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学位論文の題目	Influence of mesiodens on adjacent teeth and the timing of its safe removal (上顎正中過剰埋伏歯の隣在歯への影響と適切な治療方針の検討)
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学位論文内容の要旨

Supernumerary tooth is a dental anomaly defined as an extra tooth beyond the normal number. Mesiodens is the most common type of supernumerary teeth located in the premaxilla with a reported prevalence of 0.15%–1.9%. Mesiodens can give rise to numerous complications related to both the adjacent teeth and other vital structures. The effects on adjacent teeth may range from displacement, rotation, and interference with normal tooth eruption to even more severe complications such as root resorption or abnormal root formation. Mesiodens may also affect adjacent vital structures, causing perforation of the nasopalatine canal or nasal floor, or the formation of cysts.

The exact criteria for treatment planning for mesiodens still remain unclear. Some researchers recommended that mesiodens should be left in place with regular follow-up appointments if it does not appear to cause any problems, other reports suggested the removal of mesiodens; however, the timing of the extraction remains controversial (early versus late). The aim of our study is to end the controversy regarding the diagnosis and treatment planning of mesiodens. By using cone-beam computed tomography (CBCT) to precisely identify the 3-dimensional (3D) position of the mesiodens and study its various effects on adjacent teeth, we can investigate the preferable timing for its safe removal.

For this study, CBCT examinations, obtained at the Dental School of Okayama University Hospital over a three-year period, were thoroughly examined to detect mesiodens and to assess their relationship with adjacent teeth and other vital structures. Additionally, we studied the chronology of the movement of the mesiodens and the development of any mesiodens-related complications. Data were collected for all patients including the patient's age, sex, and dentition phase. In addition, a thorough analysis of the 3D location of all mesiodens was performed, and other mesiodens-related data were recorded including eruption status; effects on adjacent teeth; and associated abnormalities in the surrounding vital structures. Moreover, our study focused on two important points that were thought to be essential for diagnosis and treatment planning: the contact points and the maturity status of the adjacent teeth. The relation between the mesiodens and adjacent teeth has been carefully examined in order to locate direct contact with the vital point which in the present study describes the open apex of the immature tooth. The maturity status of the adjacent teeth was assessed by studying both their eruption status (unerupted, semi-erupted, erupted) and the development stage of their roots (incomplete, complete).

Taking these two factors into account, the risk of developing complications due to extraction of a mesiodens was divided into three categories: high risk (the mesiodens is in direct contact with a vital point), medium risk (the mesiodens is so close that the adjacent tooth might be injured during extraction) and low risk (the mesiodens is far enough away from any vital point of the tooth or the tooth is mature and unlikely to be affected by external force). All other cases in which the mesiodens is not in contact with the adjacent teeth were considered to be low risk cases.

As for the results of our study, a total of 5,958 CBCT exams were obtained, 460 patients aged 3–85 years were diagnosed with a total of 568 mesiodens, 382 (67.3%) of which were discovered in young patients (age < 10 years) teeth and 333 (87.2%) of these were associated with abnormalities. Out of 568 mesiodens, 289 (50.9%) exhibited one or more complications related to the adjacent teeth. The most common complication, found in 164 mesiodens (28.9%), was displacement of the adjacent teeth. One rare case (0.2%) was found with calcification of the root canal of the adjacent tooth. Moreover, 351 mesiodens (61.8%) exhibited one or more effects related to surrounding vital structures. The most common effect, found in 233 mesiodens (41.0%), was the association with the nasopalatine canal. In addition, 24 mesiodens (4.2%) showed cystic formation.

After analyzing the 3D position of the mesiodens, we were able to locate the exact contact point between the mesiodens and the adjacent teeth and concluded that 82 mesiodens (14.4%) had direct contact with one or more adjacent teeth with the remaining 486 located away with no contact. Regarding the risk categories, 11 (1.9%) were considered to be in the high-risk, five (0.9%) in the medium-risk and 552 (97.2%) in the low-risk categories. Out of the 11 mesiodens in the high-risk category, eight were extracted and no postoperative complications have been reported.

In conclusion, as the results showed that no postoperative complications were seen in all the extracted cases of high-risk mesiodens, this indicates the possibility of safe extraction at an early age which could reduce related future complications.

論文審査結果の要旨

The aim of this paper was to investigate the preferable timing for the safe extraction of mesiodens by using cone-beam computed tomography (CBCT) for an accurate evaluation of mesiodens and surrounding structures.

For this study, 5,958 CBCT examinations, obtained over a three-year period, were examined to detect mesiodens and data for both patients and mesiodens were collected. In addition, the study focused on two important points: the contact points and the maturity status of the adjacent teeth. And based on these two points a new classification system of risk factors has been created to evaluate the risk of extracting mesiodens.

As for the results of this study, 460 patients were diagnosed with a total of 568 mesiodens. The age of the patients ranged from 3 to 85 years old. Out of 568 mesiodens, 386 were found in patients younger than 10 years old and most of these had mesiodens-related complications. Based on the classification system, only 11 mesiodens were considered in the high-risk categories.

Based on the results of this paper, early discovery, and extraction of mesiodens might be the most appropriate approach to prevent the development of complications.

The new classification system proposed by this paper, which categorizes the risk of developing complications due to extraction of mesiodens, is a new system which has not been mentioned before in the literature. This might be of a great value to the clinical practice since it will help practitioners to make the decision regarding extraction of mesiodens easily and efficiently.

This article highly supports that mesiodens better be extracted at an early age before the eruption of adjacent permanent teeth and that safe extraction is possible with the use of CBCT. This is significant for clinical practice, because so far, no definitive decision has been made regarding timing of extraction of mesiodens. Therefore, with the help of the 3D CBCT radiography, precise information could be obtained regarding the exact position of mesiodens and surrounding environment which will lead to a more precise treatment plan and help ensure a safe extraction.

This paper has already been accepted by Imaging Science in Dentistry and has been evaluated internationally.

The thesis defense committee hereby accepts this article as a doctoral dissertation in dentistry.