

# Autotransplantation of Premolars and Esthetic Rehabilitation in a Traumatized Teenage Patient with Challenging Oral Problems: A Case Report

Junhee Kho, Howon Park, Juhyun Lee, Hyunwoo Seo

*Department of Pediatric Dentistry, Oral Science Research Center, College of Dentistry,  
Gangneung-Wonju National University*

## Abstract

The loosely structured periodontal ligament and low mineralized bone surrounding erupting teeth provide minimal resistance to an extrusive force. The maxillary central incisors are the most frequently avulsed due to trauma. The prognosis of replanted teeth is affected by extra-alveolar period and conditions. Implant-supported restorations are contraindicated in adolescent patients with poor prognosis traumatized teeth. Autotransplantation of premolar to the anterior region provides a viable treatment alternative.

This case report describes the autotransplantation of premolars and esthetic rehabilitation in a teenage patient with traumatized incisors, poor oral hygiene, and severe crowding. Comprehensive and long-term treatments were performed to improve complex and challenging oral problems.

**Key words :** Dental trauma, Avulsion, Autotransplantation, Orthodontic treatment, Teenager

## I. Introduction

In children from 7 to 9 years of age, avulsion of teeth occurs most often due to the loosely structured periodontal ligament and low calcified bone surrounding erupting teeth[1]. The maxillary central incisors are the most frequently avulsed teeth[2]. The root resorption of replanted teeth after avulsion is associated with the type and length of extra-alveolar storage[3,4]. The degree of contamination and the period of dryness were the major risk factors for resorption[5]. Treating a teenager with hopeless traumatized anterior teeth can be very challenging and requires comprehensive long-term management because implant-supported restorations are contrain-

dicated during continuous growth of the alveolar process[6]. Autotransplantation of premolars to the anterior region can provide a viable treatment alternative that addresses complex challenges[7].

This case report presents the detailed procedure of esthetic rehabilitation with premolar autotransplantation in a traumatized teenage patient. Comprehensive treatment and management were required in challenging oral problems such as severe gingival inflammation and crowding.

## II. Case Report

A 9-year-old boy visited Gangneung-Wonju National Uni-

*Corresponding author : Howon Park*

*Department of Pediatric Dentistry, College of Dentistry, Gangneung-Wonju National University, 7 Jukheon-gil, Gangneung, 25457, Republic of Korea*

*Tel: +82-33-640-2464 / Fax: +82-33-640-3113 / E-mail: pedo@gwnu.ac.kr*

*Received November 27, 2019 / Revised December 5, 2019 / Accepted December 5, 2019*

versity Dental Hospital with a chief complaint of "3 hours ago, I fell and injured my teeth". The patient's bilateral maxillary central incisors had been stored in milk after avulsion. Resin-wire splinting after emergency replantation of avulsed teeth was performed in department of oral & maxillofacial surgery (OMFS). The next day, the patient was referred to the pediatric dentistry from OMFS for comprehensive evaluation and follow-up treatment. On radiographic examination, nearly complete root developments of replanted teeth were observed (Fig. 1). Risk of root resorption was high due to delayed replantation more than 3 hours. For these reasons, pulp extirpation of the replanted central incisors and apexification with calcium hydroxide were performed (Fig. 2A).

The patient did not come to follow-up after recall visit at 11-year of age. The patient returned to the pediatric dentistry

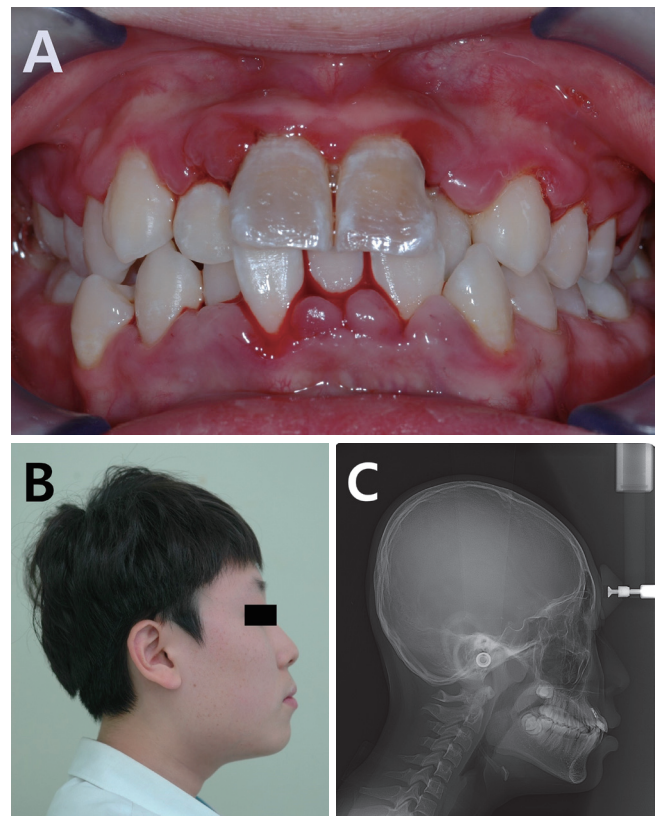
3 years later and oral hygiene was severely poor. In periapical radiograph, internal and external root resorptions of the maxillary central incisors were observed (Fig. 2B). Changing of calcium hydroxide paste was performed but long-term prognosis of maxillary central incisors was poor. Since the patient had a severe crowding in permanent dentition, orthodontic treatment was performed. (Fig. 3A). The clinical examination showed an acute nasolabial angle and convex lateral profile (Fig. 3B). The cephalometric analysis demonstrated a Class II skeletal relationship. The maxillary and mandibular anterior teeth were proclined and lips were protrusive (Fig. 3C). Based on the pre-orthodontic measurements and analysis, it was decided to extract 4 first premolars for improvement of facial profile and occlusion. Autotransplantation of the mandibular premolars into the anterior region after extraction of maxillary central incisors was included in treatment plan. Prior to orthodontic treatment with autotransplantation, management of gingival inflammation and oral hygiene was required. Scaling,



**Fig. 1.** Initial panoramic radiograph one day after splinting of avulsed maxillary central incisors.



**Fig. 2.** Periapical radiographs of the maxillary central incisors after filling the root canals with calcium hydroxide paste. (A) 8-month follow-up, (B) 50-month follow-up.



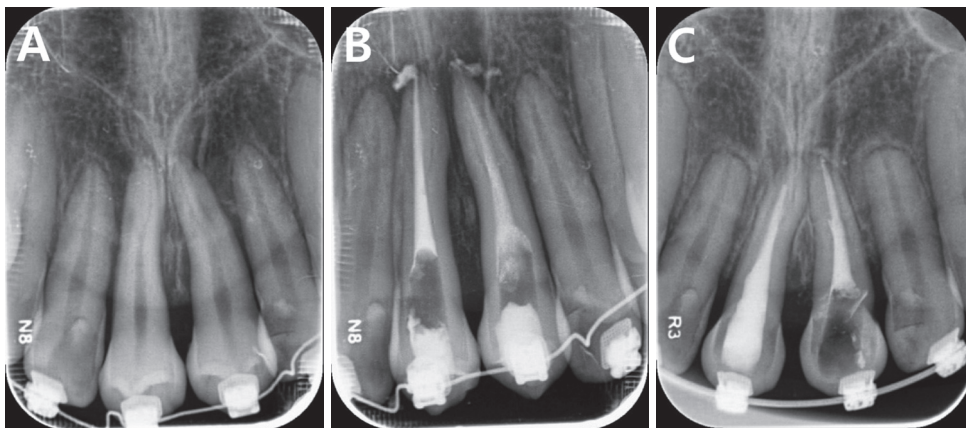
**Fig. 3.** Pre-orthodontic photographs and radiograph. (A) Intraoral photograph, (B) Extraoral photograph; lateral view, (C) Cephalometric radiograph.

lower anterior flap surgery, upper anterior and posterior cu-rettage were performed. Continuous plaque control including chlorhexidine application and patient instruction were required over the entire period of treatment.

1 year after start of orthodontic treatment, maxillary central incisors were extracted. The donor mandibular first premolars were extracted slowly and as atraumatically as possible. The recipient sockets of anterior region were prepared a little larger than root of premolars. Surgical round bur at low speed under saline cooling was used for preparation of the socket. Both premolars were autotransplanted in same side extraction socket of the maxillary central incisors (Fig. 4A). Fixation of premolars was maintained for seven weeks. The root canals of the autotransplanted premolars were filled with calcium hy-

droxide paste (Fig. 4B). Seven weeks after autotransplantation, copper Ni-Ti wire was inserted into the #11 (#44) and #21 (#34) brackets for levelling (Fig. 5). At the same time, occlusal reduction of #11 and 21 was performed.

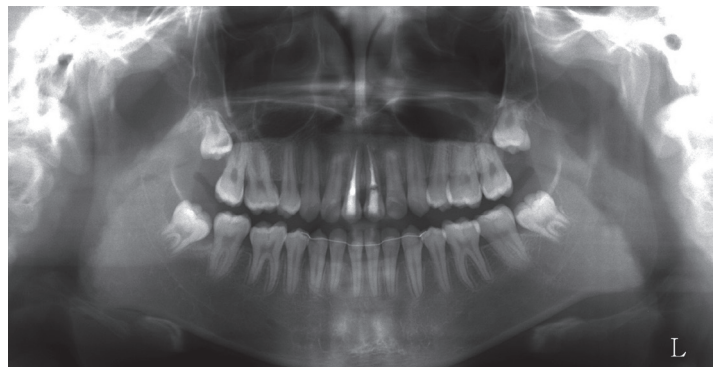
Bony healing around the transplanted premolars was observed 1 year after autotransplantation. The root canals were permanently filled with gutta percha because additional apical lesions or symptoms were not observed (Fig. 4C). After 2 years and 2 months of orthodontic treatment, all orthodontic appliances were removed (Fig. 6). The patient was referred to the prosthodontics for maxillary anterior prosthesis. 9 years after the patient's first visit, the final setting of porcelain-laminate veneers was completed (Fig. 7).



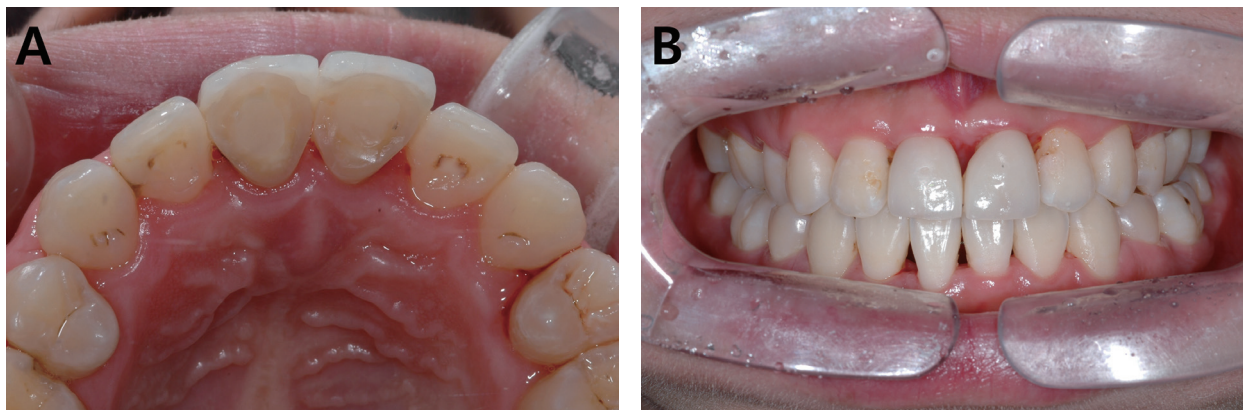
**Fig. 4.** Periapical radiographs of autotransplanted mandibular first premolars. (A) Immediately after autotransplantation, (B) Root canals filled with calcium hydroxide state, (C) Root canals filled with gutta percha.



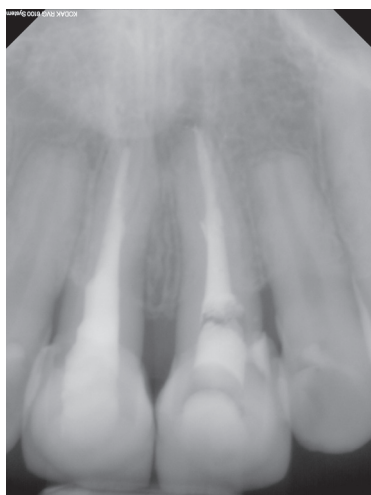
**Fig. 5.** Intraoral radiograph of autotranplanted mandibular first premolars.



**Fig. 6.** Post-orthodontic panoramic radiograph.



**Fig. 7.** Intraoral photograph after final setting of laminates on autotransplanted maxillary anterior premolars. (A) Occlusal view, (B) Frontal view.



**Fig. 8.** Periapical radiograph of autotransplanted premolars at 29-month follow-up after autotransplantation surgery.

### III. Discussion

Long-term prognosis of an avulsed tooth worsens the longer the tooth is out of socket. The best alternative storage medium is milk if culture media such as Hanks balanced salt solution (HBSS) is not available[8]. Most replanted teeth demonstrate ankylosis followed by inflammatory or replacement resorption after a certain period of time[9]. At the first visit of this patient, maxillary central incisors were stored in milk and replantation of teeth was performed 3 hours after injury occurred. External root resorptions were observed 10 months after replantation and internal root resorptions were also ob-

served when the patient returned to the hospital 3 years later.

Placement of implants in growing regions is found to be inappropriate in children and young adolescents[10]. The osseointegrated implants stay in their original position and do not participate in growth[11]. Autotransplantation of premolars to the anterior region is a treatment modality with high success rates[12]. In long-term studies of autotransplanted teeth with immature root development, the 10-year survival rate was reported to be 87 - 95%[13]. This survival rate appears to be equal to implants and fixed prosthetic appliances. The healing potential of periodontal ligaments can be as low as 55% in autotransplantation of the teeth with closed apex[14]. Success of transplantation of mature teeth can be ensured with adequate endodontic therapy of the pulp space[15]. Periodontal ligament cells can be damaged mechanically during extraction or bio-chemically due to various extra-oral conditions and favorable periodontal ligament healing is the critical factor for success. In the present case, the patient was 16 years old at the time of premolar autotransplantation and root development was completed with a closed apex. At the 3-year follow-up after autotransplantation, clinically no discomfort or pain was occurred and well-defined periodontal ligament space with lamina dura was observed in periapical radiograph (Fig. 8).

Treating traumatized teeth in teenagers requires long-term observation and management. Pubertal hormonal changes and inadequate plaque control induce interdental papillary swelling[16,17]. Maintaining oral hygiene is more difficult in crowded dentition. In teenage patients, esthetic and functional rehabilitation of challenging oral problems such as trauma, caries, gingival inflammation and malocclusion is essential

in terms of self-confidence and psychological development. Pediatric dentists play a vital role in the long-term and comprehensive management of complex oral problems in children and adolescents.

#### IV. Summary

Treating a teenage patient with avulsed maxillary incisors, severe crowding and gingival inflammation can be challenging. In this patient, autotransplantation of premolars to anterior region was performed and esthetic rehabilitation was achieved through comprehensive and long-term treatments including orthodontic treatment and management of oral hygiene.

#### Authors' Information

Junhee Kho <https://orcid.org/0000-0002-3418-0869>

Howon Park <https://orcid.org/0000-0001-5741-9804>

Juhyun Lee <https://orcid.org/0000-0002-7586-9478>

Hyunwoo Seo <https://orcid.org/0000-0001-6894-0099>

#### References

- Andreasen JO, Hjørtting-Hansen E : Replantation of teeth. I. Radiographic and clinical study of 110 human teeth replanted after accidental loss. *Acta Odontol Scand*, 24:263-286, 1966.
- Andreasen JO, Andreasen FM, Andersson L : Textbook and color atlas of traumatic injuries to the teeth, 4th ed. Blackwell, 444-488, 2007.
- Andreasen JO, Borum M, Andreasen FM : Replantation of 400 avulsed permanent incisors. 3. Factors related to root growth. *Endod Dent Traumatol*, 11:69-75, 1995.
- McIntyre JD, Lee JY, Trope M, Vann WF Jr : Permanent tooth replantation following avulsion: using a decision tree to achieve the best outcome. *Pediatr Dent*, 31:137-144, 2009.
- Kinirons MJ, Gregg TA, Welbury RR, Cole BO : Variations in the presenting and treatment features in reimplanted permanent incisors in children and their effect on the prevalence of root resorption. *Br Dent J*, 189:263-266, 2000.
- Schwartz-Arad D, Levin L, Ashkenazi M : Treatment options of untreatable traumatized anterior maxillary teeth for future use of dental implantation. *Implant Dent*, 13:11-19, 2004.
- Gupta S, Goel M, Malhotra D, et al. : Autotransplantation. *J Conserv Dent*, 18:500-503, 2015.
- Sigalas E, Regan JD, Opperman LA : Survival of human periodontal ligament cells in media proposed for transport of avulsed teeth. *Dent Traumatol*, 20:21-28, 2004.
- Hsanuddin S, Reddy JS : Sequelae of delayed replantation of maxillary permanent incisors after avulsion: A case series with 24-month follow and clinical review. *J Indian Soc Pedod Prev Dent*, 36:410-416, 2018.
- Sennerby L, Odman J, Lekholm U, Thilander B : Tissue reactions towards titanium implants inserted in growing jaws. A histological study in the pig. *Clin Oral Implants Res*, 4:65-75, 1993.
- Thilander B, Odman J, Lekholm U : Orthodontic aspects of the use of oral implants in adolescents: a 10-year follow-up study. *Eur J Orthod*, 23:715-731, 2001.
- Jung JS, Park HW, Lee JH, Seo HW : Autotransplantation of tooth with immature root formation. *J Korean Acad Pediatr Dent*, 39:66-72, 2012.
- Kristerson L, Lagerström L : Autotransplantation of teeth in cases with agenesis of traumatic loss of maxillary incisors. *Eur J Orthod*, 13:486-492, 1991.
- Andreasen JO, Andreasen FM, Andersson L : Textbook and color atlas of traumatic injuries to the teeth, 4th ed. Blackwell, 740-760, 2007.
- Tsukiboshi M : Autotransplantation of teeth: requirements for predictable success. *Dent Traumatol*, 18:157-180, 2002.
- Murakami S, Mealey BL, Mariotti A, Chapple ILC : Dental plaque-induced gingival conditions. *J Periodontol*, 89:17-27, 2018.
- Kara C, Demir T, Tezel A : Effectiveness of periodontal therapies on the treatment of different aetiological factors induced gingival overgrowth in puberty. *Int J Dent Hyg*, 5: 211-217, 2007.

국문초록

## 어려운 구강 문제를 가진 외상당한 청소년 환자의 소구치 자가이식 및 심미적 회복: 증례 보고

고준희 대학원생 · 박호원 교수 · 이주현 교수 · 서현우 교수

*강릉원주대학교 치과대학 소아청소년치과학교실 및 구강과학연구소*

어린이의 맹출 중인 치아는 느슨한 치주 인대와 덜 석회화 된 치조골로 둘러싸여 있기 때문에 외상에 취약하다. 외상에 의한 치아의 완전 탈구는 상악 중절치에 가장 빈번하게 발생한다. 탈구된 치아의 재식 후 예후는 구강 외 보존 시간과 상태에 영향을 받는다. 외상당한 전치의 예후가 불량한 경우 소구치의 전치부 자가 이식은 임플란트 보철이 어려운 성장기 청소년 환자의 적절한 치료 방법으로 받아들여진다.

이 증례 보고는 외상당한 전치와 불량한 구강 위생 및 심한 총생을 가진 청소년 환자에서 치근이 완성된 소구치의 전치부 자가 이식을 통한 심미적 회복의 결과를 기술하고 있다. 복잡하고 어려운 구강 문제의 개선을 위해 포괄적이고 장기간에 걸친 치료가 진행되었다.