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Case Report

Long-term follow-up in lower right second premolar tooth with a dental follicle but no tooth bud: A case report

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Abstract

Aim: The patient was followed up in consultation with the orthodontist, and after a long-term follow-up, it was found that the dental germ developed, but the position of the tooth was horizontal. When the follow-ups were continued, it was observed that the position of the tooth also improved, and it progressed smoothly along the tooth eruption path.
Methodology: In the panoramic radiography of an 8-year-old male patient who applied to the clinic complaining about the left upper first primary molar tooth, the right lower permanent second premolar tooth follicle developed, but there was no tooth development in the follicle.
Results: When follicle formation is observed, only following the patients without directing them to orthodontic treatment, which is expensive and difficult, positively affects their dental structure. Following patients without affecting their lives can be significant.
Conclusion: We emphasize the importance of long-term follow-up when follicle formation was observed. We predicted that this situation was caused by the disconnection in the interaction of transcription factors and signals in the tooth development stage.

Keywords: dental follicle, lower second premolar, tooth deficiency

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Introduction

Mineralization of all permanent teeth, except the third molar teeth, starts at three and a half years. After this period, any congenital tooth deficiency can be detected radiographically (1, 2). It has been reported that environmental and genetic factors are effective in identifying congenital tooth deficiency, which is a widespread anomaly. Mandibular second molars have been identified as the most frequently affected teeth among the teeth by congenital tooth deficiency (1, 3, 4).

The mesenchyme surrounding the enamel organ and dental papilla, which will form the future enamel with the ectodermal origin, was densified, and the dental follicle structure was formatted by it. Enamel organ, dental papillae, and dental follicle form the dental follicle germ (5, 6). These stages contain essential transcription factors and signals for certain developmental stages. The shaping of all teeth is controlled by homeobox (HOX) genes expressed in the mesenchyme. Transcription factors, such as sonic hedgehog (Shh), muscle segment homeobox 1 (Msx1), muscle segment homeobox 2 (Msx2), Wnt signaling proteins, bone morphogenetic proteins (BMPs), and fibroblast growth factors (FGFs), have critical roles in the development and differentiation of teeth (7). Most developmental defects in teeth arise due to mutations in genes encoding these transcription factors and signal molecules (8).

Msx1 mutations are associated with agenesis of the 2nd premolar and 3rd Molar teeth (9, 10). In their 1996 study, Chen and Ark (11) proposed that the significant developmental function of the Msx gene is to allow inductive reciprocal signals to develop among tissue layers.

On the other hand, the p63 gene (12), a member of the p53 tumor suppressor family, has a vital role in maintaining the ability of epithelial stem cells to regenerate and proliferate (9). Human p63 gene mutations are related to various syndromes, including dental anomalies, such as tooth loss, which affect primary and permanent teeth (9, 13).

The enamel knot, growing up in the cap stage, is the signaling center that acts as an organizer in tooth development and disappears due to the death of cells by apoptosis at the end of the cap stage. This knot expresses Shh, Fgf-3, Fgf-4, Fgf-9, Fgf-20, Bmp-2, Bmp-4, Bmp-7, Wnt-3, Wnt-10a, and Wnt-10b. The growth of teeth is regulated by Fgf-4 (7, 14, 15).

Both epithelial and mesenchymal cells are affected by these signals emanating from the enamel knot. These reciprocal interactions between the epithelium and the mesenchyme are responsible for advanced tooth morphogenesis (16).

From this point of view, dental follicle formation and dental germ development within the follicle may be caused by the disconnection in the reciprocal interactions occurring in a complex structure, in line with the information mentioned above. We emphasized that only following the patient when follicle formation is observed positively affects the dental structure. In this scenario, follow-ups without directing the patients to orthodontic treatment, which is difficult and expensive and affects the lives of the patients, may be crucial. However, it is vital to observe dental follicle formation in the radiographs taken from the patient in these and similar cases.

Case Report

Panoramic radiography was taken from an 8-year-old healthy male patient who applied to our clinic complaining of pain in the left upper first primary molar tooth. In the radiography, it was found that the follicle of the permanent lower right second premolar tooth was formed without a dental germ in this follicle (Fig. 1). Before the case report, an approval form was requested from the parents of the patient.

Figure 1. Only the follicle is observed where the lower right second premolar tooth should be located.

A follow-up under the supervision of an orthodontist was recommended to the patient. When the same patient came back for control four years later, his whole mouth was checked with panoramic radiography, and his right lower second premolar tooth, in which the germ did not develop, was examined. During the elapsed time, it was determined that the crown of the relevant tooth was completely developed, and approximately one-third of its root developed. Nonetheless, it was located horizontally in the jawbone. In an orthodontic consultation, it was determined that the relevant tooth did not cause any damage to the roots of the adjacent teeth. Patient follow-up continued under the supervision of an orthodontist (Fig. 2).

Figure 2. It was observed that the second premolar tooth was formed in the right lower region, but it was located horizontally.

In the panoramic radiography taken from the patient one year after the second control, it was observed that two-thirds of the root formation of the lower right second premolars was completed (Fig. 3).

The last control radiography of the patient was taken seven years after the beginning of the follow-ups and two years after the third control. Then, it was observed that the position of the horizontally located lower right second premolar tooth improved, and it began to erupt into the mouth in the normal position (Fig. 4).

Figure 3. The lower right second premolar tooth, which is observed to be beginning to complete root formation.

Figure 4. The lower right second premolar tooth that has improved its position and is on the eruption path in the mouth.

Discussion

Considering that the mineralization of permanent teeth started at the age of three and a half years, in this case, only a dental follicle was detected in the place of the lower right second premolar tooth, which was eight years old but still not grown up. In the literature review, no such case was found, and the dental follicle of the relevant tooth was thought to be expected. The age of the patient was much higher than the age of teeth calcification. The other teeth keep their active eruption in the age range specified in the literature. The orthodontic treatment can be performed in any period of life, even in possible agenesis in the right lower second premolar tooth. The tooth of the patient, which was followed up without any intervention, was developed in the long term and took its place in the mouth. It is thought that the development of teeth halts after dental follicle formation due to mutation and suppression in reciprocal signals and transcription factors, which are known to have significant roles in the embryological development period of teeth and have a very complex relationship.

It is thought that when there is no problem in the epithelial-mesenchymal interactions that grow up during early tooth development, there will be no problems in tooth development.

Conclusions

In this case report, the formation of dental follicle and development of dental germ within the follicle was thought to be caused by the disconnection in the reciprocal interactions that develop in a very complex structure. We emphasized that when follicle formation is observed in patients, it is expensive and difficult to follow the patients without directing them to orthodontic treatment. In such a situation, the dental structure of the patients may be positively affected and following the patient without affecting their lives is very important. However, we believe it is crucial to observe dental follicle formation in the radiographs taken from the patient in these and similar cases.

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