

## EDITORIAL



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## Occlusal concepts in implantology.

Dragomir Lucian Paul<sup>1</sup><sup>1</sup> Craiova University of Medicine and Pharmacy, Romania.

Oral implantology, a mixture of surgery, prosthetics, and gnathology, has revolutionized dentistry in general and dental prosthetics in particular.

The success of a prosthetic restoration on implants depends not only on the success of the surgical intervention and the preparation of a structure with an appropriate design, but also on the gnathological integration of the prosthetic restoration in the context of the functionality of the dentomaxillary apparatus [1].

The determining element in maintaining the integration of implants is the observance of occlusal rules. An excessive osseous force can be the leading cause of initial bone loss around implants and failures of implant-supported prosthetic restorations because implants lack a proprioceptive system (proper only to natural teeth) as well as specific defense mechanisms against the action of certain forces untimely occlusions [2]. The mobility of a natural tooth can increase in case of occlusal trauma. Through this, the excessive force is broken down and transmitted to the adjacent bone. After removing the occlusal trauma, the natural tooth can return to its original condition [3]. In the case of an implant after the removal of the occlusal trauma, in very few cases, it can return to the initial implantation; most of the time, the implant is compromised. In conclusion, the implants must be protected from occlusal overloads [4].

In the case of prosthetic restorations on implants, knowledge of gnathological principles is of particular importance. It is known that a natural tooth subjected to functional stress undergoes an intrusion into its alveolus by approximately 30  $\mu\text{m}$ .

Theoretically, a bridge built exclusively on osseointegrated implants does not intrude into the bone bed. From this consideration it follows that the contacts in the case of occlusion in centric relation of a bridge that rests exclusively on implants must be weaker than on natural teeth. Therefore, at first, the bridge on osseointegrated implants must not contact the antagonists. Contacts will only occur in the maximum intercuspation position when the natural teeth have intruded approximately 30 $\mu\text{m}$ . If this desire is not respected, the prosthetic superstructure will overload the implants, causing consecutive failures [5].

There is no unanimously accepted, clear, specific, and complete occlusal concept in implantology prosthetics. There are series of occlusal aspects that the doctor is obliged to consider, and which depend on the transosseous forces, the biomechanics of the bone, the existing mobility differences between natural teeth and implants, the action of the masticatory muscles, the prosthetic design, and, last but not least, the quantity and quality that have been described regarding bone supply [6].

Zarb and Chapmann were among the first to issue the main rules of the occlusal concept in oral implantology. Apart from the major principles, there are also several secondary aspects, the compliance of which largely depends on the success of achieving a functional occlusion, namely:

- ensuring the integration of the prosthetic restoration in the functionality of the dentomaxillary apparatus.
- control of the forces generated at the bone-implant interface [7].

The prosthetic design of the superstructure must be very close to that of the natural teeth, and this desire is possible by creating a functional anatomy in accordance with the cuspid guidance and the articular structures of natural teeth. This ensures optimal mastication and swallowing in accordance with the neuromuscular system and avoids the appearance of maxillary dysfunctions.

Regarding the occlusal scheme, it is necessary to carefully check the distribution of functional occlusal forces and the intensity of tooth-tooth contacts in the maximum intercuspation position. This means:

- a) occlusal balancing of prostheses on implants with the help of very fine articulation paper under minimal occlusal pressure. Occlusal contacts must exist but must be less pronounced than those on natural teeth, ensuring a balanced distribution of occlusal forces between natural teeth and implants.
- b) verification of the existing guides, which will also be done with the help of a paper articulation and their adjustment to ensure a balanced relationship between the prosthetic restoration on implants and the rest of the natural teeth.

The construction of the superstructure in the dental laboratory involves:

- a) mandatory use of the articulator, a device that partially or totally imitates the movements of the mandible and allows the correct and complete evaluation of all functional mandibular movements.
- b) obtaining passive relationships between superstructure and infrastructure.
- c) making splints that will solidify the natural teeth that present a significant degree of clinical mobility from the prosthetic restoration on implants. With the help of these splints, contention is achieved, mobility is reduced, and overstraining of the implants is avoided.

The principles of occlusion in oral implantology derive from the principles of functional occlusion in traditional prosthetics. Three occlusal concepts (generalized balance

occlusion, group protection, and mutual protection occlusion) have also been successfully adopted in the case of prosthetic restorations with implant support [4].

Misch and Bidez proposed that occlusion with mutual protection is specific to prosthetic restorations on implants. This concept provides for the reduction of occlusal forces at the implant level and, in this way, the reduction of failures in implantology.

Zarb and Chapman issued the principles of functional occlusion in implant prosthetics [8]. These principles without which implantological prosthetics cannot be realized are the following:

1. Establishing an intermaxillary relationship with multiple, stable, and uniform bilateral contacts;
2. Realization of an occlusal relief with cusp-fossa type contacts according to the "freedom in centric" principle;
3. The absence of premature contacts in the position of maximum intercuspation and centric relation and the absence of occlusal interference during mandibular movements;
4. The absence of occlusal contacts on the non-working parts in lateral movements.

In prosthetic restorations with implant support, the concept of "occlusion with mutual protection" works, considered by many authors to be the most compatible concept at present with a prosthetic restoration only on implants and which can be rendered in concentrated form as follows:

- the necessity of the existence of multiple, simultaneous, uniform, and stable tripodal occlusal contacts (of the cusp-fossil type) in the lateral areas in the position of maximum intercuspation;
- it is good to have a frontal inoclusion of 30  $\mu\text{m}$  (in the case of a prosthetic restoration in the anterior area or a total bridge on implants) [9];
- the presence of disocclusion at the level of the cuspid teeth in the propulsion movements and at the level of the non-

working part in the mandibular lateropulsion movements;

- it is desirable to guide the group in the lateropulsion movements of the mandible.

For a prosthetic restoration exclusively on implants, it is not recommended to carry out canine guidance due to the excessive occlusal forces that develop at the level of a single implant. No implant can reproduce the stability and value of the implantation index of an upper canine root [3].

The advantages of occlusion with mutual protection in implantology prosthetics can be summarized as follows:

- increasing masticatory efficiency;
- ensuring vestibulo-oral stability;
- achieving an appropriate physiognomy.

The disadvantages of respecting the principles of occlusion with mutual protection in implant prosthetics are:

- the difficulty of accurate assessment of simultaneous bilateral occlusal contacts;
- there is the possibility of the appearance of harmful forces at the implant-bone interface by not canceling the contacts at the level of the cusp slopes;
- requires the mandatory use of dentomaxillary apparatus simulators.

In conclusion, at the level of a prosthetic restoration on implants that respects the principle of occlusion with mutual protection, the following will be obtained:

- reception of forces exerted vertically in maximum intercuspation position;
- the anterior guide is supported by as many teeth as possible;
- the absence of posterior contacts during mandibular propulsion and lateropulsion movements;
- the vertical dimension of occlusion will be in harmony with the muscular balance and the minimum speech space;

- achieving satisfactory esthetic effects for the patient [9].

**Conflict of interest:** None to declare.

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## Corresponding author:

Dragomir Lucian Paul

Craiova University of Medicine and Pharmacy, Petru Rares No. 2 Street, Craiova, Dolj, Romania.

Email: [dragomirlucianpaul@gmail.com](mailto:dragomirlucianpaul@gmail.com)

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