

Assessment of CBCT Gray Scale Scoring of Periapical Cyst

¹Prashanth Shenoy, Professor, Department of Oral Medicine & Radiology, Yenepoya Dental college, Yenepoya University, University road, Deralakatte, Mangalore, India.

²Dr. Farzhana T H, Postgraduate Student, Speciality of Oral Medicine & Radiology, Yenepoya Dental College, Yenepoya University, University road, Deralakatte, Mangalore, India.

³Dr. Laxmikanth Chatra, Senior professor and Head of the department, Department of Oral Medicine & Radiology, Yenepoya Dental college, Yenepoya University, University road, Deralakatte, Mangalore, India

⁴Dr. Veena.K.M, Professor, Department of Oral Medicine & Radiology, Yenepoya Dental college, Yenepoya University, University road, Deralakatte, Mangalore, India.

⁵Dr. Rachana Prabhu, Reader, Department of Oral Medicine & Radiology, Yenepoya Dental college, Yenepoya University, University road, Deralakatte, Mangalore, India.

Correspondence Author: Dr. Prashanth Shenoy, Professor, Department of Oral Medicine & Radiology, Yenepoya Dental college, Yenepoya University, University road, Deralakatte, Mangalore, India.

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Abstract

Aim: To identify the gray scale value in periapical cyst.

Materials and Methods: This study was conducted in the Yenepoya dental college, Mangalore. CBCT images of approximately 7 patients taken from the Department of Oral medicine and Radiology in Yenepoya dental college, which have been taken for diagnostic and therapeutic purpose (convenient sampling technique). The radiographically and histopathologically proven cases of periapical abscess were included in the study. The gray scale values of these lesions are explored in all the planes. Measurement was recorded at the centre of the lesion. One

maximum and one minimum values at the centre were recorded. The obtained data were then subjected to statistical analysis to evaluate possible correlation.

Results: Periapical cyst showed value of -7.6429 as mean value with standard deviation \pm 21.64624 and HU value ranged from -35.50 to 22.50.

Conclusion: This study, aimed at giving a standard gray scale value of commonly found periapical cyst in CBCT image taken in Planmeca promax 3D mid CBCT machine by using Romexis software. The standard gray scale value for cyst was -7.6429 ± 21.64624 .

Keywords: Gray scale, CBCT.

Introduction

Radicular cyst is an odontogenic cyst of inflammatory origin¹. It is one of the most common cystic lesions affecting the human jaw² and usually arises from the epithelial residues of the periodontal ligament as a result of inflammation which leads to the proliferation of epithelial residues into the periodontal ligament. Radicular cyst is often preceded by periapical abscess or periapical granuloma. Pulpal infection, following dental caries or trauma, generally results in its formation¹. Persistent periapical inflammation causes the host cells to release cytokines, the growth factors which induce the proliferation of epithelial cells to form a three dimensional mass.

Oral examination alone may not always be sufficient for the diagnosis of any disease. Therefore, during the dental examination, radiological imaging methods are utilized which will assist in the examination of invisible intrabony regions. Dental images periapical cyst can be obtained via periapical radiography, panoramic radiography, and cone beam computed tomography (CBCT)³

Clinically Periapical cyst is usually asymptomatic unless secondarily infection occurs. The affected tooth will be non vital. It may slowly enlarge and cause expansion of the cortical plates. Radiographically, a radicular cyst forms a well-defined dark radiolucency with or without a sclerotic border. The more pronounced the sclerotic border, the more likely is the lesion to be a radicular cyst⁴. Radicular cysts tend to lose sclerotic border when it is secondarily infected.

Presence of periapical radiolucent lesions often leads to a diagnostic dilemma. Intra oral periapical radiographs are usually sufficient to diagnose periapical cysts; however it may require extensive imaging like CBCT to know the location, extent, and size of the lesion⁵⁻⁷. It is often confusing to predict small periapical lesion as granuloma

or cyst. As per the literature periapical these two entities are difficult to be distinguished by radiograph alone, if the radiolucency of size greater than 2cm in diameter is more characteristic of radicular cyst³. Hence CBCT play role in distinguishing between these lesions as it can be used to diagnose periapical lesions based on the gray scale value⁸⁻¹².

Hence this project was undertaken to study the gray scale variation in periapical cyst in Romexis software. In the present study too, with the help of CBCT interpretations, the diagnosis of radicular cyst was made.

Aim: To identify the gray scale value in periapical cyst.

Objectives of the study: To determine a standard radiographic gray scale value in periapical cyst

Materials and methods

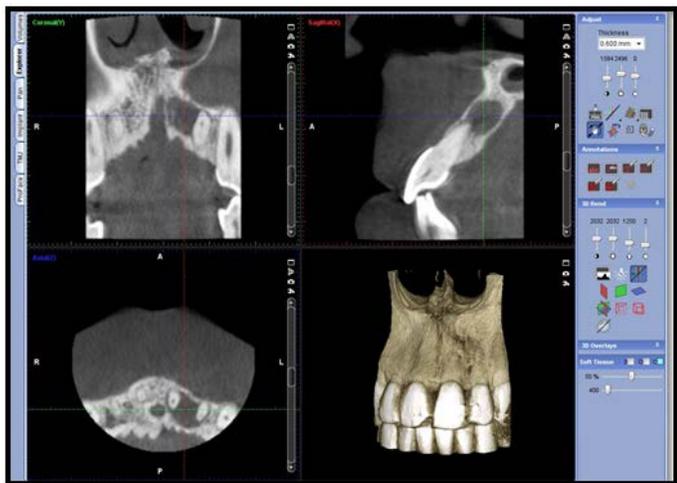
This study is conducted in the Yenepoya dental college, Mangalore. CBCT images of approximately 7 patients taken from the Department of Oral medicine and Radiology in Yenepoya dental college, which have been taken for diagnostic and therapeutic purpose (convenient sampling technique). The scans were acquired using Planmeca Promax Proface 3D mid that uses Romexis software 3.5.1 for image reconstructions. The radiographically and histopathologically proven cases of periapical abscess were included in the study. The gray scale values of these lesions are explored in all the planes. Measurement was recorded at the centre of the lesion, the centre of the lesion was determined by drawing two intersecting line right angle to each other which was considered as reference point (figure 1). One maximum and one minimum values at the centre were recorded. The obtained data were then subjected to statistical analysis to evaluate possible correlation

Inclusion criteria

CBCT images of clinically and Histopathologically diagnosed cases of periapical cyst

Exclusion criteria

1. CBCT images of periapical cyst, where histopathological diagnosis is not available
2. Medically compromised patient
3. CBCT images where the image interpretation is affected by artefacts



Statistical analysis

Statistical analysis was carried out as per proper guidelines depending upon the sample size and sensitivity for the study as per statistician.

- Data is expressed in terms of mean and SD
- Appropriate charts are used for data visualization
- Data was analysed using SPSS version 22.0

Result

Table 1: Mean Gray Value of Periapical Cyst

	N	Mean	Std. Deviation	Minimum	Maximum
Avg periapical cyst	7	-7.6429	21.64624	-35.50	22.50

Table shows mean gray values of 7 periapical cyst. Periapical cyst showed value of -7.6429 as mean value with standard deviation ± 21.64624 and HU value ranged from -35.50 to 22.50.

Discussion

Among all the periapical inflammatory lesions, the incidence of periapical cyst ranges between 6 to 55%.¹⁸ Endodontic treatments is the treatment of choice for

periapical cyst. Root canal treatment has a very high success rate, which is a non surgical and most employed method.^{14, 15} Therefore; a necrotic tooth with apical periodontitis generally receives non-surgical root canal treatment alone. The diagnosis of periapical lesions is usually done based on clinical and radiographic findings. A final diagnosis can be achieved by histopathological examination of the tissues, which is not possible when the treatment is done non-surgically.¹³ In conventional radiography, periapical cyst which is inflammatory periapical pathology presents as a radiolucent region, with or without a well-defined periphery simulating a cortex¹⁶. When the lesion is secondarily infected, the corticated border appears to be losing which make the lesion difficult to distinguish from other periapical lesions. As per the literature, radiolucent region of size 2cm is more of radicular cyst.³ However, conventional radiograph being two-dimensional representation of a three-dimensional object, does not give accurate information about the lesion & surrounding structures. Moreover, early cases of demineralization are not always detected appropriately. Cone beam computed tomography (CBCT) produces detailed high-resolution, three-dimensional images of oral structures, which may allow bone lesions to be detected at an early stage.^{10,17}

7 CBCT images were included in the present study. The minimum and maximum gray scale values were assessed from the centre of the lesions and were subjected to statistical analysis for calculation of mean grayscale value. The variation in grayscale values is noted in radicular cyst because of the fact that radicular cyst consists of proteinaceous fluid reflecting the characteristics of inflammatory exudates. The tissue fluids, soft tissues and hard tissues produce attenuations in the positive range.

In our study, Periapical cyst showed minimum and maximum HU value ranging from -35.50 to 22.50.

However mean value was -7.6429 with standard deviation of ± 21.64624 (table 1)

In a study conducted by Aggarwal et al, to evaluate the use of CT scan in diagnosis of periapical lesion, the HU values were within the range of -20 to 20, and hence, all the lesions were labeled as cystic lesions.¹⁹ The variation in value may be due to the high total protein concentration in radicular cysts. According to Michel et al²¹ and Simon et al²⁰ CBCT value for cyst was 10.93 ± 1.15 and -468 to -43 respectively. The CBCT value in this study ranged from -35.50 to 22.50 at the centre of the lesion and the total mean value was -7.6429 ± 21.64624 which was in close approximation with CT value found in study done by Aggarwal et al¹⁹. Both positive and negative values within the lesion represent heterogeneity within the lesion. This is representative of the fact that the contents of these cysts are inflammatory exudates

Conclusion

This study, aimed at giving a standard gray scale value of commonly found periapical cyst in CBCT image taken in Planmeca promax 3D mid CBCT machine by using Romexis software. The standard gray scale value for cyst was -7.6429 ± 21.64624 .

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