

Case Report BC: Extraction decisions based on treatment responses

We have all been into treatment and lost sight of the "plan" we were so familiar with at the treatment planning stage. Eighteen to 21 months into treatment, we are faced with extraction decisions or surgical planning that should have been addressed at 9 or 12 months. This case report illustrates a treatment plan with several variables that were dependent upon treatment responses. It also illustrates planning a gingival graft to increase the crown length of a first premolar after the canine was substituted as the lateral incisor.

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At the initial exam, it was apparent this patient was genuinely concerned with the appearance of his teeth. He hadn't seen a general dentist for several years but he was clearly willing to comply with whatever was necessary to correct his dental problems.

The diagnosis was a Class I malocclusion with crowding. Frontally and in profile, the patient's facial proportions were balanced and acceptable, with lip competency at rest. Dentally, however, the patient had excessive maxillary and mandibular arch length deficiencies (Figure 2A-E). The maxillary right and left deciduous canines were over-retained. The maxillary right permanent canine was palatally impacted. The left canine had erupted ectopically to the facial and had minimal attached gingiva. The left lateral incisor had erupted ectopically to the palate with the left central and lateral incisors and canine in close proximity. There was gross carious involvement of the left central and lateral incisors. The mandibular canines had erupted ectopically to the labial with the mandibular right canine and maxillary right deciduous canine in crossbite.

In addition to the pretreatment panelipse, a maxillary occlusal and three periapical radiographs were taken to more closely examine the impacted canine and left lateral and central incisors (Figure 4A-C). The occlusal radiograph showed a possible supernumerary tooth in close proximity to the palatally positioned left lateral incisor. A radio-opacity was noted near the apex of the mandibular left second premolar. Although it did not

appear to be pathological, it would need to be monitored.

Cephalometrically, the patient had a Class I skeletal pattern (ANB 1°) with the maxillary anterior teeth well positioned within basal bone (Figure 3). The mandibular anterior teeth were slightly upright.

Both temporomandibular joints were asymptomatic. The patient had good range of motion in maximal opening as well as lateral and protrusive excursive movements.

Figure 1A-B
Pretreatment facial
photographs at 16
years 4 months.



Figure 1A

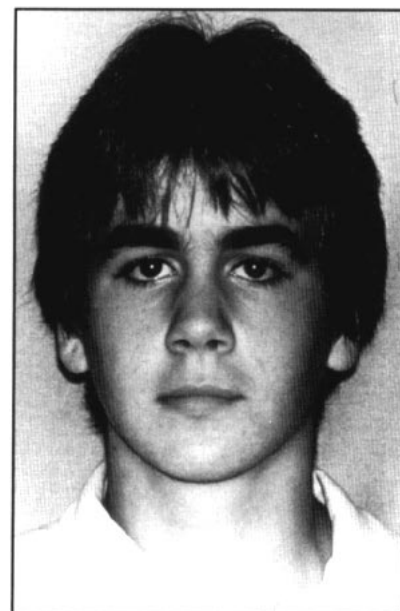


Figure 1B

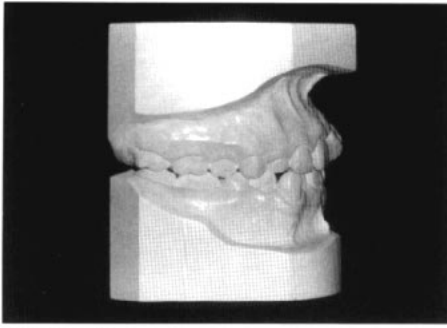


Figure 2A

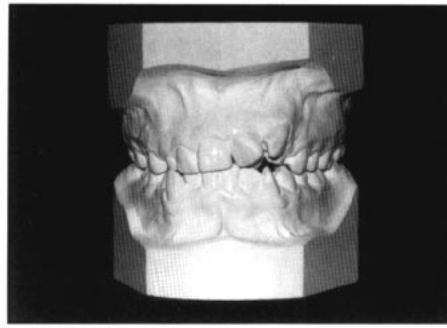


Figure 2B

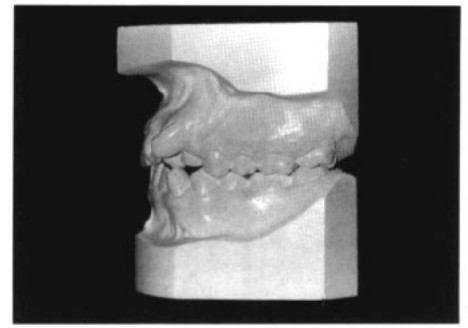


Figure 2C

Figure 2A-E
Pretreatment study casts show excessive maxillary and mandibular arch length deficiencies.

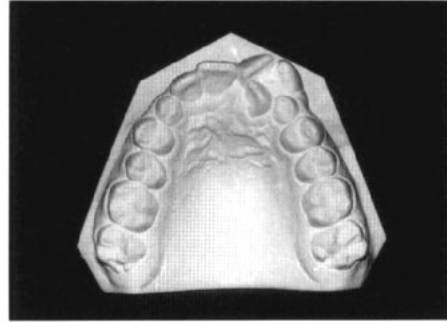


Figure 2D

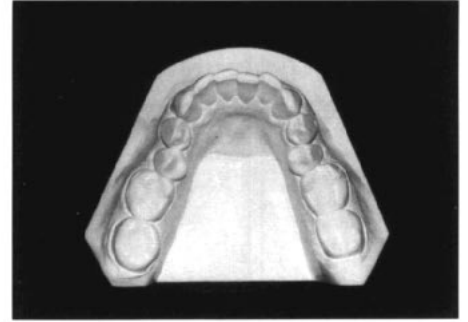


Figure 2E

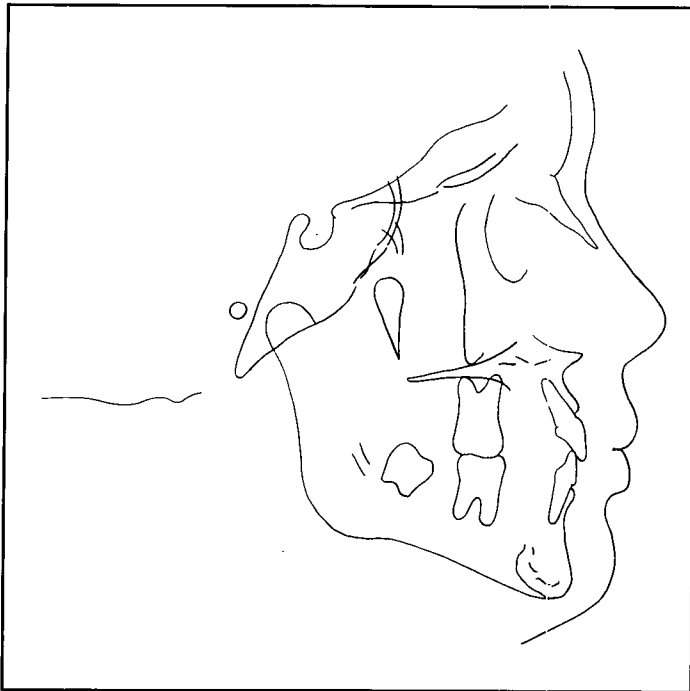


Figure 3
Pretreatment cephalometric tracing at 16 years 4 months.

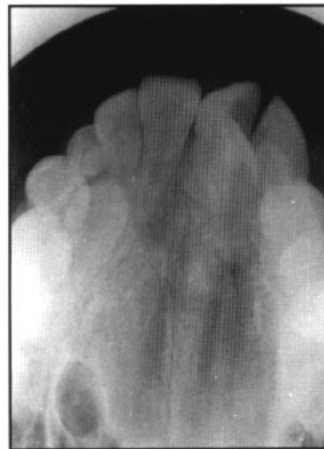


Figure 4A



Figure 4B



Figure 4C

Figure 4A-C
Gross carious involvement of the central and lateral incisors (#9 and #10) was present. Pretreatment radiographs show impacted left canine (#6), close root proximity of teeth #9, 10 and 11, and a supernumerary tooth close to the apex of the left lateral incisor.

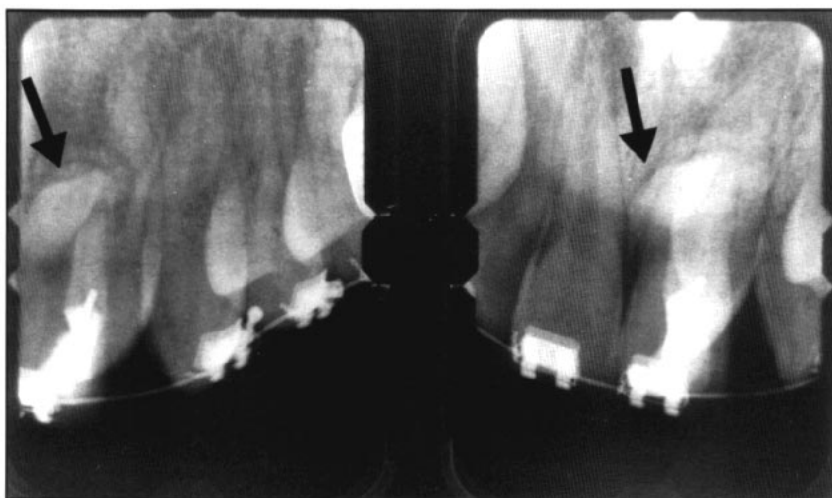


Figure 5A



Figure 5B

Treatment objectives

1. Achieve an ideal overbite and overjet.
2. Alleviate the excessive maxillary and mandibular arch length deficiencies.
3. Reposition the palatally impacted canine and remove the supernumerary tooth.
4. Restore the dental health through caries control.
5. Improve the root proximity of the maxillary anterior teeth.
6. Improve the periodontal health by management of the mucogingival problems.
7. Achieve the best balance of optimal esthetics and function by achieving a Class I posterior occlusion bilaterally with no balancing or working interferences.

General treatment plan

Outlining the most appropriate plan of treatment was not a matter of deciding whether or not extractions were indicated, but rather which teeth should be extracted and when. There was concern about removing four first premolars because several questions could not be answered regarding the long-term prognosis of the maxillary left lateral and central incisors (#9 and #10) until certain tooth movements were initiated.

Consequently, the plan initially called for removal of the over-retained deciduous canines, the maxillary right first premolar, and the mandibular right and left first premolars. This would allow for some alignment of the maxillary lateral and central incisors and canine (#9, 10 and 11) so the restorative dentist could determine the restorability of the grossly carious incisors. Depending upon his recommendation at that time, either the lateral incisor would be removed and the canine substituted for it, or the first premolar would be removed and the canine moved distally.

The lateral incisor would then be moved labially into alignment.

Treatment time was estimated at 30 months. Periodontal therapy to expose the palatal impaction and to manage the minimal attached tissue labial to the maxillary left canine would be necessary. Oral surgery would be required for the extractions, particularly surgical management of the supernumerary tooth. The patient was also advised that endodontic therapy on both carious incisors might become indicated.

Treatment progress

Removal of caries on the maxillary left lateral and central incisors resulted in pulpal exposure of the lateral incisor. An immediate pulp cap was performed and a temporary medicated restorative material placed. The treatment plan precluded removal of the maxillary left first premolar initially since the restorative dentist did not know the prognosis of the lateral incisor. The planned extraction of the other teeth was authorized. Separators were placed approximately 1 week after extraction of the maxillary right first premolar, mandibular first premolars, over-retained deciduous canines (#5, 21, 28, C, and H) and a supernumerary tooth. Fixed maxillary and mandibular edgewise appliances were placed 1 week later.

Initially, round nickel-titanium archwires were inserted. Approximately 6 months into treatment, additional periapicals of the maxillary left lateral and central incisors were taken, along with a maxillary occlusal radiograph, to reevaluate the tooth alignment (Figure 5A-B). The radiographs showed an additional supernumerary tooth, again in close proximity to the root of the lateral incisor.

After consulting with the restorative dentist, the decision was made to extract both the lateral incisor and the supernumerary tooth, and use the

Figure 5A-B Radiographs taken 6 months into treatment show probable root resorption of left lateral incisor and additional supernumerary tooth (arrow). Decision was made to remove the lateral incisor and supernumerary tooth and substitute the canine for the lateral incisor.

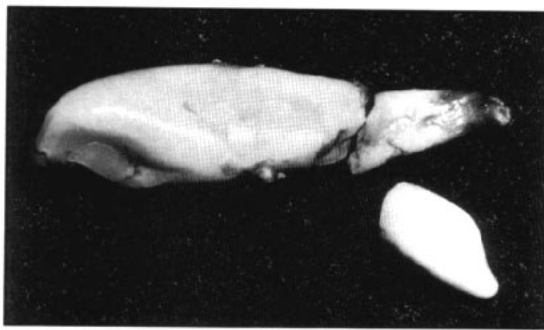


Figure 6

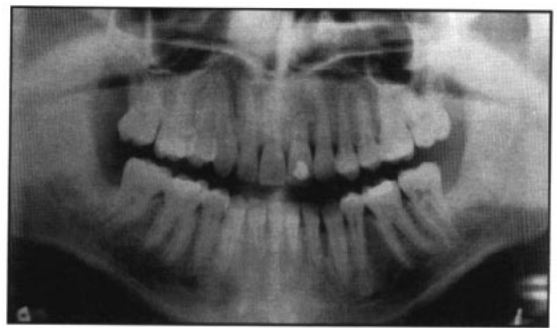


Figure 7



Figure 8A



Figure 8B



Figure 8C

Figure 6
Extracted maxillary left lateral incisor and supernumerary tooth. Note the external resorption present.

Figure 7
Posttreatment panelipse shows acceptable root proximity.

Figure 8A-C
Posttreatment intraoral photographs at age 19 years. Clinical crown heights of right lateral and left (substituted) canine are similar for optimal esthetics.

canine as a substitute. The prognosis for the lateral incisor was guarded due to possible external resorption from the supernumerary tooth. Endodontic therapy would then be required. The amount of tooth movement required to use the canine as a substitute would be considerably less than if the premolar was removed and the lateral incisor moved labially.

By this time, the maxillary right canine (#6) was moving favorably into the alveolus but the attached tissue labial to it was minimal to absent. Since grafting was indicated on both canines to insure an adequate zone of attached tissue, the periodontist was consulted about extending the free gingival graft of the left canine posteriorly to increase the zone of attached tissue facial to the left first premolar. The importance of achieving some crown coverage of the left canine was discussed. Doing the graft prior to any additional tooth movement would minimize additional recession over the canine and reduce the clinical crown height. Reducing the clinical crown height would improve the esthetics of the canine as a substitute for the lateral incisor. Additionally, the graft would provide an ample zone of attached tissue for gingival recontouring on the first premolar to increase its clinical crown height. This would result in an improvement in crown height relative to the canine on the right side and better balance.

Removal of the maxillary left lateral incisor and the second supernumerary tooth was completed. The extracted tooth showed evidence of external

resorption because of the supernumerary tooth (Figure 6). Edgewise archwires (.019 x .025) were placed approximately 11 months into treatment. The remaining space was closed reciprocally with elastomeric chains and sliding mechanics. After 18 months of treatment, the space was closed and a progress panelipse was taken to evaluate root proximity and health. Removal of the third molars was advised. This was done 8 months later.

During the finishing phase of treatment, the maxillary left canine root was positioned with approximately the same angulation as the right lateral incisor for optimal anterior esthetics (Figure 7). Lingual root torque was used to reduce the canine eminence. The first premolar was torqued slightly facially and rotated mesially to mimic the canine eminence and expose the facial surface so it would more closely resemble a canine when viewed frontally. The cusp tip of the substituted canine was gradually flattened and the tooth narrowed mesiodistally. The lingual surface was reduced to improve the contact with the mandibular incisors. The lingual cusp of the left first premolar was reduced to try to alleviate its contact in lateral excursions. Treatment was completed in 30 months.

Results

A very acceptable result was achieved and most treatment goals were satisfied. Overbite and overjet were brought within normal limits and the excessive arch length deficiencies were alleviated. Canine disclusion was established on the right side.



Figure 9A

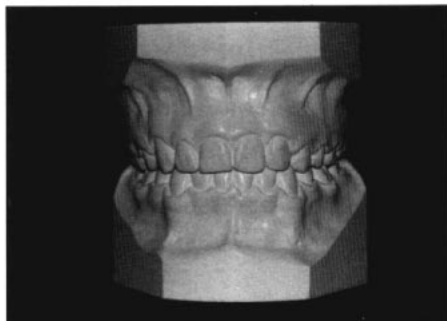


Figure 9B

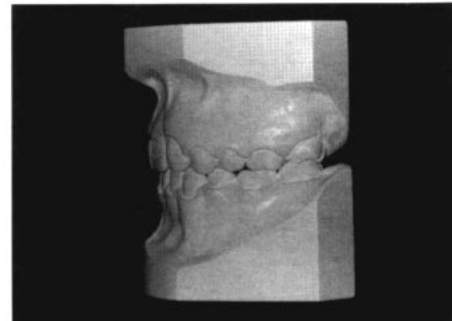


Figure 9C

Figure 9A-E
Posttreatment study casts at age 19 years.

Figure 9D

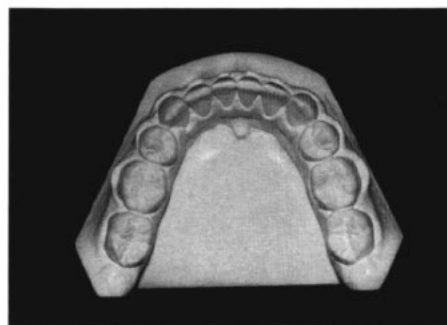


Figure 9E

An attempt to establish group function on the left side was unsuccessful. The patient still discluded on the buccal cusp of the first premolar with an early interference on the mandibular left second molar. The posttreatment panelipse shows acceptable root proximity. Both right and left temporomandibular joints remained asymptomatic throughout treatment and the patient has a good range of motion on maximal opening and lateral and protrusive movements.

Cephalometric measurements were virtually unchanged from pretreatment to posttreatment, with the exception of the soft tissue measurements (Figure 10). Retraction of the maxillary and mandibular incisors, although bodily, reduced the lip support by approximately 2 mm. This retraction, in combination with some growth of the nose and chin, resulted in a more concave facial profile.

Retention

Removable maxillary and mandibular retainers were placed 1 week after appliance removal. The maxillary Hawley retainer was of a circumferential design. The mandibular retainer had a canine-to-canine labial bow with C-clasps soldered to the labial bow for the second premolars. Clear acrylic was added to the labial bow of the mandibular retainer to provide additional retention of the severely crowded (pretreatment) anterior teeth. The retainers were worn full time for the first year with nightly wear recommended indefinitely thereafter.

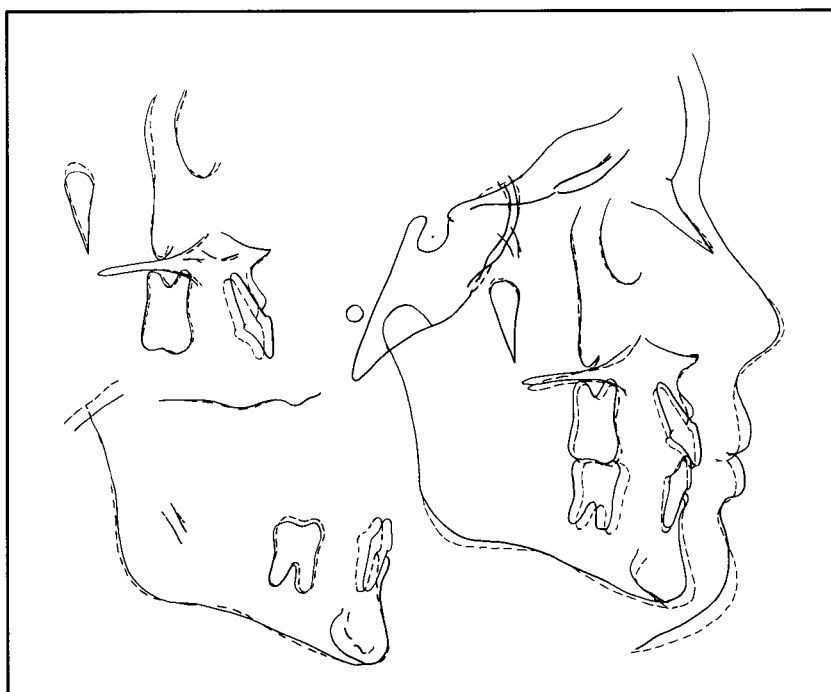


Figure 10

Final evaluation

The final treatment result is a very acceptable balance of function, esthetics, and optimal dental and periodontal health. This was accomplished through sequential diagnosis and treatment planning and the successful interaction of periodontal, restorative, and oral surgical therapies.

Anterior esthetics could be improved once the patient has a gingivectomy of approximately 2 mm on the maxillary left first premolar. This

Figure 10
Although inclination of the incisors was maintained, slight flattening of the profile occurred.

Figure 11A-C
Improved self-confidence accompanied the improvement in dental and periodontal health.

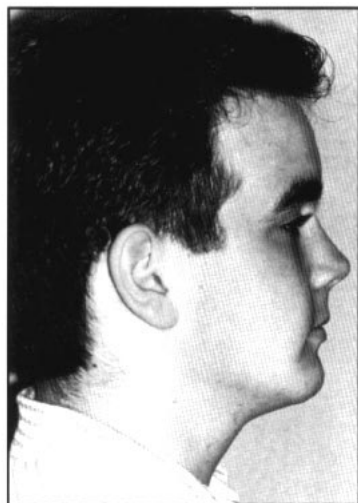


Figure 11A

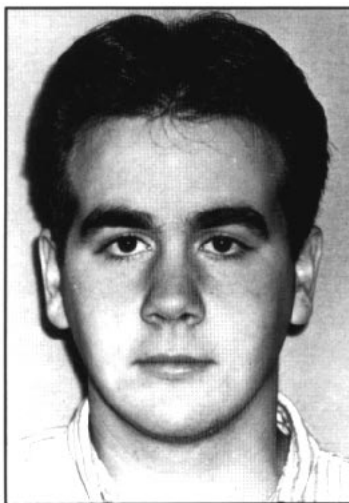


Figure 11B

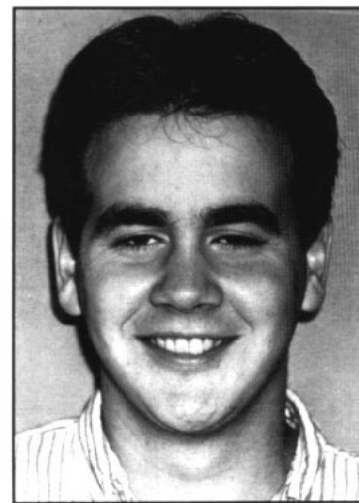


Figure 11C

would improve the balance of his smile by making the clinical crown length closer to that of the contralateral canine and improving the relationship of gingival form and contour between the premolar and the adjacent canine substitution. Unfortunately, the patient left for military service and hasn't had the gingivectomy procedure to date.

Equilibration of the posterior occlusion on the left side alleviated the lateral stress on the buccal cusp of the maxillary first premolar that was substituted for the canine. The second molars were also adjusted. Achieving group function occlusion on the left side helped distribute the occlusal forces more evenly.

Radiographically, the apex of the maxillary left central incisor is severely dilacerated with the root tip in close proximity to the root of the canine. In the absence of pathology, this probably will not become a problem periodontally or endo-

dontically. The radio-opacity near the apex of the mandibular left second premolar that was present pretreatment did not appear to enlarge.

The profile changes would have been difficult to avoid, considering the dental malocclusion. The loss of upper lip support was minimized by maintaining the torque of the maxillary incisors. Outlining treatment decisions based on treatment responses initially and executing these early in treatment allowed a difficult malocclusion to be corrected within a reasonable period of time.

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