

Sifting of Jaw Lesions: A Comparative Study of Conventional Radiography, Advanced Radiography and Histopathology

Dr. V. Shakuntala Soujanya, M.D.S¹, Dr. M. Vinuthna, M.D.S^{2*}, Dr. Abhishek, M.D.S³, Dr. T. Harshavardhan, M.D.S⁴, Dr. Suresh Kumar, M.D.S⁵, Dr. Jayakrishna, M.D.S⁶

¹Assistant professor, department of oral medicine and radiology, meghna institute of dental sciences, Nizamabad, Telangana, India

²Assistant professor, department of dentistry, government medical college, Nizamabad, Telangana, India

³Assistant professor, department of oral and maxillofacial surgery, meghna institute of dental sciences, Nizamabad, Telangana, India

⁴Professor and hod, department of oral medicine and radiology, meghna institute of dental sciences, Nizamabad, Telangana, India

⁵Professor and hod, Department of oral maxillofacial surgery, Meghna institute of dental sciences, Nizamabad, Telangana, India

⁶Associate professor, department of dentistry, government medical college, nizamabad, Telangana, India

*Corresponding author: Dr. M. Vinuthna

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Abstract

Original Research Article

Aims and Objectives: To compare and highlight the role of conventional radiography advanced radiography and histopathology in diagnosis of various jaw lesions. **Methods:** A retrospective study was carried out using available past 3 years dental records of the Meghna Institute of Dental sciences and from them 30 cases were selected and analyzed for clinical features, provisional diagnosis, radiographic diagnosis- both conventional and advanced then finally followed by histopathological diagnosis. **Results:** Among the 100% of contributed jaw lesions, the most prevalent and diagnosed lesions on Conventional radiography were 33.3% Cystic lesions, 23.3% Malignant lesions, 16.7% Inflammatory lesions, syndrome and systemic diseases, 10% Benign tumours, 10% fractures and 6.7% Fibro osseous lesions whose correlation with the advanced radiographic diagnosis was found to be less statistically significant when compared to histopathological diagnosis which was found to be more statistically significant. **Conclusions:** Thus, Advanced radiography is definitely an adjuvant in diagnosis of jaw lesions over conventional radiography, especially to assess severity/number of fractures and to know the exact margins of malignant lesions; however histopathology is a gold standard for diagnosis of jaw lesions.

Keywords: Jaw lesions, Conventional radiography, Advanced radiography, Histopathology, Key diagnosis, Prognosis.

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INTRODUCTION

Among the various lesions encountered in the orofacial region, the majority of them have preponderance to occur in jaws which when neglected in early stages may hamper the esthetic and functional components of an individual, thereby complicating the treatment and prognosis thereafter. The art and skill of any oral physician lies in his or her own knowledge and ability to perpetuate and differentiate different jaw lesions thus aiding in arriving at appropriate diagnosis and treatment plan thereby improvising the prognosis of any lesion [1]. In the initial days, the only tools for the diagnosis of jaw lesions were the clinical features and conventional radiography whose accessibility got increased with the time by the invention and intrusion of many newer investigations like advanced radiography, histopathology, etc.

The radiographic revelation of any jaw lesion depends on its characteristic features like its location,

margin, density, relation to tooth, etc. [2, 3]. However, as many of the lesions have similar radiographic appearances it often becomes difficult to differentiate them [4]. From the era of conventional radiography, despite of the development of so many modern imaging modalities, it still remains as the most important standard mode of investigation for the evaluation of jaw lesions where intraoral radiographs provides a highly detailed view of lesions of size less than 3 cm, extraoral radiographs to examine larger lesions, maxillofacial structures and finally panoramic radiographs produces an image of broad area with low radiation dose especially in patients who are unable to open their mouth.

Thus, jaw lesions are difficult to distinguish from each other barely on conventional radiography [5]. Hence, the patient's history, thorough clinical examination followed by analytical approach to radiographs help in narrowing down the differential diagnosis where the role of advanced radiography like

CT thereafter remains in knowing exactly the spatial extension of any lesion, its nature, in surgical planning, etc.,. However the histopathological examination finally aids in confirmatory diagnosis [1] to assess prognosis and modify the treatment plan if needed. Thus, the present study aims at highlighting the comparative role of a conventional radiography, advanced radiography and histopathology in appropriate diagnosis of jaw lesions using 30 clinical case series.

MATERIALS AND METHODS

A retrospective study was carried out using available past 3 years dental records of the Meghna Institute of Dental sciences and from them 30 selected cases were analysed for clinical features, provisional diagnosis, radiographic diagnosis-both conventional and advanced then finally followed by histopathological diagnosis.

Inclusion criteria

- Patients of any age, both genders, all racial and ethnic groups diagnosed with Jaw lesions
- Including fractures and inflammatory group of lesions secondary to systemic diseases, syndromes.
- Only jaw lesions with suspected clinic-radiological manifestations and available histopathological diagnosis were considered.

Exclusion criteria

- Lesions whose diagnosis and treatment ended up with provisional diagnosis and/or conventional radiographic diagnosis.
- Patients not under regular follow-up

Then the selected cases of 30 were classified into:

Group I: Cystic lesions

Group II: Benign tumors

Group III: Fibrous lesions

Group III: Malignant lesions

Group IV: Inflammatory lesions, Syndromes, Systemic diseases

Group V: Fractures

RESULTS

Here as the available data is qualitative rather than quantitative, statistical analysis is done using Chi square test and SPS software version 20. Among these selected cases of 30, they showed variation in age, sex predilection, commonly presenting clinical symptom and diagnosis using conventional radiography, advanced radiography and histopathology.

Age distribution

Out of 100% of cases, 50% of patients belong to age group of 10-25yrs, 26.7% belongs to age group of 26-50yrs and 23.3% belongs to age group of 51-65yrs showing predilection in younger age group (Table 1).

Sex distribution

Out of 100% of study group, 53.3% belongs to females and 46.7% belongs to males (Figure 1).

Prevalence of clinical symptoms

Among the various prevalent symptoms among the study group, the most common prevalent was swelling (33.3%), swelling and pain (23.3%), pain and trismus (6.7%) followed by other symptoms like mobility, pus discharge, ulcer and facial deformity (Table 2).

Prevalence of jaw lesions among study subjects

Among the various jaw lesions distributed among the study group, the most prevalent and diagnosed lesions on Conventional radiography were Cystic lesions (33.3%), Malignant lesions (23.3%), Inflammatory lesions, syndrome and systemic diseases (16.7%), Benign tumours and fractures(10% each) and finally the Fibro osseous group of lesions(6.7%.) (Table 3).

Proportion of jaw lesions detected by various investigations

Out of 26.7% cases where advanced radiography was performed for final diagnosis 3.3% were cystic lesions, 3.3% were fibro osseous lesions, 13.3% were malignant lesions and 6.7% were fractures. However, the correlation of final diagnosis of individual group of jaw lesions using advanced radiography with that of conventional radiography is less and it is proven to be statistically significant ($p < 0.001$) (Table 4) especially in diagnosis of fractures and knowing the exact extension of malignant lesions.

Out of 73.3% cases where Histopathological examination was performed for final diagnosis, 33.3% were cystic lesions, 10% were benign tumors, 6.7% were fibro osseous lesions, 20% were malignant lesions and 3.3% were inflammatory lesions, syndromes, systemic diseases. There is a higher correlation of final diagnosis of individual group of jaw lesions using histopathology with that of conventional radiography (Table 4) which is much more statistically significant ($p = 0.025$). This minor variation may be due to the inclusion of fractures in study group where histopathology has no role in it.

Table-1: Distribution of study subjects based on their age

Age group	N	Percentage (%)
10-25 years	15	50.0
26-50 years	8	26.7
51-65 years	7	23.3
Total	30	100%

Table-2: various cases Prevalence of clinical symptoms among

Clinical symptom	Cases	Percentage (%)
Swelling and pain	7	23.3
Swelling and mobility	1	3.3
Swelling	10	33.3
Pain, swelling, trismus	1	3.3
Pus discharge, missing teeth	1	3.3
Pain	1	3.3
Swelling, pus discharge	1	3.3
Pain, trismus	2	6.7
Pain, facial deformity	1	3.3
Missing and mobile teeth	1	3.3
Pain, pus discharge	1	3.3
Pain, ulcer	1	3.3
Swelling, pain, loose teeth	1	3.3
Swelling, pain, loose teeth, pus	1	3.3

Table-3: Prevalence of jaw lesions among study subjects

Provisional diagnosis	Frequency (N)	Percentage (%)
Cystic lesion	10	33.3
Benign tumour	3	10.0
Fibro osseous lesion	2	6.7
Malignant lesion	7	23.3
Inflammatory lesion, syndrome and systemic diseases	5	16.7
Fractures	3	10.0
Total	30	100.0

Table-4: Proportion of jaw lesions detected by various investigations

Lesions	Conventional radiography	Advanced radiography	Histopathology
Cystic lesions	33.3%	3.3%	33.3%
Benign tumors	10%	0%	10%
Fibro osseous lesions	6.7%	3.3%	6.7%
Malignant lesions	23.3%	13.3%	20%
Inflammatory lesions, syndromes, systemic diseases	16.7%	0%	3.3%
Fractures	10%	6.7%	0%
Total	100%	26.7%	73.3%
P value	0.101	0.000	0.025

Figure 1: Distribution of study subjects based on gender

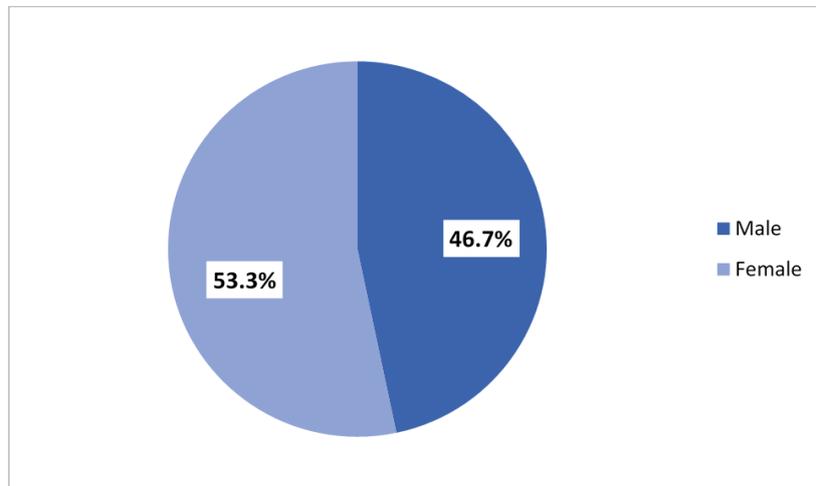


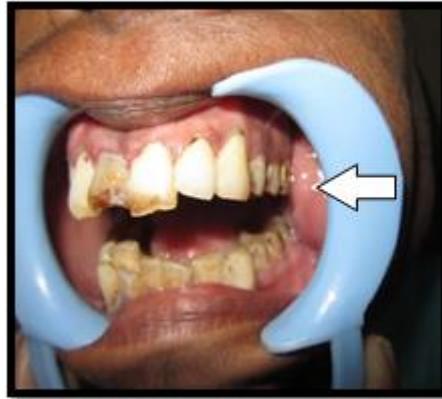
Photo-1: Case: “Adenoid cystic carcinoma”



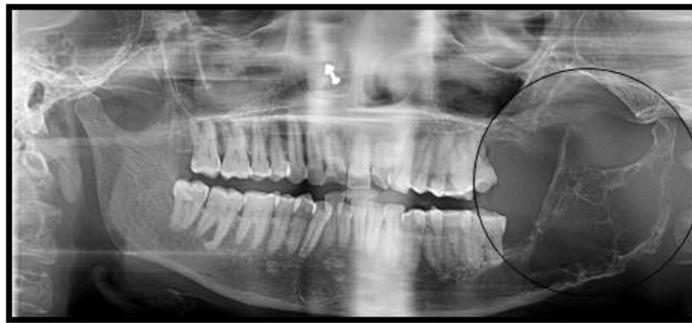
Extra-oral examination



Intra-oral examination



Pre-operative radiographs



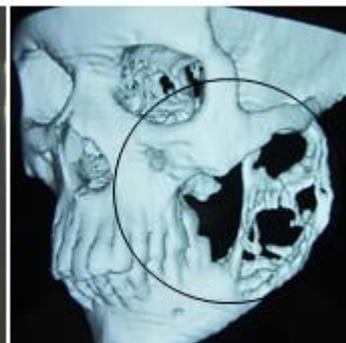
OPG



CT Coronal section



CT Axial section



CT 3D image



Surgical excision followed by hemi-mandibulectomy



Post-op OPG



Post-op follow-up photographs

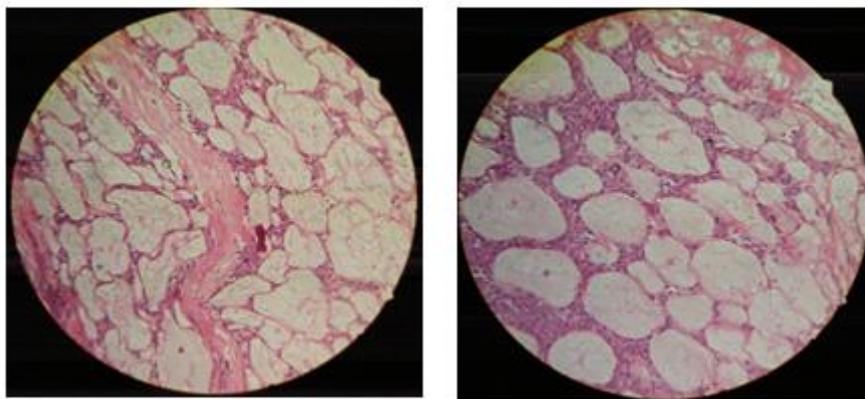
Photo-2: Case: "Lateral Periodontal cyst

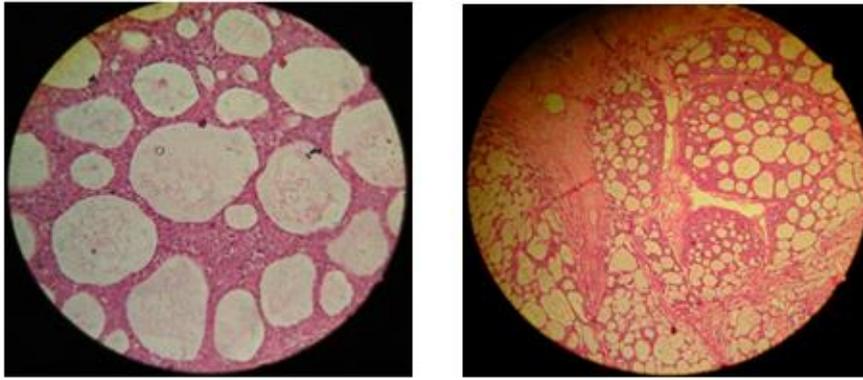


Clinical examination



Aspiration

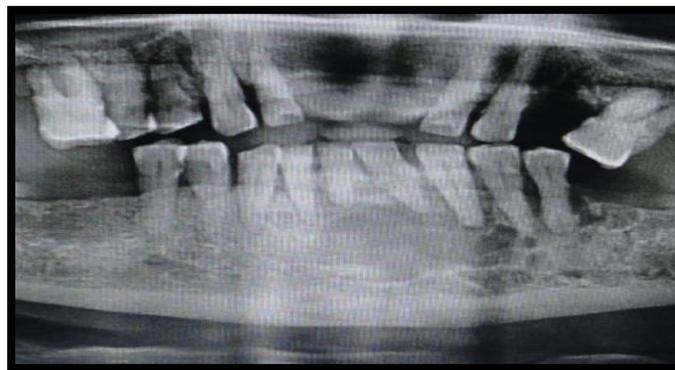




Histopathological microphotographs



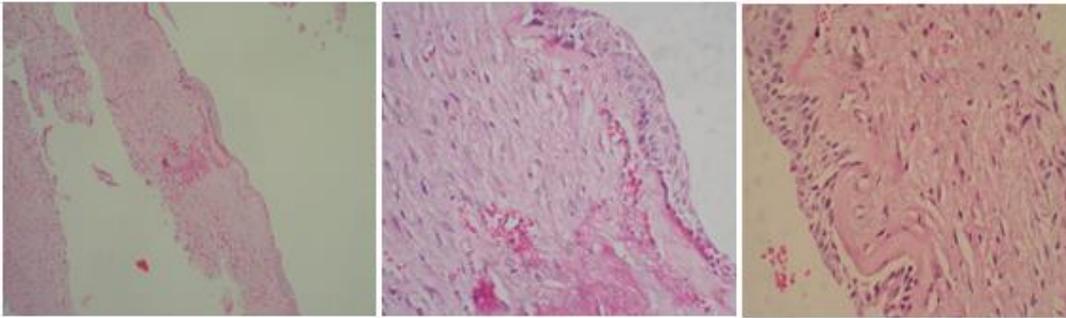
Occlusal radiograph



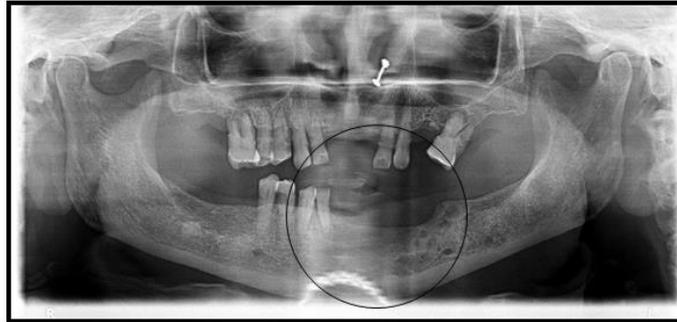
Pre-OP OPG



Enucleation of cyst



Histopathology microphotographs



Post-op OPG after 8 months

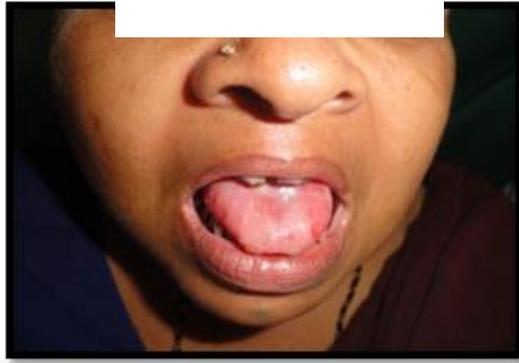
Photo-3: Case: “Invasive squamous cell carcinoma of mandible”





Extraoral examination





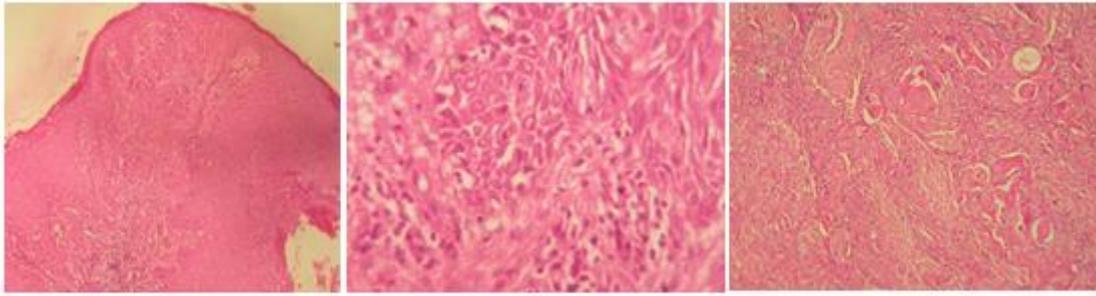
Intraoral examination



Biopsy



Orthopantamograph



Histopathology microphotographs

Photo-4: Case: “Dentigerous cyst”



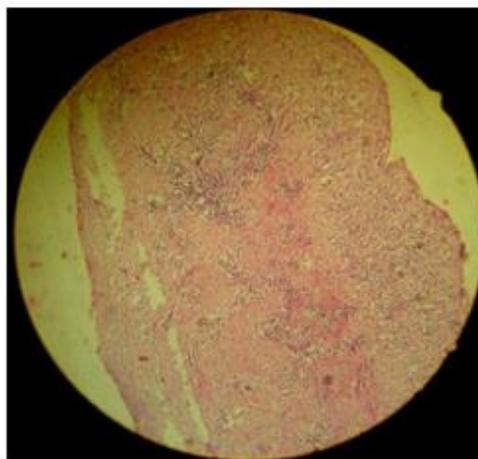
Clinical examination

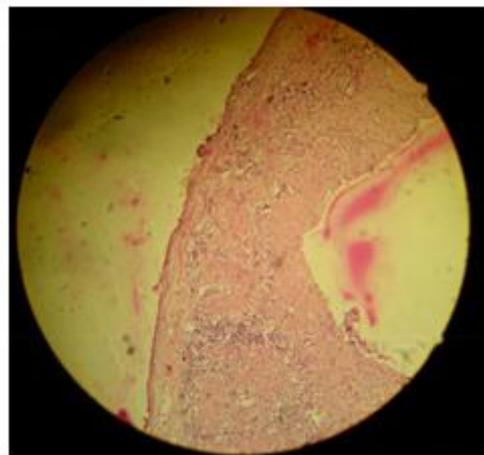
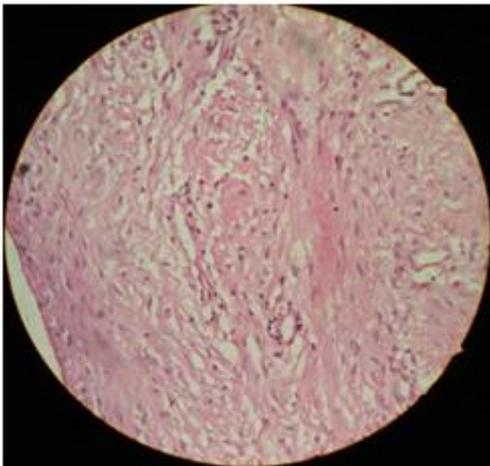
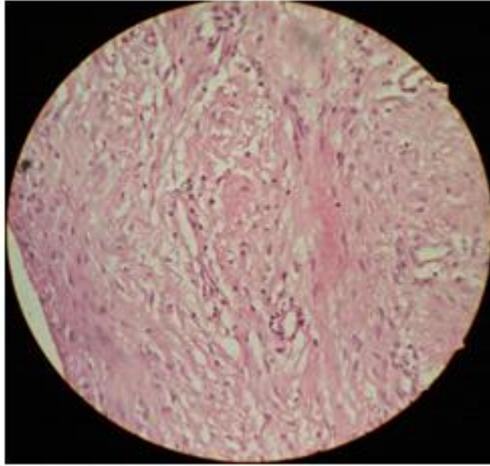


OPG



Enucleation of cyst





Histopathological microphotographs

Photo-5: Case: “ Juvenile ossifying fibroma”



Clinical examination



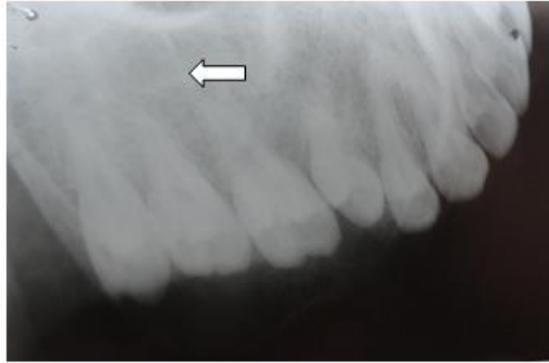
PA skull



PNS view of skull



OPG



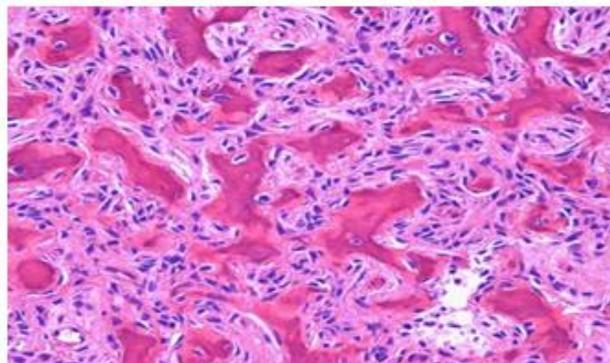
Maxillary occlusal radiograph



IOPA



CT-axial section



Histopathological microphotographs

Photo 6: Case: Odontogenic and non-Specific odontogenic cyst



Clinical examination



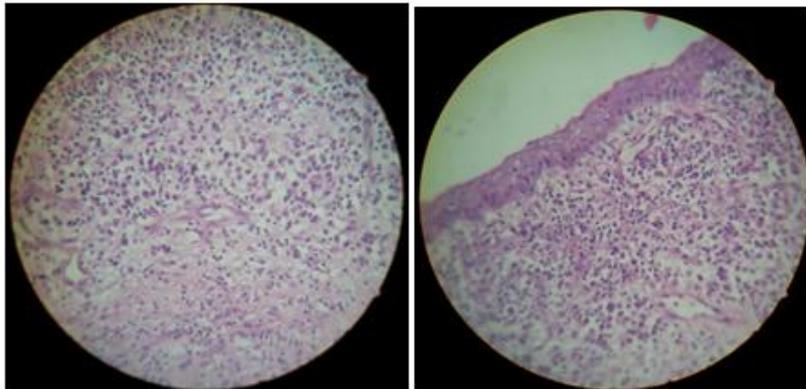
IOPA



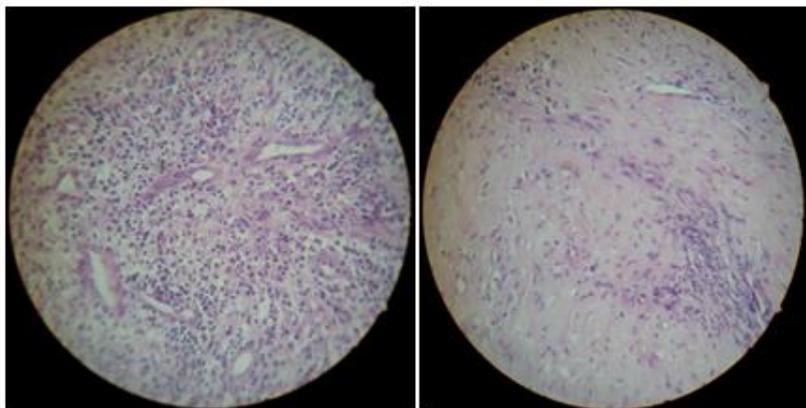
Pre-op Radiographs



Enucleation of cyst



Odontogenic inflammatory cyst



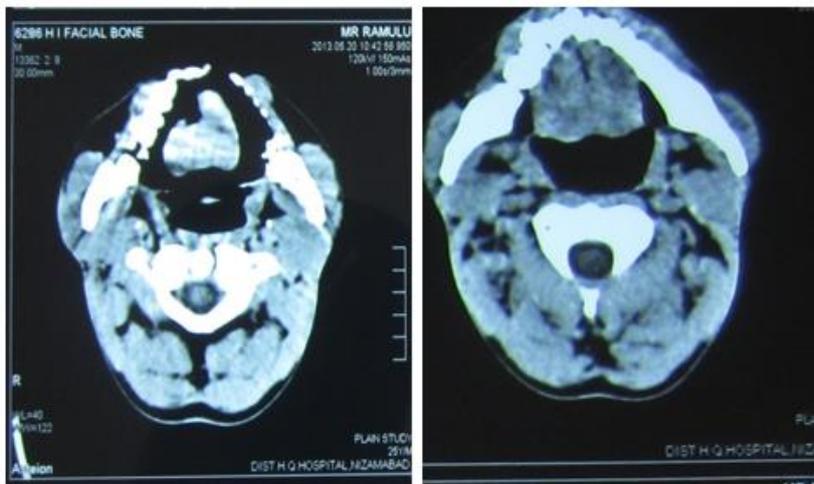
Non-specific inflammatory odontogenic cyst
Histopathological microphotographs



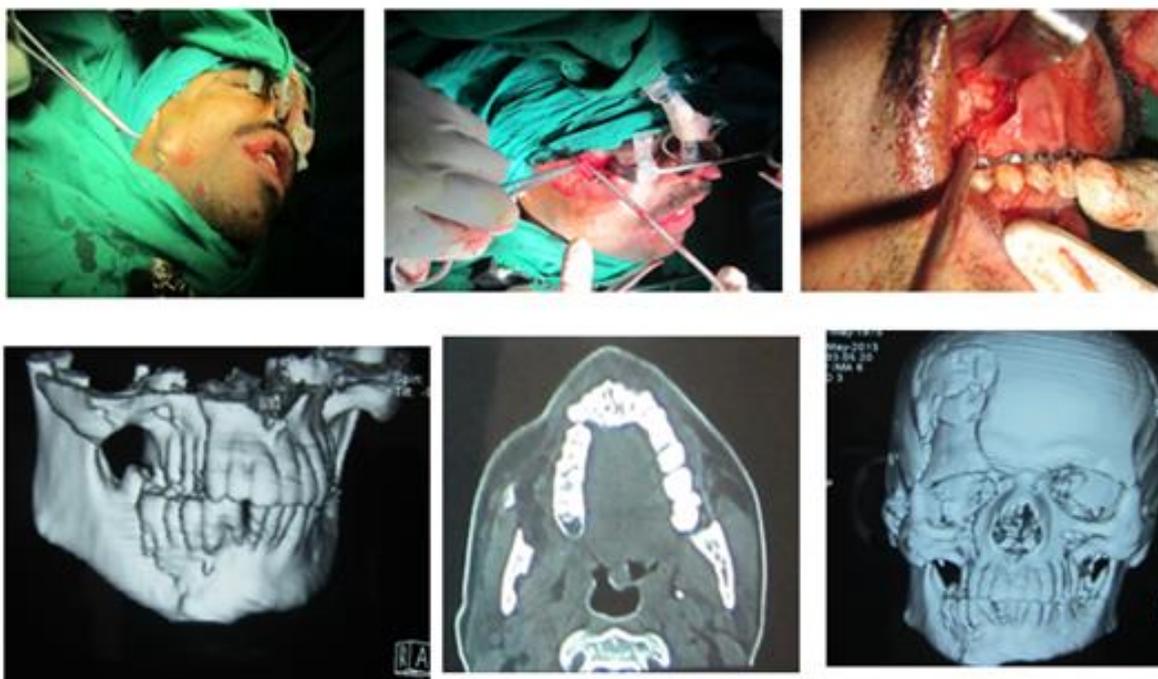
Post-op clinical evaluation

Photo- 7: Case: pan facial trauma





Radiographic examination



Operative



Post-operative radiograph

DISCUSSION

In our day to day practice, the diagnosis of jaw lesion has become challenging as most of the lesions share common clinical, radiological features and hence can be differentiated only through histological features [6]. In year 1985, Burkes found a case of mandibular right first premolar which initially diagnosed with a periapical lesion of endodontic origin which later diagnosed with an adenoid cystic carcinoma on biopsy [7]. Similarly in year 1992 Shah and Sarkar reported a case of maxillary left lateral incisor with an open immature apex associated with a large periapical radiolucency whose conservative treatment failed to show any improvement and was histopathologically diagnosed with a plasmocytoma [8].

Similarly there are several case reports in the literature, which were initially they were diagnosed with a dentigerous cyst of an impacted tooth which were later diagnosed as odontogenic keratocyst, cystic ameloblastoma, etc. histopathologically [1]. This compulsion in precise diagnosis of jaw lesions has led

to several studies where most of them are retrospective [9,10,11] and thus our study is one of such kind aiming at comparing conventional, advanced radiography and histopathology in diagnosis of jaw lesions where past 3 years dental records of the Meghna Institute of Dental sciences were collected out of which 30 selected cases were analyzed for clinical features, provisional diagnosis, radiographic diagnosis- both conventional and advanced then finally followed by histopathological diagnosis.

The selected cases were then grouped into Group I: Cystic lesions, Group II: Benign tumors, Group III: Fibrosesous lesions, Group III: Malignant lesions, Group IV: Inflammatory lesions, Syndromes, Systemic diseases, Group V: Fractures where 50% of the lesions fall under the age group of 10-25 years, predominant in females and the common presenting symptom was swelling followed by pain [3]. Among the various jaw lesions, the most prevalent and diagnosed lesions on conventional radiography were cystic lesions 33.3%, followed by malignant lesions

23.3%, inflammatory lesions, syndrome and systemic diseases 16.7%, benign tumours and fractures 10% each and fibro osseous lesion 6.7% [1,12].

Out of which 26.7% of jaw lesions were subjected to advanced radiography and were diagnosed as 3.3% cystic lesions, 3.3% fibro osseous lesions, 13.3% malignant lesions and 6.7% fractures which is statistically significant ($p < 0.001$) [2,5,13]. Similarly, 73.3% of jaw lesions were subjected to histopathological examination and were diagnosed as 33.3% cystic lesions, 10% benign tumors, 6.7% fibro osseous lesions, 20% malignant lesions and 3.3% inflammatory lesions, syndromes, systemic diseases which is statistically much more significant ($p = 0.025$) [14-16].

Here are the few case reports where the ultimate diagnosis was finally done by histopathology:

Case report 1

A female patient of age 51 yrs. with chief complaint of pain and swelling from past 3 months was diagnosed based on clinical, conventional and advanced radiographic features as ameloblastoma due to the presence of afebrile hard swelling with buccolingual cortical expansion, a huge osteolytic lesion involving entire ramus of the mandible where hemimandibulectomy was done and was diagnosed as Adenoid cystic carcinoma due to the presence of cells are arranged in follicular pattern showing basaloid pattern and stroma rich in spindle cells (Photo 1).

Case report 2

A female patient of age 65 yrs with chief complaint of loosening and swelling at lower front teeth region during past 1 year was diagnosed as lateral periodontal cyst based on clinical, conventional radiographic features due to the presence of obliteration of lower labial vestibule, mobility of the lower anteriors and radiographically the presence of well- defined multilocular radiolucent lesion with well-defined corticated border seen w.r.t 33 34 35 on lateral aspect of roots which correlated with histopathological diagnosis as same due to the presence of delicate thin friable, discontinued epithelial lining with few areas of 10 cell layer and few with 2-3 cell layer thickness resembling reduced epithelium with juxta-epithelial hyalinization and connective tissue rich in plumpy fibroblasts (Photo 2)

Case report 3

A female patient of age 50 yrs with chief complaint of pain in lower left back tooth region from past 1 month was diagnosed as Intra-alveolar carcinoma based on chewing habit of beetle leaf and nut with slaked lime from the duration of past 25 yrs, clinical, conventional radiographic features such as severe trismus, solitary, firm and fixed left submandibular lymphnode of size 60mm x 50mm approximately,

blanching of mucosa, palpable fibrous bands, depapillation of tongue, erythematous alveolar mucosa w.r.t. 38 with mobility and radiographically the presence of bone loss around 36 37 38 where histopathologically it was diagnosed as Intra-alveolar carcinoma due to the presence of islands of dysplastic epithelial cells, infiltrating connective tissue stroma, dysplastic features such as keratin pearl formation, individual cell keratinization, cellular and nuclear pleomorphism and lymphocytic infiltration (Photo 3)

Case report 4

A Male patient of age 24 yrs with chief complaint of swelling on right side of the face since past 1 year was diagnosed as dentigerous cyst based on clinical, conventional radiographic features due to the presence of obliteration of buccal vestibule near unerupted mandibular 3rd molar region and radiographically the presence of well- defined unilocular radiolucent lesion with well-defined corticated border seen surrounding the crown i.r.t impacted 48 originating from CEJ which correlated with histopathological diagnosis as same due to the presence of cystic capsule resembling reduced enamel epithelium with cell rests (Photo 4)

Case report 5

A male patient of age 20 yrs with chief complaint of swelling on right malar region since 15 yrs after a history of trauma was diagnosed initially as fibrous dysplasia due to the presence of non-tender, hard extra-oral swelling displacing lower eyelid, intra-orally the presence of obliterated buccal vestibule i.r.t 13 14 15 16 17 with palatally displaced 14 15 16 with buccal cortical expansion and radiographically the presence of ground glass appearance of trabecular bone obliterating maxillary sinus. However, histopathologically was diagnosed as Juvenile ossifying fibroma due to the presence of psammoma bodies and woven bone interspersed in stroma rich in spindle shaped cells (Photo 5)

Case report 6

A female patient of age 25 yrs with chief complaint of pain in lower left back teeth region from past 3 days was diagnosed as odontogenic cysts due to the clinical presentation of solitary, ovoid, hard, febrile, tender extra-oral swelling on left side of body of the mandible with intra-oral findings of obliterated buccal vestibule i.r.t 35 36 37 38, root stump w.r.t 36, radiographically the presence of two solitary separate unilocular cystic lesions w.r.t root remnants of 74 75 and 36 respectively which finally diagnosed as specific and non-specific inflammatory odontogenic cysts due to the presence of remnants of reduced enamel epithelium rich in inflammatory cells in cystic capsule histopathologically (Photo 6)

Case report 7

OPG showing only parasymphysis fracture on right side and CT revealing multiple fractures involving left zygomatic arch, lower orbital rim on left side; premaxillae and parasymphysis on right side. (Photo 7)

Case report 8

OPG revealing malunion of fractured segments near premaxillary region and parasymphysis on right side followed by CT showing complete malunion of fractured segments involving zygomatico-orbital complex, maxillary and mandibular bones (Photo 8).

CONCLUSION

Hence through our study we want to conclude that the histopathological diagnosis offers a gold standard judgment in the final diagnosis of jaw lesions whereas the role of advanced radiography like CT, most of the times, lies in the diagnosis and treatment planning of maxillofacial fractures involving mid-facial fractures because of the relatively thin bones and lower specificity and sensitivity of conventional radiography over CT scan.

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