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Evaluation of functional parameters in the occlusion of complete denture wearers before and after prosthetic treatment

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ABSTRACT

Purpose: The aim of the study was to evaluate functional parameters of the occlusion in complete denture wearers before and after prosthetic treatment.

Methods: The sample used as the basis for the present study consisted of 50 healthy Caucasian patients (35 women and 15 men), aged from 44 to 86 years (mean=69.18±10), with a total deficiency of teeth. All patients received new complete dentures. Each patient underwent lateral radiograph with the presence of complete dentures, both before (initially existing dentures) and after the prosthetic treatment (new restorations). Cephalometric analysis was based on the Ricketts and McNamara criteria. In order to assess the functional parameters of the occlusion T-scan III analysis was conducted. The following parameters were measured: occlusion – and disclusion time.

Results: Statistically significant differences of functional parameters obtained before and 3 months after the treatment were noted in the whole study group. Both before and after therapy occlusion time was longer in women than in men. No statistically significant link was noted between functional parameters in occlusion and age of the patients, denture wearing time, and edentulous period. Some relationships were noted between occlusion time and cephalometric parameters associated with anterior facial height.

Conclusion: Reconstruction of the surface of artificial teeth and vertical occlusal dimension affects the sustainability of parameters of occlusion and balance of forces in centric

Abbreviations: TO, occlusion time; TDR, disclusion time on the right side; TDL, disclusion time on the left side; cm, centimeter; mSv, milisievert; kV, kilovolt; mA, milliamper; s, second; mm, millimeter; G'-Me', linear distance between glabella and menton; Sn'-Me', linear distance between subnasale and menton; N-Me, linear distance between nasion and menton; Ans-Me, linear distance between spina nasalis anterior and menton; AnsXiPm, angular measurement between spina nasalis anterior, xilion and suprapogonion; SNA, angular measurement between sella, nasion and subspinale; NFCA, angular measurement between nasion, facial centre and subspinale; N-Ans, linear distance between nasion and spina nasalis anterior; Co-Gn, linear distance between condylion and gnathion (mandibular length); Co-Go, linear distance between condylion and gonion; ANB, angular measurement between anterior nasal spine, nasion and supramentale; SNB, angular measurement between sella, nasion and supramentale; Ba-N, line between basion and nasion; PT-Gn, line between PT point and gnathion; G'-Sn', linear distance between glabella and subnasale; N-Ans/AnsMe, proportion of the morphological face; Ba-N/Pt-Gn, facial axis.

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occlusion. The progressive shortening of occlusion time during the period of monitoring may be considered as a sign of progressive adaptation.

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1. Introduction

The priority of prosthetic rehabilitation of the edentulous patient is to restore function of the stomatognathic system with the optimal retention and stability of the complete dentures [1,2]. In order to balance the disturbed relationships of the vertical and horizontal part of the face, the individual profile of skeletal morphology of the patients should be considered. Successful treatment depends on the condition of the alveolar ridge. Anatomy of the maxilla and mandible affects the possibility of using a specific type of occlusion. Occlusal pattern of complete dentures includes bilateral balanced occlusion, canine-guided scheme, group function and concepts involving lingualised or neutrocentric occlusion [3].

The study of natural teeth emphasizes overriding benefits of anterior guidance in relation to the group one [4]. The occlusal pattern closed by canines strongly restricts the ability of free mandibular movement in the horizontal plane. In addition, the anatomical configuration of the masticatory surface of the lateral tooth affects vertical type of chewing and also increases the efficiency of the stomatognathic system. In the case of edentulous patients with difficult conditions of the prosthetic base this kind of occlusion suggests the loss of stability of restorations. Long-term observations show that the canine guidance in the construction of complete dentures, paradoxically promotes chewing efficiency, better retention and more rapid adaptation with respect to the classical model of bilateral balanced occlusion [5–7]. Probably it also limits the resorption of alveolar processes while maintaining vertical dimension, and helps to avoid the development of craniomandibular dysfunction, pathologically increased muscle activity with muscle pain and potential temporomandibular joint disorders or destruction [8].

This kind of occlusal scheme enables denture wearing around the clock. Laboratory procedures related to the performance of this type of prosthetic restoration seem to be easier than in the case of unilateral balanced occlusion. From the esthetic point of view it seems that canine guidance is also more desirable.

It should be emphasized that balancing contacts disappear one year after insertion of complete dentures [9]. This is a result of the acrylic tooth abrasion and involutinal process of oral tissue of the stomatognathic system [9]. Probably due to the adaptation these changes are not felt by the patients.

In the case of bilateral balanced occlusion an important role is ascribed to even compression of the prosthetic base in dynamic occlusion and optimal stability during mastication. Symmetrical distribution of the chewing forces protects alveolar bone from dissimilation [10,11]. Because this type of occlusion prefers a horizontal pattern of chewing, probably bilateral balanced occlusion may help patients to adapt to new dental restorations.

During progressive adaptation, differences between these both occlusal concepts are obliterated and lose significance [12]. Existing observations indicate that the occlusal pattern has little influence on clinical outcomes and patient satisfaction. In addition there are insufficient scientific reasons for using bilateral balanced occlusion as an optimal concept of occlusal scheme in complete denture wearers [13,14].

The question is whether the advantages of canine guidance are in fact the result of the existing occlusal contacts in the canine area or, the use of anatomically-shaped artificial teeth in the lateral part of the dentures. Is it possible that prosthetic rehabilitation of complete denture wearers with the use of cusped artificial teeth and bilateral balanced occlusion could functionally normalize the stomatognathic system? Is there a chance that canine guidance in removable prosthetic restorations is required to restore function of the stomatognathic system? Is it appropriate in light of biometrics and new diagnostic methods to use teeth with reduced or flat chewing surfaces?

Perhaps, maximal intercuspitation in the lateral part of the artificial dental arch of the dentures could optimize activity of the stomatognathic system. Probably the use of cusped teeth without canine guidance (in the front of the dental arch) will result in balance of the chewing forces in the centric occlusion.

Considering that fabrication of new complete dentures is associated with reconstruction of the vertical occlusal dimension and occlusal surfaces it was hypothesized that after prosthetic treatment functional parameters of the occlusion (occlusion time, disclusion time) could also be changed. It was predicted that occlusion and disclusion time could be differentiated in terms of gender. It was expected that there exists potential link between functional parameters of the occlusion (occlusion time, disclusion time) of currently used dentures and age of the patients, denture wearing time, satisfaction, edentulous period number of sets of the dentures and cephalometric parameters. The suggestion was that there are some statistically significant differences of the occlusal parameters between two groups divided according to the criterion of the lower limit of the reference value of the AnsXiPm angle (norm $47^\circ \pm 4$) which is associated with anterior lower facial height. It was hypothesized that after prosthetic treatment occlusion and disclusion time would be changed in groups separated according to AnsXiPm angle. It was suggested that reconstruction of occlusal surfaces with restoring of canine guidance could improve occlusal parameters in complete denture wearers.

2. Method of research (Material and methods)

2.1. The subjects and sample size

The sample used as the basis for the present study consisted of 50 healthy Caucasian patients (35 women and 15 men), aged

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