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What occlusion and Disocclusion Standard We Should Use in Complete Dentures Supported by Implants? Literature Review

Gustavo Diniz Greco*

Universidade Federal de Minas Gerais, Brazil

***Corresponding author:** Gustavo Diniz Greco, Doctor of Clinical Dentistry, Universidade Federal de Minas Gerais, Master and Specialist in Prosthodontics, Dentist - CRO-MG 30278, Professor of Prosthodontics and Implant Dentistry, FEAD-Minas, Coordinator of the Specialization Program in Prosthodontics, ABO-Seven ponds, DENTAL CENTER W, W FILE - Digital Dental Radiology, Brazil, Tel: 3334-3673/3334-3335, E-mail: gustavodgreco@yahoo.com.br

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Introduction

The patterns of occlusion and disocclusion can be considered critical to the longevity of the components of the stomatognathic system, including the dental implants. In natural teeth, periodontal ligament behaves very differently from what happens with the implant abutments, precisely the absence of this ligament way. By not exist the periodontal ligament bone-implant interface, the distribution of these tensions works more directly , while in the natural teeth, this tissue acts as a shock absorber system that improves the absorption of occlusal tensions. Thus, the stresses transmitted to the implant and its components for implants and for implant bone interface are totally different from those observed in natural teeth. It is noteworthy that if the occlusal tensions exceed the carrying capacity of the system, the job will fail due to overloading and poor distribution of mastigatory tensions [1-4].

The installation of four to six implants in the anterior mandible, between the mental foramen, united by a metal infrastructure allows the introduction of teeth or distal extension cantilever, restoring esthetics, phonetics and function of the masticatory system. This type of prosthesis had its initial indication when coupled with a complete denture tissue supported in the opposite arch allowing the stress distribution of lesser tensions to the implants and components of this prosthesis [5].

The Brånemark protocol was developed as an antagonist to have a complete denture supported by tissue [6]. With the evolution of technology in implant dentistry, both in the design of implants in the treatment of the implant surface technology and surgical techniques, this type of prosthesis is being increasingly used antagonists of various shapes and supports, such as implants, teeth's or joint prostheses. With this, what is observed clinically is that the distribution of the stresses generated in the functional loads comes overloading implants may cause fracture of the prostheses free distal extremity [7-10].

In 2000, Becker and Kaiser analyzed the compressive stresses and tensile stresses on implants installed in the edentulous jaws. At first only four implants were used in the mental, pre - foramen, with a bilateral free end with a length of 8 mm. A vertical load of 100 N and horizontal 10 N was applied in distal extensions. The result showed that the first implant suffered compressive tensions, while the second suffered tensile stresses. Increasing the length of the distal extension free for 16 mm, tensions have risen considerably. Prostheses with bilateral free end are acceptable, but may not exceed this length twice the width of premolar teeth. Even with the use of more implants, this length is still an unfavorable condition promoting, maintaining the compressive stress in the distal implant [11].

A model of jaw with implant-supported prosthesis was simulated using the 3D FEM analysis. The input variables in this study included: density of bone, implants and intermediate length, length of the cantlever, arrangement and number of implants, the degree of curvature of the jaw and turns the metal structure. A tension of 100 N was applied in the vertical direction. The authors concluded that the stress distribution showed improved in a bone with prosthetic intermediate and long implants free end [12].

The effects of variations in the length of the free ends were investigated by evaluating clinical cases, with distribution of load applied vertically to the implants. Were investigated obtaining models of clinical cases, introducing the arc geometry, location of implants and the maximum length allowed for calculation of the cantlever. The results showed that when the occlusal load was applied to the cantlever region of the first implant, the most distal (closest to the load), has compressive tensions and other implants, suffer tensile stress. Excessive stresses always occur when the occlusal load is applied to the distal regions of the cantlever. When we analyzed the distribution of the implants in the front area view and observe a distance of 11.1mm is possible to establish sufficient to provide esthetic, phonetic and biomechanical function without major complications with distal extension. The maximum length from the tip calculated by the model varied linearly with this distance of the implants, but always the compressive stresses are concentrated at the implant more distal region [13].

Tensions of masticatory forces acting on dental implants can generate compressive tensions, which are undesirable in the adjacent bone structures, may cause bone defects and eventual failure of the implant. The influence of the length and diameter of the implant in stress distribution was evaluated using the 3D FEM. Models simulating implants placed in vertical positions in the region of mandibular molars, with variations in the diameter and length of these were made. The masticatory load was simulated, perpendicular to the occlusal plane. The values of stresses were computed in ossoimplante interface. The areas of maximum stresses were localized around the neck area of the implants. The authors concluded that an increase in the diameter of the implant has a more satisfactory result that increasing the length of it in relation to the reduction of maximum tensions [14].

With the aid of computed tomography and (Cad/Cam - surgical template) computer program, clinical outcomes were analyzed in immediate loading guided surgery, implants as having four pillars that support a complete denture supportedby implants were installed in 23 patients with clinical follow-up 6-21 months. Bone insertion, suppuration, patient discomfort, infection and mobility were evaluated. The results showed that the success rate was 92.7% in the maxilla and 100% in the mandible. The mean marginal bone loss was 1.9mm in the first year of monitoring. It was concluded that this type of prosthesis has a good predictability and a high rate of great results [15].

Another model of complete denture supported by implant used as immediate loading, composed only without conventional metallic structure with bilateral resin cantlever was analyzed using the FEM. The authors concluded that this prosthetic system tolerable maximum tensions transmitted to the bone cortical [16].

Those generated in bone implant interface for different patterns of malocclusion in a lower complete denture supported by implants, with bilateral cantlever end tensions, according to the Brånemark protocol, were analyzed using 3D FEM. The results showed that the pattern of unclamping canine guide (CG) generates a higher tension in the interface between the first implant and the supporting tissues region, and the bilateral balanced occlusion (BBO), tensions were high in the region of bone implant interface of the first and the last implants. The maximum stress found in the simulation of the BBO was approximately three times greater than that found in the simulation of disocclusion in CG. The authors concluded that the pattern of disocclusion in canine guide is best suited for this type of prostheses [7].

An alternative for mandibular edentulous patients has been described as the use of implant supported fixed prostheses in bilateral free distal end. The author suggested that when the bone quality is good enough on the mandibular canal could be installed isolated implants bilaterally. These two implants would promote support one distal extremities. For the author, the use of posterior implants to support the distal extension reduces the potential to produce microstresses [17].

The occlusal patterns are key requirements for the clinical success of oral rehabilitation supported by implants. This study compared the stresses generated by the disocclusion in canine guide and bilateral balanced occlusion on the implants and metallic infrastructure of a complete denture type Brặnemark protocol modified with the inclusion of the one posterior short implant on the each side. A three-dimensional model simulated a mandible with seven titanium implants as pillars, five of them being installed between the mental foramen and the two posterior implants, located in the midpoint of the occlusal surface of the first molar. A load of 15 N with an angle of 45° was applied to a tooth or distributed in three teeth to simulate CG or BBO, respectively. The commercial program ABAQUS ® was used for model development and pre and post processing of data. The results were based on a linear static analysis and were used to compare the magnitude of the equivalent stress for each of the simulations. The results showed that the CG disocclusion generated higher stresses concentrated on the work side in the region of the short implant. In BBO, stresses were less intense and more evenly distributed on the prosthesis. The maximum stress found in the simulation of disocclusion CG was two times higher than that found in the simulation of BBO. The point of maximum stress was located in the neck of the short implant on the work side. Under the conditions of this study, it was concluded that the pattern of BBO was more suitable than CG for the lower complete denture supported by implants without distal end free [18].

With the evolution of the manufacturing technology of short implants, this alternative to eliminate the distal free end became more viable, clinical studies are needed to validate these findings.

References

1. Brånemark PI (1983) Osseointegration and its experimental background. J Prosthet Dent. 50: 399-410.
2. Eskitascioglu G, Usumez A, Sevimay M, Soykan E (2004) The influence of occlusal loading location on stresses transferred to implant-supported prostheses and supporting bone: a three-dimensional finite element study. J Prosthet Dent 91: 144-150.
3. Lin CL, Wang JC, Kuo YC (2006) Numerical simulation on the biomechanical interactions of tooth/implant-supported system under various occlusal forces with rigid/non-rigid connections. J Biomec 39: 453-463.
4. Greco GD, Landre Junior J, Jansen WC, Seraidarian PI (2009) Biomechanical analysis of the stresses generated by different disoclusion patterns in an implant-supported mandibular complete denture. J Appl Oral Sci. 2009, 17:515-520.
5. Greco GD, Landre Junior J, Jansen WC, Seraidarian PI (2009) Stress analysis of the free end distal extension of an implant-supported mandibular complete denture. Braz Oral Res 23: 175-181.
6. Becker CM, Kaiser DA (2000) Implant-Retained cantilever fixed prosthesis: Where and When. J Prosthet Dent 84: 432-435.
7. Malo, P, Nobre, M.A, Lopes, A (2007) The use of computer-guided flapless implant surgery and four implants placed in immediate function to support a fixed denture: Preliminary results after a mean follow-up period of thirteen months. J Prosthet Dent 97: S26-S34.
8. Oliveira SG, Seraidarian PI, Landre Junior, Oliveira DD, Cavalcanti BN (2006) Tooth displacement due to occlusal contacts: a three dimensional finite elements study. J Oral Rehabil 33: 874-880.
9. Daas M, Dubois G, Bonnet AS, Lipinski P, Rignon-Bret C (2008) A complete finite element model of a mandibular implant-retained overdenture with two implants: Comparison between rigid and resilient attachment configurations. Medical Engineering & Physics 30: 218–225.
10. Saab XE, Griggs JA, Powers JM, Engelmeier RL (2007)Effect of abutment angulation on the strain on the bone around an implant in the anterior maxilla: A finite element study. J Prosthet Dent 97: 85-92.
11. Huang HL, Fuh LJ, Hsu MG, Tu YW, Shen CL (2008) Effects of implant surface roughness and stiffness of grafted bone on an immediately loaded maxillary implant: a 3D numerical analysis. J Oral Rehabil 35: 283–290.
12. Ogawa T, Ogimoto T, Koyano K (2000) Validity of the examination method of occlusal contact pattern relating to mandibular position. J Dent 28: 23-29.
13. Rubo JH, Zarb GA, Xiao-Yan JH, Curran (1998)Finite Element Analysis of Stress Distribuition on Dental Implants: a Study of Seven Clinical Variables. J Dent Res 77.
14. Mcalarney ME, Stauropoulos DN (2000) Theoretical cantilever lengths versus clinical cases. J Prosthet Dent 83: 332-343.
15. Himmlová L, Dostálová T, Kácovský A, Konviková S (2004) Influence of implant length and diameter on stress distribuition: A finite element analysis. J Prosthet Dent 91: 20-25.
16. Teixeira MF, Ramalho SA, Sartori IAM, Lehmann RB (2008) Análise das tensões de prótese em resina acrílica para carga imediata em mandíbula edêntula. Implant News 5: 683-689.
17. Mccartney HW (1992) Cantilever rests: an alternative to the unsupported distal cantilever of osseointegrated implant-supported prostheses for the endentulous mandible. J Prosthet Dent 68: 817-819.
18. Greco GD, Las Casas EB, Cornaglia T, Magalhães CS, Moreira AN (2012) Standard of disocclusion in complete dentures supported by implants without free distal end: analysis by the finite elements method. Journal of Applied Oral Science 20:64-69.