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Pulp Treatment of Triple Tooth in Primary Dentition: Two Case Reports

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Abstract

Triple tooth is rare in primary dentition; it is the abnormal fusion of three teeth. There are a few reports of double teeth, but triple teeth are rare. These multiple teeth create several clinical problems, not only esthetic problems but also a high caries susceptibility, congenital missing permanent tooth germ(s), orthodontic problems, and periodontal problems. They also make it difficult to perform pulp treatment because of the complex tooth structure.

A 1-year 7-month-old male underwent a partial pulpotomy with mineral trioxide aggregate (MTA) when pulp exposure caused by deep caries occurred at a maxillary anterior triple tooth in the first case. The second case was a 1-year 9-month-old male presenting with a fracture line at a mandibular anterior triple tooth. After removing the fractured fragment, a pulpectomy was performed at the remaining primary lateral incisors. Specific complications were not observed during 24 and 6 months of follow-up, respectively.

Key words : Triple tooth, Double tooth, Pulp treatment

Ⅰ. Introduction

Gemination results from one tooth bud, with intrusion of tissue and incomplete division into two teeth; there are normally two divided crowns and one large root, pulp chamber, and canal. Conversely, fusion refers to the union of the dentin or enamel of two normally separated developing tooth buds. These tooth form abnormalities can be distinguished through clinical and radiological examination, but clinically it is difficult to classify gemination versus fusion exactly, so today 'double tooth' is often used to cover both[1]. Moreover, conjoined tooth, double formation, fused tooth, and other terms have also been used. Prevalence rates have been reported to be 0.5% to 2.5% and there are predilections for deciduous dentition versus permanent dentition, unilateral versus bilateral, and anteriors versus posteriors[2].

The term 'triple tooth' was first used by Knapp and McMahon[3] in 1983 to describe an abnormal tooth form with the union of three teeth. It can be the result of fusion, gemination, concrescence, or a combination thereof, and typically involves the union of two primary teeth and a supernumerary tooth. Union of only primary teeth has also been reported and union of primary teeth and permanent teeth is rare. The prevalence of triple tooth is much lower than double tooth (-1.5%) and supernumerary tooth (-0.5%). It shows a greater predilection for maxillary anteriors versus the mandible, in contrast to double tooth. Triple tooth is detected in a routine dental examination with no symptoms and may also be detect-

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ed with various chief complaints, such as abnormalities of tooth form and number, dental caries, trauma, fistula formation, residual deciduous tooth, and ectopic eruption of a permanent succedaneous tooth.

In a total of 32 cases of triple tooth, Shilpa and Nuvvula[4] reported restoration treatment was performed in only 1 case, extraction was performed in 10 cases, and pulp treatment was not attempted in any case. Indistinct canals on radiographs, difficulties in filling unknown canals, and uncertain prognosis were reasons for extraction, instead of pulp treatment, in each case report. Lee et al.[5] reported a pulpectomy of triple tooth in the maxillary primary incisors. The difficulty in pulp treatment of triple teeth is caused by the unknown and complex pulp structure. Thus, various approaches should be considered with triple teeth.

There are two case reports. The first was treated by a pulpotomy with MTA in a triple tooth. The second case involved dividing a fractured triple tooth and removing a segment. The other section was conserved with a pulpectomy and the two cases showed favorable prognoses.

Ⅱ. Case Reports

1. Case 1

A 1-year, 7-month old male came to the department of pediatric dentistry, Chosun university dental hospital, with form abnormalities in the anteriors. The union of the right maxillary primary central incisor, primary lateral incisor, and a supernumerary tooth was seen on clinical examination (Fig. 1). On the lingual side, caries was seen at the fissures between the crowns. On an intraoral radiograph, two separate canals and pulp chambers, and crowns regarded as supernumerary teeth between the two distinct crowns, were seen and the root was in a developmental state (Fig. 2). The pulp structure was seen faintly, but not distinctly, for the supernumerary teeth. A radiolucent caries lesion was seen between the crowns. A panoramic radiograph could not be taken because the patient was too young and permanent succedaneous teeth on the periapical radiograph were estimated to be the right maxillary incisor and canine and a missing lateral tooth bud was suspected. The need for a definite diagnosis with further panoramic radiographs was explained to the parents.

Because of the deep caries, the need for pulp treatment was expected, but the patient was as yet too young and root development was incomplete. An absolute pulpectomy was considered difficult because of the complexity and indistinctness of the pulp structure, so a partial pulpotomy was performed using mineral trioxide aggregate (MTA; Fig. 3). Then, a restoration using composite resin was carried out.

Clinical and radiographic examinations after 6, 12, 18 months, and 2 years showed no specific findings, a well-maintained restoration, and normally developing periapical and periodontal tissue (Fig. 4). In clinical photography at 18 months, there was no specific abnormal finding except slight discoloration of the crown (Fig. 5). The missing right maxillary lateral incisor was confirmed at 2 years when an intraoral radiograph was compared with the left permanent succedaneous tooth bud. The possibilities of a pulpectomy or an early extraction were explained to the parents when symptoms were expressed and a follow-up examination was scheduled at the time of shedding of the primary incisor. Panoramic radiography is needed to examine the numbers and development pattern of succedaneous teeth after several years; moreover, space and esthetic problems of maxillary anteriors should also be considered.

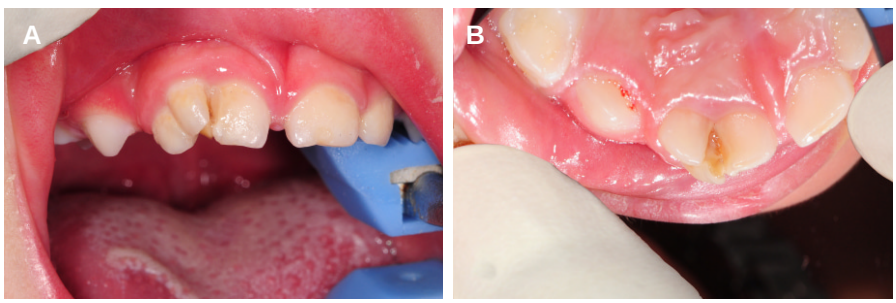

Fig. 1. (A, B) Initial visit intra-oral photographs. Union of the right maxillary primary central incisor, the primary lateral incisor and a supernumerary tooth and caries were observed.

Fig. 2. Initial periapical view. A triple tooth with open apex and dental caries was observed. A congenital missing right lateral incisor was suspected.

Fig. 3. Treatment procedure. (A) Bleeding control with sterile cotton pellet. (B, C) Restoration with composite resin.

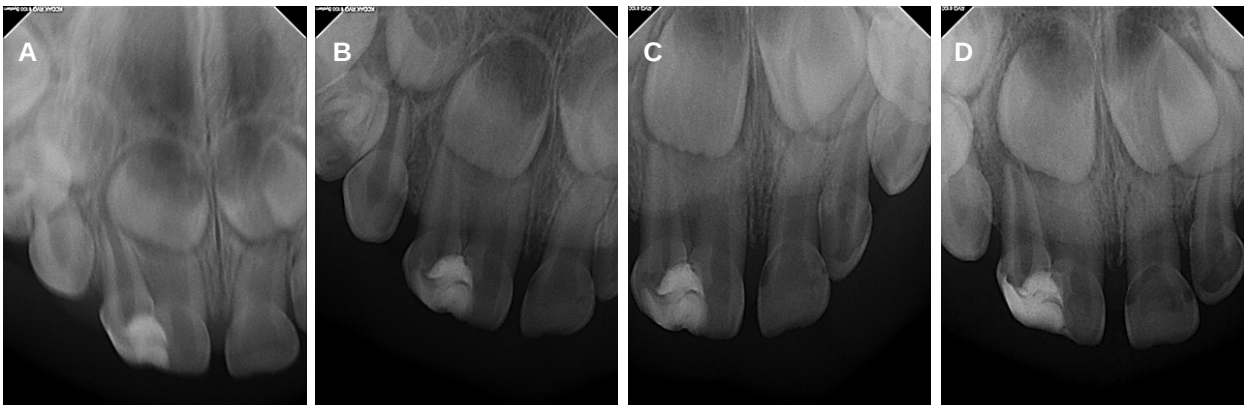

Fig. 4. (A, B, C, D) Follow-up radiographs showing the triple tooth and periodontal tissues after 6,12,18, and 24 months, respectively. Normal root development and no complications were observed. (D) The congenital missing maxillary right lateral incisor was observed.

Fig. 5. After 18 months. Intraoral photographs showed no specific abnormal findings except slight discoloration.

2. Case 2

A 1-year, 5-month old male came to the department of pediatric dentistry, Chosun university dental hospital, with trauma to the mandibular primary incisors. Union of the right mandibular primary central incisor, primary lateral incisor, and a supernumerary tooth at the middle area was seen on clinical examination (Fig. 6). Also, a sinus tract was seen at the labial gingiva of the unioned crowns. Mobility measurements of the fractured fragment, the right mandibular primary incisor, and the supernumerary tooth showed class 3 mobility and a fracture line was seen between the crowns on the lingual side. Periapical infection through the gap between crowns was supposed to have occurred following the fracture of crown by trauma. On an intraoral radiographic examination, the pulp chamber structure was obvious but a canal structure was not clear for the supernumerary tooth. The two primary teeth had clear canals (Fig. 7). Also, loss of the lamina dura and alveolar bone surrounding right primary incisor was evident and all of the permanent succedaneous teeth were apparently present. In an intraoral radiograph of the maxilla, two mesiodens were seen (Fig. 8). Negative factors that could affect pulp treatment-such as anatomical variation of the canal, an open apical foramen, and thin root wall, and general complications that might arise after an operation, such as early extraction-were explained to the parents.

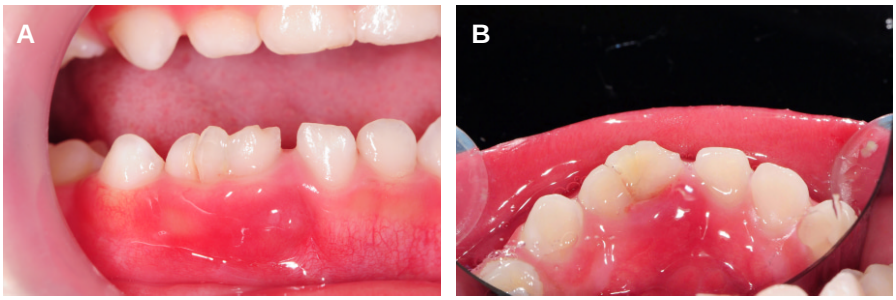

Fig. 6. Initial visit intra-oral photographs. Union of the right mandibular primary central incisor, the primary lateral incisor, and supernumerary tooth and a sinus tract were observed.

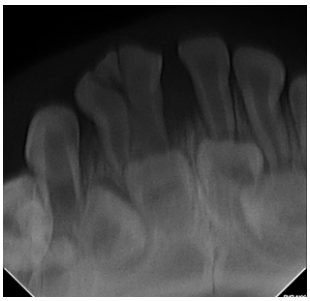

Fig. 7. On intra-oral radiographic examination, the pulp chamber structure was obvious but a canal structure was not clearly seen for the supernumerary tooth.

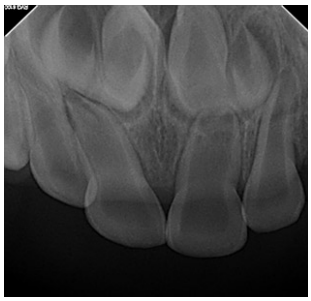

Fig. 8. Two supernumerary teeth were observed bilaterally.

Fig. 9. Removed fragment. It was estimated to be the mandibular right primary incisor and a supernumerary tooth.

Fig. 10. After treatment. Gingivoplasty and composite resin restoration were performed under local anesthesia.

Fig. 11. Periapical radiograph after filling of calcium hydroxide paste.

Fragments with great mobility were removed under local anesthesia (Fig. 9). Compared with radiograph taken after removal of fragments, the structure was confirmed to be the right primary central incisor and a supernumerary tooth; pulp treatment aimed at preserving the remaining tooth was performed considering the remaining period until the eruption of permanent incisors. A conventional pulpectomy was performed after finding the canal orifice of the remaining tooth. There was no bleeding during pulp extirpation, canal irrigation, or drying, and filling with calcium hydroxide material was not considered necessary, so a gingivoplasty using electrocautery and a composite resin restoration after finishing the pulpectomy were performed (Fig. 10). In the radiograph after filling, it seemed there may have been overfilling at the mesial root, but we judged this to be overlapping because of the thin dentin wall of the root (Fig. 11).

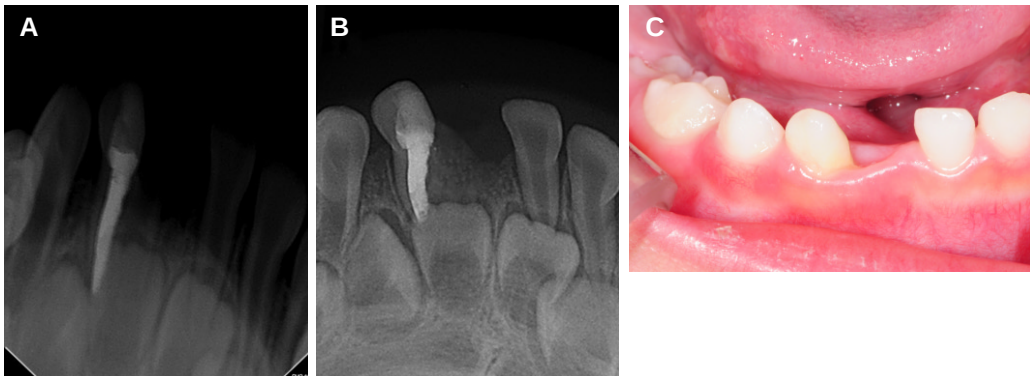

Fig. 12. (A, B) Follow-up radiographs showing the periapical status at 3 and 6 months after canal filling, respectively. (C) Follow-up intraoral photograph showing normal healing state at the residual tooth.

Fig. 13. Triple tooth with talon cusp. Only four pulp chambers and three canals were seen clearly.

There were no specific findings in the intraoral radiograph after 3 months or clinical photography and radiograph after 6 months (Fig. 12). The need for continued follow-up and the possibility of early extraction were explained. Examination of the numbers of permanent tooth buds and their developmental state through panoramic radiographs and consideration at of supernumerary tooth extraction at the erupting time of the maxillary permanent central incisor are needed.

Ⅲ. Discussion

Reasons for multiple tooth formation are varied and genetic and environmental factors may be involved. There is a report that fusion was inherited through three generations and it has also been found in connection with ectodermal dysplasia and Down's syndrome. It may also involve acquired factors, such as infection and radiation exposure. No obvious mechanism of tooth union has been revealed; various hypotheses have been presented. Shafer et al.[6] reported that physical forces or pressure can make the developing teeth touch each other and cause tooth bud union, while Yeun et al.[7] suggested that double tooth occurred because the tooth bud was not separated by a reduced potential force in mitosis, leading to a fused tooth. Most recently, Aguilo et al.[3] classified the reasons according to the existence or non-existence of permanent tooth buds and reported that if the permanent teeth existed, then triple tooth was formed by hyperactivity of the dental lamina and the union of these. In contrast, if there was no permanent tooth, the permanent tooth was expressed with a supernumerary tooth by imbalanced activity in the dental lamina in the primary dentition and expressed as a defect in the permanent dentition.

Problems associated with multiple teeth include vulnerability to dental caries and fractures, causing periodontal disease if a fissure on the buccolingual side is extended to the root surface, and complexity in pulp treatment. In primary dentition, it may not be esthetic due to diastema and contact loss, and reduction of dental arch length can cause malocclusion and delayed or ectopic eruption of permanent teeth can occur due to residual deciduous teeth. Missing teeth can occur in the permanent dentition[2].

In the first case in this report, esthetic problems due to diastema and missing permanent succedaneous teeth can be expected. So, consideration of esthetic problems in the defect area in terms of permanent dentition and space management (space maintenance or space closing) are important. Prosthetic restoration may be needed after the completion of growth. In the second case, we must consider non-esthetic problems, slight crowding,

and problems associated with supernumerary teeth in the maxillary anteriors.

Shilpa and Nuvvula[4] analyzed 32 triple teeth in 31 patients. Triple tooth showed a twofold male predilection, the subjects' mean age was 4.9 years, and triple tooth was found at various ages, from 1 year, 11 months to 10 years old. There was a threefold predilection for the maxilla; triple tooth was unilateral in 30 patients and bilateral in only one. Among the total of 32 triple teeth, the unioned teeth were the primary central incisor, primary lateral incisor, and supernumerary teeth in 13 cases, and where there was a record of a relationship between permanent teeth, the permanent tooth existed in six cases and was missing in seven cases. One of the six cases that had permanent a succedaneous tooth had a supernumerary tooth; this case was similar to the second case in this report.

There are many reports of relationships between multiple teeth and permanent succedaneous teeth. However, there is only one report, by Lee et al.[5], about triple tooth in which a missing maxillary lateral incisor was suspected. In two studies of double tooth, Ra et al.[8] reported a missing permanent tooth in 25 of 54 patients and Yang et al.[9] reported a missing permanent tooth in 3 of 4 patients. Ra et al. reported different prevalence depend on the affected site in the mandible. In case of double tooth between mandibular primary lateral incisor and mandibular primary canine, 17 of 23 (74%) patients showed missing of permanent successors. On the other hand, in case of double tooth between mandibular primary central incisor and mandibular primary lateral incisor, 5 of 24 (21%) patients showed missing of permanent successors. It was about one-third of the former.

As mentioned earlier, little is known about the pulp structure of triple teeth. There may be three separate canals or one canal combining the three canals. Aguilo et al.[3] reported that knowing the anatomical structure inside a tooth is important in making an appropriate treatment plan. Previous studies provided only two-dimensional information, such as clinical photographs and intraoral radiographs. Aguilo et al. mentioned the lack of information about the form and structure of the pulp of triple teeth and suggested a method using histological examination and computed tomography. Through these techniques, correct information about teeth without overlapping can be obtained: not only size and location of teeth but also the form of the tooth and canal and the relationship between root canals can be determined. They reported canal patterns with three separate pulp chambers at the crown in the teeth analyzed and observed patterns in which canals communicated more with a supernumerary tooth than the central incisor and lateral incisor. Lee et al.[5] reported the pulpectomy of a triple tooth and regular examination over 7 months and stated that the canals of the central and lateral incisor were seen as one wide canal on a radiograph but there was a septum down to the root apex. We can confirm that the pulp structures in these cases were consistent with those reported previously.

Shilpa and Nuvvula[4] also suggested a new classification. They classified triple teeth as Type I if there were three pulp chambers and three canals, Type Ia with two normal teeth and a supernumerary tooth, and Type Ib describes the union of three normal teeth. In Type II, the triple tooth consists of two pulp chambers and two canals, Type IIa consists of two fused teeth and a supernumerary tooth, and Type IIb describes the fusion of two teeth and a normal tooth. In this study, the first case can be classified as Type Ia because of the three separate pulp chambers and canals, based on this classification. The second case can be classified as Type Ia if considered as two primary teeth and one supernumerary tooth, but it seemed to have three pulp chambers and two canals, so there is no ideal classification.

A newly formed, triple tooth with an estimated talon cusp in which a restoration treatment was performed had four pulp chambers and three canals and could also not be classified (Fig. 13). Further subdivision of the classification is needed through examination of a greater number of cases and a three-dimensional analysis.

According to the recent guideline for pulp treatment of the American Academy of Pediatric Dentistry, MTA is recommended, rather than calcium hydroxide, as the pulpotomy material[10]. The effects of MTA are outstanding, or at least as good as formocresol and ferric sulfate, and may be the preferred material in future. Existing pulpotomy materials may cause complications, such as cell toxicity and internal resorption of roots, but MTA has been shown to be an excellent pulpotomy material in many studies, as it is biocompatible, induces calcific barrier formation, shows especially good marginal sealing ability, and in many clinical experiments shows high clinical and radiological success rates.

In the first case in this study, the pulp was exposed after caries removal and we selected MTA as pulpotomy material considering the difficulty of pulpectomy due to

the pulp chamber complexity of the triple tooth. We expected a better prognosis by paying attention to discoloration and continuous induction of root development. Slight discoloration was observed at the 2-year examination but was acceptable and normal root development was seen.

Approaches to double tooth and triple tooth are varied. Multiple teeth are vulnerable to caries and fractures so early diagnosis and preventative treatment are important. Fissures on the labial and palatal side can be sealed early with sealant materials or composite resins. To improve esthetics, esthetic restorations with shaping or composite resin may be needed and prosthetic restoration may also be considered. If necessary, prosthetic restoration and orthodontic treatment after dividing the multiple tooth surgically can be considered. Also, regular examinations until extraction and space management for permanent dentition are needed because impaction or ectopic eruption of permanent tooth can occur due to a residual deciduous tooth.

In the first case in this study, a pulpotomy was performed due to pulp exposure during caries removal. No specific complication and normal root formation were observed after 2 years of examination. In the second case, a sinus tract was observed due to the fracture and a pulpectomy for the residual tooth was performed after removal of the fractured fragments. There was no specific complication after 6 months. Long-term successful results of MTA with pulpotomies have been reported but there is no report of multiple tooth treatment. Also, there is no the long-term follow-up report after a pulpotomy with multiple teeth. We cannot be certain whether a perfect pulp extirpation at a residual tooth was performed, whether there is communication between the extraction site and the canal, or whether the canal filling material is well-sealed and applied. Thus, examination of the patients until the time the primary incisors change is needed. Moreover, consideration of the eruption of the permanent succedaneous teeth and space management associated with lateral incisor missing and supernumerary tooth and periodic clinical, radiographic examinations are necessary.

Ⅳ. Summary

Triple tooth is a very rare tooth form abnormality and can cause multiple problems. The treatment plan is determined by a clinical assessment and the developmental state of the patient. To treat deep caries with pulp exposure, a pulpotomy using MTA was first considered due to the unknown pulp chamber and canal structure. Triple tooth is vulnerable to trauma so if symptoms occur, such as sinus tract formation associated with trauma, a pulpectomy can be considered in a treatment plan. Furthermore, understanding of the pulp structure of triple tooth, consideration of development problems, and long-term follow-up of pulp treatment are necessary.

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국문초록

유치열에 나타난 삼중치에서 치수 치료 : 증례 보고

정한글 · 이난영 · 이상호

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유치열에서 드물게 관찰되는 삼중치는 세 치아의 비정상적인 융합으로 나타난다. 몇몇 문헌들에서 이중치에 대해 보고하고 있지만, 삼중치에 대한 보고는 매우 드물다. 이러한 다중치는 유치열에서 더 흔하게 관찰되며, 몇 가지 임상적 문제점을 나타낸다. 심미적인 문제 뿐만 아니라 치아 우식증 및 파절에 취약함, 영구 치배의 결손, 교정적, 치주적 문제를 야기할 수 있으며, 복잡한 치아 구조로 인해 치수 치료를 어렵게 한다.

첫 번째 증례는 만 1세 7개월 남아의 상악 유전치부에 나타난 삼중치로, 깊은 우식으로 치수 치료가 필요할 것으로 예상되었고, Mineral Trioxide Aggregate (MTA)를 이용하여 부분 치수 절단술을 시행하였다. 두 번째 증례는 만 1세 9개월 남아의 하악 유전치부에 나타난 삼중치로 파절을 주소로 내원하였다. 파절편 조각을 제거한 뒤, 잔존 치아에서 치수 절제술을 시행하였다. 각각 24개월, 6개월간의 정기 검진시까지 특별한 합병증은 나타나지 않았으며, 수복물 또한 비교적 양호하게 유지되었다.

주요어: 삼중치, 이중치, 치수 치료