

Double Root and Root Canals in Right Mandibular Cusp Teeth and Double Root Canals in Lateral Incisor Teeth: A Case Report

Jingli Zhu¹, Tianzhu Song², Lili Ding¹ and Miao Li^{1,*}

¹Hospital of Stomatology, Lanzhou University, Lanzhou, Gansu, 730000, China

²Key Laboratory of Oral Diseases of Gansu Province, Northwest Minzu University, Lanzhou, Gansu, China

Keywords: Mandibular Canines, Lateral Incisors, Double Root Canals, X-ray, CBCT, Microscope.

Abstract: Root canal therapy is an important treatment for pulp disease and periapical disease. Root canal omission is one of the main reasons for the failure of root canal therapy. Most of the mandibular apical and lateral incisors are single root canals, and the number of double root canals is less. The case of double root canals of mandibular canines is even less. This case will report the root canal treatment in which the right mandibular canines and lateral incisors are double root canals at the same time.

1 INTRODUCTION

Root canal treatment is an important treatment for endodontic and periapical diseases. Perfect root canal preparation and root canal filling are the key factors for successful root canal treatment. However, in the clinic it is found that some patients still have discomfort after root canal treatment, such as occlusal pain and radicular pain, which are mostly caused by root canal leakage due to root canal anatomical variation (Siqueira, 2001). Routine imaging before treatment is the primary factor for successful root canal treatment, but the limited view of parallel projection radiographs often makes it easy to miss root canals routinely. Therefore, CBCT can be used in difficult cases or cases where root canal omission is considered possible. The mandibular cuspids have long roots in stomatognathic system and have an occlusal guidance role (Magne, 2015). The mandibular cuspids are mostly single root with single root canal. The double root with double root canal have been rare in recent year compared with single root with single root canal. In contrast, more mandibular lateral incisors with double root canals have been reported. This is a case of double root with double canals in right mandibular cusp teeth and double root canals in lateral incisor teeth. Therefore, it is important to discuss the root canals anatomical morphology of the mandibular cuspids and lateral

incisors and clinical considerations for the success of root canal treatment and the preservation of the treated tooth.

2 CASE INFORMATION

The patient, a 45-year-old female, was treated in an outside hospital for her lower right tooth ten years ago. The original restoration was fractured three days ago. She was then treated in our prosthodontics department, and is now referred to our department for root canal treatment. The examination found 42 was residual roots, with the edge flush with the gingiva or 1-2mm above the gingiva. 43 was residual crowns with distal residual tooth tissue and exposed root canal orifice which have no probing pain; 42 and 43 teeth without loosening and periodontal pocket were not suitable for percussion and was slightly painful for palpation, and no obvious abnormality was found in buccal mucosa. 42 and 43 cases were diagnosed as chronic apicitis and tooth tissue defect. The treatment plan was post core crown repair after 42 and 43 root canal treatment. The treatment process was that 42 and 43 teeth cleared rotten matter under the microscope with rubber barrier. 42 probed two root canals and 43 one root canal. After root canal length measurement, M3 cleared root canal with ultrasonic swing washing and 1% sodium hypochlorite. Before

* Corresponding author

glass ion temporary sealing ,42and 43 was dried with paper tip suction and then used calcium hydroxide in root canal. The root canal filling was prepared at the second visit, but it was found that glue tips of 42 tooth could reach the root canal length in the buccal root canal, while the lingual could not reach the root canal length completely. After X-ray, it was found that 42 tooth test tips were suitable, while 43 were double roots and there were root canal omissions. Then 43 was rediscovered the lingual root canal under the microscope and was cleaned .42 and 43 teeth were filled with hot gum after ultrasonic swing washing. X-ray showed that the root was filled in place and the tooth was sealed with glass ion. It was suggested that the prosthetic department should carry out further prosthetic treatment after one week of observation. (Fig.1-4).

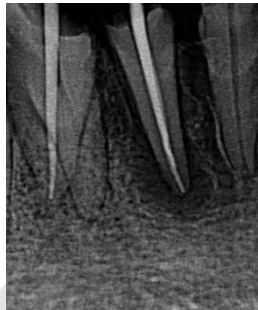


Figure 1: First root canal test tip.



Figure 2: Second root canal test tip.

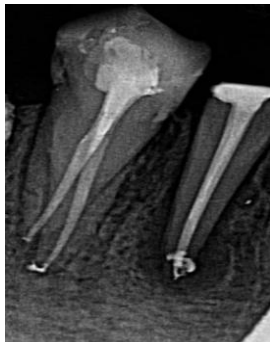


Figure 3: Root filling.



Figure 4: omitted root canals Under microscope.

3 DISCUSSION

3.1 Root Canal Typing

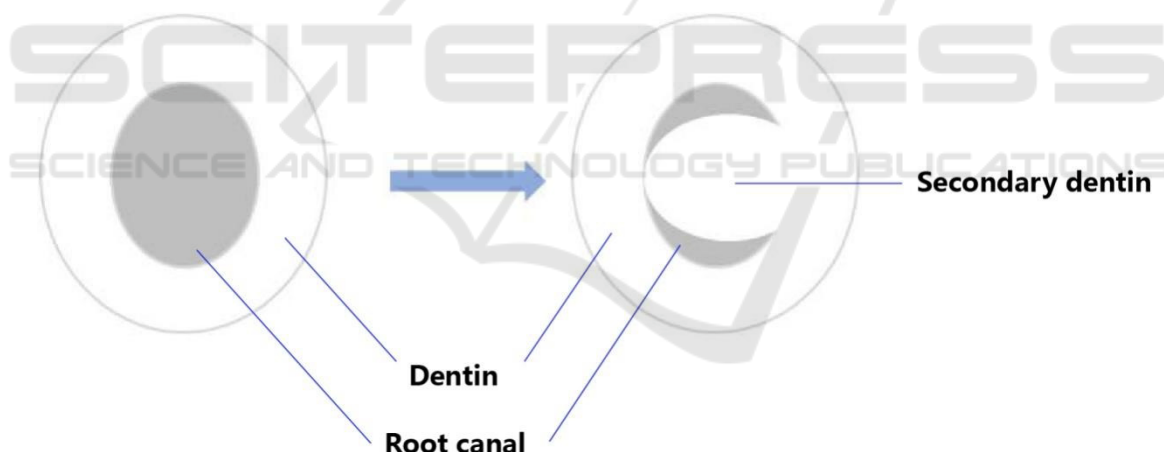
Root canal therapy will greatly reduce the success rate of root canal therapy if root canal omission occurs. Mastering the anatomical morphology of root canal will greatly reduce the occurrence of root canal omission. Scholars have carried out a series of research and experiments in recent years. Weine et al. divided the whole path change from dental pulp cavity to apical foramen into four types by truncation and radiology methods. Type I: one root canal from pulp cavity to apical foramen (type 1-1); Type II: two canals left the medullary cavity and fused into one canal before reaching the apical foramen (type 2-1); Type III: two independent canals from medullary cavity to apical foramen (type 2-2); Type IV: one canal leaves the medullary cavity and is divided into two canals with two apical foramen (type 1-2) (Weine, 1969). Vertucci et al. studied the transparent specimens of the second premolar by using the staining method and found that the complexity of root canal morphology is far more than that of weineclassification. He proposed eight types: 1-1, 2-1, 1-2-1, 2-2, 1-2-1-2, 3-3 (Vertucci, 1974). This method includes most root canal morphology in clinic. Some researchers have shown that the peak incidence of multiple root canals of mandibular canines is concentrated over the age of 30, and shows a downward trend after the age of 60. This may be related to different ethnic groups, regional populations or sample sizes, as well as root canal cross-sectional morphology and secondary dentin deposition (Fig. 5). Therefore, for middle-aged and elderly patients, in addition to mastering the number of root canals per tooth, we should also consider the impact of secondary dentin deposition on the morphology and number of root canals with age. Especially for single root canal flat root anterior teeth, it is possible to form isthmus formed by secondary dentin in the middle of root canal. The occurrence of

this situation may cause the clinician to lose the root canal during the root canal preparation or fail to complete the root canal cleaning due to the appearance of steps in the root canal. The 43 teeth of the cases were vertucciiv (2-2) root canals. The mandibular lateral incisors root is flat with mostly single root canal, but also double root canal mostly distributed in the labial and lingual direction. At present, there are many cases of mandibular lateral incisors with double root canals. It is generally believed that about 10% of mandibular lateral incisors have double root canals. Laws et al. Respectively used X-ray films to study the samples inside and outside the mouth. It was found that the incidence of double root canals of mandibular lateral incisors was more than 40%. VertucciII (2-1) root canal accounted for 5.33%. The double root canals of the central incisor in this case were vertucciII (2-1).

3.2 Application of CBCT

In order to avoid root canal omission, it is necessary to master the anatomical morphology of root canal. In addition, the imaging examination before individual tube treatment is also particularly important.

Conventional parallel projection X-ray film is one of the conventional imaging examination methods before the treatment of dental periapical disease. It can show the shape and length of root canal, and roughly evaluate whether there is root canal calcification. However, the specific number and shape of root canal and tooth root are often unclear because the X-ray film is the two-dimensional image. It will be inaccurate to judge whether there is root canal omission completely based on X-ray examination (Eisner, 1998). With the development of science and technology, the emergence of CBCT makes this problem simple (Kaasalainen, 2021). Three-dimensional imaging of CBCT can accurately judge the number, shape and variation of root canals. Therefore, CBCT examination of difficult root canals is very important. However, CBCT is not routinely used in root canal therapy due to its high cost. In this case, the patient did not take CBCT at the initial diagnosis due to economic reasons. When CBCT cannot be taken, we should also fully interpret the X-ray information. If the root canal image suddenly becomes thinner or disappears, there may be root canal branches at this location, which needs to be paid attention to in actual operation.



secondary dentin formation in root canal leads to the evolution of single root canal into multiple root canals with the increase of age; The gray area is the root canal, and the white area protruding into the root canal is secondary dentin

Figure 5. Single root canal evolving into multiple root canals.

3.3 Intraoral Manipulation

3.3.1 Oral Operation

In clinical practice, because the root of the tongue is more inclined to the lingual side, the root canal orifice is often blocked by the top of the pulp chamber or the dentin collar, which accounts for the main reason for the root canal omission of the lower anterior teeth (Sener, 2009). 43 was generally considered as a single

tube at the initial diagnosis, but after changing the X-ray projection angle in the test tip film, it can be clearly seen that 43 has two tubes and one tube is missing. Later, when looking for the missing root canal, it was found that 43 the missing root canal on the lingual side was found after uncovering the medullary chamber roof on the lingual side. In practice, it should also be noted that when the root canal deviates to one side, it should carefully look for another root canal on the opposite side. If there is

calcification blocking the root canal orifice, it should carefully remove the calcification with ultrasonic instruments under the microscope to look for another root canal.

3.4 Application of Microscope

The application of microscope is of great significance for root canal therapy. The use of microscope in root canal therapy can directly look into the medullary cavity and avoid root canal omission to a greater extent (Bonsor, 2015). For mandibular anterior teeth, most of them are single root canals and it is difficult to find multiple root canals. The 42 teeth in this case was single root and there was no obvious double root image on the X-ray film. But then two root orifices were obviously visible at the enamel cementum boundary of the medullary cavity under the microscope during the treatment. The 42 teeth length measurement and root canal preparation were carried out, but the buccal gum tip could reach the root canal length during the tip test while the lingual gum tip did not fully reach the root canal length about 5mm away from the root tip. Therefore, it is judged that 42 is the 2-1 type root canal. The results showed that the detection rate of double root canals increased from 16.08% to 27.27% before and after microscope. The microscope can enlarge the operation area and provide a clear field of vision for the operator. The removal of calcified substances under the microscope can effectively avoid the occurrence of pulp chamber floor penetration and root canal lateral penetration caused by unclear field of vision, so as to improve the detection rate of root canal and the success rate of root canal treatment.

4 CONCLUSION

This case suggests that we should be alert to the existence of root canal variation and fully understand the anatomical morphology of root canal of each tooth before root canal treatment. In root canal therapy, X-ray multi angle photography or CBCT photography should be carried out to find the variant root canal in time. Before root canal preparation, the pulp chamber top should be uncovered and combined with microscope to prevent root canal omission and improve the success rate of root canal treatment.

ACKNOWLEDGEMENTS

This work was supported by Research Support Fund of School of Stomatology Lanzhou University (No. lzukqky-2020-t05).

REFERENCES

- Bonsor SJ. The use of the operating microscope in general dental practice. Part 2: If you can see it, you can treat it! *Dent Update*. 2015 Jan-Feb;42(1):60-2, 65-6. doi: 10.12968/denu.2015.42.1.60. PMID: 26062280.
- Eisner ER. Oral-dental radiographic examination technique. *Vet Clin North Am Small Anim Pract*. 1998 Sep;28(5):1063-87. v. doi: 10.1016/s0195-5616(98)50103-9. PMID: 9779541.
- Kaasalainen T, Ekholm M, Siiskonen T, Kortnesniemi M. Dental cone beam CT: An updated review. *Phys Med*. 2021 Aug; 88:193-217. doi: 10.1016/j.ejmp.2021.07.007. Epub 2021 Jul 17. PMID: 34284332.
- Magne P. A new approach to the learning of dental morphology, function, and esthetics: the "2D-3D-4D" concept. *Int J Esthet Dent*. 2015 Spring;10(1):32-47. PMID: 25625126.
- Sener S, Cobankara FK, Akgünlü F. Calcifications of the pulp chamber: prevalence and implicated factors. *Clin Oral Investig*. 2009 Jun;13(2):209-15. doi: 10.1007/s00784-008-0212-x. Epub 2008 Jul 30. PMID: 18665398.
- Siqueira JF Jr. Aetiology of root canal treatment failure: why well-treated teeth can fail. *Int Endod J*. 2001 Jan;34(1):1-10. doi: 10.1046/j.1365-2591.2001.00396.x. PMID: 11307374.
- Vertucci, et al. *Oral Surgery, Oral Medicine and Oral Pathology*, 1974, 58, 589-99.
- Weine, et al. *Oral Surgery, Oral Medicine and Oral Pathology*, 1969, 28, 419-25; *Weine FS. Endodontic therapy*, 3rd edn (1982). St. Louis: Mosby.