# Assessment of Cysts and Cystic-Like Lesions of the Jaws and Their Effect on Adjacent Structures by Using Cone Beam Computed Tomography (CBCT)

*Thair Abdul Lateef, B.D.S., H.D.D., F.I.B.M.S.* [(a)]
*Zainab H. Al-Ghurabi, B.D.S., M.Sc.* [(b)]
*Huda Moutaz Ismael, B.D.S., M.Sc.* [(c)]
*Muthanna Kamal Ali, B.D.S., M.Sc.* [(b)]

## ABSTRACT

**Background**: Preoperative radiographical assessment of the maxillofacial lesions is of a great importance in guiding the surgeon during surgical procedure in reducing post-operative complications. This study highlighted the application of CBCT scan in the assessment of maxillofacial cystic and cystic like lesions as a part of advanced radiology

**Materials and methods**: A total of 20 patients (15 males and 5 females) participated in this prospective study. CBCT scan (Kodak 9500 CBCT) with (DICOM) software utilized to perform scanning to all patients in order to assess lesion extension, morphological features and it's relation to the adjacent vital structures.

**Results**: In this study, the total cystic and cystic like lesions involving the maxilla and mandible were (20) lesions. Statistical analysis of the collected data showed no significant differences between the radiographical records and surgical findings regarding diagnostic accuracy of the lesions.

**Conclusion**: The validity of the CBCT in the assessment of maxillofacial cystic and cystic like lesions was similar to the surgical findings regarding lesion extension, expansion, perforation of buccal/or lingual plates, and relation to the adjacent vital structures.

**Key words:** CBCT, Jaw, cystic lesion. **(J Bagh Coll Dentistry 2016; 28(4):77-81)**

## INTRODUCTION

Cysts and cystic like lesions in the maxilla and mandible could be divided into odontogenic and non-odontogenic lesions, most of lesions are benign but sometimes changes may occur [(1,2)].

As a general view, the distribution of the jaw cysts was as follows: radicular cysts 56%, dentigerous cysts 17%, nasopalatine duct cysts 13%, odontogenic keratocysts 11%, globulomaxillary cysts 2.3%, traumatic bone cysts 1.0%, and eruption cysts 0.7% [(3)].

There are many important information that should be known by the surgeon before the operation, like size of the lesion and its extension, root displacement and resorption, expansion of cortical plates (buccal and/or lingual or plates) and its relation to the adjacent structures [(4, 5)]. All these diagnostic information could not be obtained by clinical examination and two-dimensional radiographic images like periapical and panoramic images [(6, 7)].

Multidetector computed tomography (MDCT) introduces high benefits in maxillofacial region since it supplies the surgeon with high resolution and multiple projections with very thin slice [(8,9)].

Nowadays, CBCT appeared to change the view and diagnosis way of the oral and maxillofacial surgeons by providing an accurate evaluation andtreatment planning prior to operation. CBCT.A new imaging modality, introduces a three-dimensional image in addition to three multiplanar views, coronal, sagittal and axial in one rotation only with low dose and simpler technique than MDCT [(10,11)].

Many studies proved that the accuracy of CBCT in diagnosis was compared or higher than multi-slice CT, because it has isotropic voxel with high resolution and small voxel less than 0.3mm, and it could produce 160 to 360 slice with high resolution compared with MDCT [(12-14)]. This study relied on evaluation of CBCT and on intraoperative findings to compare the accuracy of CBCT outcomes.

The purpose of the present study was: to evaluate the accuracy of CBCT in the assessment of cysts and cystic like lesions in the jaws in comparison with the surgical findings as a gold standard.

## MATERIALS AND METHODS

A total of 20 patients (15 males and 5 females), aged (10-60) years old participated in this prospective study. All patients were referred for preoperative radiographic assessment (CBCT scanning) of untreated pathology (cysts and cystic like lesion) after clinical provisional diagnosis and

[(a)] Assistant Professor, Department of Oral and Maxillofacial Surgery, College of Dentistry, University of Baghdad.
[(b)] Lecturer. Department of Oral Diagnosis, College of Dentistry, University of Baghdad.
[(c)]Assistant Lecturer, Department of Oral and Maxillofacial Surgery, College of Dentistry, University of Baghdad.

aspiration of lesions in the specialist health center of Al-Sadder city.

This study established by communication between radiographical and surgical team. The scanning were performed by using Kodak 9500 CBCT ( French origin), the Kv was 90, mA10 and scanning time was 10 sec. Voxel size 0.3mm with( DICOM ) software on a multiplanar reconstruction window in which the axial, coronal and sagittal plane could be visualized in addition to three-dimensional image.

Inclusion criteria

- ✓ Patients age range from (10-60) years old.
- ✓ Well circumscribed radiolucency involving maxilla and/or mandible.
- ✓ Lesion with clinical and radiographical provisional diagnosis of being a cyst or cystic like lesion.

Exclusion criteria

- ✓ Ill-defined border of a large radiolucency involving maxilla and/or mandible with extension to the soft tissue.
- ✓ Medically compromised patients who are classified by American Society of Anesthesiologist as being class III or more.

Information required from the surgeon who performed the surgical removal of the cystic and cystic like lesions included the following points:

- Accuracy of the lesions extent
- Perforation of buccal/and or lingual cortical plate
- Resorption of the adjacent teeth roots
- Expansion
- Displacement of inferior alveolar nerve
- Maxillary sinus involvement

Image analysis

Preoperative and postoperative CBCT images were completed and reviewed for each patient, three-dimensional image initially utilized to make visualization of the lesion as in figure (1).

**Figure 1: Three-dimensional image of pathological lesion involving the mandible with displacement of teeth and resorption of their roots, which was shown to be odontogenic keratocyst (OKC) with histopathological examination.**

Coronal, axial and sagittal planes were utilized to make complete assessment of the lesion dimensions and characteristics as shown in figure (2).

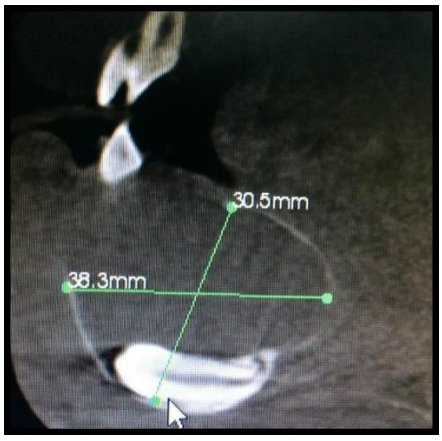


**Figure 2: CBCT scan (sagittal view) demonstrated the size and extension of the lesion involving the mandible with displacement of the canine tooth toward the lower border of the mandible.**

Outcome measures:

- ➢ Assess the extension of the lesion and its effect on adjacent structures and teeth. It should be mentioned that lesion extension recorded in two directions perpendicular to each other as (mesio-distal and superio-inferior directions).
- ➢ Record and assess the density of the lesion content, which may help the surgeon to make provisional diagnosis.
- ➢ Intra operative findings and histopathological examination were

recorded and compared with the radiographic assessment of the lesions.

Informed consent was obtained from all patients who were informed about the aim and method of the study.

## RESULTS

This study included 20 patients presenting with cystic and cystic like lesions equally distributed in both jaws, (10) lesions involved the maxilla and (10) were in the mandible. Of the total 20 cases, histopathological examination revealed 3 radicular cysts (15%), 6 dentigerous cysts (30%), 3 lateral periodontal cysts (20%), 4 odontogenic keratocysts (20%), 2 residual cysts (10%), 1 unicystic ameloblastoma (5%) and 1 periapical granuloma (5%) as shown in table (1).

**Table 1: Descriptive statistics of histopatholoical distribution of the lesions**

| Histopathological distribution of the lesions | No. | Percentage |
|---|---|---|
| **Radicular cyst** | 3 | 15% |
| **Dentigerous cyst** | 6 | 30% |
| **Lateral periodontal cyst** | 3 | 15% |
| **OKC** | 4 | 20% |
| **Residual cyst** | 2 | 10% |
| **Unicystic ameloblastoma** | 1 | 5% |
| **Periapical granuloma** | 1 | 5% |
| **Total** | 20 | 100% |

Statistical analyses were established depending on accurate assessment of CBCT, intraoperative findings and histopathological reports of each case. Percentage of agreement was used to analyze the data as shown in table (2). According to gray scale value in CBCT scan, there were 8 of 20 cases (fluid-semifluid radiodensity), 11 combined (fluid-semisolid) and 1(solid radiodensity) as demonstrated in table (3).

**Table 2: Statistical analysis of radiographical data versus intra-operative data with percentage of agreement for each record**

| Comparison of the radiographical data with intra-operative findings | | | |
|---|---|---|---|
| | **Radiographical data** | **Intra-operative findings** | **Percentage of agreement** |
| **Perforation of buccal and/or lingual cortical plate** | 11/20 (55%) | 13/20 (65%) | 84.61% |
| **Expansion** | 14/20 (70%) | 14/20 (70%) | 100% |
| **Resorption of the adjacent teeth roots** | 11/20 (55%) | 11/20 (55%) | 100% |
| **Displacement of inferior alveolar dental nerve** | 1/20 (5%) | 1/20 (5%) | 100% |
| **Maxillary sinus involvement** | 11/20 (55%) | 13/20 (65%) | 100% |

**Table 3: Statistical analysis of radiographical data versus histological findings of the lesions**

| Comparison of the radiographical data with histological records | | | |
|---|---|---|---|
| | **Radiographical data according to the gray scale value** | **Histological records** | **Percentage of agreement (%)** |
| **Density of intra-lesional contents** | 8/20 fluid-semifluid (40%) | 19/20 Fluid-semifluid (cystic lesions) (95%) | 42.10% |
| | 1/20 solid (5%) | 1/20 Solid (granuloma) (5%) | 100% |

## DISCUSSION

The new advances in maxillofacial radiology aided in accurate preoperative assessment of the maxillofacial lesions and also assist in optimizing planning for surgical procedures. Several intraoral and extra oral radiographic techniques such as periapical, occlusal, and panoramic views were available but these techniques have several limitations including two-dimensional image of three dimensional subject, insufficient

visualization, superimposition, and distortion, which lead to underestimated assessment of the lesion. Recently the introduction of CBCT scan solves the drawbacks of the old radiological methods [15].

In this study, comparing the radiographic data to intraoperative findings of the lesions showed that CBCT was an effective method in radiographic diagnostic assessment of the cyst and cystic like lesions. It revealed detailed information about lesions location, extension and relation to the adjacent vital structures, which aid the surgeon in planning surgery in a less aggressive manner avoiding damage to vital structures with subsequent decrease of complications and in a relatively shorter time. This was also confirmed by Nakagawa et al. [16] who mentioned that accurate preoperative radiological examination of odontogenic lesions avoids surgical complications, and reduces surgical stress [16].

CBCT scan showed 100% diagnostic accuracy regarding lesions extension, buccal and/or lingual expansion, resorption of the adjacent teeth roots and relation to the adjacent anatomic structures. This is achieved by comparing the preoperative radiographical assessment of the lesions with intraoperative findings as demonstrated in table (2). Radiographically, there were 11/20 (55%) cases showed perforation of buccal and/or lingual cortical plate while intraoperative findings revealed 13/20 (65%) cases of perforation. This could be attributed to surgical factor including accidental removal of the thin bony spicules during preparation of the surgical access to the lesion or radioraphical factor including insufficient percentage of minerals loss to be appeared as a defect on the radiograph.

Assessment of the lesion radiodensity by recording the gray scale value in CBCT scan had an important role in differentiation of cystic lesion from granuloma. This was confirmed by Guo et al. [17]who stated that CBCT scan is a helpful tool in the differential diagnosis between cysts and granulomas when the apical lesion have a minimum average diameter of 5 mm [17].

Similarly, Shekhar and Shashikala [18] reported that CBCT scan may be regarded as a more accurate method in differentiation between a solid from a fluid-filled large periapical lesion or cavity as compared to conventional intra-oral periapical radiographs [18].

In this study, preoperative CBCT scan showed high sensitivity in predicting the risk of post-operative paresthesia following surgical removal of cystic lesion in close proximity to the inferior alveolar canal. This is in agreement with Krennmair and Lenglinger [19] who reported that CBCT is superior to conventional CT in detecting cortical bone involvement and delineating the mandibular canal [19].

From these results, we found that, CBCT findings might predict histologic results more accurately. Also it has benefit to the patient including less time, cost, and radiation dose compared to more sophisticated CT scan imaging technique. Also it guides the surgeon in the surgical procedure in a more predictable manner.

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