REVIEW ARTICLE Bite Registration In Restorative Dentistry

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ABSTRACT

An exact reproduction of occlusal relationship on the articulator during all stages of treatment for fabrication of prosthesis, depends upon correct interocclusal records. The records totally rely on procedures and materials used for the recording, from time of diagnosis until the definitive treatment. Various techniques and materials for recording the interocclusal records are discussed here.

Keywords: Interocclusal records, TENS, Elastomers, Centric relation, Occlusion.

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INTRODUCTION

Occlusion is of paramount importance in restorative dentistry, as all restorations are planned and designed to fit harmoniously with the complexities of the neuromuscular control system, the temporomandibular joints and supporting structures of the teeth without introducing occlusal interferences.¹

Unfortunately, the occlusion of teeth is frequently overlooked because the symptoms of occlusal disease are often hidden from the practitioner not trained to recognize them or to appreciate their significance. One of the most critical aspect of any restorative dental procedure, is managing a bite relationship. Therefore bite registration plays a pivotal role, in recording intraoral relationships and thus aid in effective reconstruction of prepared teeth. It also helps to orient the maxillary and mandibular relationship during the mounting procedures.²

Errors in recording and mismanagement of the bite can negatively affect the Central Nervous system's feedback mechanism resulting in debilitating pathologic reactions at all levels of the craniomandibular/neuromuscular complex.³

The bite registration or interocclusal record can be used for diagnostic mountings in a habitual accommodated centric position or in aphysiologic maxillo-mandibular relationship to assess jaw relationships.³

The bite registration can aid the clinician and laboratory technician to better understand pathologic and physiologic relationships that exist when diagnostically analyzing the mounted study cast. The bite registration or interocclusal bite record is also used for treatment purposes. A bite registration should be easily and precisely transferred to stone models without rocking or flexing in order to reproduce an exact, yet stable upper and lower jaw relationship.³

Interocclusal registrations or bite records can be divided into 3 categories:

- 1. Bite registrations for one to 2 teeth (limited treatment segments)
- 2. Bite registrations for a group of teeth such as a quadrant of teeth
- 3. Bite registrations for a single arch or both dental arches together for treatment and transferring of intraoral information to the laboratory mounting.

An improper orientation of the maxillary and mandibular casts will lead to occlusal prematurities and interferences, requiring unduly adjustments.²

BITE REGISTRATION TECHNIQUES

There are several bite registration methods that are used for the fabrication of devices used to treat TMDs, for accurate transfer of occlusal relationships during fabrication of single unit crowns, FPD's. Each technique is different, and an understanding of the accuracy, advantages and disadvantages of each of these is necessary to select the appropriate method.⁴

A. TENS or Neuromuscular bite registration

The TENS or neuromuscular bite takes thirty to sixty minutes to record. The steps in taking a TENS bite are as follows:

Step 1. Relax the muscles using an ultra-lowfrequency TENS device. After thirty minutes to an hour of stimulation, the masticatorymuscles are usually relaxed and the bite registration can proceed. While using the TENS device, the mandible will move up and down approximately 1 mm.

Step 2. Turn off the TENS unit. Have the patient close to centric occlusion for evaluation, then have the patient tap their teeth 3 times and protrude

Step 3: This is converted into a sagittal view, in combination with EMG, a position is found where tonus of the evaluated muscles is at a minimum and the vertical dimension is within a range of treatment.

Step 4. Inject bite registration material between the occlusal surfaces of the teeth.

An alternative TENS technique uses a jaw tracking device (BioResearch JT 3D or MyoTronics K7) to track movements of the TMJs and jaws. The resulting graphics are used to determine the target position for taking the neuromuscular bite.

The drawback of the TENS bite is that the bite position taken is found by reducing muscle tonus and relaxing the muscles, which does not simulate normal conditions. The TENS bite results in a greater vertical dimension and substantial vertical change of the maxilla-mandibular relationship. It is often necessary to either temporarily or permanently augment the occlusion (with an appliance or prosthesis) to maintain this new position.⁵

B. Swallow bite registration

The swallow bite usually takes 3 minutes to be executed. The steps in taking a swallow bite registration are:

Step 1. A small portion of red box wax is placed on the first molars bilaterally.

Step 2.The patient is asked to swallow comfortably.

Step 3. The patient is followed for 90 seconds.

Step 4. The wax is removed from one side and bite registration material is injected. When it has set, then the wax is removed from the other side and material is injected.

The drawback of the swallow bite registration – corrects more in vertical direction than in anteroposterior direction.⁵

C. The Phonetic – "S" Bite Registration

The phonetic "S" bite is carried out in 2 minutes. Following guidelines must be considered when taking the Phonetic - "S" registration.

- The mandible is level, but forward of the habitual bite.
- The tongue is relaxed and level helps mute the hyperactive and dysfunctional suprahyoid muscle activity
- Also produces a patent airway and corrects the mediolateral occlusal cant

Note: Protruding the patient greater than this distance will produce muscular dysfunction.

Let "S" be your guide was the title of Earl Pound's article published in the journal of Prosthetic Dentistry in 1977.

Recent guidelines for establishing the vertical dimension of occlusion are based upon the evidence that the body of the mandible assumes an easily recordable, reproducible horizontal and vertical position, when the patient is at the "S" position during speech.⁶

The mediolateral cant of the mandible is corrected by the closest speaking space or phonetic "S" position⁷ (Figure-1).

According to Pound E, the steps in taking a phonetic "S" bite registration are as follows:

Step 1. Reducing inflammation (use Energex or Aqualizer) prior to taking this registration is imperative.

Step 2. Ask the patient to count from 66 to 77 and evaluate the anterior inter incisor distance.

This will determine the diameter of the separating device that will be used on the anterior teeth during bite registration.

Step 3. Select the separating device.

For deep bites with end-to-end speaking spaces, use a microbrush applicator. If greater vertical dimension changes are indicated, use a disposable three-way syringe tip. This works well with more ideal overbite situations (1-2 mm). If the patient has an anterior open bite, use a disposable saliva ejector tube. Anything disposable, single-use and of the appropriate dimensions can be used. (Figure -2,3)

Step 4. Inform the patient that at some point during counting you will say, "Stop" and that he or she should freeze his or her mandible in space at that point.

Step 5. Have the patient count at a normal cadence. The patient should not try to help you by moving his or her head forward or opening to assist you. If the patient thinks about what he or she is doing, the position will have been influenced by the patient and will not be accurate. Stop the patient on the upswing of the mandible separating device. (Figure -4)

Step 6. The patient must not move once the separating device has been placed between the teeth.

Step 7. Inject the bite registration material in the anterior segment first. Let it harden to stabilize the relationship.

Step 8. Next, syringe bite registration material into the posterior segments. To ensure that the bite registration material moves through to the lingual aspect of the teeth, have the patient move his or her tongue to the opposite side if the arch space is narrow or filled by the tongue.⁵

Reducing nociceptive input

Optional techniques that reduce nociceptive input may help to improve bite registration accuracy. Energex and Aqualizer are two devices used to lower down nociceptive input.

The Energex device uses pulsed radio frequency at 660Hz. The recommended protocol is six 15second treatments to each TMJ. The patient will then be able to open his or her mouth wider. This device is contraindicated in patients with pacemakers or heart monitors, pregnant women, and in the vicinity of metals (such as metal fillings).

The Aqualizer:⁵

- Fluid filled device, decompresses the joint space and reduces pain perception
- Produced in three volumes low, medium and high
- Titrated to the proper posterior interocclusal dimension.

Advantages of the phonetic "S" bite registration : Studies conducted by Miralles et al have shown that phonetic "S" bite results in a significantly higher freeway space, than after swallowing with the mandible in a relaxed postural position.⁸

Another study conducted by Bassi et al, in edentulous patients - found the phonetic or "S" bite to be more reliable than freeway space as the phonetic bite is not subject to the influence of the patient's will.⁹ In a study using the TENS, swallow and phonetic "S" bite, it was found that while the TENS and the phonetic "S" bite both had the same trajectory, they had different spatial positions of the mandible. The swallow bite resulted in the habitual trajectory being registered. Another study evaluating airways using the pharyngometer has demonstrated that there is a significant improvement in airway using the phonetic "S" bite, and less collapse of the airway. The "S" position or minimum speaking space is more reliable than freeway space as it does not rely on the patient's will.⁵

The ideal position of the temporomandibular joint is quintessential for bite registration. The phonetic "S" bite enables a clinically accurate bite registration.⁵

BITE REGISTRATION MATERIALS

The role of inter-occlusal registration in oral rehabilitation is highly consequential and relevant. In prosthetic dental treatment, casts which duplicate the patient's dentition, are frequently mounted in an articulator, which simulates jaw movements.¹¹

Ideal Requirements of Interocclusal Bite Registration Material

- 1. Rigid or resilient after setting.
- 2. Minimal dimension changes after setting.
- 3. Accurate record of the incisal and occlusal surface of teeth.

- 4. Easy to manipulate.
- 5. No adverse effects on the tissues involved in recording procedure.
- 6. The interocclusal record is verifiable. 12,13



Figure-1: "S" position or Closest Speaking

Adapted from: Management of Temporomandibular Dysfunction and Occlusion by Dr. J. Okeson



Figure-2,3: Selecting the Seperating Device



Figure-4: "S" phonetic speaking space

Types of interocclusal recording medium includes plaster of paris, waxes, zincoxide eugenol pastes, elastomers and acrylic resins.¹⁴

Impression Plaster

Although records of impression plasters are accurate, rigid after setting and do not distort with extended storage, their use is discontinued on account of its difficulty inhandling.^{12,13}

Waxes

The bite registrations are frequently made from 28 gauge casting wax or from base paste wax, specially formulated from bee wax or hydrocarbon waxes such as paraffin. They have been used in the shape of quadrant strips or segments, horse shoe shape wafers and complete or partial arch wafers and can be applied directly in sheet form or they can be laminated over tinfoil and gauze.^{12,13}

Waxes are quite popular due to their relative ease

in clinical usage, which allows them to be modified, corrected and verified with comparative ease. However wax inter occlusal records have certain drawbacks of being inaccurate. unstable and inconsistent.¹³

Technique of recording inter occlusal centric relation record using wax should be made prior to preparing the abutment. Once the abutments are prepared, another inter occlusal record is made with a half of sheet of softened wax. The wax is molded into the shape of the dental arch and is positioned on the teeth and the patient is asked to close the jaws or, the mandible is guided into centric relation. Then patient is asked to open and close the mouth several times. The wax is cooled with water, while the teeth are held together, the patient is asked to open the mouth and the wax is cooled further. The total cooling must be atleast two minutes. The wax record is removed from the mouth and is allowed to cool for one minute under running water. It is trimmed for possible interferences and is returned to the mouth.

The trimming for possible interferences is done by shaving the wax with a sharp blade to prevent its distortion. The seating of record on the teeth and closure must be precise. The registration is compared with the record made prior to abutment preparation.¹⁶

Zinc oxide Eugenol Paste

Zinc oxide Eugenol paste is an effective interocclusal registration material. The greatest advantage of this material is its fluidity. Fluidity is a critical quality of an interocclusal registration material because it ensures minimal interference with mandibular closure during record making procedures. Other advantages include adhesion to its carrier, rigidity and inelasticity after final set, accuracy in recording occlusal and incisal surfaces of the teeth and high degree of repeatability.

But not very frequently used because of certain disadvantages like lengthy setting time. significant brittleness. More over, accuracy of the registration material may surpass the accuracy of the casts resulting in improper fit.^{12,13}

Technique involves :

- Carrying the paste in Jones frame and positioning it between the teeth.
- Half of the length of the abutments and at

least one adjacent tooth should be covered by the mixed paste.

- The patient is instructed to close in centric relation.
- After the paste has set, the interocclusal record is removed from the mouth and then from the frame and is used for mounting the casts on the articulator.¹⁵

Elastomers

The elastomers available as interocclusal registration materials are addition silicone, condensation silicone and polyether. They are accurate, stable after setting, provide minimal resistance to closure and do not require a carrier. But resistance to compression of a set material contributes to difficulty in registration of the bite.^{12,13}

Equal amounts of base paste and catalyst paste are dispensed and mixed, according to manufacturer's instructions obtaining a streak free mixture. Load the syringe by maintaining a slight angle while scraping the pad. Place the material over the occlusal surface of teeth. Guide mandible to centric relation and ask patient to occlude, wait for final set according to manufacturer's instructions. Trim the excess and recheck the record.¹⁷

Acrylic resin

It is accurate and rigid after setting but the main disadvantage is polymerization shrinkage.

Petroleum jelly is applied over occlusal surfaces of teeth. Monomer and polymer are measured according to manufacturer's recommendations. Wait until dough stage is reached. Form dough putty into a flattened shape approximately 2mm thick. Keep it over occlusal surfaces of teeth. Guide mandible to centric position and ask patient to occlude. Wait for final set, trim the excess and recheck the record.¹⁷

CONCLUSION

A harmoniously functioning occlusion allows for smooth uninterrupted movements over the area of tooth contact. Some occlusions may not permit such free movements, yet the patient does not exhibit any problems, owing to the neuromuscular adaptation to the disharmony. However, if a restoration is placed which changes the occlusion, the adaptive capacity of the system maybe exceeded, leading to signs and symptoms. Every restoration, whether a simple amalgam filling or complex crown and bridgework, that involves the occlusal surface will affect occlusion. Therefore restorations should be planned so that they do not cause effects that exceed the adaptive tolerance.

Precise occlusal management is imperative to achieve accurate fit of restorations, prostheses, longevity, patient comfort and occlusal stability.

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