

**Role of Fine Needle Aspiration Cytology in the diagnosis of maxillofacial swellings-A Clinical Study**

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**Abstract**

**Background:** FNAC is now accepted as a reliable diagnostic method in diagnosis of swellings in general. The technique is simple, minimally invasive, reliable and cost effective. It has become an important pre-operative tool in management of patients with swellings of the maxillofacial region. The credibility of FNAC depends on technique of obtaining smears and accuracy of interpretation of smears. This requires a skilled and experienced cytopathologist. It has a high accuracy for distinguishing between benign and malignant neoplasms.

**Objectives**

1. To correlate the cytological findings in maxillofacial swellings with histopathology and thus assess the validity of FNAC in the diagnosis of such swellings.
2. To analyze and study the salient cytologic features of various maxillofacial swellings.

**Method:** Fifty-six (56) patients with maxillofacial swellings, who attended the Oral medicine & Radiology clinic over a period of one year, were selected for the study. After careful history taking & clinical examination, FNAC was done and cytologic smears prepared by standard procedures. The provisional diagnoses obtained from clinical examination & cytology was compared. Histopathological examination was done for the swellings

and this diagnosis was taken as the gold standard for comparison.

**Results:** FNAC showed a sensitivity of 92%, specificity of 98%, positive predictive value of 92%, negative predictive value of 98% and an accuracy of 98% in diagnosing reactive change in a cervical lymph node.

FNAC showed a sensitivity of 70%, specificity of 100%, a positive predictive value of 100% and a negative predictive value of 94% in diagnosing metastatic cervical nodes from a primary tumor of squamous cell carcinoma in the head & neck.

The overall accuracy of FNAC in diagnosing sialadenitis was 93%. FNAC was 70% sensitive, 100% specific and 94.6% accurate for diagnosing malignancy in maxillofacial swellings.

**Conclusion:** FNAC is a widely recognized, useful, inexpensive and practical test for pre-operative tissue diagnosis of maxillofacial swellings. It is quite reliable for distinguishing inflammatory (no surgical excision required), cystic and neoplastic lesions, and further, to delineate malignancies from benign swellings, which enhances surgical planning. Sampling errors and errors of interpretation are the main drawbacks of FNAC. This could be minimized by meticulous technique, repeated aspirations, if possible under ultrasound guidance,

adequate sampling when cell yield is poor and adherence to strict quality assurance.

**Keywords:** Cytology, FNAC, Dentistry, Maxillofacial swellings.

### **Introduction**

A variety of pathologies may cause swellings in the maxillofacial region. Cervical lymphadenopathy is the most common cause of swelling in this region; it may be secondary to inflammatory & infectious conditions like bacterial, viral, parasitic or fungal diseases. Salivary gland pathology constitutes another major subdivision. Other causes are congenital swellings, post traumatic pathology, thyroid gland pathology and neoplastic diseases.

The standard diagnostic protocol starts with a proper history taking, examination of the swelling, followed by specialized methods which include radiological and histological examination. The further diagnostic method is FNAC, which is done routinely for swellings. The first report of a needle biopsy was by Kun in 1847.<sup>12</sup> Dudgeon & Patrick proposed the needling of tumors as a means of rapid microscopic diagnosis.<sup>10</sup>

FNAC is now accepted as a reliable diagnostic method in diagnosis of swellings in general. The technique is simple, minimally invasive, reliable and cost effective.<sup>11</sup> It has become an important pre-operative tool in management of patients with swellings of the maxillofacial region.<sup>4,9</sup> The credibility of FNAC depends on technique of obtaining smears and accuracy of interpretation of smears. This requires a skilled and experienced cytopathologist.

The variability of results obtained from different centers necessitates the standardization of this method in each center. It has a high accuracy for distinguishing between benign and malignant neoplasms.

### **Aims**

The present study analyses the various diagnostic findings of maxillofacial swellings from a variety of causes, by FNAC. These findings are correlated with the provisional

diagnosis obtained by detailed history and patient examination. The histopathology is done finally, for all cases. Radiological diagnoses obtained by plain film radiography & CT (done in a representative number of cases) is combined with the clinical diagnosis to arrive at a provisional diagnosis. The FNAC findings are compared with histopathology. The accuracy of FNAC is assessed by standard statistical methods.

### **Objectives**

1. To correlate the cytological findings in maxillofacial swellings with histopathology and thus assess the validity of FNAC in the diagnosis of such swellings.
2. To analyze and study the salient cytologic features of various maxillofacial swellings.

### **Materials and Methods**

Fifty-six (56) patients with maxillofacial swellings, who attended the Oral medicine & Radiology clinic over a period of one year, were selected for the study. After careful history taking & clinical examination, cytology was done for the swellings. The provisional diagnoses obtained from clinical examination & FNAC were compared. Histopathological examination was done for the swellings and this diagnosis was taken as the gold standard for comparison. Intra-bony lesions and nodes of size less than 4mm were excluded from the study. Also excluded were the patients with severe systemic illness, bleeding diatheses and who were non-cooperative. The cases were collected at random with no preference given to age, sex or any other criteria.

### **Technique of FNAC**

A 22/23 gauge needle fitted on a 10ml disposable syringe was used for aspiration with full aseptic precaution. The patients were made to sit or lie down on a couch with the head turned towards the opposite side of the lesion. The procedure was explained to the patient. The skin over the swelling was cleaned with povidone-iodine or absolute alcohol. The aspiration was then carried out with out any

anesthesia. A sterile glove was worn and the swelling was fixed with the left hand. The needle was then introduced in to the swelling with the syringe attached to it. After entry, strong suction was applied by pulling the plunger of the needle fully back and the needle was advanced. Multiple passes (4 to 5) of the needle in different planes were done maintaining the suction. Finally the suction was released and the needle withdrawn. A minimum of 2-3 smears were taken whenever possible, out of which one was air dried for Giemsa staining and the others were fixed in 95% alcohol for PAP stain.

The findings obtained by FNAC was compared with the histopathological diagnosis.

Analysis of data was done as follows.

a = true positive

b = false positive

c = false negative

d = true negative

Sensitivity =  $a / a+c \times 100$

Specificity =  $d / b+d \times 100$

Positive predictive value =  $a / a+b \times 100$

Negative predictive value =  $d / c+d \times 100$

Efficiency of study =  $a+d / \text{total cases} \times 100$

A positive FNAC-Histopathology correlation is taken as true positive (TP) whereas FNAC-Histopathology disagreement is either false positive (FP) ie histology negative & Cytology positive or false negative (FN) ie Histology positive & Cytology negative. Cases where histopathology was negative is taken as true negative. Histopathology is taken to be the gold standard of comparison.

**Results**

The age of the patients selected ranged from 8 years to 78 years. 55.3 % (n=31) were males while 44.6% (n=25) were females. Out of the 56 swellings, 40 were non-neoplastic in nature. Of the 16 neoplastic swellings, 6 were benign and 10 were malignancies. On

histopathological analysis, the majority of swellings were sialadenitis, (27%) followed by reactive change lymph node (21%) and metastatic lymph node. (16%)

Of the 15 cases diagnosed as sialadenitis by histopathology, cytology yielded the same diagnosis in 11 cases (73%).

Of the 12 cases with reactive change lymph node, cytology was similarly diagnostic in 11 cases. (92%).

Of 9 cases with metastatic lymph node from squamous cell carcinoma, cytology yielded the same results in all the 9 cases. (100% correlation)

Of 5 cases which were diagnosed as odontogenic cysts, 2 were dentigerous cysts, one each were a keratocyst, a retention cyst and a Gorlin cyst. Cytology proved positive for dentigerous and one radicular cyst. FNA smear reported ‘only blood’ for the keratocyst and favoured an odontogenic neoplasm for Gorlin cyst probably due to interpretation errors. One dentigerous cyst gave a non-specific cytology report, probably due to sampling error. (Table 1)

**Table 1**

FNAC REPORT	FREQUENCY
Cystic lesion	2
Non specific	2
Odontogenic neoplasm	1

Table 2 shows the charted representation of discrepancies between cytology and histopathology in this study, excluding ‘non-specific’ reports.

**Table 2**

FNAC REPORT	HISTOPATHOLOGY
Blood only	Keratocyst
Retention cyst	Pleomorphic adenoma with cystic areas
Necrotic change node	Sialadenitis
Odontogenic neoplasm	Gorlin cyst
Inflammatory cyst	Ameloblastoma

**VALIDITY OF FNAC**

Positive FNAC	Present in histology TP = 7	Absent in histology FP = 0	PPV 100%
Negative FNAC	FN = 3	TN = 46	NPV 94%
	Sensitivity 70%	Specificity 100%	Accuracy 94.6%

True negative cases are those where both histopathology and cytology show benign lesions.

Sensitivity is the positivity of FNAC when malignancy was present. Specificity is the fraction of cases with benign histopathology report that had benign cytology report.

**Discussion**

Most authors advocate the aspiration technique of Eneroth & Zajicek.<sup>11</sup> A 22 gauge needle attached to a luer-lock type of a 10 ml syringe is used. After proper antiseptic measures, the FNA is carried out with the patient lying down. Most of the FNA was done in sitting position. In cases where the patient had a tendency to withdraw his/her head backwards on aspiration, the lying down position was employed. The syringe holder is advocated by many authors. (Eneroth & Zajicek, 1966; Frable, 1983; Sismanis et al, 1981<sup>11,18</sup>). A 20 ml syringe was advocated by Sismanis et al<sup>18</sup>, though all others used a 10 ml syringe. In our study, a 22 or 23 gauge needle attached to a 10 ml disposable syringe, without a syringe holder, was used. Orell et al (2005)<sup>12</sup> & Frable (1983)<sup>18</sup> advised the usage of cover slips to spread the smear. Their technique is used here.

**Sialadenitis**

The smear showed benign ductal and acinar cells in a background of lymphocytes, plasma cells, neutrophils and macrophages. A diagnosis of acute sialadenitis was given

when neutrophils predominated, likewise chronic cases showed a lymphocytic predominance. Two smears showed only scanty cellularity and hence, were nonspecific. One smear showed a suppurative picture with no ductal or acinar cells, which favored a diagnosis of an abscess. The gross histopathology showed foci of suppuration in the enlarged gland. This was confirmed in histology. Hence the disparity in cytology may be due to a sampling error, wherein the needle penetrated the suppurative area in the gland. One smear showed only scanty tissue and necrotic cells of a lymph node. The disparity was due to a sampling error in which the cytology was done from a degenerating node adjacent to, attached to, or intracapsular, in relation to the gland.

In our study, FNA was sensitive for sialadenitis in 79% and specific in 100%. The positive predictive value of FNAC for sialadenitis was 100%, negative predictive value was 93%. The overall accuracy of FNAC in diagnosing sialadenitis was 93%.

**Metastatic lymph node**

Of 9 cases with metastatic lymph node from squamous cell carcinoma, cytology yielded the same results in all the 9 cases. (100% correlation). The cytologic features include squamous cells with pleomorphic, hyperchromatic nuclei and moderate cytoplasm, keratinisation with pearls and necrotic material background of lymphocytes.

In our study, FNAC showed a sensitivity of 70%, specificity of 100%, a positive predictive value of 100% and a negative predictive value of 94% in diagnosing metastatic cervical nodes from a primary tumor of squamous cell carcinoma in the head & neck.

**Reactive lymph nodes**

11 out of the 12 cases of reactive change in lymph node were positive in FNAC. The diagnosis was made on mixed population of lymphoid cells with whole range of transformed lymphocytes, predominance of small lymphocytes, tingible body macrophages, few histiocytes,

eosinophils, plasma cells and neutrophils. The presence of tingible body macrophages is highly suggestive of a benign change. In our study, FNAC showed a sensitivity of 92%, specificity of 98%, positive predictive value of 92%, negative predictive value of 98% and an accuracy of 98% in diagnosing reactive change in a cervical lymph node.

**Conclusions**

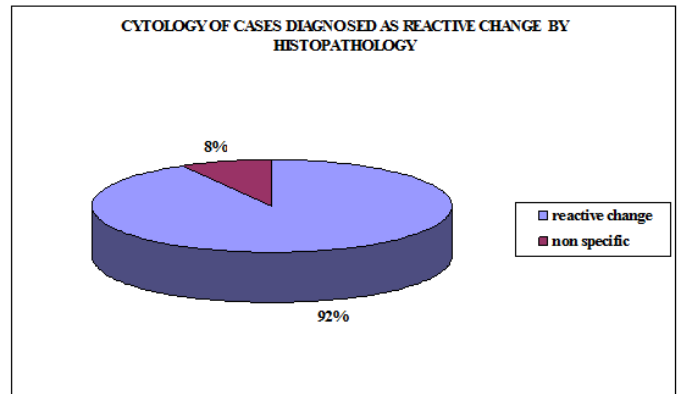
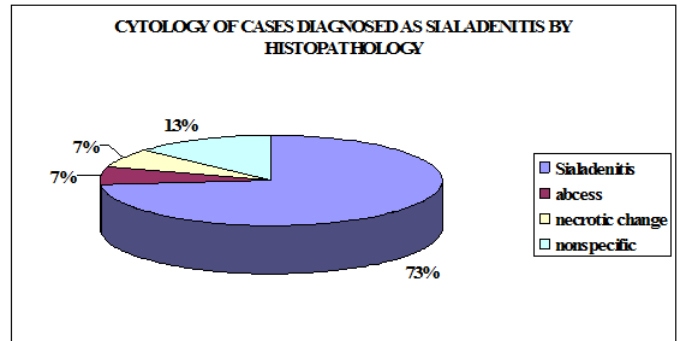
55.3% of the cases were males. 71% were non-neoplastic swellings, of which 27% were sialadenitis, 21% were reactive change lymph node and the rest were neoplastic. FNAC was 70% sensitive.100% specific and 94.6% accurate for diagnosing malignancy in maxillofacial swellings.

Histopathology	Frequency	Correct Diagnosis By FNAC	Incorrect Diagnosis By FNAC
Sialadenitis	15	10 (67%)	5 (33%)
Metastatic node	9	6 (67%)	3 (37%)
Reactive node	12	11 (92%)	1 (8%)
Abscess/ suppurative lesion	2	2 (100%)	0
Cysts	6	3 (50%)	3 (50%)
Ameloblastoma	1	0	1 (100%)
Pleomorphic adenoma	3	1 (33%)	2 (67%)
Lipoma	1	1 (100%)	0
Angioneurotic edema	2	2 (100%)	0
Hemangioma	1	1 (100%)	0
Adenoid cystic carcinoma	1	1 (100%)	0
Thyroid-MNG	1	1 (100%)	0
Thyroid-colloid	1	1 (100%)	0
TB lymph node	1	0	1 (100%)

Errors in FNAC diagnosis were due to errors in interpretation and errors in sampling. False positive diagnosis was due to error of interpretation while false negative diagnosis was due to error of sampling.

Sampling errors and errors of interpretation are the main drawbacks of FNAC. This could be minimized by meticulous technique, repeated aspirations, if possible under ultrasound guidance, adequate sampling when cell yield is poor and adherence to strict quality assurance.

Ultrasound guided FNAC is highly accurate due to the low prevalence of non-diagnostic sampling in such settings.<sup>1</sup>



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