In the Name of God

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Title:

Evaluation of Intra -osseous Jaws Lesions by Ultrasonography in Size and Content

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Contents

1) Abstract 1-2

2) Introduction 3-21

2-1) Ultrasongraphy background..... 8-9

2-2) Advantages and disadvantages of ultrasongraphy 10-12

2-3) Ultrasound physics and thechnology 13-21

3) Review of articles 22-27

4) Methods and Materials 28-32

5) Results 33-37

6) Case review 38-52

7) Discussion 53-62

7-1) Size evaluation 57-59

7-2) Content evaluation 60-63

8) Conclusions 64-65

9) References 66-69

10) Persian abstract 70-72

Figures and Tables

Figure 1 16
Figure 2.....16
Figure 3 18
Figure 4 18
Figure 5 19
Figure 6 19
Figure 7 20
Figure 8 40
Figure 9 42
Figure 10 44
Figure 11 46
Figure 12 48
Figure 13 50
Figure 14 52

Table 1 35
Table 2 36

1) Abstract

Objectives : Evaluation of intra-osseous jaws lesions with ultrasonography in size and content of each lesions and compare these with gold standard .

Methods : This study included 15 patients referred to oral surgeons for treatment .All patients had intra-osseous jaws lesions in maxilla or mandible.

Panoramic, Computed Tomography (CT) or Cone Beam CT (CBCT) scan and ultrasonography (USG) examination were performed for all patients .Size of these lesions measured by USG and compared with CT or CBCT, and Correlation between echographic pattern and histopathology result was assessed .

Results : In 12 out of 15 cases, lesions were measured by USG and the size of these had negligible difference to CT or CBCT results .3 other cases sonographist could not measured the lesions accurately . Echographic pattern in all these lesions were evaluated by USG, and according to USG finding, the jaws lesions were classified into 4 types :Cystic , Semisolid, solid and gas. Correlation of echographic pattern and histopatholohgy finding was close .

Conclusions : This study confirms that ultrasound imaging is a very useful imaging technique which can give significant diagnostic information regarding size and content of jaw bone lesions where the buccal bone thickness is thin enough

2) Introduction

Lesions occur in jaw mostly are related to the teeth or to odontogenic tissues. The jaw may harbor nonodontogenic bone lesions. Jaw bone differs from other bones in two aspects.

1) Embryologically, it is unique due to its development from cells migrating from the embryonal neuroectoderm .

2) Anatomically, that houses the tooth germs.

With both unique features in the jaw, diseases occur in this region that are not seen in any other part of the skeleton. These will be divided in 2 main groups: those related to the dentition and those restricted to the bone proper.

Tooth-related jaw bone diseases can be divided in cysts and odontogenic tumors. Reactive bone diseases, fibro-osseous lesions, giant cell lesions, and bone tumors are taken together as the main second group (1,2).

This overview of lesions in the jaw bones illustrates the huge variety occurring at this site. Because of the wide variation of these lesions, the diagnosis is complex.

Conventional radiographs play an important role in the detection, treatment and follow-up of bone lesions. Even after development of many modern imaging modalities, conventional radiography still remains the most important mode of investigation for the evaluation of jaw lesions (3).

Intraoral radiographs offer a highly detailed view of the teeth and bone in the area exposed, but they cannot be used for lesions larger than 3 cm, because of the small film size.

Extraoral radiographs are used to examine larger lesions and to visualize the skull and facial structures (4). Panoramic radiography is a special technique for detection of jaw lesions. The principal advantages of panoramic images include the following:

- Broad coverage of the facial bones and teeth
- Low patient radiation dose
- Convenience of the examination for the patient
- Ability to be used in patients unable to open their mouths
- Short time required to make a panoramic image, usually in the range of 3 to 4 minutes(includes the time necessary for positioning the patient and the actual exposure cycle).
- Patient's ready understandability of panoramic films, making them a useful visual aid in patient's education and case presentation.

The main disadvantage of panoramic radiography is that the images do not display the fine anatomic details available on intraoral periapical radiographs. Other problems associated with panoramic radiography include unequal magnification and geometric distortion across the image (4). Occasionally the presence of overlapping structures, such as the cervical spine, can hide

lesions, particularly in the incisor region . Furthermore; clinically important objects may be situated outside the plane of focus (image layer) and may appear distorted or not present at all(4). As technology improves, Computed tomography (CT) has been used in large extent to aid in diagnosis of lesions in the bone(5). For several years, Computed tomography has been the choice technique to assess oral and maxillofacial osseous lesions because it provides hard and soft tissues visualization in one examination without superimposition of surrounding structures. This examination offers a significant advance in maxillofacial lesions detection with an excellent anatomic resolution (6).

However, routine use of CT is associated with high radiation doses, even though dose reduction methods have been established. Low dose cone beam CT (CBCT) has recently been developed specifically for use in the dental and maxillofacial region.(5) CBCT scans are increasingly used for evaluating osseous pathology in the maxillofacial skeleton, e.g. cysts, benign and malignant tumors, inflammatory conditions.(4) CBCT & CT scans provide superior diagnostic information compared to panoramic radiographs. As mentioned before, limitations of panoramic radiography include variable magnification, distortion, superimposition of structures, and reliably recording only structures located in the focal trough. CBCT

and CT images are superior to panoramic radiography in all these aspects.(4)

CBCT provides clinicians with three dimension views of patient's head and neck area at relatively low radiation dose compared with medical CT. The other advantages of CBCT vs conventional CT are :

- Entire Volume with One Scan
- True Orthogonal Image
- Rapid Scan Time
- No Overlap of slices
- Reduced Motion Artifact
- In-Office Convenience
- Display Modes Unique to Maxillofacial Imaging (7).

MRI is another specialized imaging modality that does not involve the use of ionizing radiation while is important in imaging intracranial and soft tissue lesions. It has proved useful in differentiating between normal and abnormal soft tissues.

However, equipment is very expensive and tends to be claustrophobic, scanning time can be long and it is contraindicated in patients with certain types of surgical clips, cardiac pacemakers and cochlear implants (5).

2-1) Ultrasonography

Ultrasound (US) imaging technology, a safe and minimally invasive procedure, has been in use in medicine for many years.(5) The growth in use of ultrasound as a diagnostic imaging tool has been rapid. Until 30 years ago ultrasound examination was rarely in the hospital setting, but now this method of diagnosis is routine, and comprises over 25 percent of diagnostic imaging examimation undertaken in investigation of diseases (8).

2-2) Advantages and disadvantages of USG

Advantages compared with other techniques

1. Ultrasound examinations are non-invasive i.e. they do not require the body to be opened up, or anything to be inserted into the body.

2. Ultrasound methods are relatively inexpensive, quick and convenient, compared to techniques such as be inserted into the body X-rays or MRI scans. The equipment can be made portable, and the images can be stored electronically.

3. No harmful effects have been detected, at the intensity levels used for examinations and imaging. This contrasts with methods based on X-rays or on radioactive isotopes, which have known risks associated with them, and ultrasound methods are preferred whenever possible.

4. Ultrasound is particularly suited to imaging soft tissues such as the eye, heart and other internal organs, and examining blood vessels.

Disadvantages of ultrasound compared with other techniques

1. The major disadvantage is that the resolution of images is often limited.
2. Ultrasound is reflected very strongly on passing from tissue to gas. This means that ultrasound cannot be used for examinations of areas of the body containing gas, such as the lung.
3. Ultrasound also does not pass well through bone, so that the method is of limited use in diagnosing fractures.(9)