

Differential tooth wear, the Inman Aligner, the Dahl principle and an alternative to preparo-mental dentistry?

Dr Tif Qureshi, vice president of the BACD, discusses a case using the Dahl principle as a way of creating anterior space in the worn dentition

Aims and objectives

To discuss the Dahl principle, using a case presentation, and to outline a non-invasive technique that makes occlusal treatments simpler and less complicated.

Introduction

One of the questions I get asked most while teaching Inman Aligner (IA) therapy is about the use of the Dahl principle in some of my cases. In fact, I get asked so often that I decided to write an article through a case presentation on the subject.

The Dahl principle is not needed for IA therapy but in many cases it can help your overall treatment plan. I have used this principle for over 12 years on probably hundreds of patients with continued success.

During the 'cosmetic boom' years, virtually every single veneer case I placed on the upper teeth had composite tip build-ups on six to eight lower anterior teeth to treat any wear and re-establish guidance before fitting the upper ceramics. I used up to 2.5mm of composite anteriorly and this seemed to cause a combination of extrusion of the posteriors and possibly intrusion anteriorly. I rarely ever placed ceramic directly on lower teeth because I could improve aesthetics and function with non-invasive composites instead. Yes, they can wear but the usual life span for these was about five to eight years and most patients were totally satisfied with this when compared against tooth preparation and the cost of veneers. Besides, it was difficult enough being conservative on misaligned upper teeth. Lower teeth, generally got annihilated during veneer preparation if misaligned.

I am aware that occlusion gurus could be coughing into their cornflakes at this point, but this article really is only to outline a non-invasive technique that has worked for me on hundreds of patients and makes occlusal treatments far simpler and less complicated.

My ceramic technician, Tony Knight at Knight Dental Design, tells me that my ceramic failure rate was significantly lower than many of his other clients and we were convinced that this extra step I was taking was making the difference.

Nowadays, thankfully, far more patients are dealing with aesthetic issues with alignment techniques, bleaching and bonding alone. Prepping for the sake of prepping seems finally to be dying out (hence the title). Veneers, when used, can be far more minimally invasive now and hence much thinner with more predictable bonding to enamel.

The principle

Modified Lucia jigs have been used as anterior deprogrammers to help the mandible find centric relation. Direct composites can also be used as an anterior deprogrammer. Resin composites, because of their resilience and ease of manipulation even in small thicknesses, represent an ideal material to restore the palatal surface (Cardoso, Canbaborro, Myers, 2000) and the worn lower anterior incisal and canine edges too.

Dahl (1975) suggested creating space to treat localised anterior tooth wear by separating the posterior teeth using an anterior bite plane for four to six months. A combination of passive eruption of the posterior teeth and intrusion of the anterior teeth, allowed the re-establishment of posterior occlusion while holding the anterior space (Dahl, Krogstad, 1982). Dahl actually used a metal appliance to separate the posterior teeth, but, of course, we can now achieve the same result with adhesive anterior direct composites.

By identifying the difference between maximum intercuspal position and centric relation (CR), using pressure to gently guide the mandible, the position of the direct composite can be set slightly posterior to maximum intercuspal position. This will create anterior contact on the incisal edge build-ups and possibly create premature contacts on the posterior teeth.

These premature contacts can be equilibrated to improve the amount of contact, but the residual space will eventually close through passive eruption over a few months.

The case

The case described is one of a 43-year-old female who presented complaining of 'crooked front teeth'. Her main concern was her lower teeth. She asked for them to be



Figure 1: Patient in occlusion with deep bite. Note posterior contacts



Figure 2: Patient in occlusion with Dahl composite added to lower anterior teeth. Note posteriors in contact



Figure 3: Before occlusal view

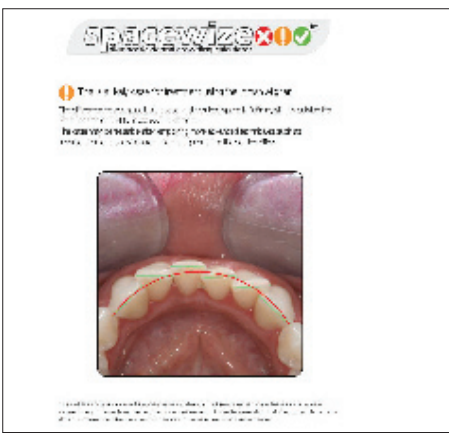


Figure 4: Spacewise calculation shows 3.8mm crowding



Figure 5: Occlusal after eight weeks of alignment and bleaching starting



Figure 6: After 12 weeks with bleaching complete and additive bonding in place



Figure 7: Before close side view. Note differential wear



Figure 8: Close side view after alignment with Inman Aligner, bleaching, and Dahl principle bonding



Figure 9: Before close view

‘straighter’. She also complained of jaw joint pain and a ‘clicky’ jaw.

On examination it was clear that there was mild to moderate crowding of the lower anteriors. Space calculation showed 3.5mm of crowding, which meant that 3.5mm of space needed to be created to allow the teeth to align. Space calculations can be carried out by Hanchers technique (Hancher, 2005), manually or using a digital space calculator, such as Spacewise. These space calculators are an excellent way for clinicians to visualise how much actual crowding

there is and whether a case is suitable for the Inman Aligner treatment or not.

The width of only one tooth needs to be measured as the programme will use this for calibration. The dentist simply then draws lines on the teeth done by a single click that measures the mesial-distal width of each tooth being moved (known as the required space, or ‘the teeth’) and then the programme allows a curve to be intuitively set up that follows the line of the ideal curve (known as the available space or ‘the curve’).



Figure 10: After close view



Figure 11: Before patient protrusive, edge to edge



Figure 12: After protrusive. Note how upper alignment has improved on its own by just aligning the lowers correctly

The programme then does the sums and subtracts the required space from the available space. This figure is the amount of crowding present, and hence the amount of space that might need to be created with interproximal reduction (IPR), expansion or domino effect.

There was clearly also a deep bite emerging and reducing anterior and canine guidance.

On discussion with the patient, close anterior photos were examined. It was pointed out that the anterior teeth were all at different lengths. Often before alignment, patients do not see this. Their eyes are focused on the crowding and they do not realise that the irregular outline is equally due to the differential wear.

This discussion is very important because patients must be aware of the extra treatment costs that may be needed after alignment.

In my experience, most adults have some degree of differential wear. After alignment I rarely grind teeth to level them off as this is clearly destructive and will only lead to reducing guidance and increasing posterior interferences over time. Instead, I nearly always build and open the bite anteriorly with composite and induce the Dahl effect. Those treating adults with orthodontics must be able to re-build the tooth structure or co-plan with a restorative dentist so the patient's guidance is protected.

The patient wanted an Inman Aligner as she wanted her teeth to align quickly and also to be able to remove the appliance for periods at work. We also quoted for eight composite tips to improve the aesthetics, treat the deep bite and induce Dahl effect to establish better anterior and canine guidance.

The treatment

Her Inman Aligner treatment took 10 weeks with three sessions of IPR and no more than 0.13mm of adjustment per tooth per appointment.

This staged IPR approach is far safer than performing all of it in one go, as often less IPR is needed than expected. It avoids excess space formation and the destruction of contact

point anatomy, which is so often seen when IPR is done all at once. Anatomically respectful IPR should be performed by anyone creating space to move teeth.

The patient was also instructed to remove the aligner for at least four hours a day.

Studies by Kameyama et al at Tokyo Medical and Dental University in Japan show that if orthodontic forces are removed from teeth for over four hours a day, the risk of root resorption drops dramatically.

At seven weeks, the patient started whitening with Day-White when not wearing the aligner. Whitening can be highly effective if the right instructions are given to the patient. Logic would suggest that dry teeth will whiten better, so why do we not routinely get patients to swallow, then suck air over their teeth before the tray is inserted?

This is something I have done for the last couple of years and it has made whitening far more predictable and the results have been consistently better.

A short-acting hydrogen peroxide gel that requires only 45-minute application each day is ideal. With sealed rubber trays, it does not matter if the teeth are still aligning. After eight weeks, they are usually 60-75% aligned. The tray will still fit at the end, but, of course, a new tray is made over the composites and wire retainer. Performing whitening in this way adds massive value and reduces chair time and, of course, can only be done with removable braces.

You cannot, and should not, use short-acting concentrated gels in rigid clear aligner trays as they are not sealed and the gel will contact the gum line. Lower percentage materials are indicated.

At 12 weeks, the composite tips were placed all in one go. It is quite possible to have your technician construct a wax-up of the proposed outline. It is also quite possible to do this with articulated models and a wax-up. You can then use a putty stent to help you create an accurate outline.

Personally, I have always preferred to build free-hand. I try to visualise the original anatomy of the teeth before they were worn. The new position is slightly posterior to maximum intercuspal position. Very minimal feather preps are used to literally just roughen the bonding surface. The

teeth were then etched, bonded and an initial outline of the load bearing areas were built-up with a hybrid composite, such as Tetric. Immediately after, a microfill is used to build up the facial and less load bearing areas. In this case, Renamel from Cosmodent was used.

A dentine shade then an incisal enamel shade is layered over. The composite is then polished back with fine burs and smoothed with sofex discs and Pogo rubbers. Critically, I try to polish with vertical strokes so the materials follow the contour of the tooth. By doing this, I find the reflective surface of the composite seems to be more in harmony with the natural tooth.

Eight composites were placed in this way. They were built up using different amounts but in a way that aligned the incisal outline and that opened the bite on the anterior teeth. It was important that their contacts are fairly even but with more load on the canine and premolar and a long centric contact on the incisors. At this point the patient's posterior teeth were discluded and a visible space was present.

The patient continued to wear her Inman Aligner and an impression was taken for a jig that would hold a stainless steel retainer to be fitted next time.

A bonded retainer was fitted to the lingual surface from canine to canine and the patient was instructed on the use of interdental brushes.

The results

On return after a few months, it was noted that the posterior teeth were now in contact again. Lateral excursion showed good predictable canine guidance and anterior guidance was also now completely discluding the posteriors. Whether this has happened due to passive eruption, anterior intrusion or even re-positioning or of the condyle can be argued. The point is that the patient's deep bite was reduced, her occlusal symptoms had disappeared and the aesthetics had massively improved. She had improved canine and anterior guidance and, one year on, she has had no issues, chips or even stains.

A potentially difficult treatment plan turned into a simple non-invasive technique and the photographs show a pleasing result.

There is also a massive attraction for patients in getting their treatment fully completed with whitening and bonding within the time quoted for alignment. Using simple logical steps, compromises do not need to be made and, more importantly, the excitement of seeing the whitening reinforces the motivation needed to ensure the patient wears the aligner for the correct number of hours.

The controversial bit

We have all read articles showing cases like this, prepped heavily for ceramic restorations in the past and more worn cases treated with full mouth rehabilitation style treatment.

Here is an option that, in my hands, works and has done on many of my patients for years now. I have treated many seemingly full mouth cases with this principle instead of

milling 28 units and, quite simply, it works.

While I certainly cannot profess it to be the answer to all occlusally compromised cases, I suspect that with the recent trend towards non-invasive treatments and rapidly rising litigation, this kind of less destructive solution might become more popular.

Dentists who influenced me – such as Peter Briggs, Martin Kelleher, Chris Orr and Pascal Magne – have been advocating the Dahl principle for years but perhaps, as there isn't a large dental industry behind it selling courses in the US market, it never got the attention it deserved. Hopefully it might soon.

References

- Cardoso ACC, Canabarro S, Myers SL (2000) Dental Erosion: Diagnostic-based non-invasive treatment. *Pract Periodon Aesthet Dent* 12: 224-228
- Dahl BL Krogstad O (1975) An alternative treatment in cases with advance localized attrition. *J Oral Rehab* 2: 209-214
- Dahl BL, Krogstad O (1982) The effect of a partial bite raising splint on the occlusal face height. An X-ray cephalometric study in human adults. *Acta Odontol Scand* 40: 17-24
- Hanchers Technique Hancher P (2005) Orthodontics for Esthetic Dentistry Part 1. *JCD Winter* (20)4
- Kameyama et al. Inactivated periods of constant orthodontic movement forces related to desirable tooth movement in rats. Tokyo Medical and Dental University, Japan



Comments to pd@fmc.co.uk

Dr Tif Qureshi BDS qualified from Kings College London in 1992. He is the vice president of the British Academy of Cosmetic Dentistry, an organisation that is promoting cosmetic dentistry in the UK and which has embraced orthodontic techniques to help minimize tooth preparations in cosmetic cases. He is a partner at Dental Elegance in Sidcup, Kent where he practices minimally invasive cosmetic and restorative dentistry. Tif has a special interest in simple orthodontics using removable appliances and was the first dentist in the UK to pioneer the Inman Aligner. He was the first dentist in the world to use the Aligner as a major tool for cosmetic dentistry. He has completed over 750 cases using Inman Aligners as a stand-alone treatment and to align teeth before veneer preparations. Tif now lectures nationally and internationally on the subject and has begun a hands-on programme to teach general dentists this new technique. For more information visit the website, www.straight-talks.com