

DISCUSSION:

In this present series, 30 cases of parotid gland surgery were studied. Out of these 30 cases, 11 patients developed facial nerve palsy immediately after operation where as four patients developed great auricular nerve palsy. These patients were followed up for one year after surgery and re-evaluated the status of nerve palsy to detect whether it was temporary or permanent palsy. The results obtained in this series were compared with other national and international studies. In a series, in case of parotid tumour, superficial lobe was involved in 90% of the patients where as the deep lobe was involved only in 10% of the patients.[2] In our study, 90.91% of the patients had pleomorphic adenoma in their superficial lobe of the parotid where as only in 9.09% of the patients had in their deep lobe. So this study is consistent with the above study. Statistical analysis of our study showed that superficial lobe involvement is significantly higher (Z= 11.03, p < 0.001) than the involvement of deep lobe. In a study Tsai HM et al mentioned that in case of parotid tumours, 85% are benign tumours and only 12% are the malignant one.[10] In our study also we found 83.33% were benign and only 16.67% were malignant. Therefore our results are comparable with the results of these authors. We

performed statistical analysis of our findings which showed that the frequency of benign tumours was significantly higher ($Z= 6.91$, $p < 0.001$) than the malignant one. In our study, superficial parotidectomy was performed in 23 (76.67%) patients and total conservative parotidectomy was performed in seven (23.34%) patients. Out of these seven patients, two (6.67%) patients of benign tumour had involved the deep lobe of the parotid and remaining five (16.67%) patients having malignant tumours but without the involvement of the facial nerve. These findings were statistically analysed which showed that superficial parotidectomy is performed significantly higher ($\chi^2= 19.78$, $df= 1$, $p < 0.001$) than the other parotid surgery.

The most common benign parotid tumours were pleomorphic adenoma (84%) followed by Warthin's tumour (10%).[2] In our study also, the most common benign parotid tumour was pleomorphic adenoma (73.33%) followed by Warthin's tumour (3.33%) which is contradicted to the results of previous study. Statistical analysis of these observations showed that pleomorphic adenoma was common benign tumour ($Z= 8.04$, $p < 0.001$) than the other benign tumours. In our series, out of 30 cases studied, superficial parotidectomy was performed in 23 (76.67%) patients. Among them, facial nerve injury was noted in six (26.08%) patients and great auricular nerve injury was noted in two (8.69%) patients. Out of these six cases of facial nerve injury, five (21.73%) cases had temporary palsy and one (4.34%) case had permanent palsy even after follow up of one year. On the other hand, two cases of great auricular nerve injury were temporary in nature. Total conservative parotidectomy was performed in seven (23.34%) patients. Among them, facial nerve injury was noted in five (71.43%) patients and great auricular nerve was in two (28.57%) patients. Out of these five patients of facial nerve injury, three (42.86%) patients had temporary palsy and two (28.57%) patients had permanent palsy. On the other hand, two cases of great auricular nerve injury, one (14.28%) case had temporary palsy and one (14.28%) had permanent palsy. The difference of facial nerve injury in between superficial parotidectomy and total conservative parotidectomy is statistically significant ($Z= 2.34$, $p < 0.05$). In a study it is mentioned that, temporary facial nerve palsy was occurred in all (26.67%) and one or two branches (18.88%) of the facial nerve. The permanent total paralysis occurred in 10% of the case and branches in 3.3%.of the cases.[11] Here we found that temporary facial nerve paresis involving all or just one or two branches of the facial nerve and permanent total paralysis occurred in 9.3% to 64.6% and in 0% to 8% respectively. So, the result is similar to above study. The branch of the facial nerve most at risk for injury during parotidectomy is the marginal mandibular branch.[12] In our study, we found five (45.46%) patients had marginal mandibular injury. So the result is comparable with the above study. The incidence of Frey's syndrome after parotidectomy has been reported from 10 to 15%.[13] In our study, 4.34% patients were presented with Frey's syndrome. This result is not similar to the above study , it could be just because of patients could not noticed the syndrome. Full recovery of facial nerve function occurred between one and six months after operation.[14] In another study it was mentioned that most of the patients with post operative facial nerve paresis, regained their normal function within 12-14 months after surgery, regardless of the pathology and that a slower recovery occurred for up to two years after surgery.[15] In this study, majority of patients showed significant functional recovery within three months after the surgery and all recovery occurred within six months after surgery.

CONCLUSION:

Nerve injury is more common in total conservative parotidectomy than in superficial parotidectomy. The best means of reducing iatrogenic facial nerve injury, in parotid gland surgery, still remains a clear understanding of the anatomy, good surgical technique with the use of multiple anatomic land marks and the use of modern instruments like harmonic scalpel and nerve monitor. The goals, rationale and risk of the operation such as the complications associated with the surgical procedure must be clearly explained. Early detection of nerve injury, is quite helpful to reduce the facial deformity by early reconstruction and other procedures

REFERENCES:

1. Laccourreye H, Laccourreye O, Cauchois R, Jouffre V, Menard M, Brasnu D. Total conservative parotidectomy for primary benign pleomorphic adenoma of the parotid gland: a 25 years experience with 229 patients. Laryngoscope 1994; 104: 1487-94.
2. Obaid MA, Yusuf A. Surgical management of epithelial parotid tumours. J Coll Physicians Surg Pak 2004; 14: 394-9.
3. Russell RCG, Williams NS, Bulstrode CJK, O' Connell PR. Disorder of the salivary gland. In: Bailey & Love's, Short practice of surgery. (25th ed). Hodder Arnold, London 2009: 752-67.
4. Datta AK. Essentials of human anatomy, Head and Neck. (4th ed). Current books international, Kolkata 2006: 132-41.
5. Ragona RM, Filippis CDE, Marioni G, Staffieri A. Treatment of Complications of parotid gland surgery. Acta Otolaryngol Ital 2005; 25: 174-8.
6. Nouraei SAR, Ismail Y, Ferguson MS, Thomson PJ, Welch AR. Analysis of complications following surgical treatment of benign parotid disease. ANZ J Surg 2008; 78: 134-8.
7. Guntinas LO, Gabriel B, Klussmann JP. Risk of facial palsy and severe Frey's syndrome after conservative parotidectomy for benign disease: analysis of 610 operations. Acta otolaryngol 2006; 126: 1104-9.
8. Roh JL, Kim HS, Park CI. Randomized clinical trial comparing partial parotidectomy versus superficial or total parotidectomy, Br J Surg 2007; 94: 1081-7.
9. Watkinson JC, Gaze MN, Wilson JA. Tumours of major salivary glands. In: Stell and Maran's Head and Neck Surgery. (4th ed). Oxford: Butterworth- Heinemann, 2000: 441-57.
10. Tsai HM, Lin CC, Huang CC, Huq CH, Tseng HC. Parotid tumours: a 10 years experience. Am J Otolaryngol Head Neck Surg 2008; 29: 94-100.
11. Staffieri A, Marioni G, Ragona RM, Filippis CDE. Treatment of complications of parotid gland surgery. Acta Otorhinolaryngol Ital 2005; 25: 174-8.
12. Gaillard C, Peries S, Susini B, Guily JL. Facial nerve dysfunction after parotidectomy: the role of local factors. Laryngoscope 2005; 115: 287-91.
13. Rhee JS, Mylonas Al, Davis RE, Goodwin WJ. Minimizing deformity from parotid gland surgery, Curr Opin Otolaryngol Head Neck Surg 1999; 7: 90-8.
14. Leverstein H, Van der Wal JE, Tiwari RM, Van der Wal I, Snow GB. Surgical management of 246 previously untreated pleomorphic adenomas of parotid gland. Br J Surg 1997; 84: 399-403.
15. Mehle ME, Kraus DH, Wood BG. Facial nerve morbidity following parotid surgery for benign disease, the Cleveland Clinic Foundation experience. Laryngoscope 1993; 103: 386-8.