CASE REPORT

Root development after surgical extraction of impacted right maxillary wisdom tooth

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INTRODUCTION

Eruption of wisdom teeth generally starts between the ages of 18-24 years, with variation in the age range. Impacted teeth are usually third molars that do not erupt into their normal place in the occlusion after their eruption time has passed. This impaction can occur due to an obstruction, lack of space or abnormal positioning. Impacted teeth can cause symptoms like swelling, pain, infection and headaches. These symptoms may be evident at any stage of development and not necessarily only during eruption periods. When this is the case, it may be indicated to remove impacted teeth surgically.[1]

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CASE REPORT

A 19-year-old female patient presented at our clinic for the removal of her third molars (18, 28, 38, 48). She experienced frequent headaches and pain in the region of the third molars. A panoramic radiograph (Figure 1) revealed that teeth 18, 28, 38 and 48 are all vertically angulated, still in the developmental stage with a follicle surrounding the crown and incomplete root development with open apices. The only difference is that tooth numbers 18, 28 and 38 were all in stage D of tooth development and mineralisation according to Demirjian (1973), while tooth 48 was in stage E with early signs of furcation development visible.[2] The patient was referred to a maxillofacial and oral surgeon who removed the 18, 28, 38 and 48 in theatre two months after the radiograph was taken.

The patient, now 26 years old, returned for yearly general check-up appointments. There were no post-treatment radiographs taken and a new panoramic radiograph (Figure 2) was taken after seven years. An incidental discovery was made of an area of increased bone density in the region where tooth number 18 was removed (Figure 2). A decision was made to take a Cone Beam Computed Tomography (CBCT) image. Fully developed roots of tooth 18 with closed apices and an absent crown was visible (Figure 3A-C).

Figure 1. A panoramic radiograph showing incomplete root development and open apices of tooth numbers 18, 28, 38 and 48.

Figure 2. A panoramic radiograph showing a radiopacity in the area of the 18 with absent tooth numbers 28, 38 and 48.

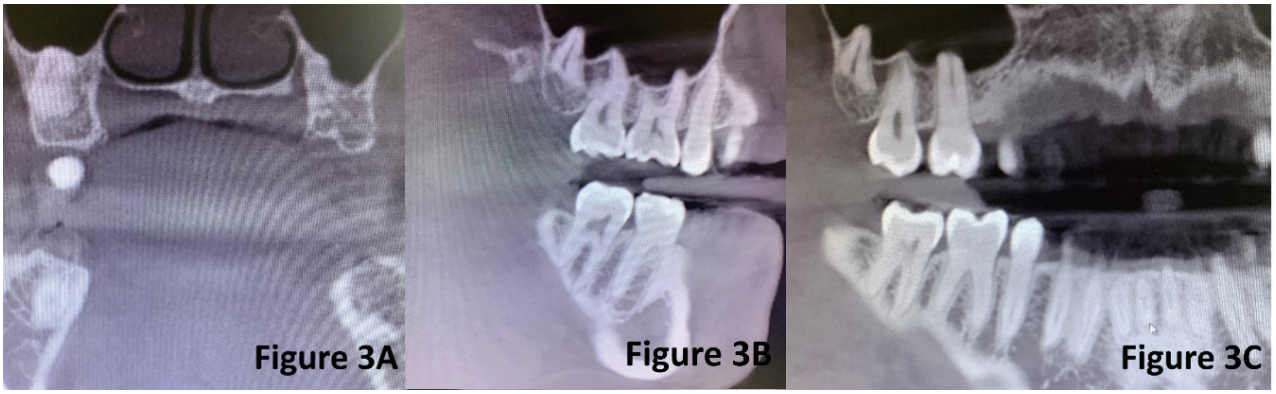

Figure 3A-C. A CBCT showing the roots of the 18 with complete absence of the crown in the coronal- (A), sagittal- (B) and reconstructed panoramic view (C).

DISCUSSION

The development of a tooth is initiated and controlled by reciprocal interaction between the dental epithelium and the ectomesenchyme.[3] A thickening of the odontogenic epithelium is regarded as the first sign of tooth development followed by the condensation of the associated ectomesenchyme. The ectomesenchyme of neural crest origin then becomes involved in the process where there is signalling between the epithelium and ectomesenchyme for the formation of the crown through the bud, cap and bell stages.[4]

Root development will only start after crown formation. This process is initiated through communication between the inner- and outer enamel epithelium of the enamel organ. It starts at the cervical loop and continues apically as a narrow sheath[5] known as Hertwig's epithelial root sheath (HERS).[6] HERS is situated between the dental papilla and dental follicle, signalling the cells of the dental papillae to differentiate into odontoblasts.[6] The odontoblasts secrete predentine that will mature into mineralised root dentine.[7] HERS is thus of critical importance to initiating root development and determining the number, shape and size of the roots.[7] If HERS is disturbed in any way it can result in complications with the root development process.[8] After dentine formation, the TGF-β1 signalling from HERS is responsible for inducing cementoblast differentiation[9] or the HERS cells themselves undergo epithelial-ectomesenchymal transformation into cementoblasts[10].

Thomas and Kollar (1989) showed that HERS could induce odontoblasts to differentiate from cells of the dental papilla only if the dental papillae already had a certain degree of commitment and exposure to signalling factors from HERS.[8] Based on this, we hypothesise that the apical aspect of HERS and the surrounding ectomesenchymal cells of the dental follicle and dental papilla might have been left intact after the surgical procedure. This could account for the continued development of the root of tooth number 18 in the presented case. For the periodontal ligament to develop and be present, like in this case, dental follicle cells also had to be present.

Although the cascade of signalling present at the apical portion of a developing tooth has not been fully explained,[10] based on the data available we can hypothesise that a root of a tooth can continue to develop even if mineralised tooth material (enamel, dentine, root cementum) is absent, but HERS and the surrounding ectomesenchymal cells of the dental follicle and pulp have to be present and is of importance for this signalling cascade to be maintained.

CONCLUSION

It is important to always inform your patient about this complication when removing wisdom teeth before root development is completed, otherwise there could potentially be a litigation case opened by a dissatisfied patient. The incidental finding and discussion of this case report highlight

the importance of adding this as a complication when removing wisdom teeth where the roots are not fully formed yet. In cases where the patient reports post-procedure pain, swelling or infection it is warranted to take radiographs. Another implication which needs to be considered is that of forensic cases following extractions.[11] Reflecting on the specific case discussed above, the finding was incidentally discovered when taking a panoramic radiograph as part of a routine dental check-up and the patient did not experience any signs and symptoms in the discussed area. The patient will be followed up to ensure there are no complications with the root and that no lesions occur around it. This was well documented in the patient's records that if a forensic case for this patient occurred, identification of the patient would be easier since the presence of the 18-root development is a distinct finding.

AUTHORS' DECLARATION

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Conflict of interest
The authors declare that they have no conflict of interest.

Ethics approval
This study was approved by the University of Pretoria Ethics Committee (Reference no: 116/2024). All procedures followed the ethical standards of the Helsinki Declaration of 1975, as revised in 2013.

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