Main Article

Comparison of Efficacy of FNAC with Histopathological Examination of Parotid Swellings

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ABSTRACT

Introduction

Parotid gland swellings are of histologically diverse group. Fine needle aspiration cytology (FNAC) is a rapid, simple, cost benefit diagnostic procedure for evaluation of such swellings. The main aim of the study is to determine specificity, sensitivity, accuracy of FNAC in parotid swellings by taking histopathological examination (HPE) as gold standard.

Materials and Methods

Retrospective study done from April 2018 – July 2018. Data was collected from medical records of 50 cases who came with parotid swellings. All have undergone preoperative FNAC for swellings followed by surgery and HPE of specimen postoperatively.

Results

In FNAC most of parotid swellings were benign in nature with pleomorphic adenoma most common. The sensitivity, specificity and accuracy of FNAC for parotid swellings in our study are 62.5%; 94%; 84% respectively.

Conclusion

Even though FNAC is rapid, simple, it is may not be completely reliable deciding factor for patient counselling and for further management according to present study as it shows less sensitivity of 62.5%.The FNAC may be considered as a best possible initial investigation but may not be as to provide a definitive diagnosis on which management decisions can be made.

Keywords

Cost benefit; Counselling; Fine needle aspiration cytology; Parotid gland swellings; Pleomorphic adenoma

The parotid is the largest of the main salivary glands that produce and excrete saliva. Parotid gland swellings are of different histological types being non-neoplastic and neoplastic, both benign and malignant. Non–neoplastic includes sialadenitis, sialolithiasis, sialosis, infections etc. 3% of head and neck tumors account for parotid tumors and 0.6% of tumours of human body.[1] Parotid tumours are mostly benign (85%), most common is pleomorphic adenoma type, while mucoepidermoid carcinoma is the most common malignant tumours. Other causes such as metastatic cancers, inflammatory conditions, lymphoma may also cause parotid gland masses.[2,3] Salivary gland tumours are important to both pathologists and surgeons as they show biological and clinical variations and due to their complex histopathological features they are difficult to diagnose.[4,5]

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Clinical history and physical examination are important prior to investigations but have limited role in having a definitive diagnosis. Accurate and fast pre-operative diagnosis is much needed, in order to diagnose malignancy and to provide better treatment. Histopathological examination provides the final definitive diagnosis of tumor types after surgical resection in spite of risks and complications associated with parotidectomy. Therefore

a less invasive more reliable method of diagnosis is required that helps in proper management. Fine needle aspiration cytology (FNAC) was first used by Martin and Ellis in 1930 as a cyto-diagnostic procedure for evaluation of head and neck swellings.[6] FNAC is dependent on the morphological findings of individual or group of cells obtained by aspiration with needle from the swelling.[7] FNAC is minimally invasive, inexpensive and routinely used diagnostic technique for various palpable swellings over the body like breast lump, lymph nodes etc.[8,9] FNAC is a reliable and useful diagnostic technique for evaluating salivary gland lesions.[10]

Different studies showed that FNAC has a diagnostic accuracy of more than 80%, with sensitivity and specificity approaching 90% and 100% respectively.[11-16] This FNAC evaluation helps us in obtaining an idea of further management and whether immediate surgery is needed or not and which type of parotidectomy to be performed. But, Batsakis et al.[17] argued that all parotid masses require surgery and that the preoperative FNAC had little impact on clinical management. This opinion implies need for surgery even in benign salivary tumours and inflammatory lesions. FNAC has a superior diagnostic role compared to the combination of physical examination and radiological evaluation,[18,19] which cannot distinguish reliably between benign and malignant lesions. As parotid gland has distinct morphology, effectiveness of FNAC in interpretation of its lesions is still considered controversial by many. So there is a need for evaluating the efficacy and reliability of FNAC as a diagnostic tool and it's usefulness in treatment planning. The present study was undertaken to assess the preoperative cytological findings of parotid glands lesions and correlate these findings with the postoperative histopathological findings, in order to evaluate the sensitivity and specificity, diagnostic accuracy of FNAC by taking Histopathological examination (HPE) as gold standard.

The main aim of this study is to determine sensitivity, specificity and diagnostic accuracy of FNAC in parotid swellings. The objectives of this study is: to determine whether the lesion arising from the parotid gland is non neoplastic or neoplastic and if neoplastic is it benign or malignant; and to correlate and compare the cytological findings with the histopathological findings; and to determine the accuracy of FNAC findings in making decision for further management.

Materials and Methods

It was a retrospective study. Done by collecting data from medical records of 50 patients who came with parotid swellings. Study period is from April 2018 to July 2018.

Patient records has shown that after complete physical and radiological examination patients had undergone FNAC for parotid swellings, followed by surgery. FNAC was performed in pathology department using a 22gauze needle by free hand technique. Pathologists used thin smears which were immediately fixed and stained. All Smears were analysed by single pathologist team. All the clinical, radiological, FNAC, HPE data was collected from medical record of each patient and was analysed. FNAC results were compared with histopathological diagnosis from surgical specimen and evaluated the sensitivity and specificity, positive predictive value, negative predictive value and overall accuracy of FNAC to differentiate benign and malignant tumors keeping HPE as gold standard.

The data collected was coded, entered into Microsoft Excel worksheet and exported to SPSS. Data was analysed using statistical package for social sciences (SPSS) version 21. Data is presented as percentage in categories and presented as tables and diagrams.

Study demographics of present study was among 50 study patients 36 were females and 14 were males with an age reference between 10 and 70 years with mean age 31.2 + 5 years. The complaints were of swelling below and in front of ear lobule. Complete history and physical examination was noted in all these cases. The medical records of patients with facial nerve palsy and other significant clinical and radiological malignant features prior to surgery were omitted.

Results

Out of 50 cases, 38 [76%] were benign and 12 [24%] were malignant in FNAC. Pleomorphic adenoma (60%) was the most common in benign tumour group and mucoepidermoidcarcinoma (8%) and adenocarcinoma (8%) in malignant group. (Table I; Fig. 1). HPE observations are out of 50 cases HPE showed 34 [68%] as benign lesions, 16 [32%] as malignant lesions (Table II; Fig. 2).

Table I: Types of FNAC Reports

FNAC TYPE	NUMBER OF CASES	PERCENTAGE
PLEOMORPHIC ADENOMA	30	60
CYSTS	4	8
WARTHINS TUMOUR	2	4
ADENOCARCINOMA	4	8
ACINIC CELL TUMOR	2	4
CARCINOMA EX PLEOMORPHIC ADENOMA	2	4
SIALADENITIS	2	4
MUCOEPIDERMOID CARCINOMA	4	8

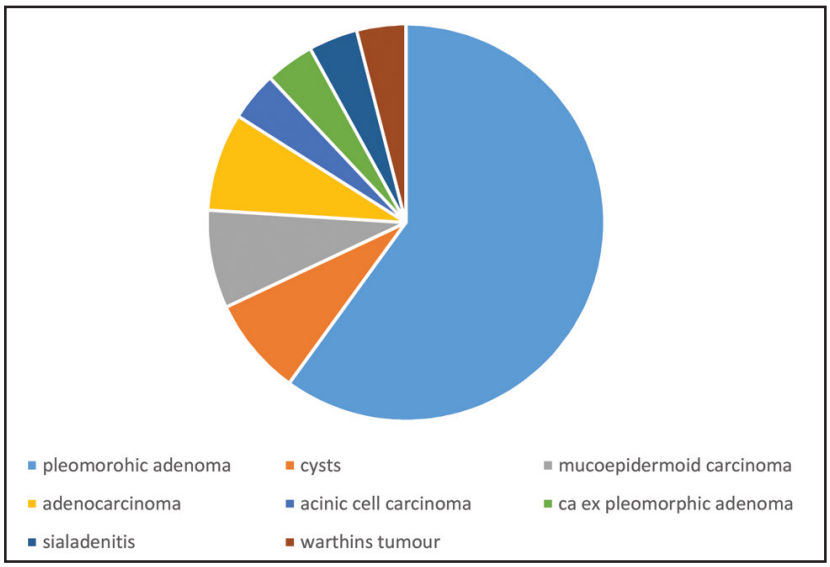

Fig. 1. Types of various FNAC reports represented as pie diagram

Data represented as percentage ratio.

Table II: Types of HPE Reports

FNAC TYPE	NUMBER OF CASES	PERCENTAGE
PLEOMORPHIC ADENOMA	30	60
WARTHINS TUMOUR	2	4
ADENOCARCINOMA	4	8
ACINIC CELL TUMOR	2	4
CARCINOMA EX PLEOMORPHIC ADENOMA	2	4
SIALADENITIS	2	4
MUCOEPIDERMOID CARCINOMA	8	6

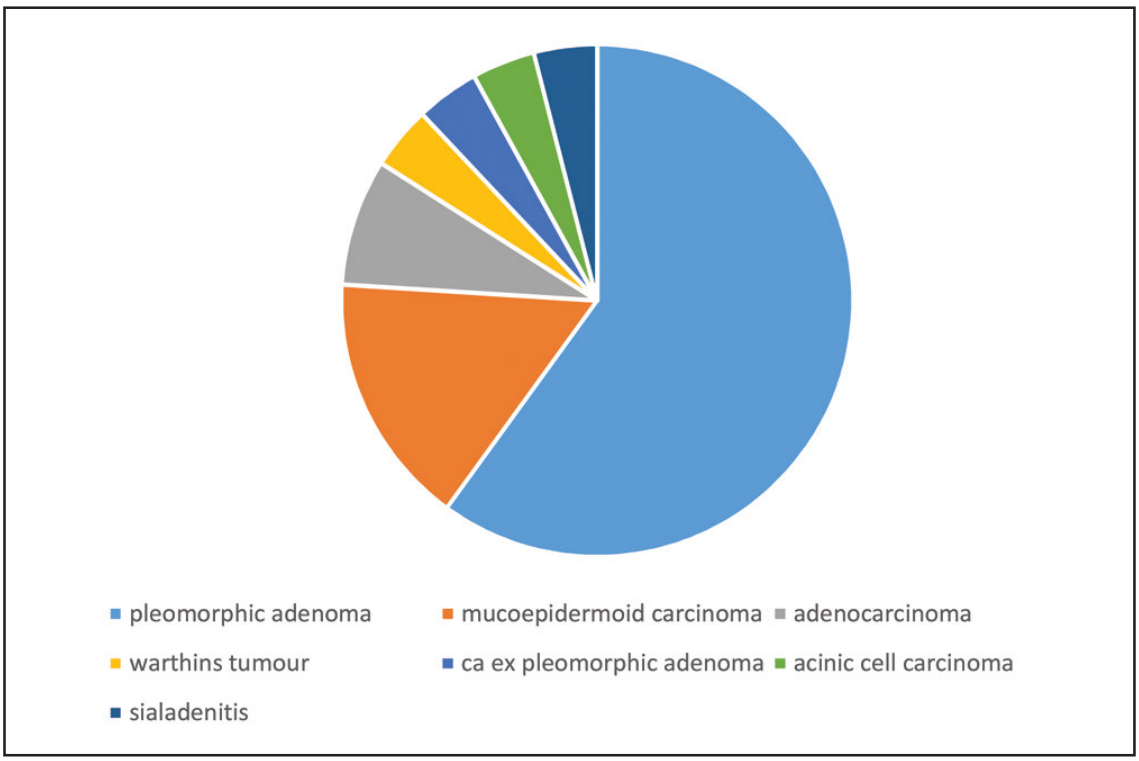

Fig. 2. Types HPE reports represented as pie diagram

Data represented as percentage ratio.

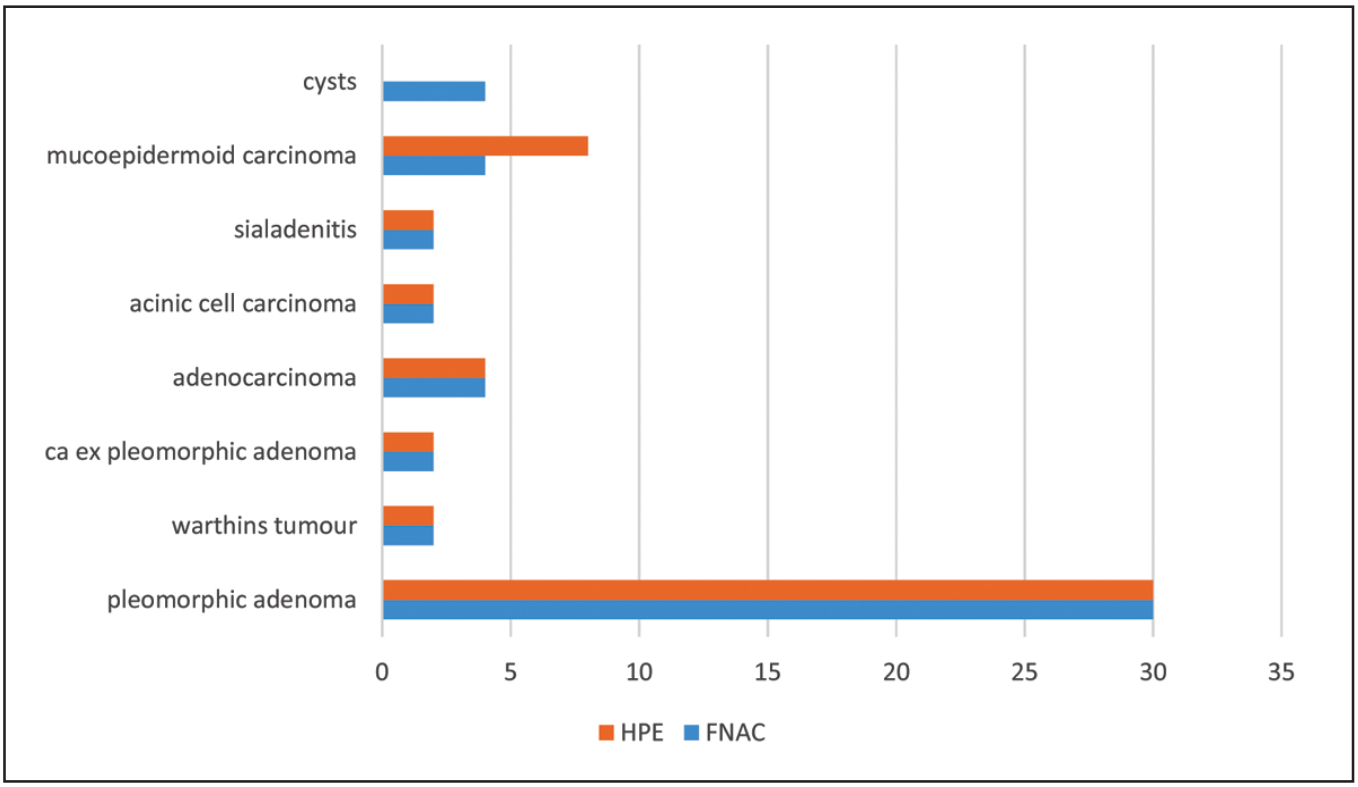

Fig. 3. Different types of pathologies noted in FNAC and HPE

Data represented as percentage ratio.

Out of 50 cases with parotid swellings: 37 cases had similar FNAC and HPE findings. 13 cases had different HPE and FNAC findings.

Pleomorphic adenoma was the most common FNAC finding in about 30 cases; of which, 26 had similar finding of pleomorphic adenoma in HPE and 4 cases showed different HPE findings of which : 2 were reported as adenocarcinoma and 2 were reported as mucoepidermoid carcinomas.4 cases were reported as cystic lesions in FNAC of which 1 was diagnosed as vascular hamartoma with sialadenitis and 1 as mucoepidermoid carcinoma and other 2 were diagnosed as pleomorphic adenoma after surgery in HPE examination. 2 cases were reported as Warthin's tumor in FNAC of which 2 were reported as Warthin'stumor in HPE also. 2 cases were reported as sialadenitis in FNAC whichwere reported to be 1 as mucoepidermoid carcinomas and other as sialadenitis in HPE. 4 cases were reported as adenocarcinomas in FNAC which were diagnosed to be 2 as carcinoma ex pleomorphic adenoma and 2 as adenocarcinoma in HPE. 2 cases were diagnosed as acinic cell carcinoma in FNAC which were diagnosed as acinic cell carcinoma in HPE also. 2 cases were diagnosed as carcinoma ex pleomorphic adenoma in FNAC which were reported as benign pleomorphic adenoma in HPE. 4 were diagnosed as mucoepidermoid carcinoma in FNAC and were reported as mucoepidermoid carcinoma in HPE as well.

Sensitivity and specificity calculation was done as follows by creating a two by two distribution table (Table III).

Table III : Two by two distribution

	MALIGNANT ON HPE	BENIGN ON HPE	TOTAL
Malignant on FNAC	**10 (a)**	**2 (b)**	**12 (a + b)**
Benign on FNAC	**6 (c)**	**32 (d)**	**38 (c + d)**
Total	**16 (a+c)**	**34 (b + d)**	**50 (a + b + c + d)**

SENSITIVITY = **62.5 %, a/a+c**

SPECIFICITY = **94.1%, d/d+b**

DISEASE PREVALENCE = **32%**

POSITIVE PREDICTIVE VALUE = **Sensitivity × prevalence ÷[sensitivity × prevalence +(1-specificity) × (1- prevalence)]= 83.3%**

NEGATIVE PREDICTIVE VALUE = **Specificity × (1- prevalence) ÷ [(1-sensitivity) × prevalence + specificity (1- prevalence)] = 84.2%**

ACCURACY = **Sensitivity × prevalence+ Specificity × (1- prevalence) = 84%, a+d/a+b+c+d**

The ROC shows the value to be 0.9 which means a strong positive correlation meaning management decision to perform a surgery or not for parotid swellings, solely depending on FNAC report may not be adequate and HPE should not missed during diagnosis as it may turn out to be a malignant pathology with FNAC being benign (Table IV; Fig. 4).

Table IV : ROC curve test variable for HPE

AREA	SE	p-VALUE	95% CI	
			Lower	Upper
0.53	**0.31**	**<0.001***	**0.000**	**0.113**
Coordinates of the curve				
Positive if greater than or equal to S.E	**Sensitivity**	**1-Specificity**		
0.00	**1.00**	**1.00**		
1.50	**0.00**	**0.895**		
3.00	**0.00**	**0.00**		

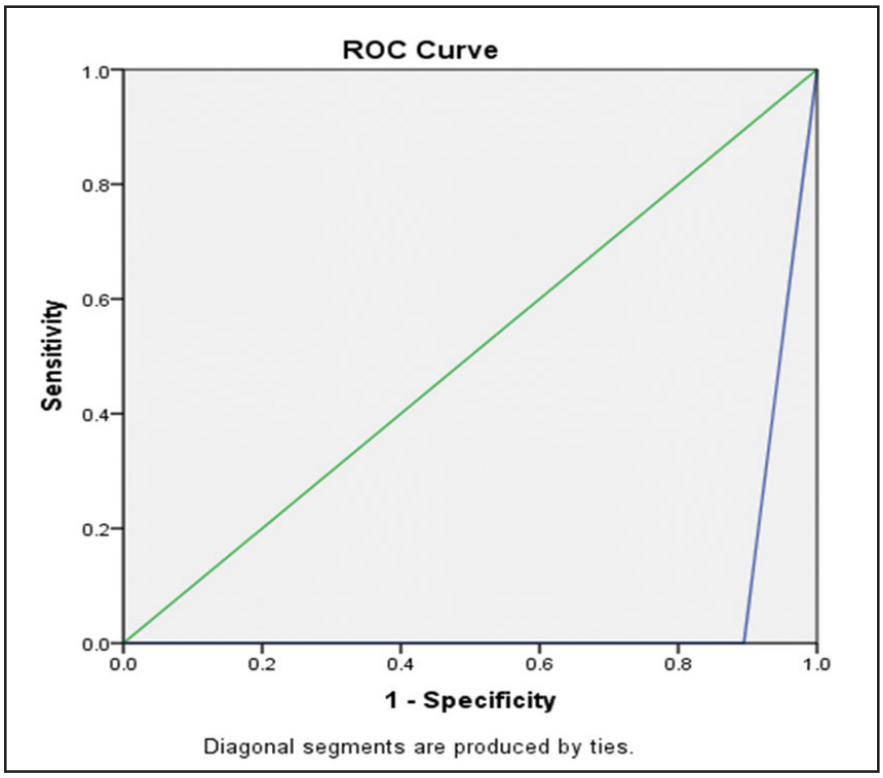

Fig. 4. ROC curve

Discussion

FNAC is a reliable diagnostic procedure with little discomfort to the patient. So regularly we consider it as a useful diagnostic tool to differentiate between inflammatory, benign and malignant swellings all over the body. In the same way it is used along with clinical examination and radiological investigations in evaluation of parotid swellings. It guides us for the further management. The management plans can be conservative medical in case of inflammatory lesions, wide local excision, superficial parotidectomy in case of benign lesions and radical surgery in malignant lesions, chemo or radiotherapy in metastatic and other lymphoproliferative lesions. However, definite tumour type and grading is achieved through final histological examination. So to consider that FNAC will give an accurate diagnosis for management it should match with HPE findings. The accuracy of FNAC depends on important factors like the experience of the clinician performing the procedure in addition to the experience of the pathologist in assessing the cytological sample. Inadequate cellularity or smears have been reported in 2 to 10% of cases in literature,[22, 21] which can be explained by needle insertion outside the target tissue or because of necrosis, haemorrhage, or cystic areas in the tumor. So, repeating the sampling may be a good option to obtain more information.[22] According to our study the sensitivity of FNAC for parotid malignancies in particular is less i.e., 62.5% and Specificity is 94%; and accuracy 84%. The limitations of this cytological examination leading to low sensitivity might be due to following reasons. 1) Histopathology of parotid gland tumors is extremely varied and complex due to heterogeneous cellular composition of the gland. 2) There are enormous number and different variety of salivary tumours. Most salivary tumours are uncommon, thus clinicians and pathologists may have limited experience with the rarer types in HPE leading to difficulty in diagnosis. 3) Many of the salivary tumours show

overlapping morphological features. Many salivary carcinomas are cytologically bland with little evidence of mitotic activity or cellular pleomorphism. Tumor invasion as a defining feature of malignancy is beyond the recognition of cytology. 4) Accuracy of FNAC also varies due to inadequate experience of the technician, improper technique while positioning the needle, cystic nature of swelling with less cellularity, varied sizes of swellings etc.

Because of this, distinguishing between different parotid tumours, including the differentiation between benign and malignant, can be difficult and the accuracy in diagnosing might be hampered. Even though we use FNAC for planning further treatment it should be accompanied by thorough history, clinical examination, radiological examination. And if at all conservative management or limited surgery is planned proper patient counselling and perfect follow up till complete cure to be taken.

Fakhry et al. has made a review that showed FNAC sensitivity ranging from 54 to 92% and a specificity ranging from 86 to 100%, compared to his own study that showed a sensitivity of 80% and specificity of 89%.[23] Another review done by Zbaren et al. mentioned that the accuracy ranged between 84 and 97%, while the sensitivity range was from 54 to 95%, and specificity ranged from 86 to 100%. On the other hand, his study showed the accuracy 84%, sensitivity 64%, and specificity 95%.[24] Present study results holds good with above study results with sensitivity, specificity and accuracy falling into above study ranges. Stewart et al. that showed overall sensitivity, specificity, and accuracy of 92%, 100%, and 98% respectively,[25] while Naeem et al. showed a sensitivity, specificity, and accuracy of 84%, 98%, and 84–97% respectively.[26] Along Suzuki et al.'s study, sensitivity, specificity, and accuracy were calculated as 82.3%, 98.7%, and 95.9% respectively.[27] The results of above study are at higher end than present study with low sensitivity and accuracy. Some other studies which shows similar results like present study are; Altin et al. showed sensitivity, specificity, and accuracy of 68.96%, 89.63%, and 86.52%.[28] Feinstein et al. showed sensitivity of 75% and specificity of 95.1%.[29]

Conclusion

Being FNAC a first investigative modality, minimally invasive, cheaper investigation; decision regarding further management on surgery and patient counselling may not be accurate if done according to FNAC report alone. All the factors like history, examination, radiological, and FNAC should be taken into account for further management and as in our study we noted that swellings with benign FNAC nature preoperatively turned out to be malignant HPE findings postoperatively, may the idea of surgery not to be delayed having a preoperative diagnosis as simple benign parotid swelling. As we have lower sample size, the findings may be slightly objectionable. More studies are needed with a larger sample size.

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