Canine Bracket Guide for Substitution Cases

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The most common error in maxillary canine-lateral incisor substitution cases is inadequate palatal torque of the relocated canine.[1] Although proper bracket selection can improve the canine torque, there is some disagreement regarding which bracket to choose. Proposed options have included maxillary central incisor, maxillary lateral incisor, flipped (180°) maxillary canine, and flipped (180°) mandibular second premolar brackets.

This article examines the rationale for various bracket choices, as well as the other factors that influence canine torque. The following guide is based on the MBT* prescription and should be modified appropriately for Roth or Damon** prescriptions.

Maxillary Central Incisor Bracket

The main reason for using a central incisor bracket *(+17° torque, 4° tip)* is to add palatal root torque that will counteract the canine's root prominence (Fig. 1). The central incisor bracket provides significantly more palatal root torque than a lateral incisor bracket would, thus compensating for the torque loss within the wire-slot interface. The bracket position can be adjusted to add another 4° of distal root tip.

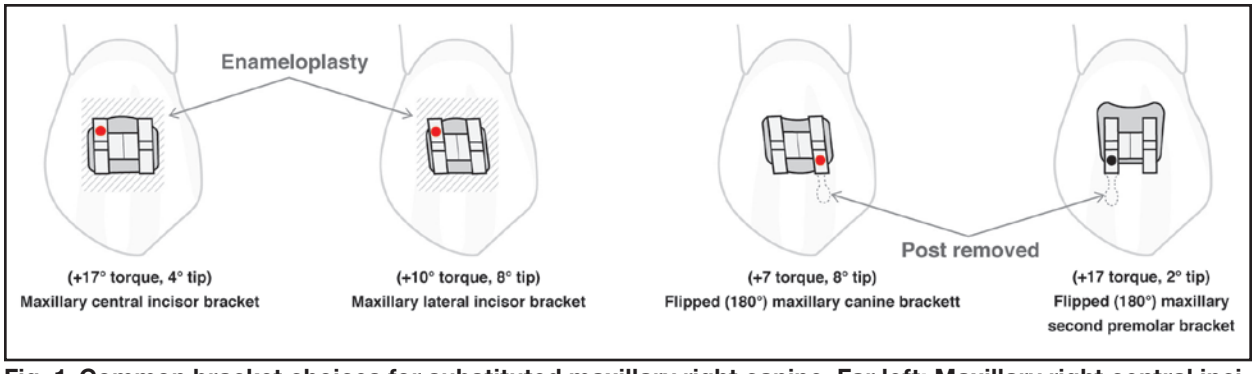

Fig. 1 Common bracket choices for substituted maxillary right canine. Far left: Maxillary right central incisor bracket adds palatal torque. Left center: Maxillary right lateral incisor bracket adds torque and controls tip. With incisor brackets, enameloplasty is advised prior to bonding. Right center: Flipped maxillary right canine bracket controls torque and tip without first having to perform enameloplasty, though it may not provide sufficient torque. Canine bracket provides same tip as lateral incisor bracket. Far right: Flipped mandibular right second premolar bracket provides same torque as central incisor bracket without enameloplasty. With flipped brackets, posts must be removed after bonding.




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Maxillary Lateral Incisor Bracket

The rationale for using a lateral incisor bracket *(+10° torque, 8° tip)* is its added torque and tip control, as well as the simplicity of placing it on a tooth in the lateral incisor position. Because the distal tip is the same as that of the canine bracket, the slot will be parallel to the planned incisal edge.

Considering the flatter bases of both the maxillary central and lateral incisor brackets, enameloplasty is advised prior to bonding.

Flipped Maxillary Canine Bracket

The most commonly recommended solution is a flipped canine bracket *(becomes +7° torque, 8° tip)* on the same side. The principle of "flip, don't switch" applies. Flipping the bracket reverses the labial root torque while the distal tip remains. This provides more torque and tip control without having to first reshape the canine.

Flipped Mandibular Second Premolar Bracket

A lesser-known option is a flipped mandibular second premolar bracket *(becomes +17 torque, 2° tip)* on the same side. The main advantage is in adding palatal torque without having to reshape the canine. A flipped mandibular second premolar bracket has the same palatal torque as a maxillary central incisor bracket. The bracket position can be adjusted for an extra 6° of distal root tip.

The curved bracket bases of the maxillary canine and mandibular second premolar adhere to the canine's facial curvature, so that enameloplasty is unnecessary prior to bonding. The flipped brackets do require removal of their posts after bonding.

Other Factors Influencing Canine Torque

Bracket selection will have little impact on torque if the archwire does not adequately fill the bracket slot. Torque is created by the physical interaction between the archwire and the slot. For every .001" of vertical play or "slop" between slot and archwire, approximately 5° of torque is lost.[2] We refer to this as the "1 to 5" rule of thumb (Fig. 2).

As an example, an .017" × .025" archwire in an .018" slot will have .001" of play, or approximately 5° of rotational freedom (.018" minus .017" equals .001", or 5° of torque loss). An .019" × .025" archwire in an .022" slot will have .003" of play, or 10-15° of torque loss.

Theoretically, the torque loss of an .019" × .025" wire in an .022" slot would be calculated as 7.3°.[3] In actuality, the torque loss is closer to 10-15°, because the dimensions of the bracket slots tend to be larger and the dimensions of the archwires smaller or more rounded than stated by the manufacturer.[4,5]

*MBT: Trademark of 3M Unitek, Monrovia, CA; www.3MUnitek.com.
**Damon: Registered trademark of Ormco Corporation, Orange, CA; www.ormco.com.

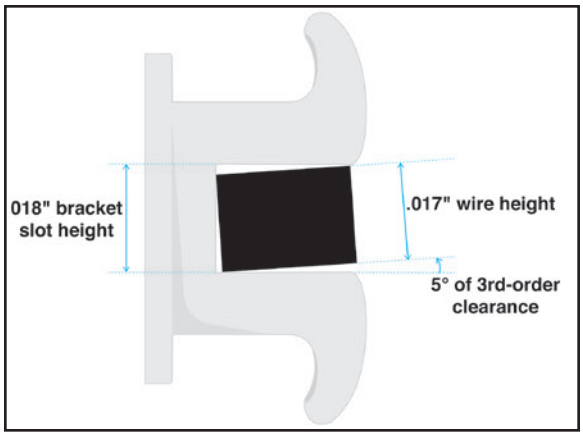

Fig. 2 "1 to 5" rule of thumb: for every .001" of vertical play between bracket slot and archwire, about 5° of effective torque is lost. .017" × .025" archwire in .018" slot will have .001" of play, or about 5° of rotational freedom. Theoretically, .019" × .025" archwire in .022" slot will have .003" of play, or 10-15° of rotational freedom. Wire performs better than expected in clinical use, presumably due to residual tip, which remains uncorrected at time of wire placement.[10]

Some of the torque loss inherent in the wire-slot interface is regained during the detailing phase by extruding the canine and moving it labially. Canine extrusion helps achieve a natural-looking gingival architecture, though it may cause traumatic occlusal contact with the mandibular incisors. Placing a labial step-out bend in the archwire will help avoid excessive contact and add palatal root torque to the canine[6] (Fig. 3).

Various other factors influence canine torque irrespective of bracket selection. These include archwire material,[7] bracket material,[8] type of ligation,[9] interbracket distance, and individual variability of biology and tooth morphology. Depending on the case, auxiliary springs or torquing bends may still be needed.

At relatively low torque angles—including the bracket prescriptions described here—the archwire material makes little difference in the expression of canine torque. At higher torque angles (>24°), stainless steel wires yield twice the torque expression of beta titanium and three times that of nickel titanium.[7] If differential torque is placed in the archwire only at the canine, the torsional force from stainless steel may be excessive. Beta titanium is a better solution for extreme torquing bends.

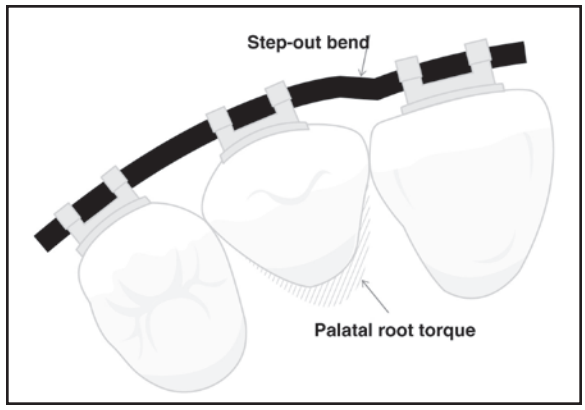

Fig. 3 Labial step-out bend in archwire adds palatal root torque and reduces occlusal trauma on mandibular incisors while improving interproximal contact between central incisor and canine.[2] In this image, flipped canine bracket is placed on relocated canine.

Conclusion

The choice of bracket for a relocated maxillary canine should be based primarily on two factors: the palatal torque and the shape of the bracket base. A flipped canine bracket is commonly recommended, but it may not provide sufficient torque. A lateral incisor bracket provides slightly greater torque, and a central incisor bracket even more, but enameloplasty is generally required prior to bonding. If you prefer delaying enameloplasty until the end of treatment and significant torque is needed, consider using a flipped mandibular second premolar bracket.

The torque of the relocated canine bracket also depends on archwire thickness, among other factors. To minimize torque loss, advance to an .017" × .025" archwire for an .018" slot or an .019" × .025" archwire for an .022" slot.

Those interested in learning more about esthetics in canine-lateral incisor substitution cases should read the landmark JCO article by Rosa and Zachrisson.[6]

REFERENCES

1. Thordarson, A.; Zachrisson, B.U.; and Mjör, I.A.: Remodeling of canines to the shape of lateral incisors by grinding: A long-term clinical and radiographic evaluation, Am. J. Orthod. 100:123-132, 1991.
2. Alexander, R.G.: *The 20 Principles of the Alexander Discipline*, Quintessence Publishing Co., Inc., Chicago, 2008.
3. Joch, A.; Pichelmayer, M.; and Weiland, F.: Bracket slot and archwire dimensions: Manufacturing precision and third order clearance, J. Orthod. 37:241-249, 2010.
4. Cash, A.C.; Good, S.A.; Curtis, R.V.; and McDonald, F.: An evaluation of slot size in orthodontic brackets—Are standards as expected? Angle Orthod. 74:450-453, 2004.
5. Meling, T.R. and Odegaard, J.: On the variability of cross-sectional dimensions and torsional properties of rectangular nickel-titanium archwires, Am. J. Orthod. 113:546-557, 1998.
6. Rosa, M. and Zachrisson, B.U.: Integrating esthetic dentistry and space closure in patients with missing maxillary lateral incisors, J. Clin. Orthod. 35:221-234, 2001.
7. Archambault, A.; Major, T.W.; Carey, J.P.; Heo, G.; Badawi, H.; and Major, P.W.: A comparison of torque expression between stainless steel, titanium molybdenum alloy, and copper nickel titanium wires in metallic self-ligating brackets, Angle Orthod. 80:884-889, 2010.
8. Morina, E.; Eliades, T.; Pandis, N.; Jäger, A.; and Bourauel, C.: Torque expression of self-ligating brackets compared with conventional metallic, ceramic, and plastic brackets, Eur. J. Orthod. 30:233-238, 2008.
9. Brauchli, L.M.; Steineck, M.; and Wichelhaus, A.: Active and passive self-ligation: A myth? Part 1: Torque control, Angle Orthod. 82:663-669, 2012.
10. McLaughlin, R.; Bennett, J.; and Trevisi, H.: *Systemized Orthodontic Treatment Mechanics,* Mosby, St. Louis, 2001.