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Reliable and Repeatable Centric Relation Adjustment of the Maxillary Occlusal Device

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Abstract

This technique article describes a quantifiable, repeatable, and reliable method for occlusal device adjustment in centric relation using a leaf gauge. In addition, specific suggestions for occlusal device design are provided to enhance patient comfort with the prosthesis in place.

The dental literature provides little information on how to clinically insert and adjust occlusal devices used to protect teeth during parafunction, to determine a stable and repeatable patient-derived centric relation position, or to treat symptoms of temporomandibular dysfunction.[1] Although many different designs for occlusal devices exist,[2-5] the aim of this technique article is to describe the fabrication of a maxillary occlusal device and a method of clinical adjustment that is reliable and ensures adjustment to the centric relation position using a leaf gauge.[6]

Technique

(1) Make maxillary and mandibular irreversible hydrocolloid (Jeltrate, Dentsply Caulk, Milford, DE) impressions and a facebow record to be used for mounting on a semi-adjustable articulator on the patient.
(2) Use a leaf gauge (Huffman Dental Products LLC, Springfield, OH) to create an interocclusal centric relation record at the proposed restorative vertical dimension of the device. Enough leaves should be used to allow for a minimum of 1.5 mm of acrylic resin between the closest maxillary and mandibular cusp tips (Fig 1).[7,8]
(3) Have the patient close on the leaf gauge with medium force. Ask the patient to protrude and retrude the mandible quickly and then hold this centric relation position. If pain is present with mandibular movement or the patient has limited range of motion, the gauge can also be used as an occlusal stop.
(4) With this technique, it is recommended to leave the leaf gauge in the patient's mouth for 5 minutes to 15 minutes to allow for muscle deprogramming.[9-12] Closely observe the patient's movements to ensure the patient does not protrude.

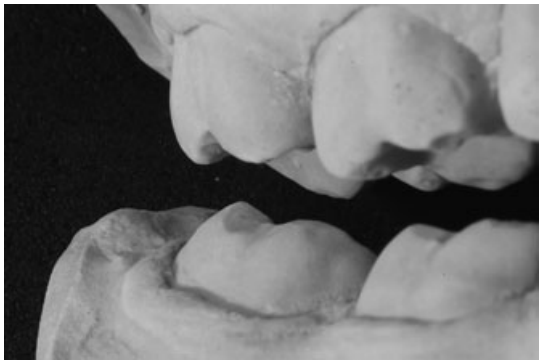

Figure 1 It is critical that 1.5 mm to 2.0 mm of interocclusal space be present between the two points in the dentition in closest proximity, not just from cusp tip to fossa.

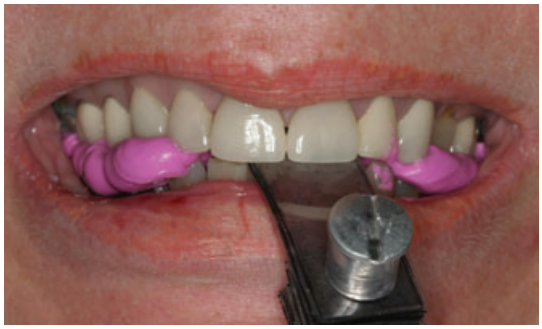

Figure 2 Occlusal registration material is placed between the posterior sextants only with the correct number of leaves.

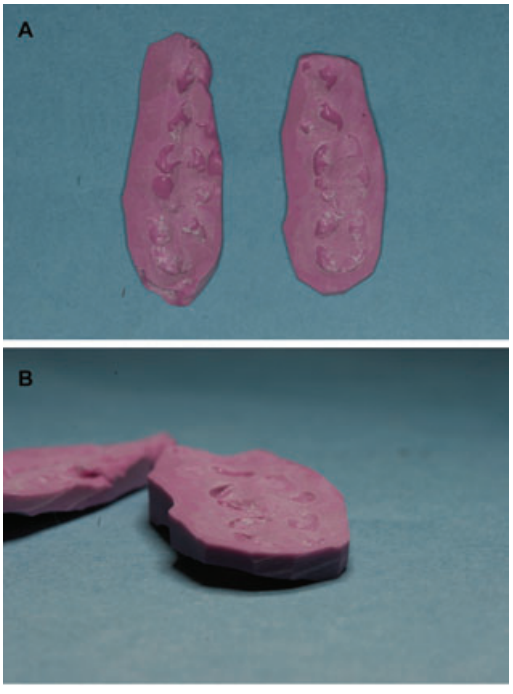

Figure 3 A, B Trimming the occlusal device record to cusp tips allows for accurate seating of the record on the dental casts.

Figure 4 The leaf gauge is inserted between the mandibular incisors and the occlusal device in place. Enough leaves should be placed to prevent tooth contact on the device.

Figure 5 The buccal aspect of the occlusal device is contoured to follow the facial contours of the teeth. All edges and surfaces should be polished after reshaping and adjustments. (The occlusal was air-particle abraded for photographic purposes only.)

(5) Re-inspect the inter-cusp distance to ensure the required amount of space is still present. If the vertical distance has decreased, add enough leaves to attain the 1.5 mm requirement and wait 2 to 5 minutes, then check again.
(6) Without permitting the patient to occlude his/her teeth, remove the leaf gauge and apply poly(vinyl siloxane) occlusal registration material (Regisil PB, Dentsply Caulk) between the posterior teeth only. Then reinsert the leaf gauge as an anterior guiding point and have the patient hold in centric relation position until the material has set (Fig 2). Trim the record to "cusp tips only" using a #25 blade (Safco Dental Supply Co., Buffalo Grove, IL) or lab bur (Carbide Cutter 015358UO, Brassler USA, Savannah, GA) (Fig 3). If the patient's performance of the record making procedure is less than ideal, then repeat by making two more records and verify the cast mounting with two out of the three records confirming correctness.
(7) Mount the maxillary cast using the facebow. Then place the trimmed record between the casts and mount the mandibular cast onto a semi-adjustable articulator.

(8) Instruct the dental laboratory to fabricate the maxillary occlusal device making sure not to alter the incisal guide-pin position on the articulator, as this will introduce arc of rotation error.
(9) The laboratory should ensure the device has mutually protected occlusion and articulation, thus achieving dot centric contacts on cusp tips of the posterior teeth and shallow anterior disocclusion.[13]
(10) The device is then inserted, checking for proper fit with no rocking or unwanted dislodgement.
(11) The leaf gauge is inserted between the mandibular incisors with the occlusal device seated in place. Add enough leaves so there is no contact between the device and the opposing dentition (Fig 4). Using the method described in step 3 again, allow for the muscles to deprogram. If tooth/device contact occurs while the patient is deprogramming, increase the number of leaves until no contact occurs.[6]
(12) Bring the device into equilibration by removing one leaf at a time until contact occurs between the device and the teeth (tooth). Assess the location of the contacts using thin occlusal contact paper or tape (Accufilm II, Parkell, Farmingdale, NY). If contact is present, the device should be removed and lightly adjusted using the side of a football-shaped carbide laboratory bur (Carbide Cutter 015358UO), so as to not create a concavity in the device at that point of contact. To ensure the patient does not activate tooth contact engrams while adjusting the device outside his/her mouth, place the leaf gauge in the mouth at an increased occlusal vertical dimension, preventing tooth contact.
(13) With the current number of leaves in place, continually make adjustments until no posterior tooth contact is present on the device.
(14) Replace the device and continue to assess tooth-to-device contact subtracting one leaf at a time. Assess in the same fashion as above.
(15) After two or three adjustments, the patient may have activated occlusal proprioceptive engrams and is now programmed to an incorrect tooth-to-device position, which is typically slightly protruded. Therefore, the dentist must accomplish "intervening deprogramming" procedures throughout the device adjustment to prevent this continued and unfavorable error. The authors recommend doing an additional 1-minute deprogramming following every subtraction of two to three leaves. Thus, the patient will be maintained in a more accurate centric relation position. The "intervening deprogramming" method is a key element of the technique described.
(16) Continue subtracting leaves until reaching the end point. The goal is a device with even centric relation point contacts between the posterior teeth and the device, and an immediate comfortable anterior disocclusion of posterior teeth from centric occlusion, thus a mutually protected occlusion and articulation. Ideally, one dot centric occlusal contact should be present per tooth, canine-guided laterotrusion, and mandibular central incisor protrusive guidance. The definitive presence of contact should be assessed with shimstock (Shimstock Strips 12μ, Almore International, Inc., Portland, OR). Fine adjustments to occlusal contacts can be made using acrylic polishing points (Black Bullet 5000640U0, Brassler USA) after locating them with occlusal contact paper.
(17) The occlusal device should be trimmed and rounded at the edges. The anterior sextant is trimmed to be flush with the facial aspect of the maxillary anterior teeth (unless a malocclusion is present that requires acrylic resin anterior to this area) and follow tooth form and position in the arch (Fig 5). The more closely the acrylic resembles the patient's dentition, the more comfortable the prosthesis will be. The lingual acrylic resin contours should be no more than 2 to 3 mm from the gingival sulcus, thus preventing adverse interaction with the tongue and air space. The occlusal device should be carefully polished to round buccal and palatal contours. Do not apply pumice polish to the occlusal surface, as the occlusal contacts previously obtained could be removed.
(18) Appoint the patient for follow-up care in 1 to 3 weeks. Patients who demonstrate limited repeatability of occlusal contacts during step 16 may require additional appointments for adjustments prior to the intended recall interval previously mentioned. During follow-up, the occlusion on the occlusal device is verified. If minor adjustment is necessary, it should be accomplished using the method presented above.

Discussion

The three key elements of this technique are the following: First, the use of the leaf gauge will reliably position the mandible, prevent posterior tooth contact, and ensure tooth contact on the device in the desired position. Second, intervening deprogramming done throughout the adjustment procedure will prevent protrusive errors, thus ensuring the device is being adjusted to the patient's centric relation position. Third, changes in mandibular position on the device can be quantified by the number of leaves required to prevent tooth contact on the device.

The occlusal device is now suitable for extended use due to stable centric occlusal tooth contacts and comfortable disclusive angles. Additionally, using this procedure may decrease the likelihood of multiple follow-up adjustment appointments to obtain a suitable end point. If additional appointments for adjustment are required, they can be accomplished by repeating this procedure.

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