Eruption of Impacted Canines with an Australian Helical Archwire

CHRISTINE HAUSER, DDS
YON H. LAI, DDS
ELINA KARAMALIKI, DDS

Various methods have been proposed to bring impacted canines into the arch after surgical exposure.[1-8] Elastic force modules have the disadvantages of rapid force decay and the need for stiff main archwires to avoid side effects on the adjacent teeth.[1] If a superelastic nickel titanium wire is inserted directly into the canine bracket, the wire must be deflected, and archform can become distorted. This can result in tipping or intrusion of adjacent teeth, canting of the occlusal plane, and a consequent lateral[2] or anterior open bite. An overlay or piggyback wire avoids these side effects, but delays the forced eruption of the impacted canine, since the rest of the dentition must be fully aligned before a sufficiently rigid main archwire can be placed. Furthermore, the stiff primary archwire prevents the flexible nickel titanium archwire from sliding freely through the brackets.

If the movement of an impacted canine is delayed, subsequent healing and scarring of the surrounding tissues may prevent further eruption and require additional surgery. This article demonstrates an alternative technique, using an Australian helical archwire* to obtain continuous canine eruption.

Mechanics of the Australian Helical Archwire

Australian wire is made of austenitic stainless steel that has been heat-treated and cold-drawn down to a desired diameter to gain exceptional resilience, toughness, and tensile strength.[9] For moving impacted teeth, we recommend the Special Plus .016" archwire; straight lengths are preferable over spooled wire because they are more formable and less brittle.

The Australian wire is bent with helices that serve as stops against the brackets of the adjacent teeth to maintain space for the erupting canine (Fig. 1). An additional incisal helix increases the resilience of the system and anchors the stainless steel ligature running to the canine attachment. The force vector for the canine can be altered by changing the transverse position of the incisal helix.

The appliance is activated by twisting the steel ligature. This force also maintains space for the erupting tooth. The amount of force can be varied by using different archwire designs (Fig. 2).

Clinical Procedure

After leveling and alignment has been carried out, sufficient space must be provided for the eruption of the canine. During surgical exposure, if placement of the canine attachment is complicated by a wet field, a moisture-compatible bonding material may be used. Silver or gold chain attachments with multiple eyelets are recommended because they break less frequently, are easier to engage, and are easier to reactivate than other materials.

A twisted stainless steel ligature is affixed to the end of the chain attachment. The Australian helical archwire is placed in the bracket slots and activated by passing the steel ligature

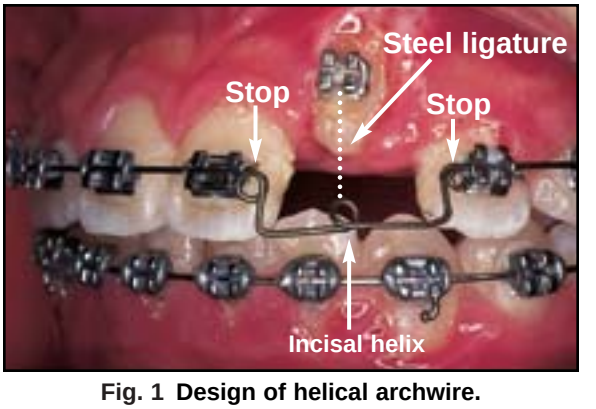


Fig. 1 Design of helical archwire.

*A.J. Wilcock Australian wire, distributed by G&H Wire Company, P.O. Box 248, Greenwood, IN 46142.

Dr. Hauser is a Lecturer and Dr. Lai is an Associate Clinical Professor and Director of the Cleft Palate Group, Department of Orthodontics, College of Dentistry, New York University, 345 E. 24th St., New York, NY 10010. Dr. Karamaliki, a former postgraduate resident in the Department of Orthodontics, New York University, is in private practice in Papanikoli, Greece.

Dr. Hauser

Dr. Lai

Dr. Karamaliki

through the incisal helix. The ligature is then twisted until the correct deflection is achieved and the desired force is applied to the impacted tooth (Fig. 2). The force should not exceed 200g.

Further activation is performed every two weeks by twisting the steel ligature a few turns until the tip of the crown is exposed. This should keep the eruptive force between 150g and 200g—enough to overcome the resistance from soft tissue and bone. Once the clinical crown is visible, the force can be reduced to between 60g[7] and 150g, and the patient can then be seen every four weeks. Final eruption can be accomplished with either a nickel titanium wire or an elas-

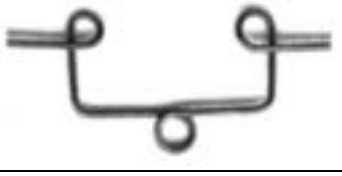
Archwire Design (.016")	Amount of Deflection (mm)	Force Delivery (g)
	0.5 1.0 1.5	110 150 215
	0.5 1.0 1.5	80 140 190
	0.5 1.0 1.5	120 155 210
	0.5 1.0 1.5	160 225 >250
	0.5	>250

Fig. 2 Correlation between amount of deflection and force delivery.

Fig. 3 30-year-old male with impacted maxillary canines and maxillary space deficiency before treatment.

Fig. 4 A. Elastomeric thread attached to .018" × .022" stainless steel archwire for eruption of canines. Tip of left canine was visible after six months. B. Further eruption of both canines attempted with .018" nickel titanium piggyback wire. C. Australian helical archwire used to stimulate eruption of right canine. Half of right canine crown was exposed within three weeks.

tomeric thread.

Case Report

A 30-year-old male sought orthodontic treatment for alignment of his impacted maxillary canines (Fig. 3). Clinical examination revealed a Class I occlusion with a mandibular midline shift of 2mm to the right. Despite a 6.5mm space deficiency for the maxillary canines, a nonextraction approach was chosen.

A preadjusted appliance was placed in the maxillary arch, with open-coil springs used to provide space for the canines. Seven months later, the canines were surgically exposed, and their movement was initiated with elastomeric thread from the canine attachments to the .018" × .022" stainless steel archwire (Fig. 4A).

Six months later, the tip of the left canine was visible, but the right canine was not erupting. An .018" nickel titanium piggyback wire was inserted (Fig. 4B). After eight months, this had still produced no appreciable movement.

The .016" Australian helical archwire was then inserted (Fig. 4C). Within three weeks, half of the right canine crown was exposed. The helical archwire was removed three months later, and final eruption was accomplished with an elastomeric thread (Fig. 5).

Fig. 5 Patient after three years of treatment with fixed appliances. Future prosthodontic repair of mandibular central incisors and right first premolar is planned.

Discussion

The helices in the Australian wire provide enough elasticity to make an adequate substitute for elastic force modules. The Australian helical archwire also provides a longer period of continuous activation without significant force decay, thus requiring fewer appointments. Since the Australian wire does not require a stiff main archwire, it can be inserted after a relatively short period of leveling, allowing a shorter overall treatment time.

In contrast with overlay or piggyback techniques, the Australian helical archwire provides a virtually friction-free system. It also avoids the side effects associated with superelastic nickel titanium archwires. Unlike a rectangular arch, a round arch has no torquing effect on the adjacent teeth. The stiffness of the Australian wire resists deformation by the forces applied to it and reduces intrusive reciprocal forces on the adjacent teeth. If intrusive forces are a concern, however, vertical elastics can be used.

Although this article has concentrated on movement of impacted canines, the same method may be applied to stimulate the eruption of any other tooth.

ACKNOWLEDGMENT: The authors would like to thank postgraduate resident Dr. T. Salyer for allowing us to publish the records of the case treated by him.

REFERENCES

1. Shroff, B.: Canine impaction: Diagnosis, treatment planning and clinical management, in *Biomechanics in Clinical Orthodontics*, ed. R. Nanda, W.B. Saunders Co., Philadelphia, 1997, pp. 99-109.
2. Patel, S.; Cacciafesta, V.; and Bosch, C.: Alignment of impacted canines with cantilevers and box loops, J. Clin. Orthod. 33:82-85, 1999.
3. Ross, L.L.: Nickel titanium closed-coil spring for extrusion of impacted canines, J. Clin. Orthod. 33:99-100, 1999.
4. Terry, S.J. and Thomson, M.E.: Treatment of palatally impacted cuspids with the extrusion spring arm, J. Clin. Orthod. 29:709-712, 1995.
5. Gange, R.J.: Technique Clinic: Attachment of elastomeric thread to a palatally impacted cuspid, J. Clin. Orthod. 28:458, 1994.
6. Darendeliler, M.A. and Friedli, J.M.: Case Report: Treatment of an impacted canine with magnets, J. Clin. Orthod. 28:639-643, 1994.
7. Bishara, S.E.: Clinical management of impacted maxillary canines, Semin. Orthod. 4:87-98, 1998.
8. Sinha, P.K. and Nanda, R.S.: Management of impacted maxillary canines using mandibular anchorage, Am. J. Orthod. 115:254-257, 1999.
9. Begg, P.R. and Kesling, P.C.: Orthodontic appliances, in *Begg Orthodontic Theory and Technique*, 3rd ed., W.B. Saunders Co, Philadelphia, 1977, p. 94.