By Nathalie Schüller, DTI

Dr Sean K. Carlson is Associate Professor of Orthodontics at the University of the Pacific’s Arthur A. Dugoni School of Dentistry in San Francisco and maintains a private practice in Mill Valley, both in California in the U.S. Carlson is also a senior investigator in the Craniofacial Research Instrumentation Laboratory at the dental school. He lectures nationally on a variety of clinical and theoretical subjects, with a focus on 3-D imaging in orthodontics. His primary focus is on using computer technology to improve the way we study, teach and practise orthodontics. During the Spring Meeting of the European Aligner Society, which took place in Venice in Italy from 29 to 30 March, Carlson shared some of his thoughts on making the change to 3-D technology in orthodontics, the use of clear aligners and treating sleep apnoea.

Why did you choose to specialise in orthodontics? Did your need for creativity have anything to do with your choice?

Of course! Orthodontics is incredibly creative, and I think, depending on the type of orthodontist you become, you can express that creativity in ways that are difficult in other careers. I’ve always liked the idea of healthcare; I am very altruistic in nature and like to help people, so all fitted very well in choosing orthodontics. It is a very clean profession in healthcare; your patients are not truly sick, but you are helping them with your engineering skills and spatial relationships, which also interested me; so it all came perfectly into place with my personality traits. I’ve never found anything more interesting.

What do you mean when you say that depending on the type of orthodontist you choose you can express your creativity better? Do you think there’s a link between creativity and orthodontics? Some orthodontists tend to think that caring is about altruism or about giving back, whereas other orthodontists think it’s about improving health.

Yes, that is one answer but not the only one. There are many reasons why orthodontists choose this specialty and they differ from one to another. A number of reasons can be identified:

1. A variety of career choices. You can focus on different aspects of orthodontics, such as treating adults, children, or patients with complex conditions.
2. Creativity. Orthodontics requires a high degree of creativity and problem-solving skills. You can express your creativity in the way you treat patients, the use of technology, and the development of new techniques.
3. Research opportunities. Orthodontics is a rapidly evolving field, with new technologies and treatments being developed regularly.
4. Positive impact on patient’s lives. Orthodontic treatments can improve patients’ appearance and self-esteem, leading to improved quality of life.

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real answer. Bringing costs down is not the way to solve fear. An example is CBCT. When I got into it, almost 12 years ago, it was very expensive and there was no education available — it was like diving off a cliff.

My first CBCT machine cost over US$200,000 and that was a lot of money! You can now get a machine for much less, so yes, the cost will always come down as technology advances, but seeing something that offers so many new possibilities, that insight, as happened for me when I first saw what CBCT could do, meant I could not go back; I had to have it. The value overcame the cost; I could not practise consciously and not have that because I knew it was out there and how it could improve the treatments and care I was giving my patients.

Aligners are not suitable for every one. Can you tell me when you do not see them as a treatment possibility, and if you use them as part of a hybrid treatment plan?

My practice treats children exclusively — a conscious decision I took four years ago when I decided to commit to what I was really good at, and really loved, which is building faces and young bites that are healthy and will last a lifetime. I do a lot of developmental treatments, a lot of two-phase treatments. Therefore, I have very small interarch structures, a lot of two-phase treatments. I evaluate your results to get to a result that is good and stable. Therefore, as long as you are paying attention, you can use anything. Personally, I do not use aligner therapy a lot simply because it is disruptive to what I am doing, results that I cannot achieve with conventional labial appliances, which are on for very short periods. For my practice model, it is very efficient and the only reason I do it that way. I think someone can have a practice exactly like mine and do it with aligners completely; it is just not what I developed. If I wanted to switch my practice to aligners, thought that is that much better than what I am doing, I would push through the pain we talked about before and do it. But I don't yet see someone getting results that are remarkably different to what I am doing, results that I cannot achieve with the way I work. Okay, but do you use them in particular cases or in combination with conventional fixed appliances? Do you see that one day they will replace conventional appliances? Much depends on the area where you live and the demand for it. In my area, a very wealthy community with a lot of discretionary income and high education, and because I treat children, the demand for aligners is not as high. Will conventional fixed appliances ever go away completely? Maybe, but I think that because there are still certain challenges with aligners conventional brackets are slightly better at certain things. I just don’t think it is going to be an all-or-nothing game; it just depends on the type of practice you have.

In your presentation, you spoke about a 91 per cent decrease in the apnoea-hypopnoea index with maxillary expansion and removal of adenoids and tonsils. Is it a possible solution to snoring for both children and adults?

If you identify and can remove those tissues, it is a benefit. I think that, at least in the US, adenoids and tonsils are largely overlooked new compared with the 1970s. I believe in the late 1970s or early 1980s, a study had come out stating that recurrent infection was not a reason to remove adenoids and tonsils, so doctors decided not to do it anymore and insurance didn’t cover it so readily. What they did not know at the time was that all these breathing issues were also related to obstruction in the upper airway — that probably overlooked the fact that many of these children were suffering from sleep-disordered breathing because of their tonsils and adenoids. If you can identify this problem, it is a life change for these children, and I think that, if you don’t look at that, you could be missing a massive health benefit for your patients, and I therefore believe all of us should consider this.

Does expansion or adenoid and tonsil removal cure sleep apnoea? No, it is a very complex disease. We do a lot of early expansions in my practice, called rapid palatal expansion, which is a natural distraction of the maxilla, to improve the width of the maxillary bones, and this is now also done more commonly on adults, using temporary anchorage devices to produce larger maxillae. There are many studies in the literature that show an increase in upper airway volume with maxillary expansion, so physically, you create a larger airway space. That does not necessarily correlate with curing sleep apnoea. For some patients with a structural issue, it improves their sleeping quality tremendously and sometimes you can eliminate intraoral appliances.

If you can benefit many patients and understand that you won’t cure or benefit all patients, then I think it is an important thing to do, I think what is happening, at least in the US, is that people are trying to make it an all or nothing argument. They either want to know that it definitely works and cures everybody, or it definitely does not work. The problem is that, it is never that easy. Biology, healthcare and medicine are never that easy. Getting a study to tell you one way or another is not how research works, you are never going to get the answer from one study, but people want black and white. —

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Dr. Sean K. Carlson
ORTHOSCIENCE

263 Miller Avenue, Suite 4
Mill Valley, CA 94941
+1 888 673 2827
info@orthoscience.com
Treatment of a moderate to severe Class II malocclusion using Invisalign® treatment with mandibular advancement—a case report

By Dr Donna Galante, USA

Introduction

Minimizing the use of elastics in Class II treatments not only addresses a patient compliance concern, it also addresses a treatment efficiency concern. The vertical force component of Class II elastics tends to extrude teeth, which redirects mandibular growth in a vertical direction and makes the A-P correction less efficient. Avoiding clockwise rotation of the mandible (i.e., downward and backward) helps to keep mandibular growth along a horizontal trajectory in order to maximize the sagittal change.

Case Report

Patient information:
- 14 years old
- Male
- Chief concern: overbite and crowding
- Orthodontic diagnosis:
  - Right side: Class II molar and canine (moderate)
  - Left side: Class II molar and canine (severe)
  - Overbite: severe deep bite
  - Upper arch: moderate crowding, with retroclined incisors
  - Lower arch: moderate crowding

Invisalign treatment with mandibular advancement utilizes integrated precision wings to advance the mandible without the use of interarch elastics. The precision wings in the lower aligners position the mandible forward by sliding against the precision wings in the upper aligners. At the same time, the active portions of the aligners straighten the teeth and coordinate the arches to remove interarch interferences and stabilize the sagittal changes. This approach maximizes the horizontal component of the mandibular advancement and minimizes unwanted vertical changes.

KEY CEPHALOMETRIC VALUES

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<tr>
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• Total treatment time: 22 months
• Mandibular advancement aligners: not used in this case (see discussion)
• Mandibular advancement aligners: U:23, L:26, L:22 changed weekly for 22 months total
• Additional aligners: U:23, L:23, changed weekly (10 months total)
• Retention: Invisible retainers 16 hours a day for 6 months, then at night for life

Discussion
Removing anterior interferences was important for maximizing the correction of the sagittal di- mension, and expansion of the upper arch was critical for preventing posterior crosbites from forming if the mandible came forward. When the upper arch is constricted, the posterior teeth are unable to interdigitate fully due to premu- ture posterior contacts as the mandible ad- vances. Widening the upper arch forms removes these interferences so that the lower posterior teeth can fully seat against the upper teeth. By doing this, mandibular plane divergence is avoided, and the horizontal component of the sagittal correction is maximized. The deep bite is also improved when the mandible is ad- vanced downward and forward.

In the additional aligner phase, the goal was to continue leveling the curve of Spee by intruding the lower incisors. Anterior interferences after Class II correction can lead to a mild posterior open bite. By intruding the incisors to remove these interferences, interdigitation of the poste- rior teeth is restored.

To help stabilize the A-P correction during ad- ditional aligner treatment, the patient wore Class II elastics (4oz, 3/8” diameter) connected to precision cuts in the aligners near the upper canines and lower first molars. Elastics were worn for 10 hours a day (typically at night only), for 3 months.

The sagittal improvement and the amount of upper incisor torque achieved were both good (U1SN = 92.8° and U1SN = 40°, respec- tively). The final upper incisor position was es- thetically pleasing, but slightly under-toothed relative to orthodontic norms (U1SN = 38°), so additional incisor inclination might have al- lowed the mandible to advance a little bit more. Avoiding excessively proclined lower incisors was an important factor in successfully correct- ing the Class II, especially since a mild- to-tooth-size discrepancy was also present. If the lower in- xor torque control had been poor, the amount of incisor torque achieved would have been significantly reduced due to incisor interfer- ences.

Excellent vertical control was maintained throughout treatment (ANB = -3.0°) even with the use of Class II elastics during additional aligners, in large part because extrusive forces on the posterior teeth were kept to a minimum. Not opening the mandibular plane angle al- lowed the horizontal component of the man- dibular advancement product maximizes the horizontal component of mandibular advancement while minimizing the vertical den- tal component typically associated with the use of Class II elastics (which tend to extrude the anchor teeth). As a result, excellent verti- cal control during Class II correction can be expected.

Summary
Overall thoughts and learnings about how to be successful with using the mandibular ad- vancement feature:
If a deep curve of Spee is present, a lateral/ posterior open bite will often appear when the mandible advances. Removing anterior inter- ferences early allows the mandible to come for- ward gradually, into a comfortable and stable position. To help identify anterior and trans- verse interferences with the potential to create a lateral open bite, the patient can be asked to posture their jaw forward into a Class I canine relationship during the initial consultation. This should reveal anterior interferences and areas of arch construction that need to be addressed in the aligner setup.
If the patient has significant anterior interferences, a pre-mandibular advancement group of aligners (included as part of Invisalign treat- ment with mandibular advancement) is highly recommended, so the curve of Spee and lat- eral crown torque can be introduced to the upper anterior teeth early. Pre-mandibular advance- ment aligners can also be used to widen the upper arch form, rotate the upper molars distally (typically up to 20 degrees), and level the curve of Spee.

Cephalometric superimpositions (black = initial / red = final)
Three key take away points
1. The precision wings feature of Invisalign treatment with mandibular advancement product maximizes the horizontal component of mandibular advancement while minimizing the vertical dental component typically associated with the use of Class II elastics (which tend to extrude the anchor teeth). As a result, excellent vertical control during Class II correction can be expected.
2. Any retroclined upper incisors need to be set up with proper incli- nation (positive incisor torque) in order for the mandible to advance into a stable Class I relationship. This can be initiated early in a pre- mandibular advancement phase of aligner treatment if needed. Ex- cessive lower incisor inclination should be avoided, since anterior interferences will limit how far the mandible can come forward.
3. Three transverse problems should also be addressed early with a pre- mandibular advancement aligner phase. The crowns of the upper molars and premolars (and often times the canines) should be up- righted buccally to properly coordinate the arches while the lower arch is moving forward into a Class I relationship. If the clinical crowns are short, additional attachments can be added to the setup to improve aligner retention during arch development.