

SCD

Case Study

Vertical dimension (VD) can be defined as the distance between any two points measured in the maxilla and the mandible when the teeth are in maximum intercuspation (Lucia VO., 1961).

1. Anterior teeth are the dominant factor in determining vertical dimension (Smith DM. et al., 1986).
2. VD is unrelated to temporomandibular disease (TMD) and there is no evidence to suggest that by changing VD one can treat TMD (Bloom DR., Padayachy J.N. 2006).
3. The vertical dimension of occlusion (VDO) is determined by the repetitive contracted length of the closing muscles. Increases in VDO cannot be maintained as the jaw to jaw relationship will always return to the original dimension i.e. “the muscles always win” (Eriksson, P.O. and Thornell, L.E., 1983).
4. Wear does not result in loss of VD, as the alveolar process lengthens to compensate.
5. The position of the condyles does affect muscle length and hence the VDO. When looking at changes in VD the study casts must be mounted in centric relation (CR) (Dawson P., 2006).

POSSIBLE CLINICAL CONCERNS BEHIND CHANGING VD

Joint or muscle pain	This is not a problem, as altering VD does not produce pain of more than one to two weeks' duration. Any pain is a result of increased temporary muscle awareness (Christensen J. 1970).
Stability	<p>When closing VD there is very little relapse; it may open by up to 1 mm within the first year and will then remain stable and undetectable by either the clinician or the patient (Dahl BL, Krogstad O. 1985).</p> <p>When opening the VD some patients can remain stable, others can relapse slightly or significantly. Again, this may go unnoticed dentally.</p>
Muscle activity	The postural muscle tone (i.e. the rest position) reduces when VD is increased but returns to normal within three months (Lindauer SJ., Gay T, Rendell J., 1993).
Phonetics	<p>This can sometimes be a problem for 'S' sounds. Patient adaptation usually occurs within one month. Correction of persistent phonetic problems for patient adaptation requires creation of space by shortening the lower incisors (as shortening the upper incisors will have aesthetic implications) and will depend on the lower incisor position when the 'S' sound is created.</p> <p>If 'S' is generated with the lower incisors in the cingulum area of the upper incisors (i.e. behind and above the upper incisal tip), shortening the lower incisors will leave them out of contact when the teeth are in occlusion. Thus the VD will then need to be reduced.</p> <p>If 'S' is generated by the incisors being more edge-to-edge the lower incisors can be reduced and the linguals of the upper incisors built out to maintain contact.</p>

RATIONALE FOR ALTERING VD

1. Aesthetics (especially where patients appear overclosed with a prominent chin, or exhibit excessively worn, short teeth).
2. Alter the occlusal relationship.
3. Prosthodontic convenience to allow space for restorations.

ANTERIOR DETERMINANTS OF VERTICAL DIMENSION (Bloom DR., Padayachy J.N. 2006)

When changing incisal position restoratively, provisional restorations must be provided initially and subsequently modified until all guidelines below have been followed. The patient must be comfortable and satisfied aesthetically, phonetically and functionally. A diagnostic wax-up will enable evaluation so that the following are produced:

1. Stable CR contacts.
2. Correct labial and incisal contours:
 - Upper half of the labial surface. The upper half of the labial surface is continuous with the labial surface of the alveolar process.
 - Lower half of labial surface. This is in two planes - for incisal position and to allow the lip closure path to slide along the labial surface hence the need to roll in the incisal tip.
3. Incisal edge. This should rest along the inner vermilion border of the lower lip and is best observed watching the patient counting from 50 to 55 i.e. creating an 'F' sound. This needs to be in harmony with the neutral zone, lip closure path, phonetics, envelope of function and aesthetics.
4. Anterior guidance. This is determined by the protrusive path but should include a 'long centric' that allows a little freedom before this path is engaged and so the lower incisors are not locked.
5. Contour of the lingual surface from the centric stop to the gingival margin to ensure correct phonetics. There should be no interferences with the 'T', 'D' or 'S' sounds.

Dawson P. 2006 discusses the concept of programmed treatment planning in the planning process for severe wear starting with the verification of stable, completely seated TMJ's.

INDICATIONS FOR SUCCESSFUL VDO CHANGE

Absence of :

- Tension or tenderness in either joint when it is vertically loaded
- Tenderness in the teeth
- Grinding and the absence of posterior interferences
- Fremitus
- Instability – i.e. wear or chipping

Six factors need to be understood regarding severe wear:

- Does not cause a loss of VDO.
- Does not eliminate all deflective occlusal interferences (even if occlusal surfaces appear to be flat).
- Can only occur if the upper teeth are in the way of the lower teeth during functional or parafunctional mandibular movement.
- Is not caused by bruxing or clenching unless teeth are in the way of mandibular movement. Teeth cannot wear if they cannot rub.
- Posterior teeth cannot wear (from attrition) if posterior occlusion is perfected and anterior guidance is stable.
- Restoration of severely worn teeth must be performed so that the altered tooth contours do not steepen or restrict the envelope of function. Any restriction of anterior guidance can result in wear or movement of the anterior teeth and loss of the disclusive effect on the posterior teeth.

The goal of treatment for all severe wear patients is restoration of clinically effective form and function to prevent further tooth surface damage. This is achieved by ensuring posterior disclusion from the moment the mandible moves from centric relation and that this disclusion is maintained by a perfected anterior guidance.

Dawson P. also summarises the five requirements for occlusal stability:

1. Stable stops on all the teeth when the condyles are in centric relation.
2. Anterior guidance is in harmony with the border movements of the envelope of function. The anterior teeth are better able to resist stress than the posterior teeth.
3. The posterior teeth disclude in protrusive movements.
4. The posterior teeth disclude on the non-working side.
5. There is no interference of all the posterior teeth on the working side with either the lateral anterior guidance or the border movements of the mandible.

CASE REPORT

Patient has presented to dentist seeking an improved dental appearance. The patient wanted more tooth structure to be visible for a more attractive smile. The plan was to divide the new vertical build-up between the lower and upper arches.



The dentist sent the original models to the laboratory with a record of the interocclusal registration so that the technician could increase the vertical dimension. The laboratory was asked to design a diagnostic wax up for the patient to approve. This wax-up involved increasing the height of teeth in both arches as originally planned.



The dentist then requested that a Penn Composite Stent™ be made for the upper arch which the dentist would build up entirely with composite. Due to the patient's financial constraints, the build-up on the lower teeth was achieved using a lower full arch Michigan splint.

Using a splint to adjust the occlusal height in one arch can provide flexibility to alter the VDO over time, protect restorations and enhance achievement of posterior disclusion. Pending finances at a later date, the patient may decide to have the lower arch restored with the Penn Composite Stent technique.

Southern Cross Dental acknowledges the assistance of Dr. Harshwardhan Narde, 1 Piper Street, North Tamworth, NSW, Australia for his co-operation in this case presentation.

BIBLIOGRAPHY

Bloom, D.R. and Padayachy, J.N., 2006. Increasing occlusal vertical dimension—Why, when and how. *British dental journal*, 200(5), pp.251-256.

Christensen, J.O.H.N., 1970. Effect of occlusion-raising procedures on the chewing system. *The Dental practitioner and dental record*, 20(7), p.233.

Dahl, B.L. and Krogstad, O., 1985. Long-term observations of an increased occlusal face height obtained by a combined orthodontic/prosthetic approach. *Journal of oral rehabilitation*, 12(2), pp.173-176.

Dawson, P.E., 2006. *Functional occlusion: from TMJ to smile design*. Elsevier Health Sciences.

Eriksson, P.O. and Thornell, L.E., 1983. Histochemical and morphological muscle-fibre characteristics of the human masseter, the medial pterygoid and the temporal muscles. *Archives of Oral Biology*, 28(9), pp.781-795.

Lindauer, S.J., Gay, T. and Rendell, J., 1993. Effect of jaw opening on masticatory muscle EMG-force characteristics. *Journal of dental research*, 72(1), pp.51-55.

Lucia, V.O., 1961. *Modern gnathological concepts*. CV Mosby Co..

Smith, D.M., McLachlan, K.R. and McCall Jr, W.D., 1986. A numerical model of temporomandibular joint loading. *Journal of Dental Research*, 65(8), pp.1046-1052.