

# Advanced Restorative Techniques and the Full Mouth Reconstruction. The Dahl Appliance. Part Six

In part six of the series, Paul Tipton provides an insight into the Dahl concept by discussing the use of the appliance in today's modern restorative dentistry techniques

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Bjorn Dahl first described the Dahl appliance in the early 1970's. Since then they have gradually been incorporated into the field of restorative dentistry, although many orthodontists still dispute their efficacy and relevance. This article will cover its usage in today's modern restorative dentistry techniques, focusing on the use of the traditional chrome cobalt 'Maryland wings' style of appliance to the use of splinted temporary or prototype restorations and to definitive restorations used to gain space during restorative procedures. Dahl proposed creating space in the treatment of localised anterior tooth wear by separating the posterior teeth through an anterior bite plane for about four to six months. A combination of passive eruption (posterior teeth) and intrusion (anterior teeth) allowed the re-establishment of posterior occlusion while maintaining the anterior space. Dahl originally used a cast metal appliance to separate posterior teeth. The same goal can be achieved today using provisional restorations or adhesive dentistry (direct resin composites) and can be used to create similar space posteriorly.

## Tooth surface loss

Tooth surface loss (TSL) is a normal, physiological process that occurs throughout life. Depending on the rate of wear, this physiological process can be described as a pathological one if it occurs rapidly and/or if it is accompanied by acid erosion – as in acid regurgitation at night, bulimia, fizzy drinks consumed excessively, etc.

In the majority of patients, TSL is accompanied by dento-alveolar compensation, including alveolar bone growth and cementum deposition. These physiological compensatory processes ensure that, for the majority of patients, occlusal contacts are maintained in order to retain the efficacy of the masticatory apparatus. This lack of interocclusal space presents a problem for the restorative dentist.

One approach is to conform to the existing intercuspal position (ICP) and create the necessary interocclusal space by further occlusal reduction of the worn teeth. Occlusal reduction of already worn teeth may lead to a lack of axial height and thus insufficient retention and resistance for conventional restorations. Perioden-

tal crown lengthening procedures will aid retention but, unfortunately, introduce other disadvantages.

Tooth preparation and the associated loss of coronal tissue can risk further insult to the pulp and limit the options for future restoration replacement and many patients do not enjoy this surgical option.

An alternative approach is to create the necessary space by reorganising the occlusion by means of an increase of the vertical dimension of occlusion but many will require a full mouth reconstruction. A different variation involves reconstruction of the occlusion to a retruded contact position (RCP) in a case where there is a large horizontal slide from RCP to ICP.

Orthodontic appliances can be used to create sufficient interocclusal space by a combination of relative vertical and horizontal bodily movements and a change in the axial inclination of the teeth. These comprehensive and specialised techniques may be more appropriate when other features of the occlusion require treatment such as anterior crowding or midline changes.

A typical example of this is shown in Figures 1 to 6. This 55-year-old lady was referred by the GDP because of the wear on her lower anterior teeth and for the replacement of the missing upper left canine tooth and correction of the associated centre line discrepancy.

In this instance, traditional orthodontics not only corrected the centre line but also moved the upper anterior teeth upwards, creating space for the restoration of the worn lower anterior teeth.

## Anterior Dahl appliance

A typical example of a Dahl appliance is shown in Figures 7 to 11. The patient was a 35-year-old man who was referred by his GDP with extensive erosion of the palatal surfaces in the upper anterior teeth to a degree that he was concerned about the sensitivity of the teeth. Although all teeth had a degree of tooth wear, only the upper anterior teeth were worn sufficiently to justify intervention.

A nickel chromium fixed Dahl appliance covering the palatal surfaces of all the upper anterior teeth was made on a working model articulated with

a lower model in the terminal hinge axis position. The interocclusal distance was increased by raising the incisal pin point on the articulator and the appliance waxed up to produce an occlusal platform at right angles to the long axis of the lower incisor teeth. The cast appliance was then sandblasted and cemented to the teeth with glass ionomer cement. The appliance was adjusted to establish even contact of all lower anterior teeth in occlusion with the Dahl appliance and it was confirmed that none of the posterior teeth made contact in any excursion of the mandible. There was no problem with retention of the appliance throughout the active phase of treatment, even though the amount of enamel around the exposed dentine on the palatal surfaces of the teeth was minimal. An alternative approach could have been to do a similar treatment using direct composite, splinting the anterior teeth.

After 12 weeks, the posterior teeth had fully erupted until occlusion, allowing for removal of the Dahl appliance and restoration of the eroded

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Figure 1: Over erupted upper anterior teeth and centre line shift



Figure 2: Traditional orthodontics to align and intrude



Figure 3: Lower worn teeth



Figure 4: Final captek restorations



Figure 5: Final smile



Figure 6: Final full face view



Figure 7: Worn palatal surfaces



Figure 8: Diagnostic waxing



Figure 9: Nickel chromium Dahl appliance



Figure 10: Dahl appliance cemented onto the teeth



Figure 11: Space acquired using the Dahl appliance



Figure 12: Final 'empress' palatal veneers



Figure 13: Poor aesthetic smile



Figure 14: Worn spaced upper anterior teeth



Figure 15: Palatal wear due to bulimia



Figure 16: Prototype splinted composite crowns

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palatal aspects with Empress (Ivoclar Vivadent) palatal veneers.

### Posterior Dahl appliance

Tooth wear affecting only posterior teeth is usually part of a generalised condition affecting the whole dentition. Occasionally, the pattern of this tooth wear is such that individual posterior teeth may require restoration. More often, however, the Dahl appliance principle can be used to reverse the over eruption of posterior teeth due to the opposing teeth being extracted.

Where space is at a premium, the selection of a gold alloy as opposed to porcelain will be advantageous. Because of the normal arc of mandibular closure, there will often be more space available in the premolar regions, allowing the opportunity to use more aesthetic restorations. Aesthetic demand is often greater for occlusal surfaces in the mandibular arch.

In selected cases, it is possible to consider a full mouth reconstruction of the worn dentition using resin-bonded ceramic restorations. The longer-term durability, particularly of the posterior onlay restoration, remains unpredictable and characteristically small fracture lines can appear in time, which may eventually result in catastrophic failure.

### Alternative Dahl appliances

The same principles can be used in traditional crown and bridgework by leaving the prototype crowns high and waiting for over-eruption. Figures 13-19 is a typical case study of a young lady with bulimia requiring anterior restoration, by using the Dahl appliance theory with 'high' anterior prototype crowns to gain space, the palatal aspects of the eroded teeth need not be prepared.

Over-eruption, when it does occur, is seldom axial and involves tipping as well. In this scenario palatal upper cusps often appear to 'grow' longer and, likewise, lower buccal cusps. This increases the potential for the introduction both RCP-ICP slides and also non-working side interferences. Thus, every Dahl appliance treatment should finish with careful assessment of the occlusion and where appropriate occlusal adjustment in order to maintain the five principles of occlusion in the restored case.

### Conclusion

It is hoped that this article gives you an update and insight into the Dahl concept. Although there is a need for further research, the evidence to date indicates that the technique can be confidently and successfully used in a variety of PDclinical situations and for many patients, irrespective of age or sex.

The technique appears to be safe and avoids performing destructive restorative procedures on compromised teeth. The development of adverse events is very rare. If they do occur, they tend to be minor in nature and transient with no long-term adverse sequelae.

The Dahl concept tends to be associated with the management of the worn dentition. However, the technique could also be applied to compromised and root filled teeth, and to correct localised distortions in the occlusal plane. [DTI](#)



Figure 17: Final view of palatal surfaces



Figure 18: Final restorations on the six anterior teeth



Figure 19: Final smile

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