



Australian Society  
of Orthodontists



THE UNIVERSITY OF  
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# CLEAR ALIGNERS beyond 2020

PART 1

*Creating Brighter Futures*

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# Clear Aligners Beyond 2020 **PART 1**

Orthodontic treatment modalities have changed over the last 10 to 15 years. With the advent of digital technology, fast internet speeds and various digital mobile platforms, orthodontic treatment planning and execution has never been so convenient. However, while advanced technology makes for greater convenience, the biology of dental movement remains unchanged and the complex nature of orthodontic treatment should not be underestimated.

Aligner treatment has broadened our range of orthodontic appliance options, especially for aesthetically conscious adult and adolescent patients. They may not accept treatment with conventional therapies but may do so when offered clear aligners. It is important for the clinician to understand the intricacies of digital treatment planning and their innate shortfalls to ensure their seamless incorporation into daily orthodontic practice.

Since the introduction of Invisalign appliances (Align Technology) from a mere afterthought as a university engineering project back in 1997, clear aligners have become an important part of the orthodontic armamentarium.

Looking at past cases, why did those early cases not work as well, and how is it now possible to minimize failures? This Newsletter and the next issue will provide some considerations in achieving better treatment results with clear aligner therapy.

## **Initial appointments and informed consent**

Vitality, clinicians must provide realistic treatment goals to patients during the initial consultation. Digital manipulation cannot completely mimic dental movements – at least not yet. The biology of orthodontic movement is complex, involving a cascade of exchange of biochemicals, hormone pre-cursors and enzymes (Meikle, 2006). The components of the periodontium supporting this movement have different physical properties and the dynamic nature of this system - the constant changing of stress/strain patterns within the periodontal ligament - has made its in vitro duplication difficult, if not impossible. Without fully considering the patient's dental biology, studying the physical anatomy of the dentition, and understanding the intricacies of aligner mechanotherapy, it would be unwise to assume that virtual treatment outcomes can be readily achieved clinically. Generous treatment time frames, absolute compliance with appliance wear (including elastics), the need to place

attachments and/or other auxiliaries must be clearly discussed. Skeletal versus dental discrepancies contributing to the malocclusion need to be carefully considered and explained. Additional aligners, multiple staging patterns with updated impressions or intra-oral scans will be required. Retention appliances and regimes need to be discussed during these initial appointments as well.

## **Non-extraction plans**

### **Class I treatment considerations**

The soft and hard tissue resistance to posterior dental arch expansion must be considered. In theory, and on average, every 1mm of dental arch expansion produces an arch perimeter increase of approximately 0.7mm (Adkins et al., 1990). However, tissue resistance prevents obtaining or maintaining this correction so during the treatment planning process it is important to plan a certain degree of over-expansion.

Anterior dental proclination is an efficient way of gaining arch space. For every 1mm of incisor proclination, 2mm of dental arch perimeter can be obtained. This translation from the digital plan to the clinical process is usually reliable due to less dentoalveolar tissue resistance in the anterior region. However, anterior labial recession, reduced gingival attachments and bone loss are contra-indications to excessive anterior proclination.

Inter-proximal reduction (IPR), to provide space, is a non-reversible clinical procedure and must be undertaken with care. IPR is contraindicated, or its use greatly limited, in cases where it was done during previous orthodontic treatment, where the enamel is already thin, where the teeth are slender and have long contacts down to the alveolar crests, or cases where there is poor oral hygiene or enamel defects.

### **Class II treatment considerations**

When correcting Class II dental relationships using clear aligners to distalise the maxillary arch, a sequential staging pattern is often helpful. Commencing with upper molar distalisation, the terminal molars are moved followed by the premolars, canines and then the anterior teeth. These movements need to be supported with intra-oral Class II elastics. Some forward movement of the lower dentition usually also occurs and therefore the desirability of this movement must be taken into consideration. En-masse Class II correction requires more anchorage, which could be in the form of



Fig 1. Before & after images of a non-extraction case with proclination of anterior teeth to obtain space for alignment. Virtual treatment plan showing superimposition of the amount of proclination of anterior teeth with measuring grid. 1 square is 1mm.



Fig 2. Class II treatment using en-masse maxillary arch retraction or upper arch distalisation with the placement of TADs in the upper posterior segments. Position 'x' being the position of the TAD; elastics are worn to an aesthetic button bonded on the canines. An alignment attachment is placed on the canine tooth to negate any side effects of the elastic traction

temporary anchorage devices (TADs) concurrent with elastics wear. The compliant wear of aligners and Class II elastics can usually correct routine half-unit molar Class II occlusions. Sometimes, if conditions are ideal involving good clinical crown heights, good biological response, compliant wear of aligners and elastics - it will be possible to correct a full unit molar Class II.

### Class III treatment considerations

Cases with an anterior pre-mature contact and Functional Shift may be much easier to correct. Using conventional methods such as a 'Dawson bimanual

technique' (Dawson, 1995), try to locate the patients' premature contact and track its functional shift. If the patient can move from a reverse overjet to an edge-to-edge bite, the prognosis of successful treatment will be much higher.

Although dental movements are predictable when correcting pseudo Class III malocclusions, Class III inter-maxillary elastics and/or lower arch IPR, may be required to support the AP correction as planned in the virtual treatment plans.

Lower molar distalisation for AP correction in Class III malocclusions is less successful when compared to maxillary distalisation. However, this may still be attempted where the lower wisdom teeth have been extracted and temporary

anchorage devices are placed. Elastics can be worn from the TADs directly to the precision hook on the aligner at the premolar region to enhance anchorage control during lower dental retraction.

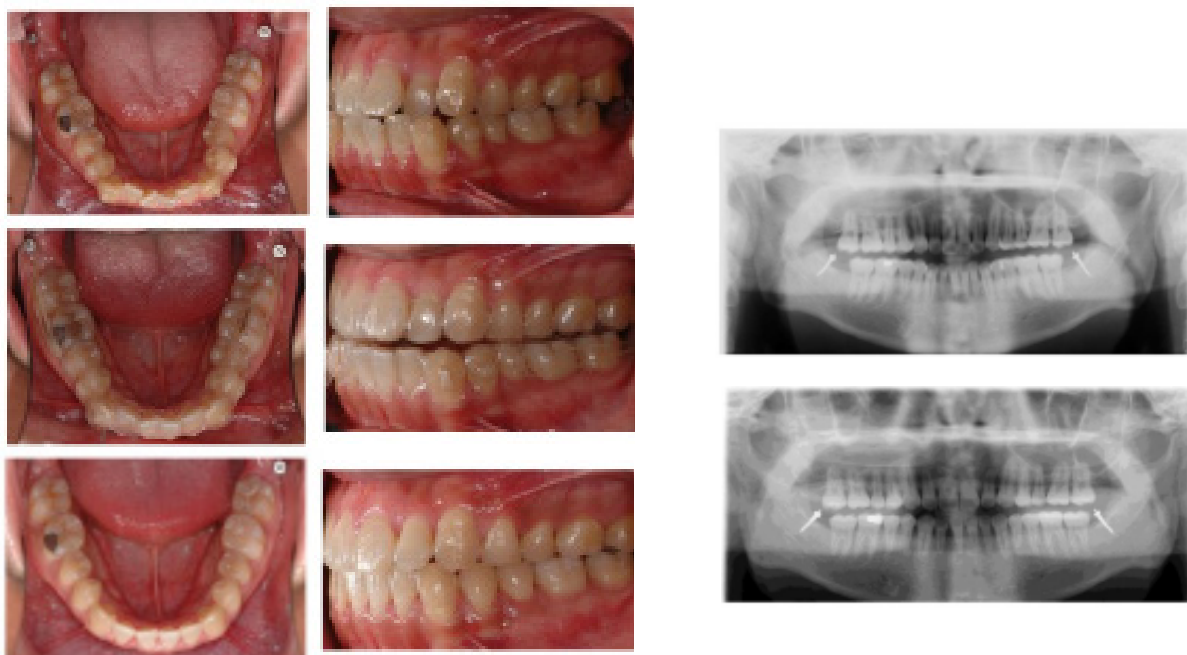


Fig 3. Before, during and after treatment using TADs and elastics for lower arch distalisation, as well as some anterior and posterior expansion. (Case courtesy of Dr. Tsai SJ).

## Conclusion

Contrary to popular belief, there is no 'cookbook' formula to the successful outcome of orthodontic treatment; biologic variation, patient compliance and the clinician's expertise all play equally important roles. Although digital technology, biomaterials, appliance designs and computing interfaces are improving and ever-changing, the biology of dental movement does not. The successful clinician fully understands that which truly affects the treatment outcome - be it a divergent root, the growth potential of the patient, or even certain pre-existing parafunctional habits or conditions.

This newsletter very briefly showcases and demonstrates some non-extraction considerations in in Class I, II and III dental malocclusions. The full extent of treatment with aligners cannot be fully contained within a newsletter. Clinical experience increases over time therefore it is still important to learn from our mistakes, understand where we have gone wrong, and how to do it right next time.

Digital-aided orthodontics is here to stay. Aligner therapy remains one of the mainstream orthodontic treatment options within this space.

## References available upon request

Past issues of Brighter Futures can be accessed at: [www.asofre.org.au/continuing-education#brighter-futures-newsletters](http://www.asofre.org.au/continuing-education#brighter-futures-newsletters)

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