

All buttoned up! Styling your plastic with elastics

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Clear aligners have become a popular method of orthodontic treatment in the new millennium, led by the launch of Invisalign by Align Technology in 1997. While the initial use of aligners was reserved for minor tooth movement and addressing orthodontic relapse, orthodontists gradually began treating cases of greater complexity as patient demand grew for this more aesthetic option. Pioneering orthodontists began incorporating dental elastics to correct malocclusions starting in the mid-2000s. This was accomplished by manually cutting the aligners chairside or by directing the technician to lower the simulated gingiva, thereby altering the trim line of the aligners. Align Technology began offering prefabricated hooks and cut-out windows in its Invisalign aligners beginning with the G3 release in 2010.¹

Orthodontists cleverly appropriated the available components for fixed orthodontic appliances to correct malocclusions with aligners. Lingual buttons, bondable molar tubes and Caplin hooks were often utilised in the early days, with variable success. Because these parts often had a small surface area and were designed for the centre of the clinical crown, there were frequent bond failures and frustrating emergency visits for patients and parents.

Recent innovations in bondable auxiliaries have made incorporating elastics into aligner cases much more predictable. Precision Aligner Buttons (DynaFlex), for example, are reimagined bondable buttons designed specifically for aligners. These buttons were engineered to fit within the prefabricated cut-outs provided by most major aligner manufacturers. Precision Aligner Buttons also have a base pad that is contoured for the cervical or gingival third of the clinical crown and a maximised surface area for additional bond strength. The following article provides a review of clinical scenarios for which incorporating elastics into your treatment plan can be advantageous.

Class II malocclusion

For mild to moderate Class II cases in which the molar classification is a half cusp or less off, I recommend incorporating prefabricated hooks, that is, notches or slits,

on the maxillary canines and cut-out windows on the mandibular first molars. I recommend placing the cut-out windows in the centre of the clinical crown, as the square anatomy of the mandibular first molar almost always resists rotational forces. If there is a large posterior open bite, I will occasionally add a composite extrusion attachment to the mesial cusp, placing the cut-out window on the distal aspect.

I prefer buttons on the mandibular first molars for several reasons. Firstly, although bonding buttons is an extra step and creates the potential for bond failure, it is simply easier for the patients to fasten elastic bands to outward-projecting buttons in the back of the mouth. Ease of use often equals better compliance. Secondly, the plastic dovetail created by a hook can bend outwards and irritate the cheek. Thirdly, heavier elastic bands can lift or potentially dislodge aligners. The only scenarios in which I will incorporate hooks in the posterior are if the patient has gold or porcelain crown restorations or if there is a severely collapsed vertical dimension.

After buttons have been bonded to the mandibular first molars, patients are instructed to start with ¼ in., 4.5 oz elastics. If additional Class II correction is needed, I advance the patient to ¼ in., 6.5 oz elastics.

There are several clinical indications for which I prefer cut-out windows on the maxillary canines as opposed to hooks. If the maxillary canines are buccally ectopic or high, the elastic band will also provide a vertical force vector to aid in extrusion. For Class II division II cases, attaching the elastic band directly to the canine avoids any distal force on the aligners, which would counteract the proclination of the maxillary central incisors. A third scenario for cut-outs on the maxillary canines is for more severe Class II cases in which the molar relationship is a half to full cusp off. Anecdotally, I have seen more effective Class II correction when bondable buttons are placed on the maxillary canines, versus hooks or notches in the aligner.

Regarding aesthetic button options, clear Precision Aligner Buttons are made of a composite-ceramic hybrid. These buttons also universally fit maxillary and



Fig. 1: The Precision Punch is part of the Clear Collection by HuFriedyGroup.

mandibular canines and premolars in the cervical or gingival third of the crown adjacent to the gingival margin.

Class III malocclusion

For Class III cases, I will design my cases with hooks on the mandibular canines and cut-out windows on the maxillary first molars. I avoid hooks on the maxillary first molars for the same reasons that I avoid them in the posterior on Class II cases. If more significant Class III correction is needed, I have had good success with buttons bonded directly to the mandibular canines. This is another great indication for clear Precision Aligner Buttons.

As transverse discrepancy and posterior crossbite are often associated with Class III malocclusion, I incorporate a pearl from Dr Maz Moshiri and prescribe the cut-out windows on the palatal aspect of the maxillary first molars. Placing the buttons on the lingual aspect introduces an expansive force vector that can be quite beneficial. If attempting this technique, I recommend either a vertical or optimised attachment on the buccal surface, as the maxillary first molars are more susceptible to rotation around their palatal cusps.

Posterior and lateral open bite

Cut-out windows and bondable buttons can be incorporated into aligner treatment plans in several ways. In low angle, skeletal deep bite patients, posterior vertical elastics can be used to help open the vertical dimension of occlusion.

Posterior elastics can also be implemented in the orthodontic finishing stages to settle a resultant posterior open

bite. In this scenario, for which button cut-outs may not have been pre-planned, the Precision Punch (Fig. 1) and the Petite Punch (both HuFriedyGroup) are an excellent option. Another situation in which posterior vertical elastics can come in handy is settling a bite after orthognathic surgery.

Anterior open bite

Elastics can be incorporated into anterior open bite cases in either triangle or anterior box configurations. For triangle elastics, clear Precision Aligner Buttons can be bonded to the maxillary and mandibular canines, as well as the mandibular first premolars. I recommend starting with $\frac{1}{4}$ in., 4.5 oz elastics. For anterior box elastics, buttons could be considered for the maxillary lateral incisors. The clear Precision Aligner Buttons have a convex base and are better suited for the canines. I recommend selecting an aesthetic button with a flat base to better match the anatomical features of the incisors. When using anterior box elastics, a $\frac{5}{16}$ in., 4.5 oz elastic is recommended. Because these elastics can inhibit speech, I ask my patients to wear them at night only.

Extraction cases

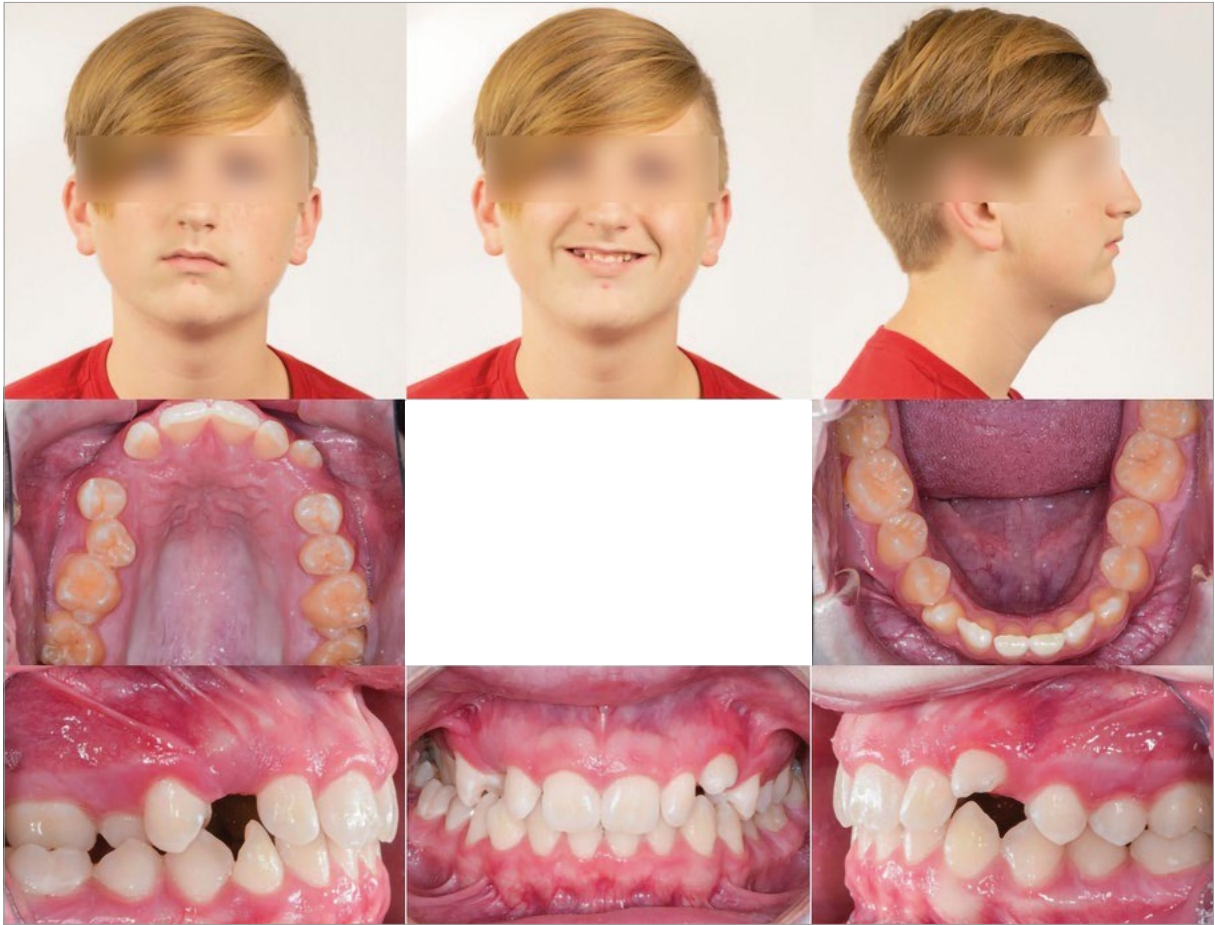
While each extraction case should be considered on an individual basis, bondable buttons may be advantageous in setting up your anchorage system for space closure mechanics. Buttons will provide a more direct force to specific teeth, as opposed to hooks, which will distribute those forces to multiple teeth through the aligner.

Impacted maxillary canines

Orthodontists have traditionally recommended fixed appliances when surgical exposure of impacted maxillary canines is necessary, owing to the obvious anchorage need for the orthodontic traction (Figs. 2 & 3). The recent popularity of aligners has forced me to think creatively regarding extrusion of these impacted teeth. My first cases incorporated either banded trans-palatal arches with cantilever arms or bondable cantilever arms that could receive an elastic thread.

While every impaction scenario is unique, I have moved away from the ancillary fixed appliances. For mild to moderate impaction, particularly when the impacted tooth is mid-alveolar ridge or on the buccal aspect, I employ an elastic band that is fastened by the patient directly to the aligner in a bootstrap fashion.

When an open exposure technique is indicated, consider requesting that the surgeon attach a bondable button to the impacted canine, as opposed to the traditional gold chain. The patient is then instructed on how to fasten an elastic band from the button to the aligner using the boot-



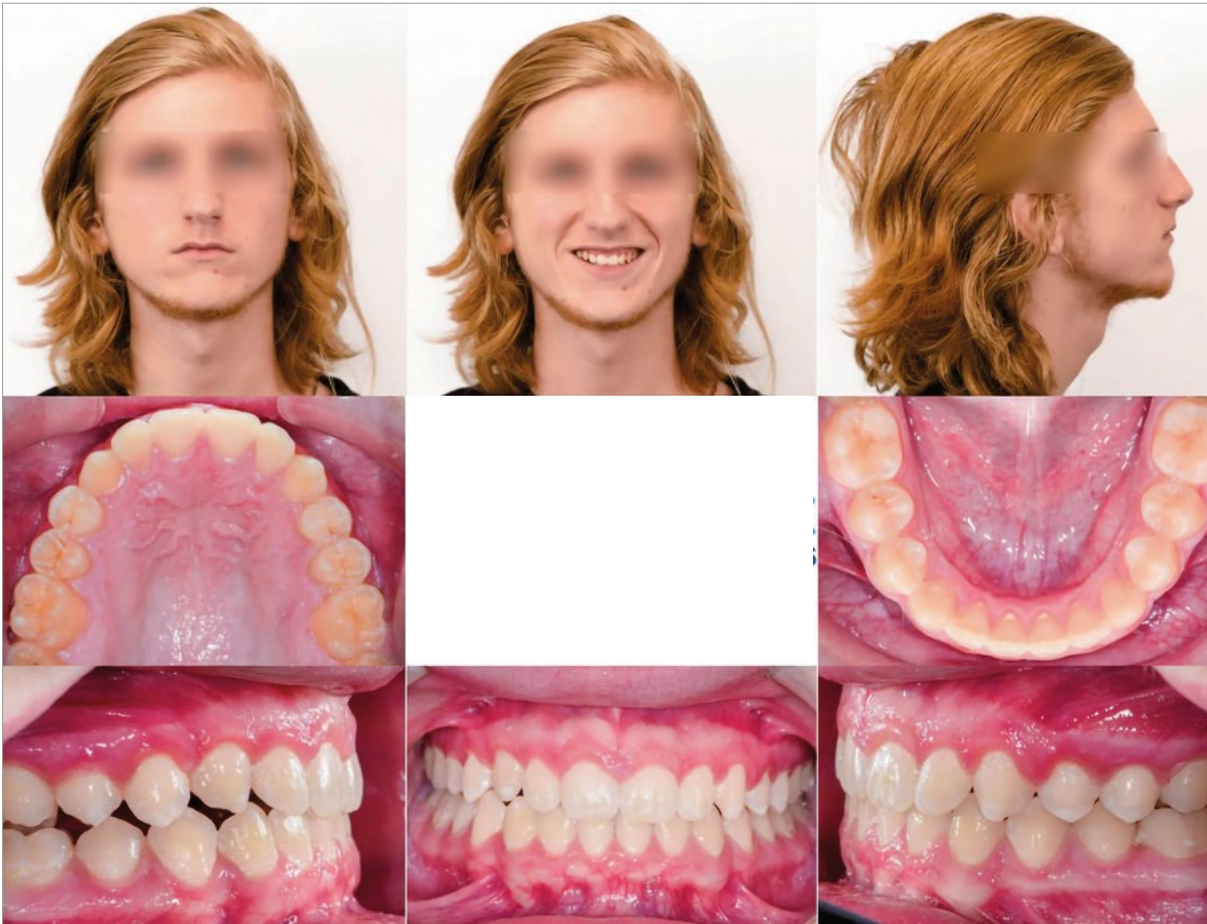
Figs. 2a-h: Initial photographs of a case involving an impacted maxillary right canine.



Fig. 3: Panoramic image showing an impacted maxillary right canine.



Figs. 4–6: Progress photographs showing a clear Precision Aligner Button which the surgeon attached to the canine. Notches were placed for the bootstrap elastic on the lingual aspect of the maxillary lateral incisor and first premolar, using the Tear Drop instrument.



Figs. 7a–h: Progress photographs showing the maxillary right canine fully erupted. The patient was scanned for an additional series of aligners (refinement) to address the Class II occlusion on the right side.

strap technique. If prefabricated hooks or notches were not requested in the aligner, the Tear Drop plier (HuFriedyGroup) can be used to incorporate the necessary notches in the aligner. I recommend placing the slits on the two adjacent teeth to avoid aligner cracking, since the plastic is often thin where the eruption compensation or virtual geometry is present. I recommend a $\frac{3}{16}$ in. elastic (Figs. 4–8).

If a closed exposure technique is warranted, consider using Dr Jay Bowman's Monkey hook (American Ortho-

dontics) to attach to the terminal end of the gold chain. This will also allow the patient to attach an elastic band from the impacted tooth to the aligner.

Moderate to severe tooth rotation

For rotated premolars and canines, consider incorporating auxiliaries such as bondable buttons into the treatment plan. Certainly, rotations can be corrected with plastic and composite attachments; however, the rate is typically limited to 2° per aligner stage.² Incorporating

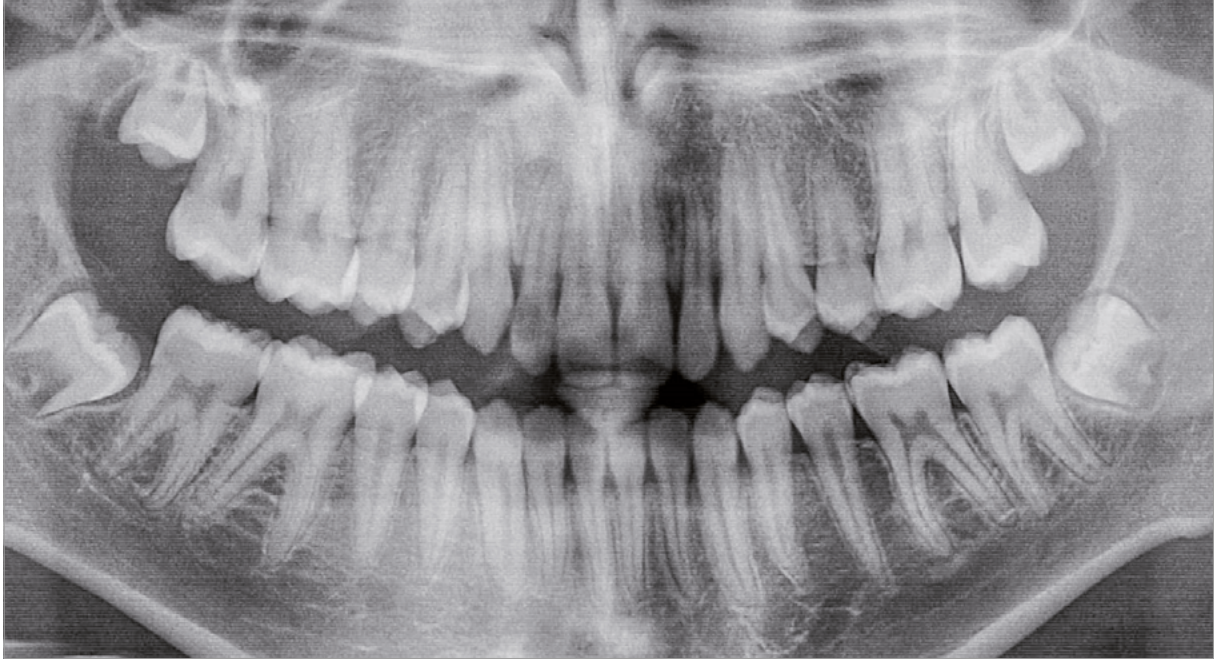


Fig. 8: Panoramic image showing the maxillary right canine fully erupted.



Fig. 9: A mandibular left premolar exhibiting a 76° rotation according to Invisalign's ClinCheck software.

auxiliaries such as bondable buttons could effect correction two to three times faster than using aligners alone.³ This is particularly advantageous when correction of the rotated tooth is the rate-limiting step in terms of the number of aligners.

Regarding selection criteria, this technique is ideal for conical shaped premolars or canines that are rotated by more than 30°. If the premolars have a boxy morphology, I suggest sticking with the composite attachment. The reason is that the premolar will not spin as easily within the confines of the aligner. For more severe rotations, consider creating space mesial and distal to the tooth with the aligner movement. Certainly, bondable buttons

can be employed on the lingual or palatal aspect to create a biomechanical force couple, though the bonded buttons on the internal surface may be irritating or bothersome to the patient.

To incorporate this technique, a prefabricated cut-out window is placed on the affected premolar or canine, as well as on an anchor tooth. If cut-outs were not planned during the design phase, the Precision and Petite punches are great options for making these windows for the buttons. First molars are recommended as anchor teeth, as the square anatomy helps resist rotational moments of force. An elastic power chain is connected between the bondable buttons. It is recommended to see the patient



Figs. 10 & 11: Invisalign aligners with a metal Precision Aligner Button bonded to the mandibular left first molar and a clear Precision Aligner Button to the rotated premolar. A clear elastic power chain connected the two teeth and was changed every four weeks.



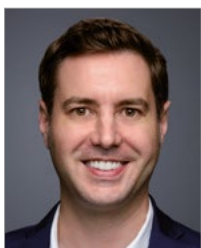
Figs. 12 & 13: Correction of the rotated premolar occurred in 12 weeks. Had the same tooth been rotated with just a composite attachment, it would have taken 38 weeks at the programmed 2° of rotation per aligner.

every four weeks to change the elastic chain owing to force decay and to monitor the progress of the rotation (Figs. 9–13).

Disclosures

Dr Cetta is the co-inventor of Precision Aligner Buttons by DynaFlex and the Precision Punch by HuFriedyGroup and receives royalties in exchange for licensing the designs.

about



Dr Chris Cetta is a board-certified orthodontist practising at Blue Wave Orthodontics in Tampa and Bradenton in Florida in the US. He is the co-inventor, along with Dr Richard Kaye, of Precision Aligner Buttons and the Precision Punch. Dr Cetta also hosts the Illuminate Orthodontic Podcast, seeking to shine a light on the innovators and inventors of the orthodontic profession.

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