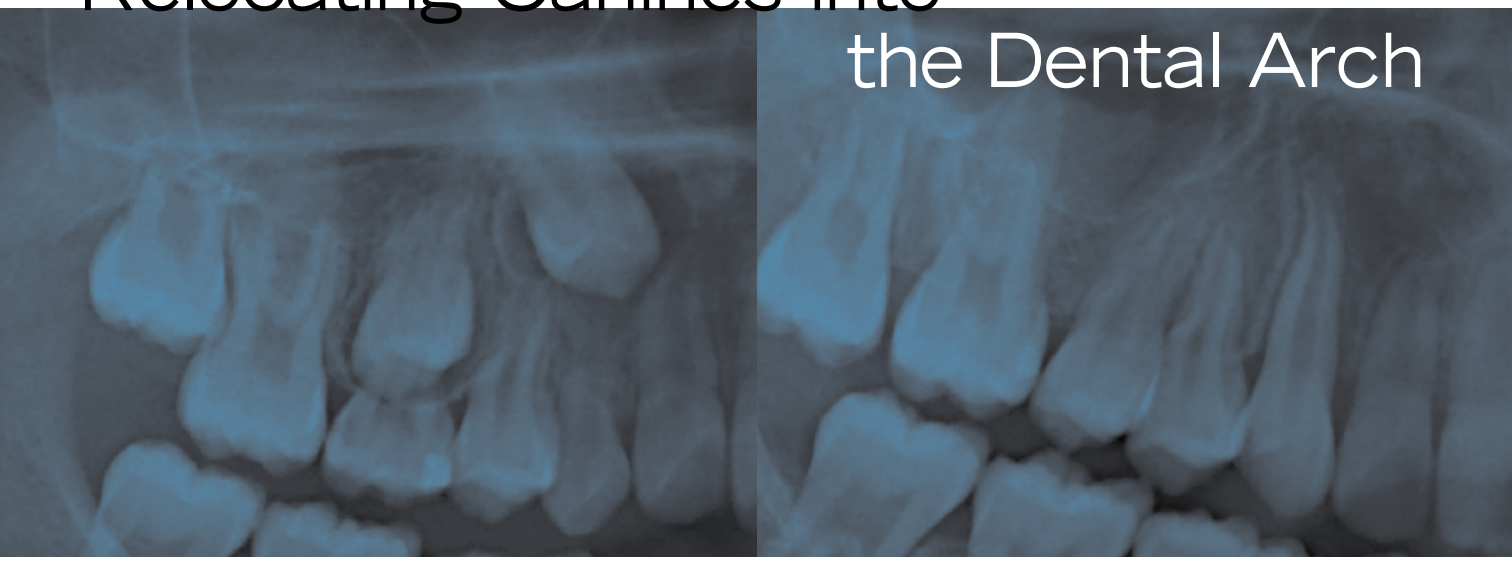
The role of self-ligating brackets with additional slots

Relocating Canines into the Dental Arch



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Apart from mandibular third molars, maxillary canines are most frequently affected by dislocation, triggering the need for therapeutic treatment. Not including wisdom teeth, maxillary canines represent about 60% of teeth selected for relocation. Among the pathological causes are shortage of space and eruption problems, as well as an atypical germ situation. Furthermore, genetical causes are often discussed. Particularly relevant in this context is the so-called guidance theory because it emphasizes the role of lateral incisors as a central stabilizing factor that allows for alignment of canine teeth, which in turn is of high importance for other teeth.[1-2]

Physiological eruption of upper teeth usually takes place at a physical age of about 11.5 years.[3] In the majority of cases, this happens on both sides at about the same time. Around 10% of cases, however, reveal a difference of up to 1 year in direct comparison of time of eruption at both sides. The prevalence rate of dislocation of maxillary canines is about 0.8% to 2.3%, with the rate of female cases slightly higher.[4] Moreover, 8% of patients are affected by bilateral relocation. About one-third of retained canine teeth are located in a labial position within the alveolar process, and about two-thirds are located in palatal positions.[5]

Clinically, dislocation of canine teeth is often easy to identify even without medical imaging because vestibular canines may be palpated unilaterally. Further indicators could be peg-shaped lateral incisors or their aplasia. The latter case imposes an obvious excess of space.

X-ray radiographs providing an overview of the patient's teeth highlight a generally better prognosis for successful integration if the angle between teeth axis and occlusal plane is higher than 45°. In turn, successful orthodontic integration of dislocated canines allows preservation of functionally very important canines.

Practical Considerations

Prior to any relocation of canine teeth, a surgical cut-down is usually required. This can be implemented via open or closed

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Figure 1: (A) Forestadent BioQuick bracket with auxiliary slot (dimension .016" x .016").

techniques, depending on localization of the respective tooth. Prompt active elongation is recommended in the postoperative period. The process of orthodontic gap opening has often been initiated at this point in time. Deep intra-osseous dislocation often necessitates prior extrusion; this could be realized using ballista springs,[6] for example. Following sufficient extrusion of the teeth (aided by respective appliances), it can then be relocated into the dental arch.

In theory, orthodontists can choose from a variety of options. However, some of these offer striking disadvantages. If the relocation "pulls" via an elastic main arch, strong reciprocal side effects are to be expected, mainly affecting teeth neighboring the gap. This shortcoming particularly applies in cases displaying strongly ectopic canines. On the other hand, if flexible sutures leading from ectopic teeth toward the rigid orthodontic arch are selected, poor esthetics and hygiene are often the result.

Figure 2: Left vestibular retained canine within the attached gingiva following laser gingivectomy; main arch .019" x .025" SS and overlay arch (.012" BioStarter) within auxiliary slot.

Figure 3: Gingiva position post-treatment. A circumscriptive gingivoplasty is planned for the integrated canine in order to improve aesthetic results.

Furthermore, a considerable decrease in pulling power can be predicted in such cases.

Another option is a flexible parallel arch, in addition to the rigid orthodontic main arch within the bracket slot. The main disadvantage in this case is the friction and barrier to teeth movement, because the parallel arch has restricted movement. Reciprocal side effects, meanwhile, can have a negative impact on overall treatment success if, for example, palatal canines are buccally shifted via the extension of a quad helix. This is due to general difficulties in controlling shifting powers of quad helix structures. Too strong, nonphysiological pulling power may result in hyalinization and, in some cases, even total suspension of teeth movement. Root ankylosis is very rare in maxillary canines.[7]

Advantages of SL Bracket Usage with Auxiliary Slots

Self-litigating brackets with additional, auxiliary slots[8] offer a good alternative to the above-discussed treatment options. Not all SL systems, however, are suitable. Inserting of additional parallel arches is often not feasible and would immediately result in dysfunctional sealing caps. Forestadent's Quick bracket system addresses this issue through a 0.016" x 0.016" auxiliary slot (Figure 1). This auxiliary slot thus aids any treatment and relocation of dislocated or ectopical canines. In addition, it has a number of major advantages. This is because it allows for insertion of parallel arches (eg, 0.012" NiTi) that can move freely almost without any friction, in cases of rigid orthodontic main arches in situ. In turn, this allows for the release of continuous physiological pulling power, effectively preventing potential hyalinization and respectively longer treatment periods. Throughout the physiologically aided integration of canine teeth, further physical teeth movements may then be realized at the rigid orthodontic main arch, offering a major contribution toward achieving overall treatment goals.

Clinical Examples

In Figures 2 and 3, we see the vestibular auxiliary slot technique post-laser (Sirona) gingivectomy. We used a Forestadent BioQuick bracket with auxiliary slot (dimension .016" x .016"). In Figure 2, we see the left vestibular retained canine within the attached gingiva following laser gingivectomy. The main arch was .019" x .025" SS and was combined with an overlay arch (.012" BioStarter) within the auxiliary slot.

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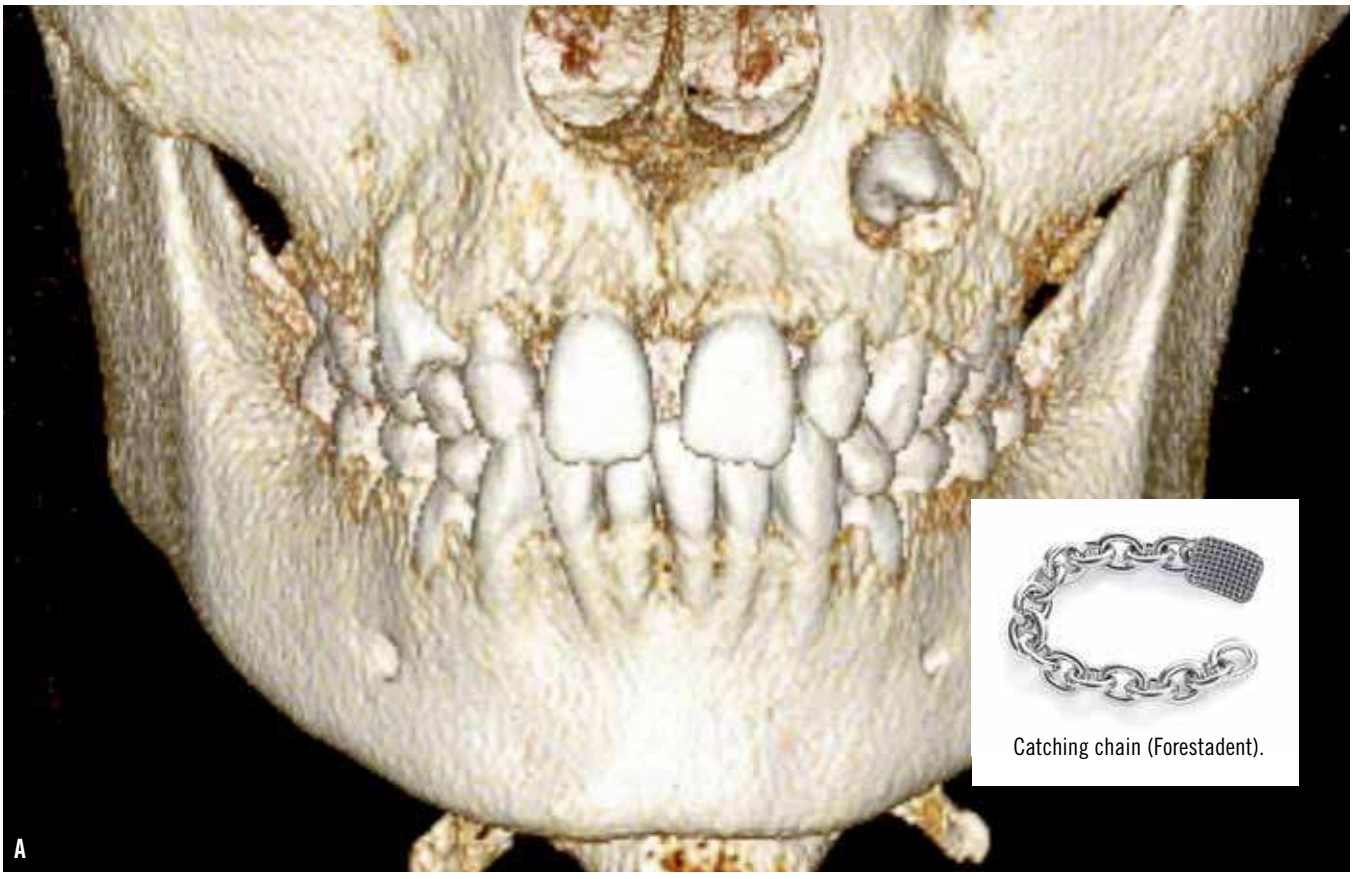

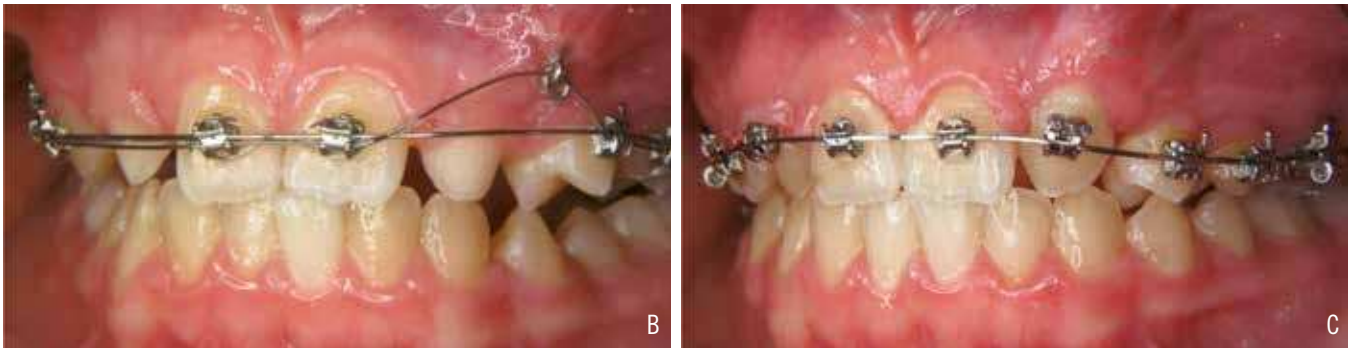

Figure 4: Vestibular auxiliary slot technique with closed exposure. (A) CBCT-data set in 3D volume image: high left vestibular canine - dislocated. (B) High vestibular canine - dislocated; main arch .019" x .025" SS and overlay arch (.012" BioStarter) within auxiliary slot. (C) The canine tooth receives a +17° palatal torque bracket in the finishing phase. This is required to be able to move the canine tooth root into the palatal bone for achievement of healthy periodontal conditions.

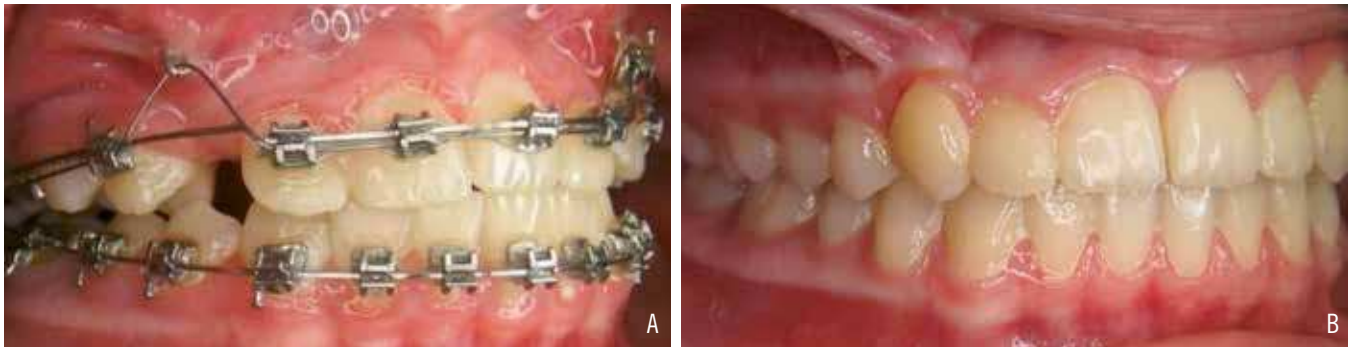

Figure 5: Vestibular auxiliary slot technique with closed exposure. (A) Vestibular highly dislocated canine tooth; main arch .019" x .025" SS and overlay arch (.012" BioStarter) within auxiliary slot. (B) Gingiva condition post-treatment completion. The gingival situation could have been further improved through more palatal torque at the canine tooth.

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Figure 6: Palatal auxiliary slot technique. (A) CBCT data set in 3D imaging (upper jaw): considerable palatal dislocation of canine teeth. (B) Palatal relocated canine teeth post-laser exposure and adhesive attachment of catching chain; main arch .019" x .025" SS and overlay arch (.012" BioStarter) within auxiliary slot.

Meanwhile, Figure 4 (page 80) shows a vestibular auxiliary slot technique with closed exposure. The CBCT data set in 3D volume image shows a dislocation of a high left vestibular canine (Figure 4A, page 80). Again the main arch was .019" x .025" SS, and the overlay arch (.012" BioStarter) was within the auxiliary slot (Figure 4B, page 80). In the final stage, the canine tooth received a +17° palatal torque bracket. This is required to be able to move the canine tooth root into the palatal bone to achieve healthy periodontal conditions (Figure 4C, page 80).

Figure 5 (page 80) shows another vestibular auxiliary slot technique with closed exposure. In this case, the vestibular canine was dislocated. The main arch was .019" x .025" SS and the overlay arch (.012" BioStarter) within the auxiliary slot. Post-treatment, the gingival situation could have been further improved through more palatal torque at the canine tooth, but the x-ray post-treatment completion showed satisfying results in relation to the canine position and root alignment.

Figure 4: (C) Natural gingiva position post-active treatment.

Finally, Figure 6 shows once more the palatal auxiliary slot technique. The CBCT data set in 3D imaging (upper jaw) shows a considerable palatal dislocation of the canine. The canine was exposed with a laser followed by adhesive attachment of a catching chain. The main arch was .019" x .025" SS, and the overlay arch (.012" BioStarter) was within the auxiliary slot. Post-active treatment, the gingival margin looks natural (Figure 7).

Conclusion

Overall, employment of SL brackets with additional auxiliary slots offers a number of advantages for integration of dislocated or ectopically positioned canines: relatively short treatment times due to easy operation and handling, uncomplicated insertion of parallel arches into the auxiliary slots, and decreased friction and physiological impact. **OP**

*References for this article are available with **Orthodontic Products'** interactive and online editions.*