

The Kilroy Spring for Impacted Teeth

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Various forms of interarch and intra-arch mechanics have been devised for the eruption of impeded and impacted teeth. One such device, the Monkey Hook,* was recently introduced as a method of applying lateral and vertical eruptive forces.¹ The Kilroy Spring* is a new option that produces directional forces without the need for special patient compliance.

The Kilroy Spring is a constant force module that is slid onto a rectangular archwire over the site of an impacted tooth (Fig. 1). (The configuration of the Kilroy Spring reminded the designers of the popular “Kilroy Was Here” graffiti of the 1940s.) In the passive state, the vertical loop of the Kilroy Spring extends perpendicular from the occlusal plane (Fig. 2). To activate the spring, a stainless steel ligature is guided through the helix at the apex of the vertical loop, and the loop is directed toward the impacted tooth. The ligature is then tied to an attachment that has been direct-bonded to the surgically exposed tooth (Fig. 3). A Kilroy Spring can be

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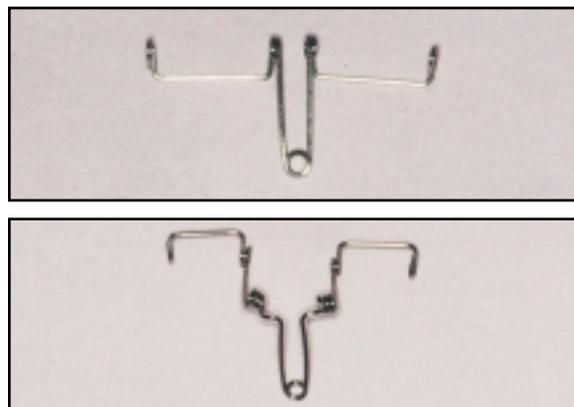


Fig. 1 Kilroy Spring (top) and Kilroy II Spring.

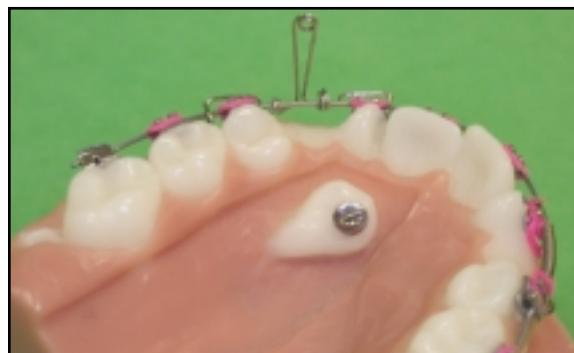


Fig. 2 When passive, vertical loop of Kilroy Spring is perpendicular to plane of occlusion.



Fig. 3 For activation, stainless steel ligature is passed through helix at end of vertical loop and ligated to bonded loop-button on impacted tooth.



Fig. 4 A. 13-year-old female patient with palatally impacted right canine. B. After surgical exposure, Kilroy Spring ligated to bonded loop-button on canine in conjunction with typical continuous-arch mechanics. C. Lateral and vertical displacement of canine after one month. D. Canine slightly overerupted after two months. E. Thermally activated superelastic rectangular wire slid through loop-button to continue buccal movement of canine. F. .018" stainless steel archwire placed one month later to move canine buccally and clear occlusion. G. Bracket bonded to canine five months after surgical exposure. H. Compliance Spring* auxiliary slid onto round archwire and secured in vertical bracket slot²; intermaxillary elastic used to activate spring for labial root torque. I. ProFlex silastic tooth positioner** delivered immediately after removal of fixed appliances and worn full-time for one week to finalize occlusion and improve gingival health.^{3,4} J. Patient after 21 months of treatment, awaiting delivery of Duralight*** clear overlay retainers. Note: Labial root torque and final vertical position of maxillary canine could have been improved.



Fig. 5 A. 12-year-old female patient with palatally impacted right canine. B. After surgical exposure and placement of bonded loop-button, Monkey Hook with elastic chain ("slingshot"¹) and intermaxillary elastic used to initiate movement. C. Kilroy Spring slid onto rectangular archwire and ligated to canine eight months later. Reciprocal forces to direct eruption of impacted tooth were derived from adjacent teeth and archwire. D. Vertical and lateral displacement after 21 months of treatment. E. After 23 months of treatment. F. Second attachment bonded to distobuccal surface of canine, and two Monkey Hooks with elastic chains connected to attachments to produce rotational couple.¹ G. After one month of rotation. H. Bracket bonded to canine after four months of rotation. I. Space consolidation with elastic chain (continued on next page).



Fig. 5 (cont.) J. Patient after 39 months of total active treatment.

tioned to a loop-button, a Monkey Hook, or a gold chain.

Support for the activated Kilroy Spring is derived from the continuous rectangular archwire and reciprocal forces from the incisal third of the adjacent teeth, which are contacted by the lateral extensions of the spring. In this arrangement, called the Kilroy I, both lateral and vertical eruptive forces are directed to the impacted tooth (Fig. 3).

The Kilroy Spring may need to be periodically retied to maintain a constant force as the tooth erupts. The spring is removed once the tooth is sufficiently erupted; an orthodontic bracket or a new loop-button is then direct-bonded to the tooth to continue moving it into the arch (Fig. 4). If the tooth is rotated, a second loop-button can be bonded to the opposite side, and Monkey Hooks with elastic chains can be used to create a rotational couple¹ (Fig. 5).

Kilroy II Spring

The Kilroy II Spring was designed to produce more vertical than lateral eruptive forces for eruption of buccally impacted teeth (Fig. 6). Its multiple helices increase its flexibility, but also increase the likelihood of impingement on the

adjacent soft tissue. Consequently, more frequent progress checks are recommended with the Kilroy II.

Versatility in Various Situations

The amount of force generated by the Kilroy Spring can be increased or decreased by bending the vertical loop toward or away from the impacted tooth. This is accomplished by holding one helical loop with a bird-beak plier, bending one leg of the vertical loop in the desired direction, and repeating the procedure for the other side (Fig. 7).

The direction of force is also adjustable. For example, if a more lateral force vector is desired or the vertical loop of the Kilroy Spring needs to be shortened to fit a particular situation, the terminal helix of the vertical loop can be “folded over” back onto itself (Fig. 8).

Because of the inherent flexibility in its design, the Kilroy Spring will typically fit the

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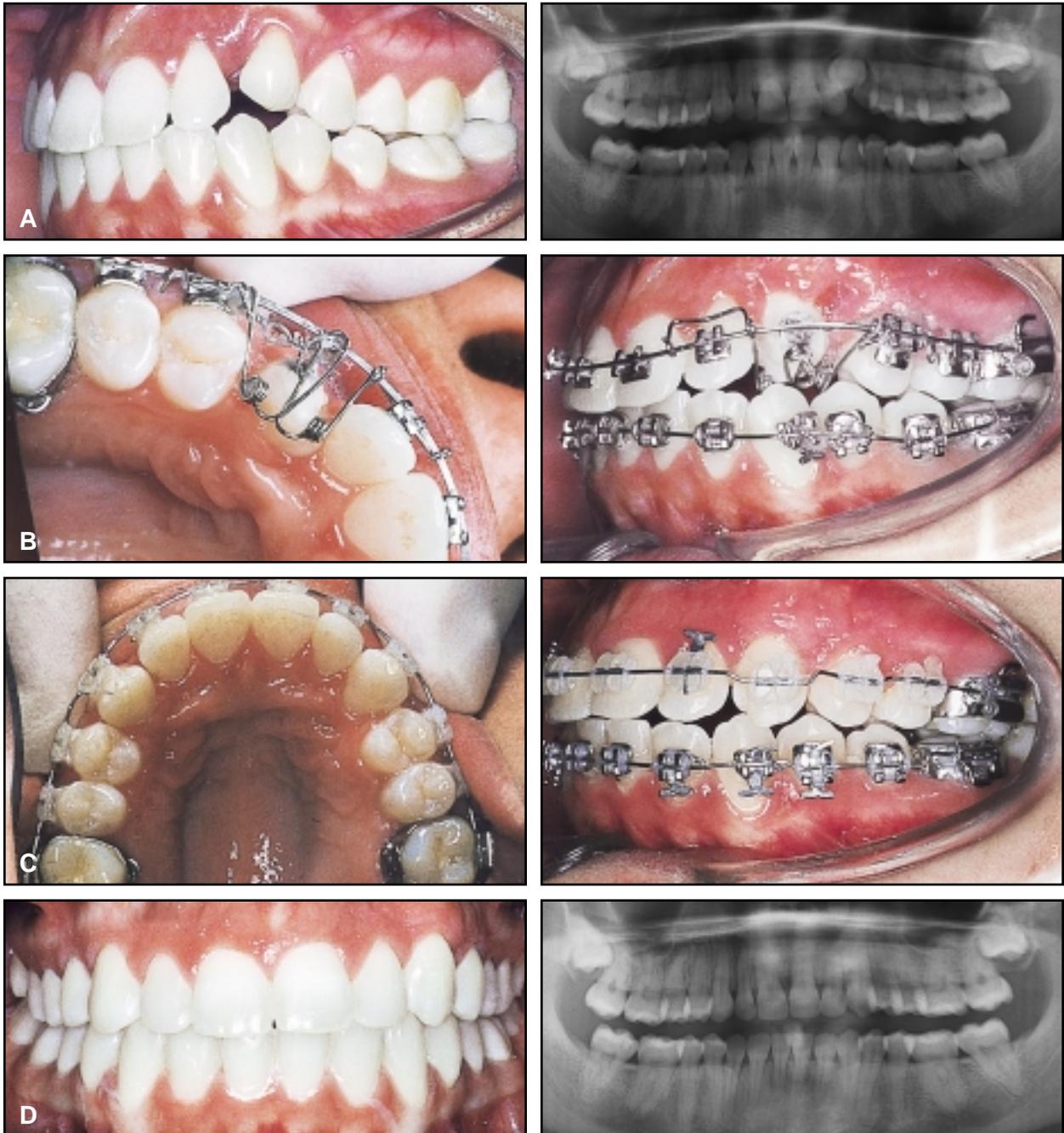


Fig. 6 A. 22-year-old female patient who had undergone previous orthodontic treatment, but still had impacted maxillary left permanent canine. B. After extraction of retained primary canine, permanent canine was exposed and loop-button bonded. With canine positioned buccally and only vertical forces needed, Kilroy II Spring was slid onto rectangular archwire and ligated to loop-button. Favorable vertical eruption was achieved in two months. C. Ceramic brackets placed at patient's request for final positioning of canine. D. Patient after 15 months of treatment.

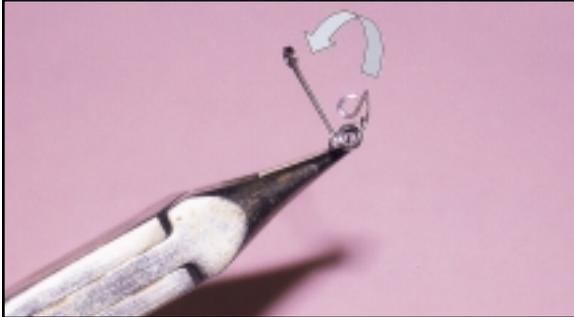


Fig. 7 Force produced by Kilroy Spring can be adjusted simply by bending vertical loop away from impacted tooth (more force) or toward tooth (less force).

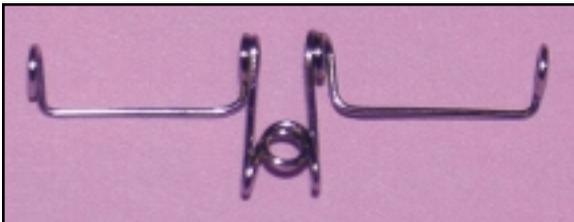
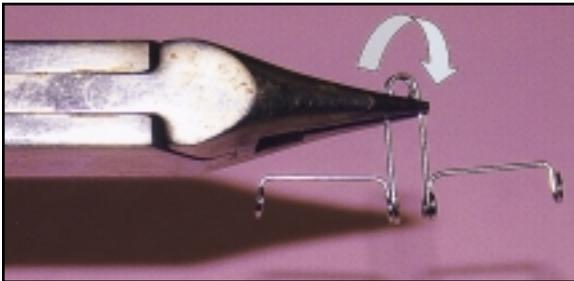


Fig. 8 Vertical loop can be shortened to increase lateral force vector or to position terminal helix of Kilroy Spring for more buccally impacted tooth.

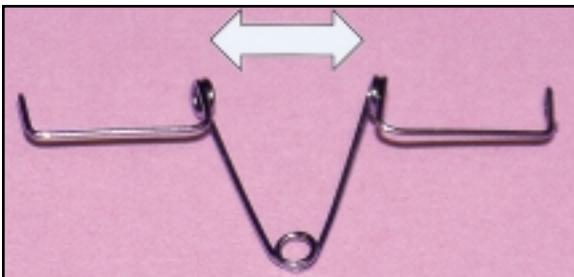


Fig. 9 Kilroy Spring can be expanded or constricted to fit available arch space or to produce light forces for opening or closing space.

available arch space whether the final destination of the impacted tooth is wider or narrower than the tooth itself. In fact, the vertical loop of the Kilroy Spring can be adjusted to produce a light force to assist in closing, maintaining, or opening space (Fig. 9).

Conclusion

The Kilroy Spring is a removable auxiliary designed to direct the eruption of an impacted tooth without interrupting traditional continuous-arch mechanics. It is simple to place and easy to adjust, provides constant vertical and lateral eruptive forces, and requires no special patient compliance. The Kilroy I is designed for palatally impacted teeth, and the Kilroy II for buccally impacted teeth.

ACKNOWLEDGMENTS: We would like to thank Drs. Peter Sotiropoulos and Gus Sotiropoulos of St. Louis University for their inspiration in this project and for their long history as role models for orthodontic residents.

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