

Lets talk ALIGNers!

The 21st century has an appliance that has firmly established itself as a definitive orthodontic solution. Although its extent and application of use have been the subject of deliberations across platforms, research of orthodontic tooth movement (OTM) using clear aligners is limited. Most of the literature consists of case reports, editorials, or articles written by authors with biases.^[1] Conventional thinking suggests that the movement is mostly uncontrolled tipping, with the center of rotation located between the center of resistance and the apex of the tooth. However, the repertoire of cases being treated with aligners has expanded the envelope of what aligners can achieve realistically on the clinical terrain, and conventional thinking is bracing itself for a rethink!

There have been few evidence-based attempts to describe the type of OTM resulting from treatment with clear aligner therapy (CAT). Rossini *et al.* in a systematic review published last year in the *Angle Orthodontist*, discussed efficacy of clear aligners in controlling OTM.^[2] Only 11 relevant articles were found from a search across databases from January 2000 to July 2014 (two randomized controlled trials, five prospective nonrandomized, and four retrospective nonrandomized). The risk of bias was moderate for six studies and unclear for the rest. The amount of mean intrusion reported was 0.72 mm. Meanwhile, extrusion was the most difficult molar tooth movement to control (30% of accuracy), followed by rotation. Upper molar distalization revealed the highest predictability (88%) when a bodily movement of 1.5 mm was prescribed. A decrease of the Little's index (mandibular arch: 5 mm and maxillary arch: 4 mm) was observed in aligning arches. The authors concluded that CAT aligns and levels the arches; it is effective in controlling anterior intrusion but not extrusion; it is effective in controlling posterior buccolingual inclination but not anterior buccolingual inclination; it is effective in controlling upper molar bodily movements of about 1.5 mm; and it is not effective in controlling rotation of rounded teeth in particular. They also state that aligners are not an appliance by themselves. The use of auxiliaries and adjuncts improves predictability of treatment with aligners. The authors did admit that the results of this review should be interpreted with caution due to the number, quality, and heterogeneity of the original studies included. From the first review published in 2005 by Lagravère and Flores-Mir^[3] where only two studies met the inclusion criteria and no conclusions could be drawn, this review a decade later has shed some light on the therapy.



Three aspects have had a significant impact on orthodontics during the last decade: The appliances being used, the anchorage being used, and finally the distribution of patients being treated.^[4] CAD-CAM appliances are a reality; Temporary Anchorage Devices (TADs) have enhanced the scope of anchorage and adults forming a sizable part of orthodontic patients who are being treated today. Adult patients have also impacted the choice of appliances that we use. Leaving commercial manifestations of this trend aside, the focus on science, and its scope is imperative, if we are to formulate clinical protocols and guidelines that optimize chairside aligner use. The orthodontic terrain in the last decade has changed. From bewilderment at an appliance that was supposed to take over the role of an orthodontist (since it did arrive on the market before the science to use it effectively did) to an attempt to seek evidence-based perspective on its application, we have come a long way!

Colleagues often discuss conditions that can be treated efficiently with aligners and source literature on it. This is analogous to seeking information on indications or contraindications for a specific therapy. However, there is a difference here! The difference is that aligners do not understand malocclusions. They only understand specific tooth anatomy and the movement desired on that tooth. The other elements that then come into play are occlusal forces, aligner material specifications, staging, and the use of adjuncts.

Stefano Negrini, a dear friend and a master technician from Ferrara, Italy, is someone who has worked on aligner fabrication and laboratory services for a considerable time now. It was a pleasure interacting with him on this subject when I visited his office a few months ago. He has devised a diagrammatic representation for the possible scope of what movements can be reasonably achieved with aligners. In light of current information, this representation could be a useful chair-side tool to determine feasibility of aligner use in a given patient. It is not a validated tool yet, but could be a starting point for beginners.

For extrusions and A-P corrections, the possible limits are described in Figures 1a, b and 2.

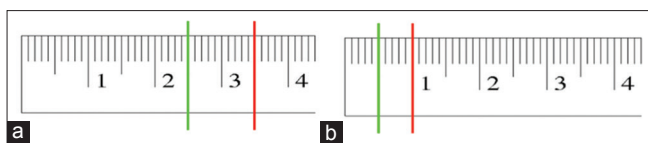


Figure 1: (a) Extrusion of upper and lower incisors. (b) Extrusion of upper and lower premolars and molars. Pic courtesy- Stefano Negrini

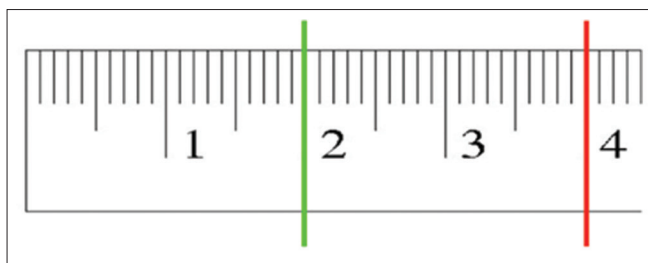


Figure 2: A-P corrections per quadrant. Pic courtesy- Stefano Negrini

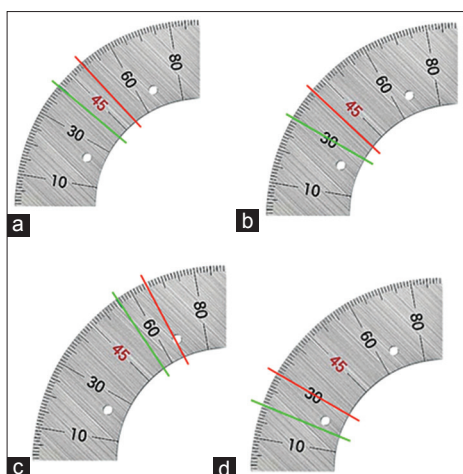


Figure 3: Rotation limits for (a) upper central and lower incisors, (b) upper lateral incisors, (c) upper and lower cuspids and premolars, (d) upper and lower molars. Pic courtesy- Stefano Negrini

For rotations, the possible limits are described in Figure 3a-d. It is interesting that tooth movement for specific teeth vary, indicating that tooth morphology plays an interesting role in aligner therapy. It is recommended that any rotation $>5^\circ$ should use an attachment for better retention of the aligner.

The Editorial team at the APOS Trends is extremely eager to receive manuscripts on this modality of treatment from clinicians and researchers across the globe. From a simplistic perspective, I have always maintained ALIGNers, Align! Expecting them to be a tool that can address all clinical situations, is an Utopian fantasy, at least today. Comparing them to fixed appliances is an Orange and

Apple comparison! However, in an era where aligners are an accepted method of delivering orthodontic care, it is only appropriate that validated information and literature of the highest level of evidence forms the basis of clinical choices and decisions! Educators and young residents who looking at pursuing research projects could really find a lot of questions for which answers can be sought by well-drafted protocols on this terrain. It's only when we have these answers that will we be able to "talk ALIGNers" with authority!

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