Normal, inflammation, and necrosis pulp radiograph image using 3D cone beam computed tomography

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ABSTRACT

Introduction: Abnormalities of the dental pulp can have several different diagnoses. Therefore, the dental pulp characteristics must be known in more detail and clear so that diagnosis be established more precisely and accurately. One characteristic of the pulp can be seen from the density value through the 3D Cone Beam Computed Tomography (3D CBCT). **Methods:** The study was conducted with a simple descriptive method. The population is all the data 3D CBCT of patients who visited the Universitas Padjadjaran Dental Hospital (RSGM Unpad) in 2012. Samples of the research were 75 pulps with normal, inflammation, and necrosis conditions and calculate the average density value. **Results:** Density values for dental pulps in the normal teeth between 465-775 HU, the inflammation teeth between 243.5 to 396 HU, and necrosis teeth between -461.5 to -170 HU. **Conclusion**: There were differences in dental pulp density between the normal pulp, inflammation, and necrosis through 3D CBCT.

Keywords: Pulp density, pulp inflammatory, pulp necrosis, 3D CBCT.

INTRODUCTION

Problems and difficulty in establishing the diagnosis in daily practice often to happen. Various investigations both radiographic examination, laboratory or other investigations sometimes still did not support/dubious clinical examination or investigation among the different results with each other.

Radiology as one investigation has played a large role in establishing the diagnosis. Limited information from clinical examination can be completed from radiological examinations. A lot of information that could be obtained from the photo of them on the depth rongent caries, pulpal involvement, root condition, the condition of periapical jawbone and others are able to provide additional information or pathological conditions so that the diagnosis can be established with appropriate and accurate.

The rapid development of technology and higher requirements regarding investigations in establishing the diagnosis, are being sought various kinds of analysis of the teeth, bones and surrounding tissues, in order to look for a sign or a specific value that can help in establishing the correct diagnosis quickly and accurately.

One of them in the science of radiology Cone Beam Computed Tomography (CBCT) 3D is one of the tools that utilize radiographic

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X-ray cone-shaped and computerized volumetric reconstruction that produces three-dimensional radiographic axial and sagital coronal sections.[1] radiografinya can interpret the results of various things necessary for such an evaluation process shows histograms, radiographs in a specific section, measuring distance or a wide area, bone density, and surface picture lainnya.[9]

Based on research at the University of Pennsylvania, School of Dental Medicine, Philadelphia, the percentage of the etiology of pulpitis were as follows 60.0% caries; 18.4% failed operative procedures; 12.9% post treatment apical periodontitis; 3.1% trauma; 3.1 % fracture; and 1.0% idiopathic.[3]

In Indonesia, one of them at the Dr. Moewardi Hospital Surakarta recorded patient data from January 2007 to December 2007 who visited the Dental Installation was 7656 people. Of overall patient who came, 46.7% were patients with a diagnosis of dental caries, while 53.3% were with another diagnosis. Among patients with dental caries, it were 26.3% of patients with a diagnosis of pulp necrosis, most of which are contained periapical lesions.[4]

Based on the background above shows that the majority of patients experiencing dental caries so that diagnosis in the case of dental caries be selected in this study. The presence of treatment failure of 18.4% shows that the possibility of error in diagnosing errors still occur, causing eventual plan of care and treatment failure.

Failure in the treatment of caries can be caused either because they are specifically, the relationship between inflammatory pulp (pulpitis) and clinical symptoms and test results are not definitive. While inflammatory pulp (pulpitis) can occur even in the early dental caries but often escape visual detection. In addition, inflammatory pulp (pulpitis) often occur without pain and without the knowledge of the patient or doctor.[5] Coupled with the limitations of the techniques available to diagnose the condition of the dental pulp.

In some cases, the boundaries of the lesion becomes difficult to determine because of radiolucent carious lesions is not well defined, especially when there is overlapping. It can not be completely avoided in routine klinis.[6]

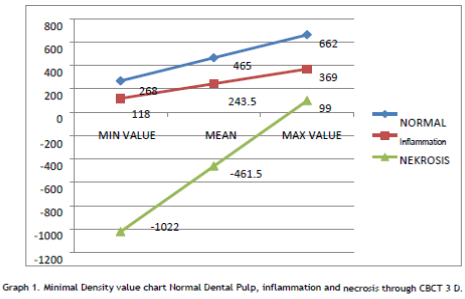

Diagram 1. Minimal density value of normal dental pulp, inflammation and necrosis through 3D CBCT

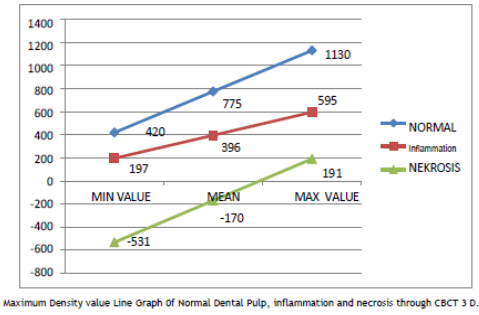

Diagram 2. Maximum density value of normal dental pulp, inflammation and necrosis through 3D CBCT

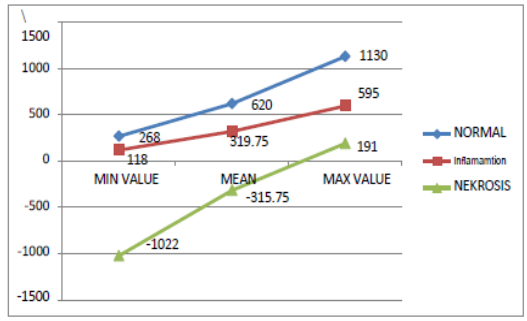

Diagram 3. Pulp density value range of normal, inflammation and necrosis through 3D CBCT

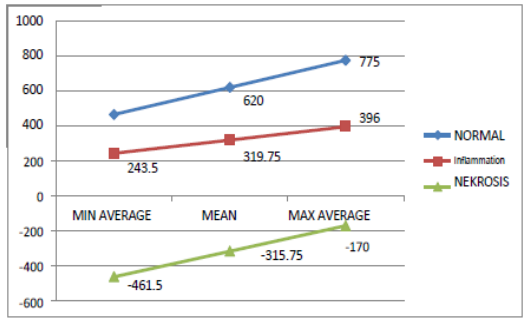

Diagram 4. Average value graph density normal dental pulp inflammation and necrosis through 3D CBCT

In assessing the condition of the pulp, radiographic examination is needed to support the clinical examination. It is very important to detect changes in the bone tissue surrounding the root apex, which indicates the pulp is infected or severely inflamed.[7] The role of CBCT 3 D as advanced technology is needed that support the diagnosis more precise and accurate by utilizing its ability to calculate the density of the dental pulp.

Based on the background above, the writer was interested in studying dental pulp density description in normal pulp, inflammation, and necrosis through 3D CBCT in RSGM Unpad Bandung. The purpose of this study was to describe the dental pulp density values in normal pulp, which is experiencing inflammation and necrosis through 3D CBCT.

METHODS

In the 3D CBCT aircraft computer program used and the unit was Hounsfield unit density (HU). If all the data in the population (represented by the sample) were collected and then made a list and finally described the frequency distribution in the form of graphs.

RESULTS

Research has been conducted with a sample of 75 teeth, consisting of 25 teeth with normal diagnoses, 25 teeth with inflammation, and 25 teeth with necrosis of the pulp, at the Radiology Dentistry Instalation Dental Hospital of Universitas Padjadjaran (RSGM Unpad). More research results are presented in Diagram 1,2,3, and 4.

DISCUSSION

It can be seen in Table 1, the normal dental pulp density, inflammation, and necrosis showed density values were varied in the dental pulp of different circumstances, and even within a single state has a value varying density of the dental pulp. This shows the value of the difference varied levels of inflammation going on in the dental pulp. This relates to the pathophysiology of inflammatory pulp/pulpitis and pulp necrosis.

Based on the results of the study can be seen in chart 1 that the minimum density value in the normal dental pulp, inflammation, and necrosis in the range and the different lines do not intersect at one point. Minimum density value line pulp necrosis (-1022-99 HU with an average -461.5 HU) is below the line density values inflamed dental pulp (118-369 HU with an average of 243.5 HU) and a minimum density value line of the normal dental pulp (268-662 HU with an average of 465 HU) above the minimum density value of dental pulp inflammation, it can be said that the minimum density values at all three state dental pulp can be distinguished clearly and firmly.

Based on the results of the study can be seen in Figure 2 that the value of the maximum density in the normal dental pulp, inflammation, and necrosis in the range and the different lines do not intersect at one point. Line of maximum density value of pulp necrosis (-531-191 HU to -170 HU average) is below the line density values inflamed dental pulp (197-595 HU with an average of 396 HU) and the maximum density value line of the normal dental pulp (420-1130 HU with an average of 775 HU) above the maximum density value of dental pulp inflammation, it can be said that the value of the maximum density at all three state of the dental pulp can be distinguished clearly and firmly.

Based on the results of the study on graph 4 can be seen that the average value of the normal dental pulp density, inflammation and necrosis in the range and the different lines do not intersect at one point. Line average density of pulp necrosis (-461.5-170 HU with an average -315.75 HU) are below the average density of the tooth pulp inflammation (243.5-396 HU with an average of 319.75 HU) and the value of the line the average density of the normal dental pulp (465-775 HU with an average 620 HU) above the average density of the dental pulp inflammation, it can be said that the average value of the density at all three state dental pulp can be distinguished clear and unequivocal.

Of the overall diagram of the results, it can be illustrated that the dental pulp density value line in normal circumstances is always placed above the density values in an inflammation of the dental pulp, as well as the density value line dental pulp necrosis was always under lines inflamed dental pulp density values. Mild pulp injury not lead to any change. However, moderate

to severe injuries will lead to local inflammation and release of inflammatory intermediaries in high concentrations. Due to the release of inflammatory intermediaries in large numbers, there will be an increase in vascular permeability, vascular stasis, and migration of leukocytes to areas of injury. The rise in capillary pressure and increased capillary permeability move the fluid from the vessels into the surrounding tissue.[8]

Arteriolar vasodilation and increased permeability venul that will happen tissue edema and increased pressure. Increased tissue pressure, inability to expand pulp, and the absence of collateral circulation may result in necrosis of the pulp that can later develop into patosis periradicular.[8]

Histopathologically experienced reversible pulpitis and pulp hyperemia blood vessels dilated and congested.[9] In microscopic, visible reparative dentin, the layer disruption odontoblas, enlarged blood vessels, extravasation of edema fluid, and the presence of chronic inflammatory cells are immunologically competent. Although prominent chronic inflammatory cells, inflammatory cells can be seen also acute.

In histopathology irreversible pulpitis dentine caries involving primary and secondary and dilate blood vessels and endothelial cells to swell.[9] Pulpitis can be seen radiographically by a contributing factor, as there is no sign of radiographic rooms inflamed pulp.[10] This is related to the opinion of some experts on the relationship of density with the density of the object. The higher density of the object, the less light that penetratesthe object rongent. Therefore, the less light that rongent the light-sensitive crystals in the film rongent. Thus, the lower the density value.[19] primary bone tissue containing mineral salts are low, so easily penetrated by x-rays,[3] so that the primary bone tissue has a high density.

Based on the above theory can be said that the composition of the pulp tissue is more dense than the composition of the pulp in a state of inflammation and necrosis, such as extravasation of edema fluid, inflammatory cells and other inflammatory material and vasodilatation of the blood vessels causes the blood volume of the pulp that goes into much more so picture raises more radiolucent so that the value of increased density.

State assessment through the dental pulp density using 3D CBCT equipment, for allegedly microscopic and histological changes will affect the composition of the dental pulp that will change the value of its density.

Based on the above results it can be said that the necrosis of the dental pulp density values decreased when compared with inflamed dental pulp density values as well as with density values which become inflamed dental pulp has decreased when compared with normal dental pulp density values.

From the above results can be seen that the condition or diagnosis of a gear tooth can be distinguished or defined or judged by the value of the dental pulp density using 3D CBCT with values that can be distinguished by a clear and unequivocal.

The advantages of this study is the use of 3D CBCT, the tool produces a three-dimensional imaging which covers the axial, coronal and sagittal. In addition this tool can generate imagery based volumemetrik so as to measure the bone density of each unit volume.[17] This is possible because of the ability and the high resolution of this instrument.

This study used a sample bit so not much variation in the data so that the results of this study apply only to this sample can not be said in general. Measurements made in this study ignores age, type of gear, as well as other factors such as systemic condition that results from this study can not be widely applicable.

CONCLUSION

Based on the results of research and discussion, it can be concluded that there are differences in dental pulp density between the normal, inflammation, and necrosis teeth. Density values in the normal dental pulp between 473.33-662.47 HU, in inflamed teeth between 304.73-507.47 HU, and in the teeth that undergo necrosis between 32.80-381.73 HU.

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