Full mouth rehabilitation

Dean Vafiadis and **Cherry Estillo** look at restoring vertical dimension of occlusion using anterior determinants of aesthetics

Restoring vertical dimension of occlusion (VDO) has always been a challenge to the clinician. Knowing where to start and where to finish has been published by many authors with various different methods.[1-4]

Three things remain constant when reviewing the literature:

1. How much to restore the VDO?
2. From which point are we restoring the VDO?
3. Will there be a negative effect on the patient upon the initial restoration increase?

While restoring the patient's VDO we also have to consider how and why the patient lost VDO; was it attrition, habitual or merely compromised occlusion in a bad environment? Using various bite plate therapies and diagnostic bite plates during day and night time, the evidence can be analysed to approximate the etiology. However, the clinical final position of VDO still must be restored in order to get the proper tooth morphology and facial aesthetics. Using some bone landmarks, radiographic analysis, facial aesthetics and facial structures, the clinician can better analyse the correct position of the anterior teeth.[5] This can also determine the amount of VDO restoration that is allowed by each patient. Some patients have been restored up to 10mm incisally using anterior determinants. This is based on Posselt's envelope of motion which showed that incisal position was directly related to the hinge axis.[6] Only when the incisal position exceeded 19-25mm did the mandibular condyle go into translation position. In this case presentation, using anterior determinants will also finalise the length and size of the central incisors that best match the patient's face and will adequately give posterior clearance for the restorative material, therefore revealing the correct incisal increase in VDO.


Figure 1


Figure 2


Figure 4


Figure 3

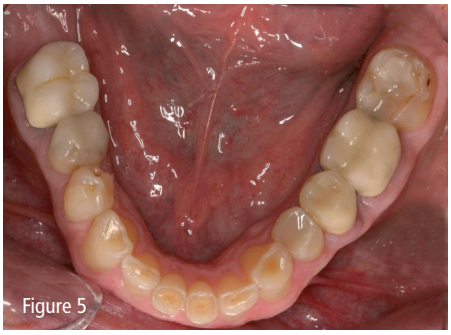


Figure 5

Figures 1-5: The patient presented with worn anterior dentition, defective crowns in the posterior and lack of protective canine guidance

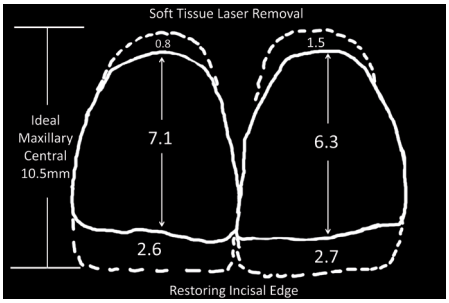


Diagram 1

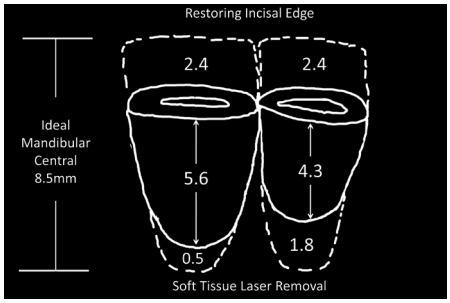


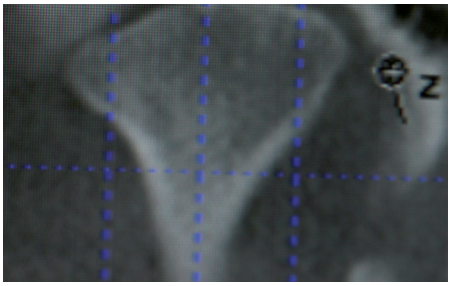
Diagram 2

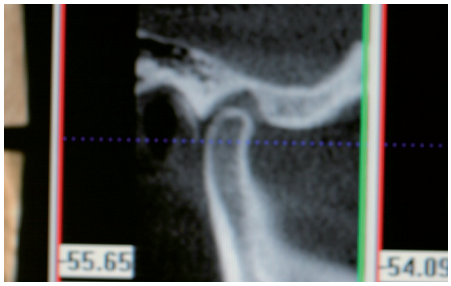
Introduction

The patient presented with worn anterior dentition, defective crowns in the posterior and lack of protective canine guidance (Figures 1-5). The patient had no joint symptoms and no peri-apical pathology or any contra-indications for dental treatment. The patient was also concerned with his misaligned teeth and wanted a better aesthetic look and lip support. He also complained that his teeth were yellow and he felt his teeth made him look older.

Diagnosis

The patient had standard radiographs taken, lateral cephalometric digital X-ray and a cone beam 3D scan of the TMJ joints (I-Cat, Image Sciences Int. Hatfield, PA) (Figures 6-7). Incisal measurements of central incisors revealed the length was 7.1mm for right central and 6.3mm for left central (Digital Caliper, Mitutoyo, USA) (Figure 8). Lower central incisors measured 5.7mm and 4.6mm respectively from CEJ to incisal edge (Figure 9). Full contour wax-up





Figures 6-7: The patient had standard radiographs taken, lateral cephalometric digital X-ray and a cone beam 3D scan of the TMJ joints

Figure 8: Incisal measurements of central incisors revealed the length was 7.1mm for right central and 6.3mm for left central

was designated for upper centrals to be 10.5mm and lower centrals at 8.5mm (Figure 10).

In addition, gingival line changes on maxillary centrals and mandibular centrals would equalize with either soft tissue laser or crown lengthening. The determination to utilise the laser tissue surgery or hard tissue crown lengthening depends on the amount of unattached tissue available above the biologic width.[7]

If the probing depth is 2-3mm, then crown lengthening would be necessary to create harmony in the gingival line. In this patient, the probing depths were 3.8mm on maxillary right central and 4.3 on maxillary left central (Diagram 1-2).

The laser tissue removal was indicated for maxillary and mandibular central and lateral incisors to remove the unattached keratinized gingival and create an ideal contour for the four incisor teeth. There was no change in any of the canine gingival levels. This allowed the mandibular central incisal length position to be restored 2.4mm and the maxillary central incisor length position 2.6mm for a total average 5.0mm VDO restoration. Once this was determined in the wax-up, an overlay provisional material (Luxa-temp DMG, Englewood, NJ) was placed over maxillary and mandibular incisors. This was then evaluated for lip position, facial position, phonetics and TMJ recording position (Figures 11-14).

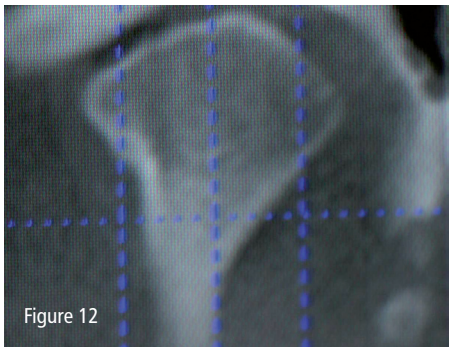
After evaluating and comparing radiographs with new length positions, additional measurements were made from CEJ levels on canine teeth #6 - #27 and #11 - #22.[8] These were designated as starting VDO measurements or VDO reference points. During the treatment phases, wax-up, provisionals, and final restorations these measurements were confirmed and remained consistent (Figure 15).

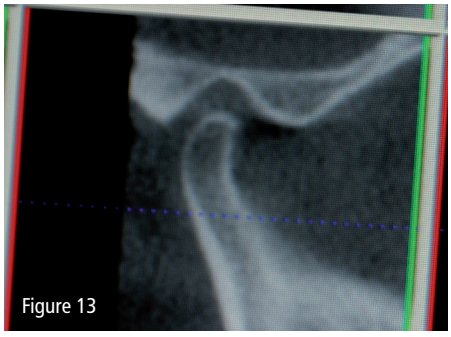
Treatment

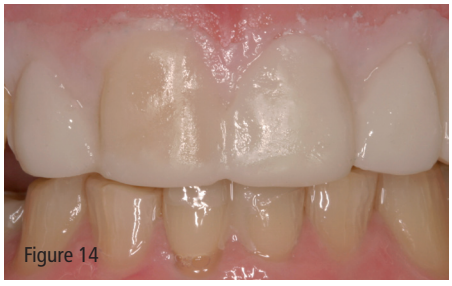
Maxillary arch was prepared first to establish maxillary anterior incisal position. Provisional material was overlaid on the maxillary anterior teeth to begin the VDO restoration. The posterior

Figure 9: Lower central incisors measured 5.7mm and 4.6mm respectively from CEJ to incisal edge

Figure 10: Full contour wax-up was designated for upper centrals to be 10.5mm and lower centrals at 8.5mm







Figures 11-14: An overlay provisional material was placed over maxillary and mandibular incisors, and then evaluated for lip position, facial position, phonetics and TMJ recording position

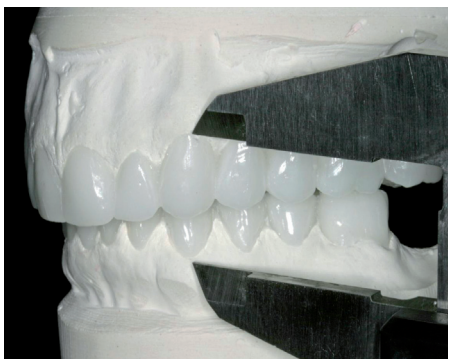


Figure 15: During the treatment phases, wax-up, provisionals, and final restorations, measurements were confirmed and remained consistent

Figure 16: The four anterior teeth were then prepared and soft tissue laser was used to remove unattached keratinized tissue

teeth were prepared initially and the VDO was maintained with the anterior provisionals in place. Once the posterior preparations were completed a polyvinyl record was made to hold the working VDO. In addition, posterior provisionals were made on posterior teeth to working VDO. The four anterior teeth were then prepared and soft tissue laser was used to remove unattached keratinized tissue; 0.8mm on maxillary right central and 1.5mm on left central (Picasso, AMD Lasers, Tulsa, OK) (Figure 16). Provisionals were fabricated at new restored VDO (Figures 17-18). Final impressions were made for all maxillary teeth and inter-occlusal record was made with blue wax (allure) and overlaid with green wax (aluwax) at the new designated VDO measurement. Face bow transfer record was made (Artex, Jensen Dental, North Haven, CN). Provisional restorations were bonded into position from teeth numbers #5 - #12. The posterior second premolars and molars were cemented with provisional cement (TempBond, Kerr, USA). Occlusal adjustments were made so that all teeth were in maximum inter-cuspation (MIP) but always maintaining the new working VDO. If any teeth were not in contact, provisional material was added instead of adjusting 'down' the occlusion. This maintained the VDO in the working/reference VDO position. Canine protected occlusion was established with lower natural canines by adding slight composite resin to the incisal of the canines. Posterior dis-occlusion was observed during all lateral excusive movements.

Figures 17-18: Provisionals were fabricated at the new restored VDO

Figures 19-23: Final cementation of posterior molars was performed

Figure 24: On the fourth and final appointment, the mandibular restorations were delivered, polished and occlusion verified and confirmed to be at the new restored VDO

Materials

After two weeks, the restorations were ready for insertion. The materials used for maxillary restoration were lithium disilicate crowns onlays on molars (IPS e.max cad, Ivoclar, Vivadent, USA) and feldspathic layered porcelain (Creation, Oral Design NY, Peter Kouvaris, MDT) for the premolars and anterior restorations.[9] The following cementation steps were used:

- Dry clean and etch 20% phosphoric acid
- Dentin bonding agent (Excite, Ivoclar, Vivadent), air dry and cure 15 seconds
- Bonding agent and adhesive double layer (Optibond solo-plus,+ Optibond 2FL adhesive liquid Kerr Dental, Orange, Cal.) air dry *no* cure
- Lightly coat the inside of the restoration with adhesive agent, *do not cure*
- Using a composite light cure flowable cement (RelyX, 3M ESPE, USA)
- Apply cement on natural tooth and all restorations
- Seat all restorations and spot cure on gingival area 5 seconds
- Place serrated separator (10mm, Brasseler, USA) between central incisors first and cure facial-interproximal area, holding separator in place
- Remove separator and continue to the next restoration distally
- Continue distally until all teeth are completed
- Cure all restorations on the lingual surface
- Trim and polish all excess cement on the facial with 12 flute carbide pointed high speed bur and polish the lingual surfaces with red diamond, football shape burs
- Polish to high shine any surfaces that have been adjusted with aluminous oxide dilate polishing wheels (White, Pink and Gold band, Brasseler, USA).

Final cementation of posterior molars was performed first (Figures 19-23). Afterward anterior and premolars were placed. In a third appointment, the mandibular anterior and posterior teeth were prepared and provisionalised. On the fourth and final appointment, the mandibular restorations were delivered, polished and occlusion verified and confirmed to be at the new restored VDO (Figure 24). Canine protective guidance was confirmed and posterior dis-occlusion occurred during all excursive movements (Figures 25-27). Comparison photos of facial aesthetics revealed aesthetic and functional rehabilitation completed in good proportions (Figures 28-29).



Figures 25-27: Canine protective guidance was confirmed and posterior dis-occlusion occurred during all excursive movements

Discussion

It is important to diagnose patients with worn dentition before beginning treatment. Using anterior determinants for anterior worn patients is another technique a clinician can use to determine the final lengths of the central incisors.

This technique is valuable because it gives the clinician the correct amount of vertical dimension necessary to restore without using arbitrary incisal pin opening on the articulator. It is important to note that patients with dramatic VDO restoration must be asymptomatic with their TMJ.

However, if the patient is asymptomatic but has posterior interferences and occlusal disharmony, restoring the VDO in the new MIP the restored dentition will automatically negate any premature contacts. Posterior determinants may be used for the posterior teeth that have been worn and waxing the correct size tooth for proper occlusion morphology. This will also show the clinician the correct amount of VDO restoration. The condylar position of the TMJ joint can now be easily recorded and confirmed with the new VDO position via cone beam scans of joints and be used as a reference point. This will allow the clinician to restore VDO with confidence that the joint will be in the proper position.


Figures 28-29: Comparison photos of facial aesthetics revealed aesthetic and functional rehabilitation completed in good proportions

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Care to comment? @AesDenToday

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