

The Ideal TM position

A Peer-Reviewed Publication
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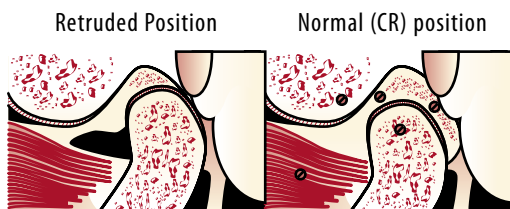
Educational Objectives

1. Know the definition of the Ideal TM position.
2. Know the types of bite registration that can be recorded, and the advantages and disadvantages of each.
3. Know how to take a phonetic “S” bite registration.

Introduction

In order to successfully treat appropriate patients with oral appliance therapy, it is necessary to know what the ideal TM position is and be able to use the technique required to find this position. The proper, or ideal TM position has been a source of intense debate. Dental students were taught to retrude the mandible to its most superior location to find a reproducible position for restoration. However, few patients – approximately 15 percent – can tolerate this position, known as centric relation (CR).

Centric occlusion is defined for this article as the condyle fossa position of habitual occlusion. Centric relation is defined as the optimal condyle fossa position for function, which may have a different dental occlusal relationship than centric occlusion.



Studies report coincidence between centric occlusion (CO) and centric relation (CR) occurs in less than 15% of the population. In order to treat the 85 percent of patients needing treatment who cannot tolerate the mandible in the retruded position, the TM position must be ascertained using a different technique.

There are several types of bite registration that can be performed. Understanding the advantages and disadvantages of these is critical in selecting the

appropriate technique. Accurate bite registration is essential for the provision of effective oral appliances.

The Ideal TM Position

The definition of the ideal TM position is based upon that of Okeson's AAOP guidelines for evaluation and treatment of TMD, which the ADA has adopted.¹ Okeson describes the ideal TM position in this as the “optimum functional relationship”. Okeson defines CR and its clinical importance, as: “The occlusal examination begins with an observation of the occlusal contacts when the condyles are in their optimum functional relationship. This is when they are in the CR position, located most superoanteriorly in the mandibular fossae and braced against the posterior slopes of the articular eminences with the discs properly interposed (musculoskeletally stable).”²

Historically, the ideal – or normal – position was a subject of debate for clinicians. Okeson and Dawson formerly held that the position with the condyle retruded as far posteriorly as possible was normal. Currently, Okeson, Dawson, Gelb and others in the field all agree that the normal position is to have the condyle positioned superoanteriorly.

Patients with disc displacement or disc dislocation need an anteroposterior (AP) correction. It is important to understand the limit of the AP correction in producing a bite that will not produce increased muscular tonus (envelope of comfort). Anterior positioning has been found to help relieve pain in 75% of patients.³

How to Locate the Ideal TM position

The objectives are to provide oral appliances with an appropriate TM and CR position such that pain and inflammation are relieved and to restore normalcy for the patient.

Bite Registration Techniques

There are several bite registration methods that are used for the fabrication of devices used to treat TMDs. Each technique is different, and an understanding of the

accuracy, advantages, and disadvantages of each of these is necessary to select the appropriate method.

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-low-frequency TENS device (BioTENS™, BioResearch). After thirty minutes to an hour of stimulation, the masticatory muscles 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 disadvantage of the TENS bite is that the bite position taken is found by reducing muscle tonus and relaxing the muscles, which is not normal. The TENS bite results in a greater vertical dimension and substantial vertical change of the maxillomandibular relationship. It is often necessary to either temporarily or permanently augment the occlusion (with an appliance or prosthesis) to maintain this new position.

Swallow bite registration

The swallow bite takes 3 minutes to perform. 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.

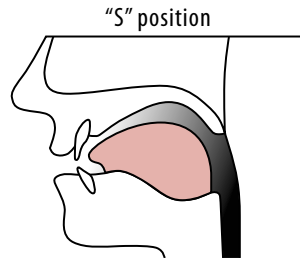
The disadvantage of the swallow bite registration is that it corrects more in the vertical direction than in the anteroposterior (AP) direction. In other words, the path of closure is the same for this technique as it would be for habitual occlusion. When there is inflammation in the joint (capsulitis), or a compressed condyle fossa relationship, then an AP change is necessary.

The Phonetic “S” Bite Registration

The phonetic “S” bite takes 2 minutes to perform. When a phonetic “S” bite registration is taken, the mandible is level, but forward of the habitual bite, and the tongue

is relaxed and level. Having the tongue relaxed helps to quiet hyperactive and dysfunctional suprahyoid muscle activity. The “S” sound also produces a patent airway and corrects the mediolateral occlusal cant. This enables AP corrections within the neuromuscular envelope of movement; gives the limit of the AP movement of the mandible, and enables evaluation of the need for rotational, cant, vertical, and AP corrections. It is important to note that protruding the patient greater than this distance will produce muscular dysfunction. The goal is to make the least amount of mandibular change of position in 3D that will restore CR.

“Let “S” be your guide” was the title of Earl Pound’s article published in the journal of Prosthetic Dentistry in 1977. “New guidelines for establishing the vertical dimension of occlusion have been reviewed. They are based upon the fact that the body of the mandible assumes an easily recordable, repetitive horizontal and vertical position when the patient is at the “S” position during speech.”⁴ Correcting the cant of the plane of occlusion cant is essential in restoring equal muscle length and proper skeletal relationships. The phonetic “S” position or closest speaking space has been found to correct the mediolateral cant of the mandible.⁵



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

Steps in taking a phonetic “S” bite registration

- 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.

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 and at a relative position for the diameter of the separating device.



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.

Reducing nociceptive input

Optional techniques that reduce nociceptive input – the transmission of noxious stimuli to the brain – may help to improve bite registration accuracy. Two devices used to reduce nociceptive input are the Energex and Aqualizer. The Energex device uses pulsed radio frequency at 660 Hz. The recommended protocol is six 15-second 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, patients who are pregnant, and it cannot be used near metal (such as metal fillings). The Aqualizer is a fluid-filled device that is used to decompress the joint space to reduce nociception. The device is produced in three volumes (low, medium, and high) and must be titrated to the proper posterior inter-occlusal dimension. The low volume would be indicated for 1 – 2 mm of posterior inter-occlusal distance with the patient in the “S” position, medium volume for 2 – 3 mm, and high volume for 3 – 5 mm.

It is worn for twenty minutes prior to taking the bite, and can be worn by the patient in the waiting room.

Energex device



Aqualizer device



Advantages of the phonetic “S” bite registration

Studies have shown that using the phonetic bite results in a significantly higher freeway space, than after swallowing with the mandible in a relaxed postural position.⁶ The same study found that clinical freeway space is slightly higher in females than in males. A second study – this time 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.⁷ In a study using the TENS, swallow and phonetic "S" bite, I 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. A current 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.⁸

Summary

The ideal TM position is an important concept for bite registration and treating patients suffering from TMDs with oral appliances. There are several positions that can be used as a bite registration. These all will record a static position but do not all record a position that can be tolerated by the majority of patients, or that is consistent at rest and during conscious effort. The phonetic "S" bite enables a bite registration that has been clinically proven to be accurate. When taken appropriately, it is reliable for fabricating appropriate oral appliances. Knowing how to take a phonetic "S" bite registration is the first step in oral appliance therapy for patients with TMDs.

Endnotes

- 1 American Dental Association. The ADA Parameters of Treatment for TMD. Available at: www.ada.org/members/prac/tools/parameters/tmd.asp. Accessed 2006.
- 2 Okeson JP. Orofacial Pain: Guidelines for Assessment, Diagnosis, and Management. Chicago, IL: Quintessence. 1996.
- 3 Okeson J. *Bell's Orofacial Pains (The Clinical Management of Orofacial Pain)*. 6th ed., Quintessence 2005.
- 4 Pound E. Let "S" be your guide. *J Prosthetic Dent*. 1977;38(5):482-489.
- 5 Rivera-Morales WC, Mohl ND. Anteroposterior and mediolateral variability of the closest speaking space. *Int J Prosthodont*. 1990, 3(2): 179-184.
- 6 Miralles R, Dodds C, Palazzi C, et al. Vertical dimension. Part 1: comparison of clinical freeway space. *Cranio*. 2001;19(4):230-236.
- 7 Bassi F, Schierano G, Marinacci M, et al. Preliminary study of the behavior of the rest position and the minimum phonetic distance in edentulous patients rehabilitated with prostheses with modification of the palatal thickness. *Minerva Stomatol*. 1999;48(6 Suppl 1):21-27.
- 8 Bassi F, Schierano G. Preliminary study of the behavior of the rest position and the minimum phonetic distance in edentulous patients rehabilitated with prostheses with modification of the palatal thickness. *Minerva Stomatol*. 1999, 48(6 Suppl 1): 21-27.

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Questions

- The ADA has adopted _____ AAOP guidelines for the evaluation and treatment of TMD.
 - Dawson's
 - Black's
 - Okeson's
 - Hall's
- Approximately _____ of patients can tolerate the mandible retruded to its most superior position.
 - 5 percent
 - 10 percent
 - 15 percent
 - 25 percent
- Coincidence between centric relation and centric occlusion occurs in _____ of the populatoin.
 - 5 percent
 - 10 percent
 - 15 percent
 - 20 percent
- It is currently agreed that the normal position is to have the condyles positioned _____.
 - Superanteriorly
 - Superposteriorly
 - Inferolaterally
 - None of the above
- Bite registration methods include _____.
 - The TENs bite
 - The swallow bite
 - The phonetic "S" bite
 - All of the above
- The disadvantage of the TENs bite is that the bite is taken _____.
 - With increased muscle tonus
 - With decreased muscle tonus
 - Under stress
 - None of the above
- The "S" sound _____.
 - Produces a patent airway
 - Corrects the mediolateral occlusal cant
 - a and b
 - None of the above
- Taken properly, the neuromuscular bite results in _____.
 - Minimal vertical change in the maxillomandibular relationship
 - Substantial vertical change in the sphenomandibular relationship
 - Substantial vertical change in the maxillomandibular relationship
 - None of the above
- Correcting the cant of the plane of occlusion is
 - Essential in restoring equal muscle length
 - Optional
 - Essential for sight
 - None of the above
- The swallow bite is _____.
 - Affected by inflammation
 - More of a vertical correction than anteroposterior correction
 - Highly reliable
 - a and b
- A phonetic "S" bite registration _____.
 - Gives the limit of anteroposterior movement
 - Has the mandible forward of the habitual bite
 - Has the mandible level
 - All of the above
- An Aqualizer is used to _____.
 - Reduce nociceptive input
 - Increase nociceptive input
 - Provide a distraction dueing bite registration
 - None of the above
- The phonetic "S" bite _____.
 - Is not subject to the patient's will
 - Results in a higher freeway space than after swallowing with the mandible in a relaxed position
 - Is reproducible
 - All of the above
- A phonetic "S" bite is best taken with _____.
 - Alginate
 - Reduced nociceptive input to the brain
 - The patient lying horizontally
 - None of the above
- During the phonetic "S" bite registration, the patient counts from _____.
 - 22 to 33
 - 44 to 55
 - 66 to 77
 - 79 to 89
- When applying bite registration material for a phonetic "S" bite, it should be _____.
 - Applied quickly to all teeth
 - First applied to the anterior teeth
 - Allowed to partially set before placing between the teeth
 - a and c
- Depending upon the space, _____ can be used as a separating device during bite registration.
 - A microbrush
 - A disposable three-way syringe
 - A disposable saliva ejector
 - One of the above
- Prior to taking the patient's bite, _____.
 - The CEJ to CEJ distance should be measured
 - The overbite should be measured
 - The overjet should be measured
 - a and b
- All bite registrations record a static position.
 - True
 - False
- When making an anteroposterior correction, it is important to understand the limit for this without increasing muscle tonus.
 - True
 - False

ANSWER SHEET

The Ideal™ position

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