Indian J. Otolaryngol. Head Neck Surg.
(April–June 2008) 60, 128–132
DOI 10.1007/s12070-008-0036-7

Main Article

Fine needle aspiration biopsy of intra-osseous lesions of the mandible and maxilla

Nazoora Khan · Nishat Afroz · Aiman Haider · S. A. Hasan · S. H. Hashmi

Abstract This study was done with an aim to assess the reliability and diagnostic accuracy of fine needle aspiration biopsy of intraosseous jaw lesions. Of the 42 cases, adequate material for cytologic evaluation was obtained in 35 cases. Malignant cells were found in 9 of 35 cases. FNAB diagnosis was confirmed by histopathology in all 9 of these specimens (100% accuracy). The FNAB diagnosis of benign lesions was confirmed in 19 of 26 cases (73% accuracy). The most common benign lesions were odontogenic cysts, followed by fibro-osseous and giant cell lesions. Incorrect diagnosis was related to lack of architectural context of the FNAB material, inadequate quantity of the aspirate and sampling of a non-representative part of a large lesion. Thus FNAB is a useful, simple, fairly reliable and outpatient procedure for diagnosis of intra-osseous jaw lesions, especially to distinguish between malignant and benign jaw lesions.

Keywords FNAB · Intra-osseous · Benign · Malignant · Jaw lesions

N. Khan[1] · N. Afroz[1] · A. Haider[1] · S. A. Hasan[2] · S. H. Hashmi[3]

[1]Professor, Department of Pathology
[1]Lecturer, Department of Pathology
[1]Junior Resident, Department of Pathology
[2]Professor, Department of ENT
J.N. Medical college,
AMU, Aligarh, India
[3]Professor, Department of Oral and Maxillofacial Surgery
Dr. Ziauddin Ahmad Dental college,
AMU, Aligarh,
India

Prof. N. Khan (✉)
A-11, Medical Colony
AMU, Aligarh - 202 002 (UP)
India
e-mail: nishat_ehsaan@yahoo.com

Introduction

Fine needle aspiration biopsy (FNAB) is frequently used for the diagnosis of soft tissue masses in the salivary glands, oral cavity, neck and thyroid glands (Head and neck masses) [1]. The reliability of FNAB for diagnosis of malignant bone lesions has been reported in both cytopathology and orthopaedic literature [2]. FNAB is a valuable tool for the differential diagnosis of benign and malignant lesions of the jaws. However, the efficacy of FNAB for diagnosis and treatment planning of intra-osseous jaw pathology has not been established.

Ramzy et al. [3] reported 23 FNABs of radiolucent lesions of jaws. Cytological diagnosis was correct in 62% of cases, a valuable differential was provided in an additional 4 cases, and 4 aspirates were non-diagnostic. The range of pathology included both benign and malignant lesions. They concluded that FNAB is simple and inexpensive technique that is valuable in the diagnosis of radiolucent changes in the jaws.

The purpose of this study was to evaluate the efficacy of FNAB in the diagnosis of benign and malignant jaw lesions in the light of clinical, radiologic and also histopathologic findings (wherever available). A brief description of key cytologic findings was also included wherever required.

Material and methods

42 patients with a chief complaint of a bony lesion in jaw (mandible or maxilla) from the ENT /Oral Surgery Department of J.N. Medical College and Z.A. Dental College, Aligarh Muslim University, Aligarh were obtained over a period of 3 years (2003–2006). The archival cytopathology material for each case was obtained and reviewed. Non-osseous lesions and cases in which either the final radiology or histopathology was not available for correlation, were excluded. In each case radiological data were available (ordinary radiographs and panoramic radiographs

(Pantomography). A panoramic radiograph is a single image of facial structures, which includes both maxillary and mandibular dental arches and their supporting structures. All the FNAB's were performed by cytopathologist in presence of an ENT/dental Surgeon. For fine needle aspiration, after localizing the lesion, a 22–33 G needle attached to a 10 ml disposable plastic syringe was inserted into the lesion, after which negative suction was created after withdrawing the piston. Repeated passes in different directions were made, while maintaining the vacuum, following which the piston was released and needle withdrawn. The specimen was first expressed onto glass slides and then multiple smears were prepared by spreading the aspirates. Air dried smears were stained with May Grunwald-Giemsa (MGG) stain while 95% ethanol fixed smears were stained with Papanicolaou stain. Cytopathologic evaluation included (1) assessment of adequacy of the aspirate, that is, whether sufficient cells were present to make interpretation possible without the presence of obscuring blood, inflammation or artifacts (2) determination of presence or absence of malignant cells (3) establishment of cytologic diagnosis. Material for histologic examination was subsequently obtained from all cases through open surgical biopsy, curettage or excision of the lesion. Paired correlation between the FNAB diagnosis and final histopathologic diagnosis was then made.

Results

FNABs were performed on 42 patients, 24 male and 20 female. There were 35 mandibular and 7 maxillary lesions.

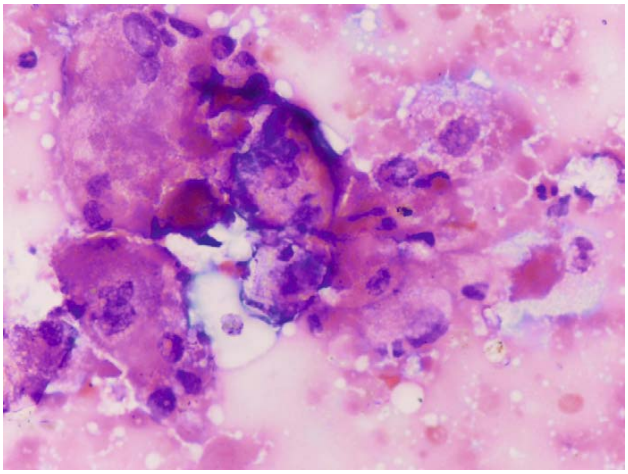

Fig. 1 FNAB – Odontogenic keratocyst: Keratinized squamous cells, anucleate squamous and necrotic keratinous debris (Pap X 400)

Of the 42 FNABs, 7 were non-diagnostic because of scanty or no cellularity, leaving 35 cases for evaluation.

Of the 35 cases, a total of 9 cases were positive for malignant cells (Table 1). In all of these cases, the correct diagnosis of tumor type was made from the cytologic smears (concordance rate with histopathology was 100%).

Of the 26 histologically diagnosed benign lesions 19 correlated with cytological diagnosis, with concordance rate (73.9%), while rest 7 cases had discordant FNAB diagnosis (Table 1).

Table 2 shows 3 types of benign odontogenic cysts diagnosed (5 of 8 cases) on FNAB with description of cy-

Table 1 Histopathological diagnosis of malignant cells

	Histopathological diagnosis	Concordant FNAB diagnosis	Discordant FNAB diagnosis
(A)	Benign lesions		
1.	Odontogenic cyst (n=8)	5	3
2.	Fibro-osseous lesion (n=6)	5	1
3.	Ameloblastoma (n=2)	2	0
4.	Giant cell lesion (n=4)	3	1
5.	Non-odontogenic cyst (n=1)	1	0
6.	Calcified odontogenic lesion (n=1)	1	0
7.	Osteomyelitis (n=1)	1	0
8.	Osteoma mandible (n=2)	0	2
9.	Intra-osseous Schwannoma (n=1)	1	0
	Total (n=26)	19	07
(B)	Malignant lesions		
1.	Primary squamous cell carcinoma (n=4)	4	0
2.	Osteogenic sarcoma (n=2)	2	0
3.	Metastatic carcinoma (n=2)	2	0
4.	Multiple myeloma (n=1)	1	0
	Total (n=9)	09	0

Indian J. Otolaryngol. Head Neck Surg.
(April–June 2008) 60, 128–132

tological features (Fig. 1). In the remaining 3 cases there were either inadequate epithelial cells for evaluation of cyst lining or no evidence of keratin lamellae.

Fibro-osseous lesion (6 cases), comprised of ossifying fibroma (2) ameloblastic fibroma (1), fibrous dysplasia (2) and cementifying fibroma, diagnosed by histopathology. Except for one case of cementifying fibroma, the cytologic diagnosis of all were reported as "consistent with a benign fibro-osseous lesion." These cytologic smears showed spindle cells, epithelial cells (ameloblastic fibroma), osteoblasts (ossifying fibroma) and background matrix substance. Thus, in the category of benign fibro-osseous lesions of the jaws, FNAB diagnosis correlated with the histopathology in 5 of 6 cases.

Two cases of ameloblastoma included in this study, were accurately diagnosed on FNABs, based on presence of mainly basaloid cells with prominent peripheral palisading (Fig. 2).

The FNAB diagnosis was correct in 3 of 4 giant cell lesions of jaw (peripheral giant cell granulomas (PGG) (2 cases) and central giant cell granuloma (CGG) (1 case).

The cytodiagnosis of CGG was based on presence of multinucleated osteoclast – like cells attached to cohesive groups of mononuclear cells [4]. This pattern was helpful in differentiating a giant cell lesion from other osteoclast-containing lesions such as aneurysmal bone cyst, fibrous dysplasia and Paget disease of bone.

The FNAB of the osteoma contained mainly blood and too few cells to be considered satisfactory for evaluation.

The aspirate of intra-osseous mandibular schwannoma showed cohesive fragments of spindle cells with pointed nuclei and peripheral palisading (Fig. 3). The diagnosis was confirmed by histopathology.

The remaining pathologic entities were a traumatic bone cyst (lytic lesion, yielding a cellular, bloody aspirate) and a case of osteomyelitis of mandible.

Of the 9 malignant lesions, diagnosed accurately on FNABs, invasive squamous cell carcinoma (4 cases) (Fig. 4) was the commonest primary malignancy followed by osteogenic sarcoma (2), and multiple myeloma (1). Of the 2 metastatic malignancies, aspirates yielded features of adenocarcinoma. Primary malignancy was simultaneously detected in lung (male) and breast (female). All these lesions produced clearly defined radiolucencies and destruction of bony cortices. Overall, benign jaw lesions were accurately diagnosed by FNAB in 19 of 26 cases (73.0% accuracy), while malignancy of jaw was diagnosed in all the cases with 100% accuracy.

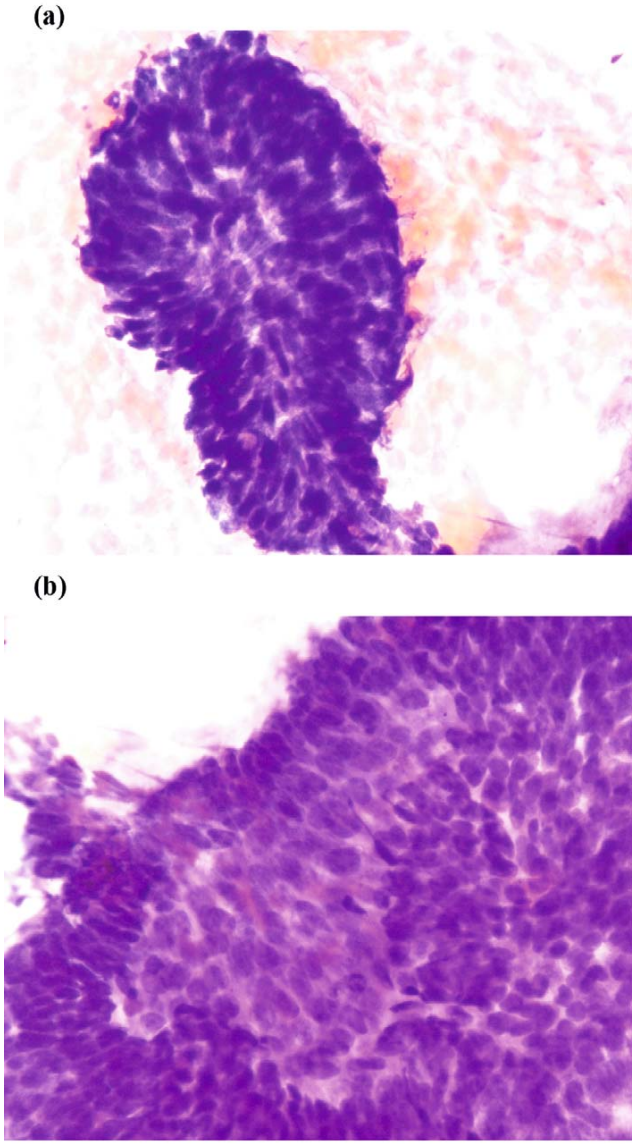

Fig. 2a,b FNAB – Ameloblastoma: solid nest of epithelial cells with peripheral palisading (Pap X 400)

Primary causes for error in diagnosing benign jaw lesions included inadequate cellular material and sampling of a non-representative portion of a large lesions.

Table 2 Diagnosis of benign odontogenic cysts

	FNAB	No. of cases	Cytological features
1	Odontogenic keratocyst (Fig. 1)	02	Keratinized squames, dyskeratotic epithelial cells and keratin lamellae.
2.	Dentigerous cyst	02	Squamous epithelial cells, hemosiderin laden nacrophages and inflammatory cells.
3.	Radicular cyst	01	Squamous cells, fibromyxoid tissue and inflammatory cells.

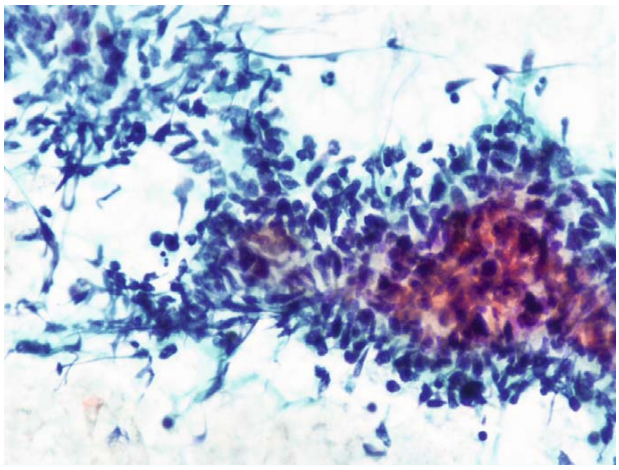

Fig. 3 FNAB – Intra-osseous Schwannoma: Spindled cells with pointed nuclei in cohesive groups, having peripheral palisading (Pap X 200)

Discussion

Fine needle aspiration biopsy has been used for years in general medicine and surgery for the evaluation of extra-oral lesions. The diagnosis of intraosseous lesions is often problematic because of their proximity to tooth apices and neurovascular bundles, and thus, they are frequently followed up periodically for radiographic changes, foregoing open biopsy for definitive histological diagnosis. Many of these patients are then lost to follow-up, and thus, some significant or serious diagnoses are often delayed. FNAB offers the clinician a conservative alternative to the more invasive procedures such as open biopsy or trephination, if a proper correlation with clinical and radiological findings is applied.

The results of this study correlate well with the excellent reported accuracy of intra-osseous FNAB for the diagnosis of malignant tumor [5]. Because of the ease with which the FNAB can be performed, the low complication rate, and rapid diagnosis, FNAB should be considered a first line diagnostic procedure in the hospital setting [6]. As is the case with open biopsy, if the results do not correlate with the clinical diagnosis, a repeat FNAB should be done.

FNAB for the diagnosis of benign pathologic conditions of the jaws is less sensitive than for the diagnosis of malignant lesions. Difficulties relate to the lack of architectural context in the FNAB material. For example to distinguish a dentigerous cyst from an odontogenic keratocyst by routine histology, the characteristics of the lining cells are of paramount importance, which are unavailable for evaluation on a FNAB.

Fibro-osseous lesions of the jaws represent a broad range of entities, and accurate histologic interpretation can be challenging even for the trained head and neck pathologist. In this series, the cytology was “consistent with a benign

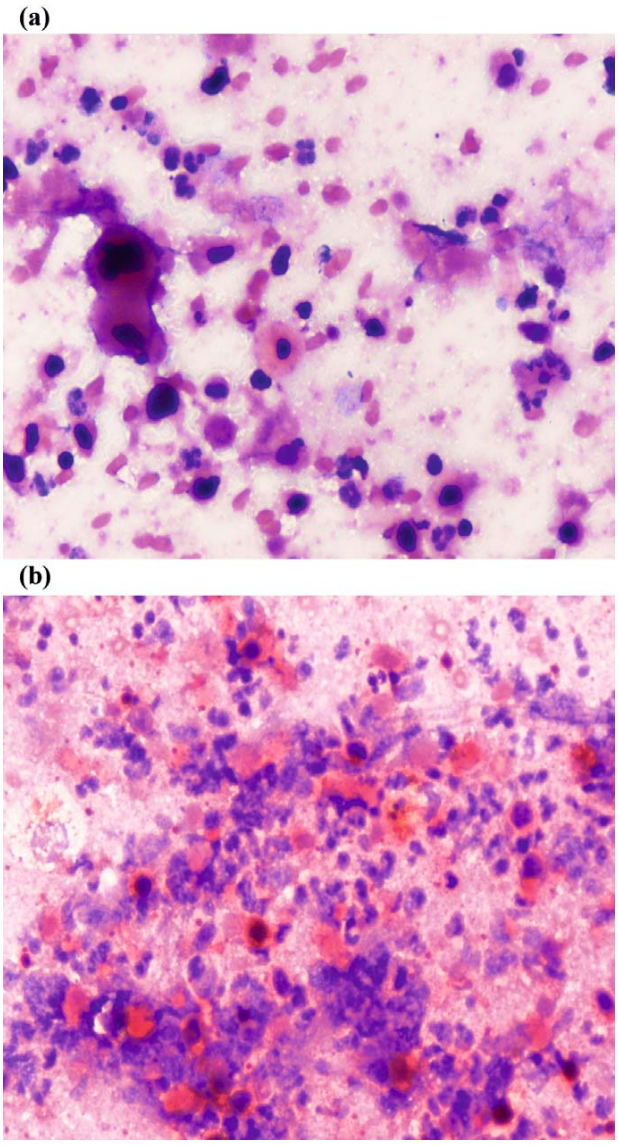

Fig. 4a,b FNAB – Invasive squamous cell Carcinoma: Scattered malignant squamous cells in a necrotic background (Pap X 400)

fibro-osseous lesion” and cytological impression of a subtype of the individual lesion was confirmed by histopathology. Obtaining sufficient cells may be difficult in more heavily calcified lesions, and we have noticed such difficulty in a case of cementifying fibroma and osteoma.

Our findings in cases of giant cell lesions were in accordance with the results of FNAB in the long bones. Vetrani et al. [4] reported a series of 9 giant cell lesions of jaw, all diagnosed by FNAB, and concluded that the cytology was sufficiently typical and unique to make diagnosis possible and reproducible. Gunhan et al. [7] reported a correct diagnosis in 5 of 6 giant cell granulomas in his series of jaw lesions.

FNAB of odontogenic tumors (e.g. ameloblastoma) is slightly difficult. Cytologically diagnosed cases of ameloblastoma were included in Ramzy et al. [3] series, Gunhan

et al. [7, 8] and Radhika et al. [9] series, describing the utility of FNAB in this diagnosis. In our series, the 2 cases of ameloblastoma mandible were correctly diagnosed on FNAB, but both the cases required multiple passes of the needle to obtain cellular constituents. Ramzy et al. [3] described the cytological features of ameloblastoma, as consisting of sheets of isolated intermediate and parabasal cells with glassy cyanophilic or orangeophilic cytoplasm. Since two of three cases were the acanthomatous variant, a significant squamous component was noted. Radhika et al. [9] described that cytologically ameloblastoma consisted mainly of two types of epithelial cells: basaloid with scanty cytoplasm with a dense, oval nucleus and squamous, with abundant cytoplasm and central nucleus. The authors [9] also described palisading of basaloid epithelial cells within the epithelial cell clusters, similar to our finding. Thus ameloblastomas have sufficiently distinctive cytologic features to make their diagnosis by FNAB possible.

Of the malignant lesions of jaw, invasive squamous cell carcinoma was the commonest, involving the mandible mostly; concurrent lesions were also present, involving buccal mucosa, or gingiva or floor of mouth. 2 cases of osteosarcoma of mandible were reported by us. As such , osteosarcoma is the most common malignant tumor of the jaw [10]. The Smears showed pleomorphic spindle and round cells, dissociated and in clusters along with osteoid and multinucleate giant cells similar to the findings of White et al. [11] Osteosarcoma of the jaw showed a prominent chondroblastic component as described by Clark et al. [12] Sometimes the absence of cytologic features of malignancy may lead to diagnostic difficulty in distinguishing osteosarcoma from benign or reactive bony lesions. The patients with osteosarcoma of jaw are slightly older [12] with a peak in 4th decade. Control of local spread remains the main clinical challenge.

In summary, FNAB is a minimally invasive procedure with low morbidity. It is readily accomplished and is applicable for use in both outpatient and inpatient settings. Furthermore, FNAB is a useful technique to distinguish between malignant and benign intra-osseous jaw lesions. This study showed that the overall accuracy of fine needle aspiration cytology in jaw bony lesion is high and is not significantly different from that obtained in other body regions, making FNAB a valuable asset in providing optimal patient care.

References

1. Platt JC, Davidson D, Nelson CL et al (1990) Fine needle aspiration biopsy. An analysis of 89 head and neck cases. J Oral Maxillofac Surg 48:706
2. Daskalopoulou D, Rapidis AD, Maounis N et al (1997) Fine needle aspiration cytology in tumors and tumor like conditions of the oral and maxillofacial region. Diagnostic reliability and limitations. Cancer 81:238
3. Ramzy I, Aufdemorte TB, Duncan DL (1985) Diagnosis of radiolucent lesions of the jaws by fine needle aspiration biopsy. Acta Cytol 29:419–424
4. Vetrani A, Fulciniti F, Boschi BD et al (1990) Fine needle aspiration biopsy diagnosis of giant cell tumor of bone: An experience with nine cases. Acta Cytol 34:863–867
5. Akerman M, Dreinhofer K, Rydholm A et al (1996) Cytogenetic studies on fine needle aspiration samples from osteosarcoma and Ewing's sarcoma. Diagn Cytopathol 15:17
6. August M, Faquin WC, Ferraro NF, Kaban LB (1999) Fine needle aspiration biopsy of intra-osseous jaw lesions. J Oral Maxillofac Surg 57(II):1282–1287
7. Günhan Ö, Doðan N, Celasun B, Sengün O, Onder T, Finci R (1993) Fine needle aspiration cytology of oral cavity and jaw bone lesions. A report of 102 cases. Acta Cytol 37:135–141
8. Günhan O (1996) Fine needle aspiration cytology of ameloblastoma. A report of 10 cases. Acta Cytol 40(5):967–969
9. Radhika S, Nijhawan R, Das A, Dey P (1993) Ameloblastoma of the mandible: Diagnosis by fine needle aspiration cytology. Diagn Cytopathol 9:310–313
10. Vege DS, Borges AM, Aggrawal K, Balasubramaniam G, Parikh DM, Bhaser B (1991) Oseosarcoma of the craniofacial bones. A clinico-pathological study. J Cranio Maxillofac Surg 19(2):90–93
11. White VA, Fanning CV, Ayala AG, Raymond AK, Carrasco CH, Murray JA (1998) Osteosarcoma and role of fine needle aspiration: A study of 51 cases. Cancer 62(6):1238–1246
12. Clarke JL, Unni KK, Dahlin DC, Devine KD (1983) Osteosarcoma of the jaw. Cancer 51:2311–2316