

Gemination of a maxillary permanent central incisor treated by autogenous transplantation of a supernumerary incisor: case report

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Abstract

This report describes the extraction of a geminated maxillary right permanent central incisor in an 8-year-old white female followed by the autogenous transplantation of a maxillary left supernumerary incisor. A 2-year clinical and radiographic follow-up revealed no pathologic findings and confirmed continued root development and pulp vitality in the transplanted tooth. This report documents the usefulness of autogenous transplantation as a viable treatment option in selected cases.

Autogenous transplantation of teeth has been utilized successfully for many years primarily for replacing grossly carious permanent molars with unerupted permanent third molars.¹⁻³ The autogenous transplantation of permanent anterior teeth is less common because of a lack of appropriate donor teeth suitable for transplantation.⁴ Supernumerary teeth may be ideal for replacing missing or developmentally malformed permanent incisors.⁵

Gemination and fusion are 2 developmental anomalies affecting the permanent and primary dentitions. Gemination, the attempt by a single tooth bud to divide, is detected clinically by crown enlargement and incisal notching.⁶ In contrast, fusion is defined as a union between the dentin and/or enamel of 2 or more developing teeth.⁶ The incidence of gemination and fusion is less than 1% and is more common in the primary dentition.⁷

Radiographically, a fused tooth will have 2 root canals and pulp chambers. Geminated teeth have a single pulp chamber and a single root canal. When fusion occurs, the total number of teeth in the dental arch will be reduced unless a supernumerary tooth is involved.⁸ Gemination of teeth by definition will not reduce the number of teeth present. Clinically, the 2 anomalies may be difficult to differentiate. Orthodontic, periodontic, endodontic, surgical, pros-

thetic, and multidisciplinary approaches have been used in the management of fused and geminated teeth.⁹⁻¹¹ This report describes the autogenous transplantation of a supernumerary incisor to replace a geminated maxillary permanent central incisor.

Case Report

A 7-year-old Caucasian female was brought to Columbus Children's Hospital dental clinic by her mother with a chief complaint that "a large tooth was growing into her daughter's mouth." Medical and dental histories were noncontributory. The mother reported that the primary dentition had appeared normal and there was no history of traumatic injury. Physical examination showed a normally developed 7-year-old white female in excellent health. Oral examination revealed a Class II mixed dentition with several carious teeth present.

The maxillary right permanent central incisor was erupting and appeared enlarged mesiodistally, measuring 13 mm (Fig 1). The enamel on this tooth was normal in color and texture. A labial depression or "coronal groove" extending cervically was present, but there was no detectable defect in the enamel covering the groove. All other teeth appeared to be developed normally and appropriate for the patient's chronological age. Initial clinical impression was either gemination or fusion of the maxillary right permanent central incisor.

Radiographic examination was utilized to establish the diagnosis and evaluate the unerupted developing dentition. Occlusal, periapical, and panoramic radiographs showed a maxillary right permanent central incisor with root canal and pulp chamber morphology consistent with gemination. A supernumerary incisor also was present between the unerupted maxillary left permanent central and lateral incisors (Fig 2).

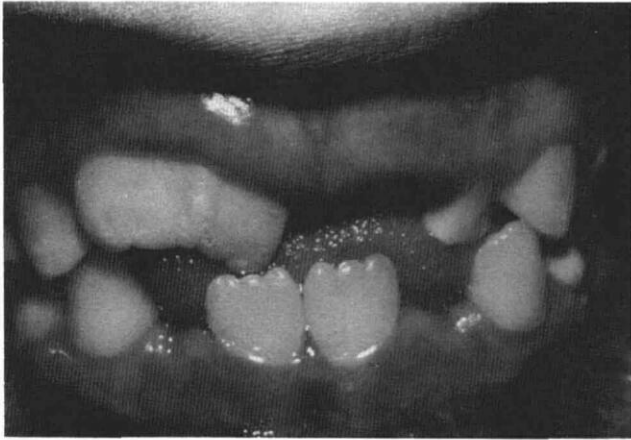


FIG 1. Geminated maxillary right permanent central incisor.

Following consideration of alternative treatment options, it was decided that autogenous transplantation of the unerupted supernumerary incisor following extraction of the geminated maxillary right permanent central incisor would provide the greatest benefit to the patient. Routine restorative dental treatment was performed and the patient was placed on 6-month recall to allow more root development on the unerupted supernumerary incisor.

The patient returned to the dental clinic 6 months following examination. Intraoral radiographs demonstrated that root development on the supernumerary incisor was between $\frac{1}{3}$ and $\frac{1}{2}$ total root length. Using local anesthesia, a mucoperiosteal flap was elevated on the left anterior maxilla. The supernumerary incisor was exposed and found to be acceptable morphologically for transplantation. The geminated maxillary right central incisor was ex-



FIG 2. Intraoral radiograph revealing pulp chamber and root canal morphology of the geminated incisor and presence of unerupted supernumerary incisor.



FIG 3. Intraoral radiograph of transplanted supernumerary incisor.

tracted and the supernumerary incisor placed immediately into the extraction site and stabilized with 3-0 silk sutures criss-crossing the incisal edge from the labial to the lingual gingivae (Fig 3). The mucoperiosteal flap was repositioned and sutured. The patient was advised not to bite on the front teeth and no rinsing of the area was allowed for 24 hr. After 24 hr, the patient was instructed to begin rinsing the oral cavity several times a day and to begin gentle brushing of the teeth.

The patient returned 1 week posttransplantation without complaints of discomfort. Excellent tissue healing was observed and the sutures were removed. Subsequent examinations on a monthly basis demonstrated normal healing, decreased mobility, and no signs or symptoms of dental infection. Radiographic examinations revealed no signs of root resorption or periapical pathology. Negative responses

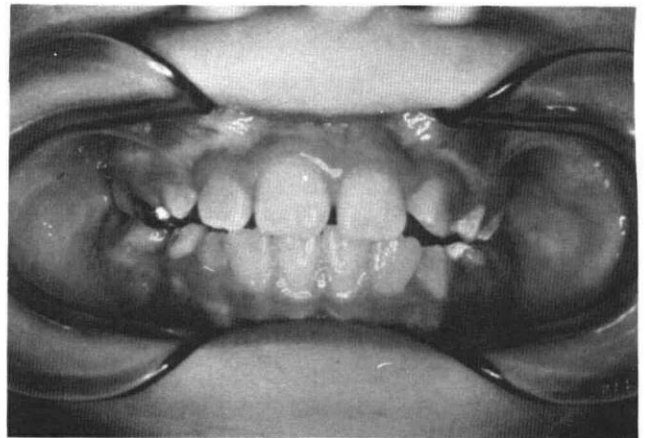


FIG 4. Photograph 2 years posttransplantation. Note that the patient appears to have 2 maxillary left central incisors.



FIG 5. Intraoral radiograph 2 years posttransplantation demonstrating continued root development and absence of periapical pathology.

were recorded to standard hot, cold, and electrical pulp tests. At 3 months posttransplantation, the patient could not be contacted. Two years posttransplantation, the mother again contacted the dental clinic and reported that she had returned to the local area and requested a dental examination for her daughter. Examination 2 years posttransplantation demonstrated normal periodontal tissue status, continued root development, and positive vitality tests to both ice and electrical stimulation (Figs 4, 5).

Discussion

The presence of a geminated permanent tooth in a developing dentition is a particularly difficult problem to manage. The mesiodistal dimension of the tooth and the arch perimeter occupied makes normal tooth alignment impossible. Reduction in the width of the tooth is the main treatment objective. When fusion is present, sectioning and reimplantation may be considered because 2 distinct pulp chambers and root canals exist.¹² When gemination occurs, pulp chamber morphology prohibits sectioning because of periodontal and endodontic problems secondary to the management of the pulp chamber and root canal perforations. In the case reported, autogenous transplantation was possible because an acceptable donor tooth was present.

The success of autogenous transplantation of teeth is related to several factors. Plainfield has reported a success rate of 95% and has defined several precautions that will help insure successful transplantation.² One of the first requirements is that the patient should be healthy with an acceptable level of oral hygiene. The parent and child must be instructed in the proper postoperative care of the transplanted tooth including keeping the operative site

clean and protecting the transplant from undue trauma until reattachment is complete. A soft diet without pulpy foods which might pack into the crevicular space during the initial stages of healing is important.

Maintenance of pulpal viability is the most important objective following the autogenous transplantation. Viability of the pulpal tissue is extremely important for continued root development. The amount of root development is directly related to the ability of the transplanted tooth to revascularize. Andreasen and Hjorting-Hansen have demonstrated that teeth with incomplete root development nearly always reestablish vascularization when reimplanted within 90 min.¹³ Studies by Skoglund and Tronstad have confirmed these findings in autotransplanted teeth in dogs.¹⁴ Plainfield states that root development of the donor tooth should be between $\frac{1}{3}$ and $\frac{1}{2}$ of the total root length.² This recommendation increases transplant stability and ensures revascularization.

Continued root development with apical closure, as demonstrated in the present case, indicates that revascularization occurred following the transplantation of the donor supernumerary tooth although pulp tests were initially negative. The lack of patient response to thermal and electrical pulp stimulation at 3 months posttransplantation is not unusual. Plainfield states that it is common for transplanted teeth to test nonvital for 6 months to 1 year after transplantation.² Johnson et al. described 2 cases where immature permanent central incisors were reimplanted following trauma and did not respond to electrical or thermal testing for over 1 year.¹⁵ In the present case, a positive response to ice and electrical stimulation was recorded at the 2-year examination. This finding indicates that sometime between 3 months and 2 years, patient response to pulpal stimulation returned. It is important to recognize that the lack of pulpal response to thermal and electrical stimulation must not be interpreted as an indication of pulp tissue necrosis or transplant failure.

Another important precaution is avoiding undue trauma to Hertwig's epithelial root sheath or the root surface of the donor tooth during transplantation. Extraction of the donor tooth should be as atraumatic as possible. Damage to the cementum and loss in viability of the periodontal ligament are associated with replacement resorption.¹⁶ The root surface of the donor tooth should not be scraped or touched and transplantation should be completed as quickly as possible.

Splinting of the transplanted tooth is controversial with recommendations ranging from 1 to 6 weeks.^{1,2,4} Andreasen has reported that splinting does

not improve periodontal ligament healing and that replacement resorption was less in nonsplinted teeth when compared to splinted teeth.¹⁷ The main objective in splinting the transplanted tooth is to insure initial reattachment. Stabilization of the tooth must not inhibit normal physiologic functions of the tooth. Sutures in the present case were allowed to remain 1 week. This allowed some movement of the transplanted incisor which may reduce the incidence of replacement resorption and encourage periodontal ligament viability.

Postoperative problems reported secondary to autogenous transplantation include pulpal necrosis, root resorption, ankylosis, arrest of root development, and root canal calcification.¹⁻³ These complications were not observed in the present case and should not be expected if biologic principles are satisfied by appropriate transplantation techniques.

Summary

The geminated maxillary permanent incisor is a particularly difficult problem to manage in a developing dentition. A clinical report has been presented documenting the successful transplantation of a supernumerary incisor to replace a geminated incisor. Pulpal viability and continued root development are to be expected in autotransplanted teeth if close attention is given to defined biologic principles and careful case selection.

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Quotable Quote: did you know that . . .

. . . the government predicts there will be 20% more dentists in the United States by the end of the century? That forecast is included in the Health and Human Services annual report on health manpower. The report to Congress anticipates that 16% of the nation's dentists will be female at the end of the century, compared to 5% today.

. . . smoking rates among male dentists declined over the past decade? The American Cancer Society reports that only 16% of male dentists aged 30-39 now smoke, whereas 25% of men smoke overall. This statistic was reported in *Ca—A Cancer Journal for Clinicians*.