Role of Fine-Needle Aspiration Cytology in Swellings of the Parotid Region

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Abstract To report the role of preoperative fine-needle aspiration cytology (FNAC) in patients with swellings in the parotid region at a tertiary care center. Prospective study of FNAC results compared with final histologic diagnosis as the standard criterion. An academic tertiary care center. A consecutive series of 51 patients who underwent FNAC of swellings in the parotid region between 2007 and 2009, of whom 41 had surgical resection. Predictive value, sensitivity, specificity, and accuracy. FNAC was performed in all the 51 patients who presented with a swelling in the parotid region in the out patient department in our hospital. Sixteen patients (31.4 %) were diagnosed to have malignancy, thirty patients (58.8 %) were diagnosed as benign condition. The FNAC was not satisfactory in 5 patients (9.8%) even after repeated aspiration. The FNAC diagnosis of malignant or suspicious lesion of the parotid region had positive and negative predictive values of 90 % and 96.66%, respectively. The diagnostic accuracy of FNAC is 95 %. We strongly recommend FNAC as a safe and accurate and less expensive method for preoperative diagnosis of the swellings in the parotid region.

Keywords Parotid swellings · Fine needle aspiration cytology

Introduction

Parotid region is the source of a wide variety of non-neoplastic and neoplastic diseases, both benign and malignant. Clinical history and physical examination play an important but

limited role in the evaluation of these diseases. Most studies have shown fine needle aspiration cytology (FNAC) to be a safe, rapid, inexpensive and relatively painless procedure with a diagnostic accuracy of more than 75%. The main objection to the use of FNAC has been the possible seeding of neoplastic cells. However, clinical studies have proven the safety of the techniques. Engzell (1971) followed 157 patients with pleomorphic adenoma of the major salivary glands for 10 to 15 years after FNAC, without evidence of tumor spread from the needle and concluded that FNAC is a safe procedure in the evaluation of salivary neoplasms [1].

FNAC can be particularly useful since it obviates the need for surgical biopsy in which, patient and the surgeon are kept under suspense until the operation is completed. Incisional (tissue) biopsy of the salivary gland carries significant risks, including fistula formation, tumor implantation, facial nerve damage, and sampling error, violation of tissue planes and, occasionally, poor placement of an incision makes subsequent surgery more difficult. Some surgeons advocated excisional biopsy of any salivary gland tumor. Since not every salivary gland swelling is neoplastic, surgery is not always appropriate [2].

If the surgeon suggests aspiration biopsy on the first visit, the doubt, uncertainty, and indecision will, in most cases, be removed. If the report is carcinoma, the surgeon may take a confident attitude, otherwise an immediate opinion may be given that the condition is benign and conservative surgery and observation only advised [3]. Hence it is quick and less expensive; and also provides a preoperative diagnosis, enabling the surgeon to plan the operative procedure [4].

During medieval times, the Arabian physician Abulcassim (1013–1107 AD) described needle puncture of the thyroid to diagnose different types of goiters. Kun first recorded needle aspiration biopsy in 1847, the same year as the formal statement of the Cell Theory by Schleiden and Schwann [5]. Papanicolaou presented his “New Cancer

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Fig. 1 Age distribution

Diagnosis,” later known as the Pap smear [6]. Today, because of its numerous advantages, fine-needle aspiration (FNA) biopsy is widely used and has a proven record of accomplishment as a safe and reliable method of making a morphologic diagnosis.

Various authors have reported a diagnostic accuracy of more than 80%, with sensitivity and specificity approaching 90% and 100% respectively [7–23]. Tumor dissemination or implantation in a fine needle track has not been reported, nor has damage to adjacent structures such as the facial nerve.

Aim

The aim of this study is to determine whether the lesion arising in/from the parotid gland tissue, is non neoplastic or

Fig. 2 FNAC report

Table 1 FNAC report

FNAC report	Cases	Percent
Pleomorphic adenoma	17	33.3
Warthin's tumor	2	3.9
Adeno cystic ca	2	3.9
Mucoepidermoid ca	10	19.6
Lymphadenitis	6	11.8
Chronic sialoadentis	3	5.9
Squamous cell ca Metastasis	3	5.9
Metastatic nodes	1	2.0
Miscellaneous	2	3.9
Inconclusive	5	9.8
Total	51	100.0

neoplastic, if neoplastic, is it benign or malignant, to correlate the cytological features with the histopathological findings whenever feasible. To determine sensitivity specificity and diagnostic accuracy of FNAC in parotid region mass.

Materials and Methods

It is a prospective study involving 51 patients between 2007–2009 from out patient departments of ENT, General Surgery and Surgical Oncology at Kasturba Hospital, Manipal who underwent FNAC for parotid tumors, followed by surgery in relevant cases. Smears were analysed by pathologist. FNAC results compared with histopathological diagnosis from surgical specimen. The sensitivity and specificity for malignant tumors was calculated in 41 cases that had biopsy correlation.

Fig. 3 FNAC report

Table 2 Histopathology

HPE report	Cases	Percent
Pleomorphic adenoma	18	35.3
Warthin's tumor	2	3.9
Mucocele	1	2.0
Mucoepidermoid ca	9	17.6
Ductal cell ca	1	2.0
Adeno cystic ca	1	2.0
Angio follicular Hyper plasia	2	3.9
Sialoadenitis	2	3.9
Epidermal inclusive Cyst	1	2.0
Lymphadenitis	5	9.8
Basal cell adenoma	1	2.0
Not available	8	15.7
Total	51	100.0

Study Demographics

Among 51 patients, 24 were women and 27 men with an age range of 7–83 years(mean-45 years).The age distribution is shown in Fig 1. Clinical presentation of 34 (66.7%) cases was benign and 17 (33.3%) cases malignant. Facial nerve was involved in 5 cases. 26 patients had swelling on the right side, 23 on the left side and 2 had bilateral swellings.

Observations

Of these 51 cases, 46 aspirations were conclusive and 5 inconclusive. Of the 46 aspirations 16 were malignant and 30 were benign (Fig. 2). The 30 benign tumors were divided as follows. Benign mixed tumor was most common

Fig. 4 Final histopathology report **Fig. 5** Histopathology correlation

occurring in 17(33.3 %) cases, 2(3.9%) cases were Warthin's tumor and other benign lesions were reactive lymphadenitis 6(11.8%) and sialadenitis 3(5.9%).And in malignant lesions most common is mucoepidermoid 10 (19.6%) cases,4 (7.9%)cases metastatic nodes and adeno-cystic ca 2(3.9%).5 (9.8%)cases were inconclusive (Table 1, Fig. 3).

Forty one of the aspirations diagnosed were confirmed histological hence available for correlation. Out of 41 cases 29 were benign (70.7%) and 12(29.3%) malignant (Table 2, Fig. 4). And in correlation among 35 cases, pre operative FNAC was same and in only 6 cases report differed(Fig. 5).

On correlating the results of FNAC & Histopathology following results were observed (Table 3, Fig. 6). Pleomorphic adenoma was the most common parotid gland tumor {17 cases (41.5%)} Out of these 17 cases 15 study reports (FNAC/HPE) were same and study reports in 2 cases were different. 1 case reported as basal cell adenoma and other mucoepidermoid ca. There were 2 cases of Warthin's tumor detected on cytology. Both of these had biopsy correlation and HPE is same. Mucoepidermoid was the most common

Table 3 Correlation of FNAC

FNAC	Cases	Percent
Pleomorphic adenoma	17	41.5
Warthin's tumor	2	4.9
Adeno cystic ca	2	4.9
Mucoepidermoid ca	9	22.0
Lymphadenitis	6	14.6
Chronic Sialoadenitis	2	4.9
Squamous cell ca Metastasis	1	2.4
Miscellaneous	2	4.9
Total	41	100.0

Fig. 6 FNAC after correlation

Table 4 Calculation of sensitivity and specificity

	Malignant on FNAC	Benign on FNAC	Total
Malignant on HPE	10(TP)	1(FN)	11
Benign on HPE	1(FP)	29(TN)	30
	11	30	41
Sensitivity		90.9%	
Specificity		96.6%	
Positive predictive value		90%	
Negative predictive value		96%	
Accuracy		95.1%	

malignant tumor in 10 cases (19.6%). But HPE correlation was available in 9 cases because surgery was deferred in one case. Out of 9 aspirates 1 aspirate reported as mucoepidermoid carcinoma but was reported as high grade Ductal cell ca in HPE and one Pleomorphic adenoma was reported as Mucoepidermoid carcinoma in final HPE. In the present study, 2 cases, of adenoid cystic carcinoma were detected on cytology. Of these in one case histopathological correlation was available. Surgery was deferred in the second case in view of extensive disease and was advised palliative radiation. Four Metastatic squamous cell carcinoma were also identified on cytology but correlation was not available. Type specific diagnosis was not possible in three aspirates showing presence of malignant cells.

The sensitivity of needle aspiration for malignancy was 90.9% while the specificity was 96.6%. There was 1 false negative case and 1 false positive case. The positive predictive value for cytology was 90% and negative predictive value 96 %. The diagnostic accuracy of test is 95.1% (Table 4). The results are comparable with those of other investigators as shown in Table 5.

Results

- 29 FNAC reported as benign.
- 12 FNAC malignant.
- 5 FNAC categorised as non-diagnostic or inadequate.
- 5 cases surgery avoided.
- Sensitivity of FNAC 90.9 %.
- Specificity of FNAC is 96.6 %.
- Positive predictive value 90% and negative predictive value is 96.66%.

Conclusion

This study indicates that fine needle aspiration cytology is a highly specific and accurate investigative modality in the evaluation of parotid region swellings. It establishes a

Table 5 Comparison with other studies

Study	Total FNAC	Sensitivity	Specificity	Accuracy
Jayaram et al 1994 [18]	247	91%	88%	98%
Orell et al 1995 [19]	325	85.5%	99.5%	
Cristallini EG 1997 [21]	153	97.5%	98.43%	97.8%
Shintani S 1997 [22]	43	88.9%	94.1%	93%
Cajulis et al 1997 [20]	151	95.4%	91%	96%
Boccatto Paolo et al 1998 [24]	841	98%	98%	97%
Stewart CJ et al 2000 [25]	341	92%	100%	98%
Present study	41	90.9%	96.6%	95.1%

diagnosis and helps in assessment of clinically questionable parotid lesions. The FNAC is usually the first investigative modality, since it is a minimally invasive, cheap, office procedure that can differentiate benign from malignant tumors. Most benign tumors frequently present in the 3rd and 4th decade and have a male preponderance. Most malignant tumors occur in the 6th and 7th decade, but have no marked sexual predominance. Pleomorphic adenoma is the commonest benign tumor. Mucoepidermoid carcinoma and adenoid cystic carcinoma are the commonest malignant tumors. In the parotid, more than 70% percent of the tumors are benign.

In view of diagnostic pitfalls of FNAC of the parotid glands and therapeutic implications that cytological interpretation may have, a close interaction between the surgeon and cytopathologist is essential in order to use FNAC to its best advantage. Its role in the diagnosis of primary salivary neoplasms is significant as the surgical modality of treatment is significantly altered by the cytological diagnosis.

We strongly recommend FNAC as a safe and accurate and less expensive method for preoperative diagnosis of the swellings in the parotid region.

Conflicts of interest None

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