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DENTAL OCCLUSION AND THE IMPORTANCE OF ITS PROPER INVESTIGATION – PART I

Gabriela Ifteni, Alina Apostu*, Oana Țănculescu

Department Odontology, Periodontology and Fixed Prosthodontics, Faculty of Dental Medicine, "Gr. T. Popa" University of Medicine and Pharmacy, Iasi, Romania

*Corresponding author: Alina Apostu, PhD, Lecturer

"Gr. T. Popa" University of Medicine and Pharmacy, Iasi, Romania

E-mail: alina_apostu@yahoo.com

ABSTRACT

The occlusal relation is remarkably complex; it must be considered in a tridimensional, static and dynamic way, interfering and intervening in all the system functions. The traumatic occlusion as clinic entity is the reverse of an anatomically and functionally normal occlusion and, within a variable time interval, is followed by the installation of the dysfunctional syndrome, a disease that causes invalidity in many patients.

This paper aims the proper knowledge of clinical investigation that is mandatory for a correct treatment. It presents our original clinical examination method regarding dental occlusion - an easy, logical, and systematized method that covers all the necessary steps for a correct occlusal diagnosis. The first part of our work comprises the first two stages; the next ones will be detailed in the next issue.

Dental occlusion is defined as the static or dynamic inter-arch relation and corresponds to all possible contacts established between the opposing teeth. The occlusal function is achieved mainly through dynamic inter-arch relations that end with stable static contacts, also called reference relations. The most frequent occlusal position reference is represented by the maximum intercuspation that corresponds to the full and maximal contact of two arches, and, along with centric occlusion, is a reference point for the clinical examination of any patient. The occlusal relation is remarkably complex; it must be considered in a tridimensional, static and dynamic way, interfering and intervening in all the system functions.

The traumatic occlusion as clinic entity is the reverse of an anatomically and functionally normal occlusion and, within a variable time interval, is followed by the installation of the dysfunctional syndrome, a disease that causes invalidity in many patients. The most common causes of traumatic occlusion are caries and periodontitis. Caries is a destructive and irreversible disease of the tooth tissue in which the infectious element is prevalent. Caries is considered the largest epidemic in human history, because it affects 85-90% or 98-100% of the developing or the underdeveloped countries. In these conditions, caries can be considered the main inducing cause of the traumatic occlusion and of the dysfunctional

syndrome, especially through the complications it induces.

The second most common cause that generates occlusal disorders is the periodontal disease that, regardless the clinical form that it takes, without a proper treatment, inevitably leads to dental malposition and edentulism. From an evolutionary point of view, the periodontal disease is unpredictable, ranging from aggressive forms (refractory periodontitis, juvenile periodontitis) to subclinical forms with intermittent and slow evolution (chronic superficial marginal periodontitis). Despite the recorded progress, the results in periodontology are inconstant, their prevention being the most effective mean to control them. Once present, the traumatic occlusion leads to the installation of a wide range of manifestations that, untreated, compromise the functionality of the whole ensemble.

First, at the dental level, the reduction of the tooth surface – the abrasion – occurs, followed immediately by the installation of the position changes of the teeth: translations, inclinations, rotations, and extrusions, because the tooth tends to seek for its neighbours and antagonists, in order to transmit the occlusal forces that it picks up. All these abnormal dental positions change the overall occlusion. The functioning of the two jaw bones, one in relation to the other, changes because of the new dental positions, triggering, in turn, other changes: the muscles begin to work in an asynchronous and asymmetric manner, through abnormal dynamic patterns, imposed by the occlusal changes. The right-left asymmetrical movements, thus the modified dynamics, leads to abnormal movement in the two temporomandibular joints (abrasions of the slope of the articular tubercle, blockages of the glenoid cavity, plications of the meniscus etc. occur), that clinically translate through multiple symptoms characteristic to the manifest syndrome. The temporomandibular joints modifications most frequently result in one joint rotation blockage. In this case, in one joint the translation is not carried out and in the other the translation movement is exaggeratedly performed through the forward displacement of the condyle, causing the destruction of the joint elements.

The abnormal movements of the mandible accentuate the dental changes that are witnesses of the dysfunctional syndrome: the periodontal overstress installs; the teeth on a semi-arch become exaggeratedly abraded, sometimes at the gingival level; on the opposite side, the teeth move vertically after an exaggerated sagittal curve; in the front, the overstressed maxillary teeth unfold in a fan disposition; the marginal gum recess and expose the roots of teeth; and the main functions of the system become disrupted. This unfavourable evolution must be known and prevented.

This paper aims the proper knowledge of clinical investigation that is mandatory for a correct treatment. It presents our original clinical examination method regarding dental occlusion - an easy, logical, and systematized method that covers all the necessary steps for a correct occlusal diagnosis.

The first part of our work comprises the first two stages; the next ones will be detailed in the next issue.

STAGE I

The occlusal examination should begin with a preliminary phase whose role is to highlight the inter-arch dental contacts able to disrupt the occlusal physiology. There is a series of elements that need to be followed, namely:

1. The closure trajectory in maximum intercuspation

This trajectory is determined by the excursion of interincisive mandibular point, from the posture relation to maximum intercuspation.

The close examination of this trajectory will give information about the presence of some incorrect, premature dento-dental contacts that destabilize the occlusion.

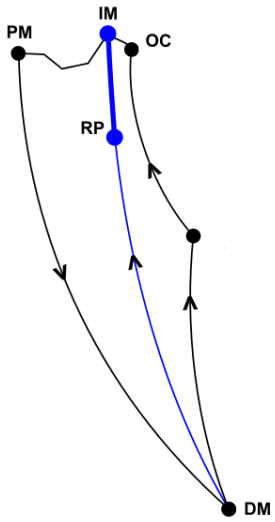

Fig. 1. Posselt's diagram in sagittal plane with closing trajectory in maximal intercuspation (OC = centric occlusion, IM = maximal intercuspation, RP = postural position, PM = maximum protrusion, DM = maximum opening)

The patient is asked to close the mouth from the posture relation until maximum intercuspation and the followed trajectory is observed. Then the patient is asked to slowly clench the teeth.

The movement is repeated several times to detect if there is a deviation of the interincisive line or if the closing trajectory of the maximum intercuspation is altered.

2. The occlusal noise

The patient in maximum intercuspation is asked to occlude several times, the dentist keeping trace of the qualities of the occlusal noise.

- If the sound made at the contact between the arches is clear, unique and short, there is no occlusal instability.
- If the noted sound is dull and long, there are non-simultaneous contacts during the occlusion and the presence of deflective (deviant) or overstressed, excessive and traumatizing contacts will be suspected.

3. Verification of the dental mobility

The dental mobility test is performed digitally, with the pulp of the index placed on the buccal sides of the teeth in primary or secondary malposition (crooked teeth, rotations, inclinations, vertical movements, extrusions) while the patient performs repeated closings (similar to teeth chattering, tap-tap). The doctor will detect slight movements of the teeth in overloading occlusion.

4. Examining the compensation curves

It involves tracing the existence of the vertical movements and of inclinations, which may be at the origin of the premature (static) contacts or of the (dynamic) occlusal interferences.

5. Marking the support points / contact points

It is the most important and the most difficult stage of the occlusal analysis, experience being the main ally of the examiner.

As armamentarium, we use articulating paper, active on two sides or two overlapping uni-

active strips, attached to the special support meant for this operation.

The occlusal surfaces to be analysed are carefully cleaned and then dried with compresses or air; it is advisable to perform the analysis on 1-4 and 2-3 semi-arches, in order to facilitate the examination. The articulating paper is inserted along the corner of the mouth, so that it covers the entire semi-arch that is to be examined.

We ask the patient to occlude strongly. It is important to avoid a mandibular deviation when marking it; therefore, a good method is to use articulating paper of the size and shape of the arch.

6. The analysis of the obtained contact points

This stage assesses **the location** and **the intensity** of the occlusal contacts, the main guidance in analysing their correctness being the ideal occlusion, which ensures a perfect occlusal stability between the supporting cusps, fossae and marginal ridges (embrasures).

It is important to get a maximum of dento-dental occlusal contacts so that all teeth participate in maximum intercuspation. However, in practice, the ideal situation (the ideal occlusogram) is only rarely encountered.

The intensity of the obtained dento-dental contacts is also important. A very pronounced marking compared to the adjacent teeth materializes the existence of an overload or of an occlusal trauma, respectively. This simple analysis cannot indicate by itself the need to suppress that contact; the analysis must be completed and, after that, the occlusal therapy must be instituted.

Ideal occlusal contacts – the occlusogram

In the case of an ideal occlusion, the dento-dental contacts must comply with a number of parameters:

- to be punctiform
- cusp-fossa; cusp-embrasure, incisal edge - palatal side type
- to be achieved between two smooth and convex surfaces
- to be multiple
- to be stable
- to be uniformly and harmoniously distributed
- to be precisely localized

Each tooth makes contact with the two antagonists, called *primary* and *secondary*, apart from the mandibular central incisors and the maxillary molars three. The stability of the antagonists is relatively simple and it is achieved as it follows:

If the tooth we are dealing with is a maxillary tooth and if we want to establish its antagonists, the primary antagonist is the homolog one; namely that if the tooth is 1.5, the primary antagonist is 4.5. The secondary antagonist, because of the slightly medialized position of the mandibular teeth against the maxillary ones, is “x + 1”; namely, in the case above, 4.6.

For the mandibular teeth, the primary antagonist is the homolog one (3.7 has 2.7 as its primary antagonist), and the secondary antagonist is “x-1”; in the given example, that is 2.6.

Ideally, only the supporting cusps make contact with the pits and the occlusal embrasures of the antagonists, the recording of these contacts being carried out in a special chart, called *occlusogram*. The occlusogram is done in

maximum intercuspation, as well as in centric occlusion.

We can carry out the analysis of the dento-dental contacts of the entire arch, and those of each tooth. In the latter case, we analyse the contacts of the cusps of the tooth in question, as well as the contacts it gets in its fosses and embrasures. For example, the contacts of 1.5 are the following: the palatal cusp of 1.5 contacts the distal pit of 4.5, and in the embrasure between 1.4-1.5 it contacts the buccal cusp of 4.5, and in the embrasure between 1.5-1.6, it contacts the mesial-buccal cusp of 4.6.

STAGE II – The analysis of the occlusion parameters

The analysis of the occlusion parameters can be carried out both clinical and paraclinical, on cast models, this second option being much easier due to the direct visualization, the absence of the soft tissue and the opportunity to observe from any direction. Whatever the situation, the sequence of the examination is the same, in the occlusal analysis sheet being noted only the encountered *pathological elements* (abnormalities, asymmetries), which can become the etiologic factor of some complex systemic dysfunctions.

1. The examination of the occlusal maxillary and mandibular areas

Normally, the occlusal area is continuous, complete, with primary or secondary natural morphology.

From a pathological point of view, changes may occur through shortening, discontinuance because of edentulism, coronary dental lesions, plastic and non-plastic obstructions, isolated dental malpositions, abrasions altering the occlusal morphology, prosthetic reconstructions with an approximate morphology, without the reconstitution of the inter- and intra-arch contacts.

2. The examination of the sagittal curves of occlusion

The sagittal curves of occlusion are examined by comparing the right with the left. The first author who described them, the embryologist Ferdinand Graf von Spee, considered only the curves at the mandibular level (imaginary line that connects the tips of the cusps, premolars and molars) but, according to the modern vision, we also must examine the curves at the maxillary level, especially in the case of some edentulism that destroy the harmony of the mandibular curves. The depth considered to be normal is about 2-3 mm.

Abnormally, the sagittal curves may be asymmetrical, accentuated, flat, inverted, discontinuous, upward or, on the contrary, downward towards the distal.

3. The examination of the transversal curve of occlusion

The examination is carried out at both premolar and molar level, even for the completed arches, as we normally notice a slight difference in concavity, which decreases toward distal. A considerable average depth is about 5 mm. From a pathological point of view, the transversal curve may be inverted, flattened, irregular, accentuated.

4. The examination of the supporting cusps (groups 1, 2, 3)

The supporting cusps can be modified by abrasion, coronary odontal lesions, and incorrect prosthetic or odontal restorations, with modified heights. The assessment is carried out globally or in dental groups. The same evaluation is made in the case of the

guiding cusps. In addition, the inclination of the cusp slopes must be assessed when it comes to the guidance cusps.

5. The examination of the frontal curvature
The examination of the frontal curvature will give us information on the regularity or the irregularity of the maxillary and the mandible, as well as on its accentuated, average or reduced convexity.

6. The examination of the anterior guidance
The examination of the anterior guidance, namely of both of its components – the retro-incisive slope and the incisive trajectory – is of great importance. Thus, abnormally, the *retro-incisive slope* can be mixed or artificial, discontinuous, with absent cingulum, with heights and inclinations in proportion to the other occlusal parameters. The *incisive trajectory* can be deviated to the right or to the left, in zig-zag.

The next stages address to the analysis of the inter-arch relationships and the analysis of the dynamic occlusion.

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