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Effects of Different Types of Periodontitis on CBCT Morphology of Dental Tissue in Two Ethnic Groups

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Abstract: For the periodontitis patients who came to our hospital from October 2021 till now, the influence of different types of periodontitis on the CBCT morphology of dental tissue of different nationalities was analyzed. To measure the distance between the enamel dentin boundary and root fork of the mandibular first molar, the thickness of the crown hard tissue above the mesial pulp Angle, the thickness of the crown hard tissue above the distal pulp Angle, the height of the pulp chamber, the volume and surface area of the pulp, so as to provide a certain basis for the possibility of future dental tissue lesions.

Keywords: Different Types of Periodontitis; Different Nationalities; CBCT; Mandibular First Molar; Tooth Tissue Morphology.

1. The Significance of Periodontitis and its Influence on Tooth Tissue

1.1. Periodontitis

When it comes to tooth loss, many people subconsciously associate it with tooth decay. Caries is clearly visible, and accompanied by tooth pain and other symptoms, with the gradual attention of the people to oral health care, as well as the relatively low threshold for the treatment of tooth defects, people can get professional treatment earlier, to avoid tooth loss. However, with the improvement of people's living standards, another major category of diseases that can cause tooth loss is more and more into the public's sight, and its consequences are often more serious, that is periodontal disease. Periodontal disease is one of the most important oral diseases causing chronic diseases in the world, and it is a very important public health problem. [1] Periodontal disease not only has a high prevalence, and the early symptoms are not obvious, is a chronic progressive disease, occasionally acute attacks, patients are mostly adults, then adolescents, the teeth will be loose or displaced in the late stage, accompanied by periodontal abscess, retrograde pulpitis and halitosis and other lesions. From 1990 to 2015, the global burden of disease study showed that the global burden of periodontitis increased by 57.3%, ranking 14th in the global burden of disease, which can be seen that periodontitis has caused great burden and impact on society and even countries.

The results of the fourth national oral health epidemiological survey show that the detection rate of adult periodontitis is 80%- 97%, which is still an upward trend compared with the results of the third national oral health epidemiological survey. [2] And periodontal disease has become the first cause of adult tooth loss in China, so the prevention, diagnosis and treatment of periodontal disease, prognosis is still the focus of current research.

1.2. The Relationship between Tooth Morphology and Periodontitis

Both pulp and periodontal tissue originated from ectodermal mesenchyma; And they are closely connected through the dentin tubules, apical foramen, collateral root canals and accessory root canals, so periodontal disease and endodontic disease may interact. When pulp infection occurs, bacterial toxins and metabolites may cause periapical tissue alveolar abscess through apical foramen, lateral root canal or accessory root canal, and the apical pus may be discharged along the periodontal tissue pathway, causing periodontal disease. When the periodontal tissue inflammation occurs, it may lead to pulp injury through the same pathway, resulting in pulpitis, pulp necrosis and pulp degeneration. Therefore, the infection and lesion of one side can affect the other side, and then lead to the combined lesion of pulp and periodontal.

Similarly, the metabolic products produced by the microorganisms in periodontal lesions can damage the pulp cells, and the toxic products invade the pulp through the a bove pathways, which may lead to inflammation of the pulp tissue. Siqueira [3] et al. found that of the bacteria sampled from symptomaticrootcanals, porphyromonas endodontidis were detected in 70% of cases, porphyromonas gingivalisin 40% of cases, and Prevotella intermedia in 10% of cases. The detection rates of Streptococcus mutans in supragingival and subgingival plaque were 56.5% and 53.5%, respectively. The rates of porphyromonas gingival are in supragingival and subgingival plaque were higher, ranging from 53.5% to 88%. Other scholars found that the detection rates of actinobacillus associated with suprgingival plaque and subgingival plaque were 28.9% and 34.2%, respectively, indicating the presence of cross infection in necrotic pulp and periodontal inflammatory tissue. Dental pulp is a kind of active tissue, which can respond to external stimulation and initiate self-protection and repair ability. Long-term and repeated stimulation usually causes adaptive changes in dental pulp and changes in dental pulp morphology.

Therefore, regarding the shape of the dental crown, its thickness will not only be due to the increase of age, odontoblast cells will continue to produce dentin with the increase of age, resulting in changes in the thickness of the hard tissue and the reduction of the volume of the pulp cavity, but also due to caries, attrition, dental facial prosthetics, pulp lesions and other chronic stimulation of the pulp, causing pulp calcification and restorative dentin accumulation. And then lead to the change of thickness.

Previous studies have shown that tooth morphological

characteristics are highly heritable, with significant differences 4 in different geographic populations, and studies of observable characteristics of teeth fall under the category of tooth morphology, where teeth are highly her it able and do not change after their development (except for tooth wear or caries). [4] The observable characteristics of teeth vary greatly in different individuals and groups, and this difference is closely related to the origin and evolution of the groups, and can reflect the characteristics of the groups and regional difference.

In China, there are certain differences in the anatomical morphology of teeth in different regions and different ethnic groups. Yang Chen et al. found that the Han and Zhuang populations in China are close to the Northeast Asian populations, showing Chinese-type teeth. In addition, there are also differences among southern, northern and central Han people in tooth phenotypes. Du Qilian et al. found the anatomical structure of maxillary premolars of Tibetan and Han, and found that the teeth of Tibetan people were longer than those of Han people, and the root forks of maxillary first premolars were closer to the crown, and the proximal and distal curvature of buccal roots was greater, and more curved positions were located at the root tip, which was different from that of Han people. Huang Ping et al. 's related studies showed that the hard tissue thickness of the mandibular first molar crown of the Uyghur and Han populations was different. It can be seen that the tooth morphology of different ethnic groups is different to some extent, and it is worth studying.

2. The Significance of the Mandibular First Molar

The first molar is the permanent tooth erupt in the mouth, and also the permanent tooth with the longest retention time in the mouth, is the key tooth to establish the occlusal relationship, and has great significance for the whole dentition, so it is necessary to preserve the integrity of the first molar as much as possible, extend the retention time of the teeth in the mouth, which is conducive to maintaining oral health, and the health of the teeth affects the health of the body to a certain extent. At present, the prevalence of dental diseases such ascaries, periodontal disease and pulp disease is high, recent studies show that the highest caries rate of permanent teeth is still the first molar, which has the highest caries rate is the mandibular first molar, followed by the maxillary first molar and mandibular second molar, and the female caries rate is higher than the male [5]. Therefore, due to its high caries rate and the high importance of stable dentition stability, it is very important to study the early detection, early prevention and early treatment of its lesions.

3. The Relationship between Imaging and Periodontal Disease

Oral and maxillofacial imaging provides important information for disease diagnosis, treatment planning, and developmental prognosis. Oral and maxillofacial cone beam CT (oro-maxillofacial cone beam computed to mography) originally in 1998 by Italian engineer Mozzo reported Italian Quantitative Radiology NewTom9000 produced by our company and Japan's mouth "Ortho-CT" reported by Arai, an oro-maxillofacial radiologist. According to relevant studies, it began to appear and put into clinical use in the late 1990s.

Compared with traditional medical CT, CBCT has higher density resolution and can clearly display hard tissue such as bone and teeth in maxillofacial region, so it has great advantages in displaying hard tissue structure and lesions in oral and maxillofacial region. At the same time, CBCT also has the advantages [6] of relatively low price, small radiation dose, fewer metal artifacts, and a variety of image post-processing software designed for the dental specialty field. With the maturity of hardware and software technology, CBCT has been widely used in many specialty fields of dental diagnosis and treatment, and even has become an indispensable means to carry out digital oral technology. CTNewTom9000, made in Italy, was introduced into China in 1999. This is the first oral and maxillofacial conical beam CT machine introduced in China, which makes our country become one of the countries that used conical beam CT earlier in the international stomatology field. With the acceleration of the introduction and the development of localized production, the number of CBCT equipment is increasing, and it has been widely penetrated grassroots and private medical institutions in recent years.

In addition, Strateman et [7] al reported that the difference between the results measured by CBCT and physical measurements was as low as (0.00+0.02) mm. Therefore, cone-beam CT is a good choice for measuring the thickness of hard crown tissue at present. Conical beam CT is not only a radiological examination method commonly used in the process of dental treatment, such as examining the root cleft, the area of apical defect, intra-root resorption and the bone defect of alveolar bone. It is also widely used to study root canal anatomy, such as the number of root canals, root curvature, root number, root length and width, etc.

4. Conclusion

There is a close relationship between periodontitis and tooth body. Xinjiang is a multi-ethnic gathering place. The diagnosis and treatment of periodontitis by CBCT, and the observation of the tissue of the first molar of the lower jaw, which is most easily affected by the lesions, and the comparison of the differences will have certain guiding significance for the possibility of tooth body lesions in the clinic.

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