Advanced restorative techniques and the full mouth reconstruction: part five - vertical dimension and changes during restorative treatment

In part five of the series, Paul Tipton discusses changes in vertical dimension, which are often required for either improving facial aesthetics or gaining space during restorative treatment.

Changes in vertical dimension are often required for either gaining restorative space during restorative procedures or for improving facial aesthetics. Occlusal splints are used to first verify that the increase in vertical dimension can be tolerated. In most cases this is easily accomplished as long as this increase is done around retruded axis position (RAP) or centre relation so that the condyles are in their most relaxed, bone braced and reproducible position.

In this article increases and decreases in vertical dimension will be discussed showing positive changes in facial aesthetics as treatment is completed.

Increasing vertical dimension of occlusion

There is some debate among professionals as to what constitutes the need to open vertical dimension of occlusion (VDO) in the restoration of anterior teeth or partial or full mouth reconstruction. In most cases, clinicians look to alter vertical dimension for one or all of the following reasons:

• To gain space for the restoration of the teeth
• To improve aesthetics
• To correct occlusal relationships.

Understanding what determines the VDO and what the effects of altering it have on the temporomandibular joint (TMJ), muscle comfort, bite force, speech, and long-term occlusal stability are prerequisites to restoring the worn dentition.

Spear (1997) clearly outlines the principles of VDO and concludes that ‘patients can function at many acceptable vertical dimensions, provided the condyles are functioning from centric relation and the joint complex is healthy’. He states that ‘vertical is a highly adaptable position, and there is no single correct vertical dimension’. He further concludes that the best vertical dimension is the one that satisfies the patient’s aesthetic desires and the practitioner’s functional goals with the most conservative approach.

Mohindra (2007) showed that increasing VDO resulted in a younger looking patient. Part three in the series dealt with the diagnostic approach to increasing VDO.

Aims and objectives

To discuss increases and decreases in vertical dimension and to demonstrate positive changes in facial aesthetics as treatment is completed.

Expected outcomes

Correctly answering the questions on page 96 will demonstrate you understand the positive changes that can take place in facial aesthetics with increasing or decreasing vertical dimension.

Verifiable CPD hours: 1

Space

When starting from RAP, opening of the anterior teeth by 3mm will yield a posterior separation of approximately 1mm and stretch the masseter muscle length approximately 1mm. If the condyles are not in retruded axis positions and are subsequently seated to a more superior position, every millimeter of vertical seating will reduce the masseter muscle length by 1mm, thereby eliminating the need for a true opening of vertical dimension.

Case study one

Mrs S (Figure 1) was referred to me by her general dental practitioner for a full mouth reconstruction because of the poor aesthetics of her upper crowns (Figure 2), the wear taking place on her lower anterior teeth (Figure 3) and because she wanted an improvement of her smile (Figure 4).

As part of the initial diagnostics, an assessment was made of her vertical facial height by using an intra-oral facebow.
Figure 1: Patient's initial full face

Figure 2: Upper anterior teeth showing centre line shift

Figure 3: Lower worn anterior teeth

Figure 4: Presenting smile with centre line shift

Figure 5: Full face closed mouth

Figure 6: Full face closed mouth with increase of 5mm in VDO

Figure 7: Upper diagnostic wax-up
and wax jaw registration as described in part three of this series (Figures 5 and 6) followed by a diagnostic wax-up at the increased vertical dimension (Figures 7 and 8).

Her anterior teeth showed severe wear in the lower and poor width/length ratio of her upper crowns (Figure 9) together with a centre line shift of approximately 2mm. Crown lengthening procedures were done (Figure 10) followed by tooth preparations (Figures 11-14) and placement of prototypes in sections as per the previous article.

The stages in full mouth reconstruction were followed as in part four of the series. The final end result can be seen in Figures 15-19, showing a facial improvement and a younger looking patient.
Reduction of VDO
Conversely, although not as predictable a procedure, reduction or shortening of vertical dimension is both possible and often advisable. In cases where there may be an overall anterior open bite, a simple posterior occlusal adjustment (reduction in vertical dimension) will result in anterior teeth meeting with the condyles in RAP. This then allows for the development of a mutually protected occlusion and anterior guidance on the anterior teeth. The following case study will show how occlusal adjustment can improve patient comfort.

A reduction in vertical dimension can also have a positive effect on facial aesthetics, for example by taking a long, thin face and making it look more in proportion.
However, a word of warning – while increases in vertical dimension can be first tried out without any tooth destruction with an occlusal splint, a reduction cannot be tried out prior to tooth preparation and so is not reversible. A great deal of experience is required before taking on a case such as this.

Case study two
This lady was referred to me because of her failing upper anterior composite veneers, TMJ dysfunction and poor aesthetics (Figure 20). Initial examination revealed a near edge-to-edge occlusion (Figure 21) with a vertical and horizontal slide from RCP into ICP. Upon manipulation to
RCP there was an anterior open bite present. The goal of treatment was to equilibrate the patient and, at the same time, reduce her VDO so that better anterior contacts were gained and then to restore to a new ICP around her RAP with better anterior guidance.

Initial casts were taken and placed on the semi-adjustable articulator (Figure 22). These casts had been pinned so that the posterior quadrants could be removed (Figure 23). Once these posterior segments were removed, the VDO was reduced by approximately 3mm showing true anterior contacts after a planned posterior occlusal equilibration (Figure 24). Further adjustment was then
done on the casts so that the anterior teeth contacted in a more even manner (Figures 25-27), further reducing VDO by 2mm (Figures 28-30).

Full diagnostic procedures were then performed, including diagnostic wax-ups to this new reduced VDO (Figures 31 and 32) and the patient was prepped for upper dentine bonded crowns (Figure 33) and upper and lower posterior porcelain fused to metal crowns. Note: the patient’s lower anterior teeth were not restored, only whitened. Silver dies (Figure 34) were used by the technician for fabrication of the final dentine bonded upper anterior crowns (Figure 35).

The final restorations show better overjet and overbite with anterior guidance now on the anterior teeth and full interdigitations of all teeth around RAP, and no slide between RCP and ICP (co-incident position) (Figure 36). Careful post-restorative adjustment was performed after fitting of the crowns and a post-restorative splint fabricated, for night-time use (Figure 37).

The final smile shows the aesthetic improvements (Figures 38 and 39).

Acknowledgements
The author would like to thank the following for their help in preparing the articles in this series:
- Dr Ibrahim Hussain, BDS, M.Med.Sci. Implantology – implant surgeon
- Dr Andrew Watson, BDS, MSc, specialist in endodontics
- Dr Amit Patel, BDS, MSc, MClInDent, MFDS, RCSEd, MRD, RCS Eng, specialist in periodontics
- Mr Jeff Caddick – dental technician, Castle Ceramics, Staffordshire.

References
For the list of references to accompany this article please email the editor at slobhan.lewney@fmc.co.uk.

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