Case Report: A.J.

Premolar autotransplantation — eight years later

Congenitally missing premolars often present a diagnostic concern to the orthodontist. Arch crowding, facial profile and the existing malocclusion must be evaluated to diagnose and establish treatment objectives and a treatment plan. When premolars are missing bilaterally in the arches, diagnosis and treatment mechanics can often be straightforward. The choices are (1) to close all spaces so that natural teeth contact each other or (2) to maintain the primary tooth in the missing tooth area with the possibility that a replacement tooth might be needed once the primary tooth exfoliates. The compromises of maintaining the primary tooth can include the periodontal and occlusal concerns due to the size and shape of the crown and root both occlusal-gingivally and mesio-distally.

By Straty E.G. Righellis, DDS

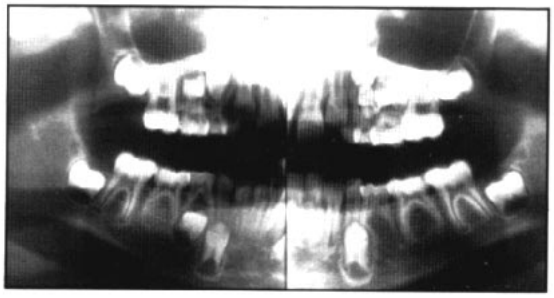
Case AJ presented at age eight with premolars missing in three quadrants, including missing both the first and second premolars in one quadrant; the fourth quadrant held a full complement of teeth, but with severe arch crowding. This presented the unique opportunity to consider premolar autotransplantation as an alternative plan of treatment.

The objective of this article is to report a case involving bicuspid autotransplantation from diagnosis and active treatment to several years following band removal. This report will discuss management of the case in the mixed dentition, the orthodontic mechanics and treatment results and cephalometric documentation of the effects of Class II elastics and reverse headgear to the mandibular dentition. Soft tissue management during the later part of active care and retention will also be discussed.

Diagnosis

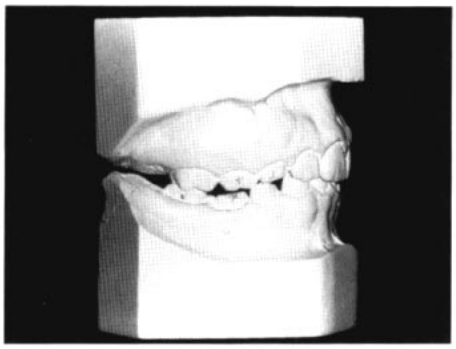
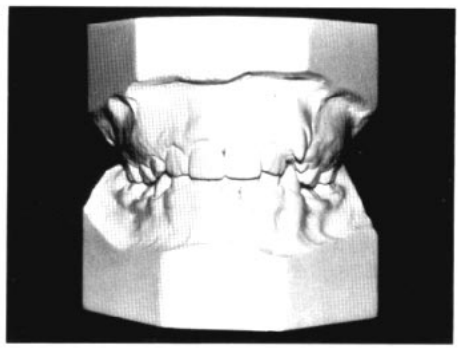
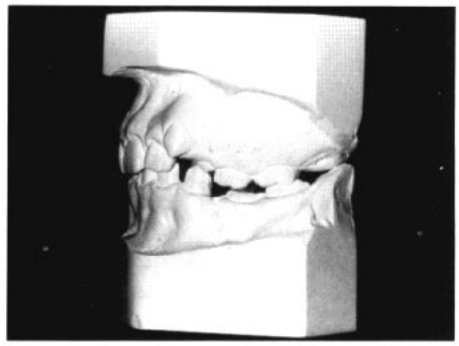
The patient presented at age eight with a mild Class II division 1 malocclusion with some evidence of lip strain upon full closure. Clinically, he had maxillary arch crowding with insufficient space for lateral incisors. Panoramic radiographs showed four missing premolars. Minimal mandibular arch crowding was apparent.

The immediate recommendation in early mixed dentition was to create temporary space for the maxillary lateral incisors by the removal of the maxillary primary canines. At this time, long-term considerations included the advantages and disadvantages of the premolar autotransplantation. The family was given two options: (1) eventually resolving the crowding in the maxillary left quadrant by the extraction of the maxillary left first premolar and eventually closing all spaces with the exception of the mandibular left second primary molar area. This primary tooth would be maintained indefinitely with the possibility of its eventual loss and prosthetic replacement. (2) Removal of the maxillary left first premolar and transplantation into the mandibular left premolar area. This would

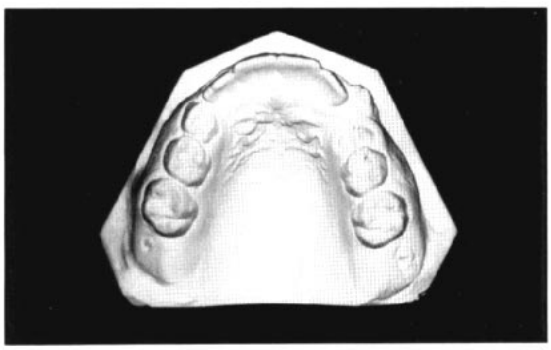
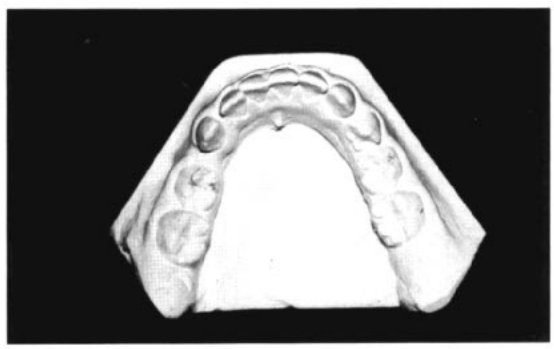


Panoramic radiograph at 7 years. Note missing premolars in three quadrants.

Pretreatment photographs at 8 years.

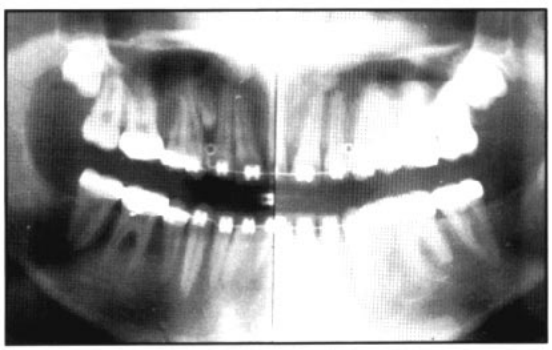
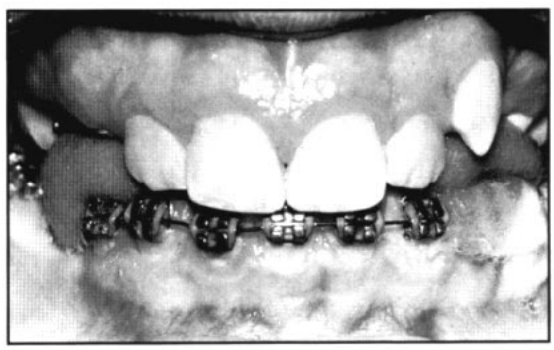




Pretreatment study casts at 11 years 10 months. Note Class II molar relationship and mandibular dental asymmetry.

Panoramic radiograph taken with active orthodontic treatment in progress.

Mandibular splint used immediately after the transplant to help maintain the premolar.



Periapical radiographs A. immediately following autotransplantation of the premolar,

B. two years after the surgical procedure,

C. almost eight years following autotransplantation.

allow full space closure and eliminate the need for eventual prosthetic placement.

The family wanted to pursue the second option, premolar autotransplantation, so the patient was monitored clinically and radiographically until the #12 root form was one-half to three-quarters of its anticipated ultimate root form.

Diagnostic problems included a Class II molar relationship, severe mandibular mid-line discrepancy (to patient's left), maxillary arch crowding, and missing bicuspids. Treatment objectives were maintenance of the facial profile, a Class I molar relationship, and resolution of crowding and closure of all spaces.

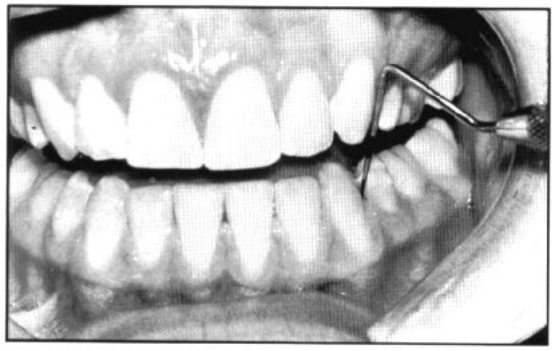
Treatment plan

1. Bond/band mandibular teeth and place maxillary removable bite plate to prepare the mandibular arch for the autotransplantation and begin to improve mandibular arch asymmetry.
2. Extract the remaining primary teeth and autotransplant #12 into #21 area, placing the tooth as far mesial as possible and out of occlusion.
3. As the mandibular arch is leveled, place a forward headgear with elastics to the mandibular first molars to help mesial molar movement to facilitate Class II molar correction.
4. Assess success of transplanted tooth clinically by mobility, and radiographically for root form changes.
5. Bond/band maxillary arch as canines erupt.
6. Close space to align roots and improve the molar relationship and dental midlines.
7. Details.
8. Retain with removable retainers.

Active care

During the initial 12 months of active orthodontic care, fixed orthodontic appliances were placed only on the mandibular arch. This was to improve the deep Curve of Spee and align the asymmetric mandibular dentition (see beginning models; note original asymmetric canine position). The transplanted tooth showed acceptable clinical mobility throughout treatment.

Later as the maxillary canines erupted, the maxillary arch and the second molars were bonded/banded. The arches were leveled and maxillary spaces closed by reciprocal space closure on a square stainless steel rectangular closing loop archwire. Mandibular arch space closure occurred on a rectangular nickel titanium wire with a reverse headgear worn 12 hours/night. Elastics were attached from the headgear to the mandibular first molars for five months. Class II elastics were worn for three months to improve the molar relationship.



Two years after treatment interproximal sulcus depth is less than three millimeters.

During the last few months of active care, a loss of labial gingival tissue was noted over #24 and #25, primarily due to inadequate oral hygiene. The patient's home care during orthodontic care required reminders to improve plaque control.

Prior to appliance removal, a final headfilm and panoramic radiograph were taken to assess incisor root form and position. To everyone's surprise, a supernumerary was noted between #6 and #7, which had not been evident radiographically in any previous images. The patient was advised of the anomaly and the extra tooth was removed prior to fixed appliance removal. Maxillary and mandibular retainers were delivered and the patient was requested to wear them 12 to 14 hours per day.

Overall active treatment time was 34 months with 38 active treatment visits. Fixed appliances on both the maxillary and mandibular arches were worn during 22 of the 34 months.

Results

Clinically

1. Acceptable facial profile.
2. Mild loss of labial gingival tissues over #24, #25.
3. Two millimeter midline discrepancy.
4. Absence of signs or symptoms of jaw or muscle dysfunction.
5. Transplanted tooth within normal limits regarding mobility.

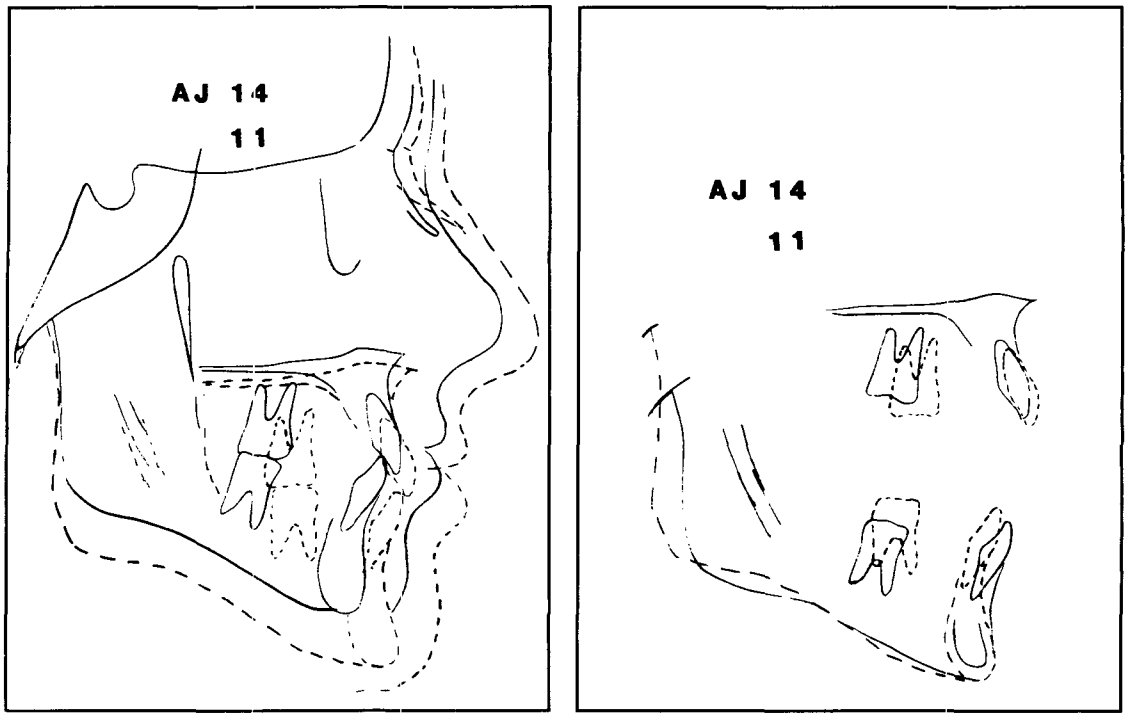
Model analysis

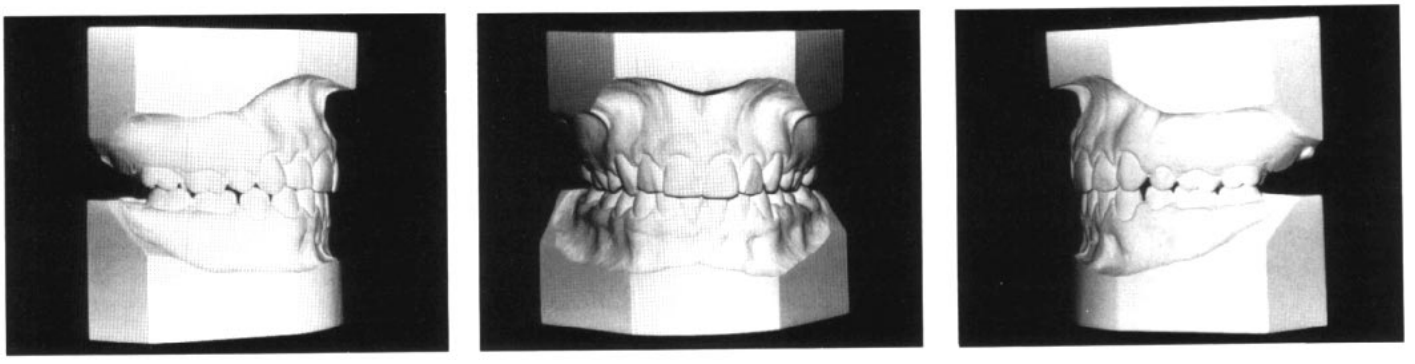
1. Class I molars with acceptable occlusion from both labial and lingual views.
2. Normal overjet and overbite.

Cephalometric evaluation

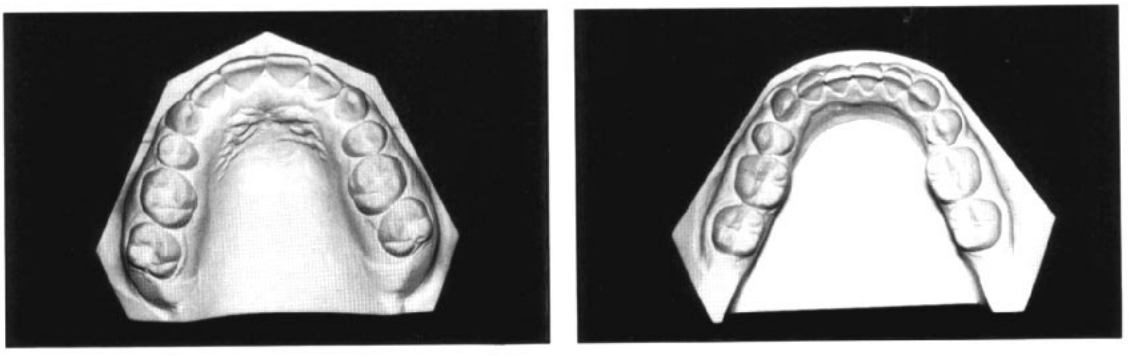
1. Overall superimposition shows normal, but exceptionally favorable mandibular growth and direction and normal growth and development of the maxillae relative to the anterior cranial base.
2. Mandibular superimposition shows lingual retraction of the mandibular incisors in spite of mechanics (Class II elastics and forward headgear to the mandibular molars) to minimize the occurrence.

Superimposed tracings

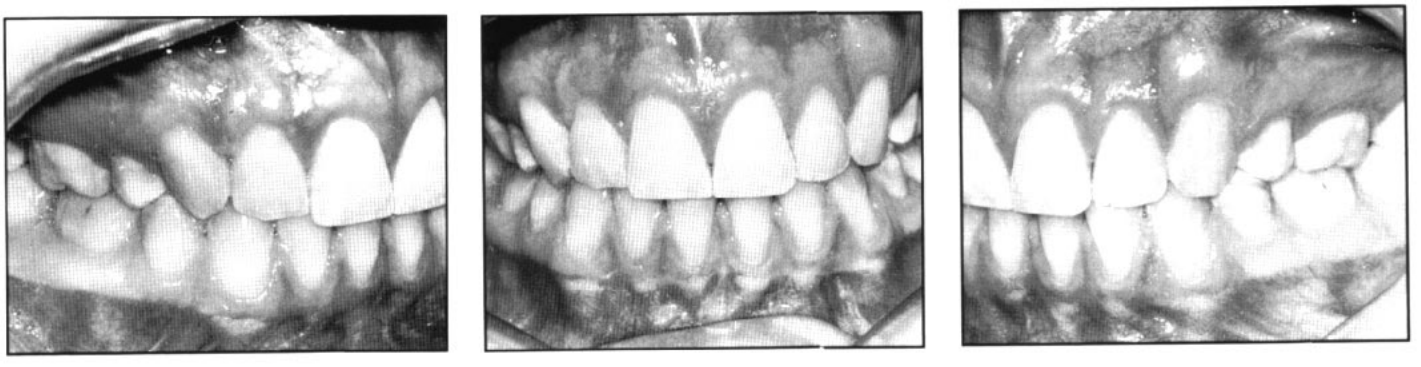




Posttreatment study casts



Final occlusion four and one-half years after appliance removal.



Radiographic analysis

The autotransplanted tooth demonstrates root canal stenosis with no additional root length increase after the transplant.

Long-term results

Clinical photographs and periapical radiographs almost eight years after the transplant demonstrate stable root form of transplanted tooth and normal soft tissue contour labial to #24 and #25. Additional treatment to this area was unnecessary, other than improved oral hygiene. Periodontal probing was within normal limits in the transplanted area.

Summary

This case was reported to demonstrate several issues:

1) Early mixed dentition patient management of missing teeth.
2) Active orthodontic care to close all spaces and improve the occlusion.
3) Autotransplantation is a viable treatment alternative when a permanent tooth must be extracted and there is need for a tooth in another area of the mouth.
4) Eight year follow-up of a transplanted tooth shows relative stability.

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Autotransplantation was performed by Dr. Larry Franz, Oral and Maxillofacial Surgeon in Oakland, CA.

References

1. Lagerstrom, L., Kristerson: Influence of orthodontic treatment on root development of autotransplanted premolars. Am. J. Orthod., 89:146-50, 1986.
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