



## Centric relation- Maximum intercuspation Discrepancy. Bibliographic review.

Espinosa-Espino Wendy Paola<sup>1</sup>, Heredia-Aguilar Clarisa Ahilda<sup>1</sup>, Soto-Castro Tely Adriana<sup>2</sup>, Hermida-Rojas Maikel<sup>2</sup>

<sup>1</sup>Dental Surgeon, Mexicali School of Dentistry, Autonomous University of Baja California, Mexico

<sup>2</sup>Associate Professor, Mexicali School of Dentistry, Autonomous University of Baja California, Mexico

Corresponding Author: Espinosa-Espino Wendy Paola

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**ABSTRACT:** Centric relation is the starting point from which any treatment must be started, if this position is not stable, sliding from centric relation to maximum intercuspation will occur, this displacement is known as centric slide. The aim of the bibliographic review is to describe the origin and importance of centric slide in Dentistry. A bibliographic search was made for articles in Spanish and English; for selection, at least 15 articles published in the last 5 years were searched. During closure in centric relation position, the presence of cusp interference or premature contacts generates repositioning of the mandibular condyles. When centric slide is not properly evaluated, diagnosis and consequently the treatment plan can be incorrect. A discrepancy greater than 2.0 mm will require treatment. An ideal method for the measurement of the condylar position currently used is known as the condylar position indicator. The centric slide is present in 90% of cases, which indicates that centric relation and maximum intercuspation are not in the same position, besides they should not be confused. The use of an occlusal splint is recommended to correct centric slide.

**KEYWORDS:** Occlusion, Centric relation, Maximum Intercuspation, Centric Slide, Neuromuscular deprogramming.

### I. INTRODUCTION

Occlusion is defined as the connection of contact between dental arches, resulting from closure of the maxilla and the jaw by contraction of different muscles. The contacts that occur during occlusion can be static when the teeth contact at maximum intercuspation, or dynamic, when the teeth slide together with the jaw movement to achieve closure.<sup>1,2</sup>

Dentistry focuses on the functional evaluation of static and dynamic occlusion, as well as the temporomandibular joint and muscles. Its

importance lies in success or failure of treatments. Establishing an ideal occlusion is the basis and a requirement for successful diagnosis and therefore a good treatment plan.<sup>2</sup>

In order to establish an ideal occlusion we must know the meaning of centric relation and maximum intercuspation.

Maldonado et al.<sup>3</sup> establishes that the glossary of prosthodontic terms, defines centric relation (RC) as “the maxillamandibular relationship in which the condyles articulate with the thinnest and avascular portion of the articular disks with the complex in the most anterior and superior position against the walls of the articular eminence. This position is independent of dental contact.” It is considered a stable and reproducible physiological maxillary-mandibular relationship.<sup>4</sup>

Maximum intercuspation (MIC) is defined as the occlusal relationship in complete intercuspation of the teeth regardless of the position of the condyles”.<sup>3</sup>

Centric relation is the starting point from which any treatment should be started, if this position is not stable, a sliding from centric relation to maximum intercuspation will occur, this displacement is known as centric slide.<sup>5</sup>

Several articles state that centric slide occurs in approximately 90% of people, some authors consider distraction from 1 to 2mm normal, while others consider it a problem that needs treatment from 2mm of distraction.<sup>6,7</sup>

The objectives of this bibliographic review are:

1. Emphasize the origin and importance of centric slide in Dentistry.
2. Specify the methods for recording the degree of condylar distraction.
3. Examine the relationship between centric slide and the presence of temporomandibular disorders.
4. Identify the treatment for correcting centric slide.



## II. MATERIAL AND METHOD

A bibliographic review was made for articles in Spanish and English, the following keywords were: Occlusion, Centric relation, Maximum Intercusation, Centric Slide and Neuromuscular deprogramming.

For selection, at least 15 articles published in the last 5 years were searched, older articles were also selected because their information was relevant to the topic.

The search engines used were: PUBMED, SciELO, Science Direct, Database of the Autonomous University of Baja California and Google Scholar, during the month of June 2021.

## III. DEVELOPMENT

### Emphasize the origin and importance of centric slide in Dentistry.

During closing when in a centric relation position, the presence of cusp interference or or premature contacts generates repositioning of the mandibular condyles, leading the jaw to a maximum intercuspation position is common.<sup>7</sup>

Over time, signals are sent to proprioceptive muscle receptors that lead to the establishment of a muscle-guided closure pattern, known as an engram.<sup>7</sup>

It should be considered during the clinical examination of patients, that the occlusion that is observed may in most cases not be correct. Generally in the area of posterior molars is where the premature contact will create a fulcrum generating the rearrangement of the jaw, some causes are the premature loss of teeth, changes in the occlusal surface by functional adaptation and even by restorations.<sup>8</sup>

Mediotrusive contacts; defined as the "occlusal contacts between the internal vertients of the maxillary lingual cusps and those of the non-working mandibular buccal cusps when laterality movements are produced"; are perceived by the neuromuscular system differently from the other types of occlusal contacts; therefore, they are responsible for increasing neuromuscular activity through stimulation of proprioceptors and nociceptors of periodontal ligament. In the same way, premature contacts increase the electrical contraction of the temporal muscles in greater proportion, compared to the masseter muscles.<sup>2</sup>

Early dental experts who described a concept of centric relation focused mainly on the development of complete maxillary and mandibular prostheses. Because no teeth were present to provide an anterior-posterior guide or vertical stop, a reference method had to be devised to determine a reasonable vertical and horizontal relationship of

the jaw, to make esthetic and functional prostheses.<sup>9</sup>

As the centric relation is a reproducible reference position, it is importance in the planning of dental treatments, it helps clinicians to prevent muscular or joint complications during the procedure. Some authors recognize the importance of articulating in centric relation as the number of occlusal units to rehabilitate increases in treatments due to loss of teeth or when occlusal surfaces are modified by the clinician.<sup>9,10,11,12</sup>

Maldonado et al.<sup>3</sup> mentions that Roth believed that mounting casts in centric relation would be great help to the orthodontist identifying the existence of a dual bite, as well as the occlusal and condylar disharmonies.

What is clinically observed inside the mouth is the neuromuscular adequacy of closure and movement for the existing occlusal arrangement. Patients will bite where the teeth adjust regardless of the position that adapts the jaw or muscles, giving our patients a diagnosis without mounting would result in an incorrect treatment plan. Schildkraut et al.<sup>13</sup> mentions that Class I patients at maximum intercuspation generally become Class II in centric relation, proving that if centric slide is not properly evaluated can lead to changes diagnosis and consequently also to treatment plan.<sup>3,12</sup>

### Specify the methods for recording the degree of condylar distraction.

Several methods are offered to evaluate the discrepancy between centric relation and maximum intercuspation: Visual evaluation in the oral cavity; the patient is asked to close slowly until the first point of contact is established, then the patient is instructed to tighten the teeth, at that time the jaw is observed to slip, a disadvantage of this method is that it gives a subjective result and does not allow an accurate measurement to be made. Other methods consist of radiological and imaging evaluation; cone-beam computed tomography (CBCT) can also be used to assess the three-dimensional positions of the condyle in the joint cavity.<sup>4,14,15</sup>

An ideal method for the measurement of condylar distraction is known as the Condylar Position Indicator (CPI), a tool that gives us precision and reliability during measurements. The recording of the condylar distraction measured by the CPI shows the trajectory that the jaw follows during the closure and allows the displacement to be measured in 3 dimensions; vertical Z (upper-lower), horizontal X (anterior-posterior) and transverse Y (medial-lateral).<sup>15,16</sup>



Steps to register condylar distraction using CPI:

1. Take impressions and pour models using class IV dye stone.
2. Maximum intercuspation obtained before centric relation. It is made with a single pink wax sheet that is cut to the size of the maxillary arch, it is warmed in a water bath until soft, then the patient bites as he normally does, the wax is removed and cooled to avoid deformation.
3. Centric relation is register with the centric power technique; two DelarMR blue wax segments are used for bite registration. An anterior block of three sheets of thickness ranging from distal left lateral incisor to distal right lateral incisor, the wax is heated to 53°, the anterior portion is placed and the jaw is driven toward centric relation by seating the condyles up and guiding the pogonion down, asking the patient to close the jaw until the posterior teeth are left with an occlusion of 2 mm. It is removed and cooled, and then refitted together with the posterior block that was heated to 53°. The patient is guided in the same way to the mandibular closure until the lower incisors are settled within the anterior block.
4. The models are mounted on the PANADENT articulating device using the split cast method; this technique has long been used to check the accuracy of the assembly and to detect errors greater than 0.0005 inches.
5. The vertical and horizontal square paper is placed in the articulator, where the position of the condyle will be marked with the marking tape at maximum intercuspation, thus recording the value of condylar distraction.
6. When maximum intercuspation mark on the horizontal plane (X) is recorded behind centric relation, the value is negative, if it is ahead it is positive.

In the vertical plane (Z) when the mark is above centric relation, the value is negative, if it is lower it is recorded as positive.<sup>3, 14, 17, 18</sup>

Interference or alterations in occlusion and temporomandibular joint may cause the so-called temporomandibular disorders (TMs), showing signs and symptoms such as joint noise or temporomandibular joint pain.<sup>2, 19</sup>

Crawford<sup>17</sup>, in his study, ensured a high correlation between the discrepancy of centric relation - maximum intercuspation and the presence of signs and symptoms of temporomandibular disorders. As distraction increases so do the symptoms of temporomandibular disorders.

Studies have shown that disharmony between the lateral pterygoid muscle and the lifting muscles can

cause joint pain by muscle spasm.<sup>20</sup>

Abraham et al.<sup>15</sup> mentions in his article that lateral pterygoid muscle has symptoms when there is a marked difference between centric relation – maximum intercuspation, but can be confused with an intra capsular temporomandibular disorder.

Signs and symptoms of temporomandibular disorders are associated when there is acentric relation- maximum intercuspation discrepancy in the negative vertical plane, since centric relation is the highest position of the condyle, also when there is a distraction greater than 0.5 mm in the transverse plane.<sup>13, 14</sup>

On the other hand, Kattiney et al.<sup>21</sup> in his study with cone-beam computed tomography (CBCT), he reported that comparisons of condyle and mandibular fossa in the centric relation and maximum intercuspation positions in young individuals have revealed discrepancies in up to 90% of individuals. No significant correlation was found with the presence of TTM. This coincides with the results of the study by Jiménez-Silva et al.<sup>7</sup> Who, after a systematic review, did not find association between the appearance of temporomandibular disorders and the discrepancy centric relation – maximum intercuspation.

#### **Identify the treatment of choice for correcting central slippage.**

A discrepancy greater than 2.0 mm between centric relation and maximum intercuspation, in the vertical or horizontal plane is a critical element that must be taken into account when making dental diagnosis and treatment. Instrumentation are required to remove the patient's neuromuscular engram from the closing path, thus observing the correct movement of the temporomandibular joints without dental interference.<sup>1, 3, 5</sup>

For orthodontic patients with significantly abnormal distraction, the jaw can be brought to a centric relation position by treating with a bite block (Ferula) before orthodontics.<sup>4</sup>

Occlusal splint (ferula) is a therapeutic diagnostic method, its main function is to decrease the load on the temporomandibular joint and decrease muscle action.<sup>4, 22</sup>

Herrera UV<sup>23</sup> mentions that the mechanisms of action of a neuromuscular deprogramming plane are: To allow greater stability in the occlusal relationship, since it presents absolute absence of slides by premature contacts; the device causes an acute modification in the occlusal relationship that would generate at central nervous system (CNS) level an unexpected



modification of the usual engram, causing a decrease in parafunction by protective mechanisms; it increases the vertical dimension, slightly modifying the condylar position, allowing a slight expansion of the retrodisc space; finally, the mechanism of disocclusion, if absent, provides the system with a protective and limiting mechanism of the parafunctional activity of the masseter muscle.

#### IV. CONCLUSION

- The centric slide is present in 90% of cases, which indicates that the centric relation and maximum intercuspation are not in the same position, besides that they should not be confused.
- The centric slide can be observed clinically, in radiological studies or by images, but the method that gives the highest accuracy to record the degree of condylar distraction is achieved by the articulating mount and the condylar position indicator (CPI).
- Establish diagnoses and treatment plans with centrally articulated patients so that alterations during treatment caused by a discrepancy between centric relation and maximum intercuspation can be prevented.
- The question goes on, is there a relationship between sliding in the center with the appearance of signs and symptoms of temporomandibular disorders? It is certainly an issue that could not be clarified with this bibliographic review and further studies will be needed to clarify whether there is a relationship or not.
- In the presence of a condylar distraction greater than 2.0 mm in the horizontal and/or vertical plane, it is recommended to use an occlusal splint to correct the slippage caused by the neuromuscular, returning the conditions to the central position.

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