

# Practical and Esthetic Considerations in Adult Canine-Extraction Treatment

MILTON MERI BENITEZ FARRET, DDS, MSD, PHD  
MARCEL MARCHIORI FARRET, DDS, MSD, PHD

**O**rthodontists generally avoid canine extractions because of the importance of these teeth in establishing a functional, esthetically correct occlusion. Not only are the canines necessary in guiding lateral disclusion,<sup>1-6</sup> but their prominence serves as a base for the upper lip while their high gingival contour helps determine the smile line.<sup>1,3,7-9</sup>

Adult patients sometimes seek orthodontic treatment because a canine is absent or damaged due to cavities, periodontal disease, or cracks.<sup>2,3,10-13</sup> In such a case, when a canine extraction is unavoidable, replacement with an implant or prosthesis is usually the first treatment option.<sup>7,10</sup> A less frequently considered alternative, however, is the extraction of both the affected canine and the contralateral canine to establish bilateral symmetry by moving the first premolars into the canine positions.<sup>14</sup>

Cases involving canine extraction must follow a careful course of treatment to ensure a functional occlusion.<sup>1,13</sup> This article describes ca-

nine extraction and orthodontic treatment in two adult patients.

## Case 1

A 31-year-old female presented with a missing upper right canine crown due to trauma (Fig. 1). Clinical analysis showed a mesodivergent facial pattern, a slightly convex profile, an impaired smile due to the absence of the canine crown, severe upper anterior crowding, variations in tooth color, and an unesthetic upper-left-canine prosthesis. The patient had a bilateral Class II molar relationship with excessive overjet and overbite; the upper midline was deviated to the left by 2mm. Radiographic examination revealed a residual upper-right-canine root.

Three treatment options were discussed with the patient. The first was to distalize the upper molars to establish a Class I molar relationship, thereby correcting the overjet and the anterior crowding, and to replace the upper right canine with an implant or prosthesis. The patient rejected this option because of the long anticipated treatment time and the need for prosthetic rehabilitation. The second option involved extraction of the residual root of the upper right canine as well as the upper left first premolar, followed by orthodontic movement to establish a Class I canine relationship on the left side, close the space on the right, and position the right first premolar in the site of the canine. This option was rejected because it would have led to asymmetry, which would have made it difficult to maintain lateral disclusion, and because surgery would have been required after treatment to restore the gingival contour. The third option called for extraction of the upper-right-canine root and the upper left canine to maintain



Dr. Milton Farret



Dr. Marcel Farret

Dr. Milton Farret is Professor and Chairman, Department of Orthodontics, Federal University of Santa Maria, Santa Maria, RS, Brazil. Dr. Marcel Farret is in the private practice of orthodontics at 1000/113 Floriano Peixoto St., Santa Maria, RS, 97015-370 Brazil; e-mail: marcelfarret@yahoo.com.br.

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**Fig. 1 Case 1. 31-year-old female patient with missing upper-right-canine crown, upper-arch crowding, and Class II molar relationship before treatment.**

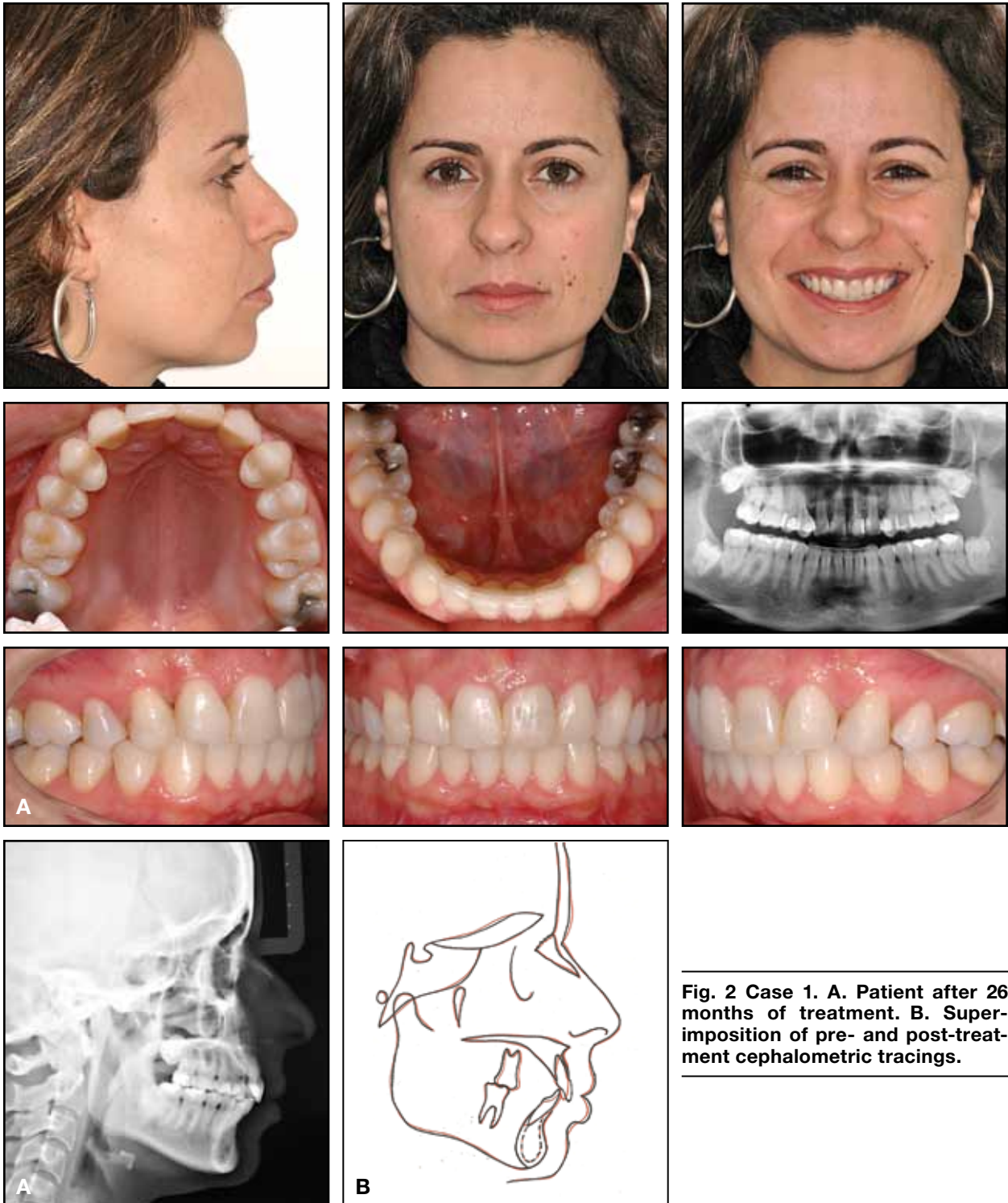


Fig. 2 Case 1. A. Patient after 26 months of treatment. B. Superimposition of pre- and post-treatment cephalometric tracings.

a bilateral Class II molar relationship. The upper first premolars would occupy the canine sites, thereby establishing group-function lateral disclusion. We recommended this option as the best of the three, and the patient agreed to the proposed treatment.

After .022" × .028" standard edgewise brackets were bonded in both arches, leveling and alignment were performed using an archwire sequence from .012" nickel titanium to .019" × .025" stainless steel. The upper incisors were shifted to the right, using elastic chains, to correct the upper midline. The upper left posterior teeth migrated slightly mesially after the canine extractions.

The incisors were retracted on an .018" × .025" stainless steel archwire with T-loops distal to the lateral incisors. An .019" × .025" stainless steel archwire was then placed for precise management of root torque—especially on the first premolars, which needed labial displacement to simulate canine prominence.

After 26 months of treatment, an optimal occlusion had been established with good intercuspation, proper overjet and overbite, coincident midlines, and no crowding (Fig. 2A). The roots of the upper first premolars were labially displaced, and an adequate gingival contour was obtained, improving the smile esthetics. The cephalometric superimposition showed a slight uprighting of the central incisors and substantial proclination of the lower incisors (Fig. 2B). A 3-3 twist-flex wire was bonded in the lower arch for retention, and a removable wraparound appliance was prescribed for the upper arch.

### Case 2

A 37-year-old female presented with an unesthetic smile resulting from an upper midline deviation and lower-arch spacing. She displayed a mesodivergent facial pattern and straight profile and an anterior open bite; the upper midline was deviated 4mm to the left (Fig. 3). The upper left canine and both lower first molars had been extracted in adolescence, although all four third molars were present. Radiographic examination showed that the adjacent teeth were inclined to-

ward the extraction sites in both arches.

The first treatment option discussed with the patient involved distalization of the upper dentition to obtain a Class I molar relationship while correcting the midline deviation and creating space for replacement of the upper left canine with an implant or prosthesis. This option was rejected due to the duration of treatment and the necessity of prosthetic rehabilitation. A second possibility was to extract the upper right first premolar to correct the midline while keeping the molars in a Class II relationship. We could not recommend this alternative because of the difficulty in achieving smile symmetry with a premolar on one side and a canine on the other. The third option involved extraction of the upper right canine, followed by space opening to correct the midline and establish a Class II molar relationship, with the upper first premolars in the canine positions. We recommended this option, and the patient accepted.

Leveling and alignment were initiated with .022" × .028" standard edgewise brackets in both arches, excluding the lower left molars, on archwires increasing in size from .014" nickel titanium to .019" × .025" stainless steel. The lower left molars were then bonded and uprighted using T-loops, and the space created by extraction of the upper right canine was closed by moving the incisors individually with elastic chains. After the spaces had been closed, the midline corrected, and the lower molars uprighted, an .019" × .025" stainless steel archwire was placed with accentuated labial torque for the upper first premolars.

An ideal occlusion was achieved in 28 months of treatment, with coincident midlines, proper overjet and overbite, and good intercuspation (Fig. 4A). Replacement of the canines with the upper first premolars resulted in an esthetically improved smile. The cephalometric superimposition demonstrated notable uprighting of the upper incisors and lower molars (Fig. 4B). Some of the marginal gingival discrepancy observed over the central incisors at the beginning of treatment could still be seen after debonding. A 3-3 retainer was bonded in the lower arch, and a removable wraparound retainer was prescribed for the upper arch.



**Fig. 3 Case 2. 37-year-old female patient with previously extracted upper left canine and lower first molars, upper midline deviation, and lower-arch spacing before treatment.**



**Fig. 4 Case 2. A. Patient after 28 months of treatment. B. Superimposition of pre- and post-treatment cephalometric tracings.**

## Discussion

The canines are extremely important in establishing a functional occlusion: by guiding lateral disclusion of the mandible, they protect the TMJ and the remaining teeth.<sup>1,2,4,5</sup> The prominence of the canines acts as a support for the upper lip, preventing the nasolabial sulcus from becoming too deep.<sup>1</sup> Furthermore, the canines have a unique shape and color, which makes it challenging to replace them with premolars.<sup>1,7-9,13,15-19</sup>

Although first premolars are more often chosen for extraction in conjunction with orthodontic treatment,<sup>3,7</sup> a canine is sometimes extracted unilaterally due to trauma or extensive restorations,<sup>2,13</sup> or occasionally to facilitate the alignment of other teeth.<sup>14</sup> Impacted canines, which are relatively common, are often positioned so that extraction is a better choice than attempting to move them into the arch, which may carry the risk of root damage to the affected canine or surrounding teeth. Such a situation can cause an asymmetry that has to be corrected orthodontically by either closing or opening spaces for implant-prosthetic rehabilitation.<sup>12</sup>

The two cases shown here presented different scenarios that both benefited from canine extractions. Although the first patient's residual canine root might have been used to support a prosthetic crown, the cervical edge of the root was considerably below the bone level, and extensive surgery would have been required to expose the root, likely creating a gap between the bone and the gingiva on the labial aspect.<sup>14</sup> Another option would have been to extrude the root, but because endodontic treatment had already been carried out and there was an accentuated bone defect around the line of fracture, the prognosis was doubtful.

The second patient's upper left canine had been extracted many years previously; by the time she consulted us, the space was totally closed. The

contralateral canine was in perfect condition. We could have chosen to extract the upper right first premolar, but in the interest of maintaining symmetry, the decision was made to extract the upper right canine.

Special consideration must be given to orthodontic mechanics when replacing upper canines with first premolars. Accentuating the labial root torque of the upper first premolars will simulate canine prominence, thereby supporting the upper lip, raising the gingival level, and filling the smile as canines do.<sup>12,13,19</sup> Lateral disclusion must be established in group function, however, to prevent overloading the first premolars. This may be accomplished by positioning the labial cusp of the upper first premolar slightly above the height of a normal canine. Adjusting (abrading) the initial contacts on the first premolars during lateral function may help produce an ideal disclusion.<sup>1,19</sup> Long-term analysis of patients with group-function occlusion after the relocation of first premolars to canine sites—as in treatment of missing lateral incisors with space-closure mechanics—has shown healthy gingival tissues and optimal premolar root conditions.<sup>4,5,16,17</sup> Such findings suggest that the techniques described in this article are safe and predictable over time.<sup>20,21</sup>

The lingual cusps of relocated first premolars may also have to be abraded to avoid interference during disclusion. Gingival contours can be corrected, if necessary, with periodontal surgery.<sup>3,19</sup> Both of our patients showed anterior marginal gingival discrepancies, but the first patient refused periodontal surgery because the small gap did not significantly affect her smile; the second patient's smile line concealed her somewhat larger gap. Both patients' occlusions were esthetically and functionally correct at the end of treatment.

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