Effect of implant-supported or retained dentures on masticatory performance: a systematic review.

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Comment in:

Abstract

STATEMENT OF PROBLEM: While subjective patient-based measures have been increasingly recognized as critical outcomes for prosthodontic treatment, there continues to be a need to validate for patients what changes in masticatory function can be expected with the provision of new implant-supported or retained dentures.

PURPOSE: The purpose of this review was to evaluate the critical factors impacting change in masticatory performance following the provision of new implant-supported or retained dentures.

MATERIAL AND METHODS: Information retrieval followed a systematic approach using PubMed and the Cochrane Library. English articles published from 1966 to June 2007, in which the masticatory performance of subjects with implant-supported or retained dentures was assessed by objective methods and compared to performance with conventional dentures, were included. Ratings of the evidence provided in each article followed United States Agency for Healthcare Research and Quality recommendations.

RESULTS: From 281 articles identified, 18 peer-reviewed articles met prespecified criteria for inclusion. Specific outcomes of significance identified by these articles rated as level II are: (1) fixed implant-supported partial dentures do not provide significant improvement in masticatory performance compared to conventional removable partial dentures for Kennedy Class I and II partially edentulous mandibles; (2) the combination of a mandibular implant-supported or retained overdenture (IOD) and maxillary conventional complete denture (CD) provides significant improvement in masticatory performance compared to CDs in both the mandible and maxilla for a limited population having persistent functional problems with an existing mandibular CD due to severely resorbed mandible; and (3) the type of implant and attachment system for mandibular IODs has a limited impact. Specific outcomes of significance identified by articles rated as having a moderate level of evidence (level III) are: (1) mandibular fixed implant-supported complete dentures provide significant improvement in masticatory performance compared to mandibular CDs in subjects dissatisfied with their CDs; and (2) implant-supported mandibular resection dentures have an advantage over conventional dentures in masticatory performance on the defect side of the mouth.
CONCLUSIONS: Objective benefits in masticatory performance of implant-supported or retained dentures compared to conventional dentures are limited to a mandibular IOD in edentulous patients with a resorbed mandible and/or difficulty adapting to CDs.

Finite element simulation of the human mandible: the role of (natural) teeth.

[Article in English, German]
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Abstract

INTRODUCTION: Individual bone quality depends on genetic, biological, and mechanical influencing factors, where the latter is accessible via Finite Element Simulation. This work is part of an interdisciplinary research project with the purpose of stepwise refinement towards anatomical reality. This approach opened the door for many interrelated applications such as atrophy of the jaw bone, periodontology, implantology, or TMJ disorders. This lecture is dedicated to the influence of dental anatomy on mandibular biomechanics.

MATERIALS AND METHODS: In general, biomechanical simulation requires reconstruction of the individual anatomy, implementation of the inhomogeneous and anisotropic material law of bone, and realization of the load case due to tooth, muscle and joint forces. The simulation chain ranges from image processing of CT data up to specifically adapted post-processing of the simulation results. In spite of ongoing research, there is still a fundamental difference of dental implants compared to natural teeth: the periodontal ligament (PDL) present at the interface between teeth and mandibular corpus. Due to its thickness of about 0.2 mm, the PDL was introduced to the simulation model by a special semiautomatic procedure.

RESULTS: Simulations "with and without PDL" proved remarkable force absorption due to the PDL, as well as qualitative changes of the stress/strain profiles of the alveolar ridge. Concerning the simulation without PDL, the observed high compressive strains at the adjacent bone were in agreement with regions of frequent implant failure.

CONCLUSION: The PDL is essential for the structural behavior of the human mandible. Based on the mechanical adaptation of bone, the comparison of the simulation with and without PDL provided special insight to the changes due to dental implants, in particular implant loss and bone resorption. Finally, the simulation will serve as a virtual platform for further evaluation (a) of implant design (b) of implant placement.
The effect of bruxism on treatment planning for dental implants.

Dent Today. 2002 Sep;21(9):76-81.

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Abstract

Bruxism is a potential risk factor for implant failure. Excessive force is the primary cause of late implant complications. An appreciation of the etiology of crestal bone loss, failure of implants, failure to retain implant restorations, and fracture of components will lead the practitioner to develop a treatment plan that reduces force on implants and their restorations. The forces are considered in terms of magnitude, duration, direction, type, and magnification. Once the dentist has identified the source(s) of additional force on the implant system, the treatment plan is altered to contend with and reduce the negative sequelae on the bone, implant, and final restoration. One viable approach is to increase the implant-bone surface area. Additional implants can be placed to decrease stress on any one implant, and implants in molar regions should have an increased width. Use of more and wider implants decreases the strain on the prosthesis and also dissipates stress to the bone, especially at the crest. The additional implants should be positioned with intent to eliminate cantilevers when possible. Greater surface area implant designs made of titanium alloy and with an external hex design can also prove advantageous. Anterior guidance in mandibular excursions further decreases force and eliminates or reduces lateral posterior force. Metal occlusal surfaces decrease the risk of porcelain fracture and do not require as much abutment reduction, which in turn enhances prosthesis retention. The retention of the final prosthesis or super-structure is also improved with additional implant abutments. Night guards designed with specific features also are a benefit to initially diagnose the influence of occlusal factors for the patient, and as importantly, to reduce the influence of extraneous stress on implants and implant-retained restorations.

Link:
http://www.dentistrytoday.net/ME2/dirmod.asp?sid=69B43E194DEC46FE9C901156B97A0F84&nm=Clinical+Articles&type=Publishing&mod=Publications%3A%3AArticle&mid=8F3A7027421841978F18BE895F87F791&tier=4&id=

Rehabilitation of partially edentulous patient with loss of vertical dimension.

[Article in English, Italian]

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Prog Orthod. 2004;5:4-17.

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Abstract

A case of rehabilitation of an edentulous patient with loss of vertical dimension is presented here. This patient presents with a Class III dental and skeletal malocclusion with an anterior
cross-bite. The objective of this case report is to demonstrate that an accurate assessment of vertical dimension is necessary for good rehabilitation. The original vertical dimension was determined by a series of tests including, kinesiographic, electromyographic and transcutaneous electronic neural stimulation (TENS). Subsequently, the lost vertical dimension was re-established orthodontically. These examinations revealed a general hypertonicity of masticatory muscles due to the lost vertical dimension. Additionally, radiographs of the temporomandibular joint showed anteriorly displaced condyles. Following the completion of orthodontic treatment osseointegrated implants were placed to restore the dental arches.

Link:
http://www2.sido.it/pio/issue.php?issue=1&volume=5

The prevalence of radiologic TMJ findings and self-reported orofacial pain in a patient group wearing implant dentures.

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Abstract

PURPOSE: This study had a twofold aim: first, to gather knowledge about the prevalence of radiologic signs of temporomandibular joint osteoarthritis (TMJ-OA) and possible risk factors in patients who had worn an implant prosthesis for between 2.5 and 10 years; and second, to investigate the diagnostic value of radiologic TMJ-OA signs for orofacial pain in a non-temporomandibular disorders group.

MATERIALS AND METHODS: Two hundred thirty patients (134 women, 96 men) answered a questionnaire regarding orofacial pain. In mean, they were 64 years old and wore 98 fixed and 132 removable implant dentures. The effect of age, gender, state of the dentition, time span after prosthesis placement, parafunction, and TMJ sounds on radiologic TMJ-OA signs was estimated through multiple logistic regression. The predictive values were calculated to assess the diagnostic value of severe TMJ-OA signs to predict orofacial pain.

RESULTS: Prevalence of TMJ-OA signs was 70% for flattening, 23% for osteophytes, and 24% for erosion. Some effect on radiologic TMJ-OA signs of gender and state of the dentition was found. The predictive values for orofacial pain from radiologic TMJ-OA ranged from 0.22 to 0.81.

CONCLUSION: Radiologic signs of TMJ-OA were common findings. The study gave no indication that long-term wearing of an implant prosthesis has a negative effect on TMJ-OA. It was not possible to predict orofacial pain from radiologic TMJ-OA signs.
Changes in signs and symptoms of temporomandibular disorders following treatment with implant-supported fixed prostheses: a prospective 3-year follow up.

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Abstract

PURPOSE: The aim was to investigate whether the replacement of lost teeth with implant-supported fixed prostheses (IFP) had any influence upon the signs and symptoms of temporomandibular disorders (TMD).

MATERIALS AND METHODS: The subjects comprised 78 consecutive patients referred to a specialist clinic for treatment with IFPs. All were examined with respect to the presence of signs and symptoms of TMD before the start of treatment and after 1 and 3 years.

RESULTS: Before treatment began, 21% of the patients were found to have moderate (15%) or severe (5%) clinical signs of dysfunction according to the Helkimo index. These figures decreased numerically but not statistically significantly to 10% and 1%, respectively, at the 3-year follow up. Nearly half of the patients (45%) reported one or more subjective symptoms of TMD at the first examination. The anamnestic index used had decreased statistically significantly at the 3-year follow up, when the 5 variables composing the index had improved, but the improvement was statistically significant only for the variables joint sounds and pain when opening the mouth wide. All patients were satisfied with the treatment received.

CONCLUSION: The results from the present investigation show that treatment with IFPs has a good and lasting effect on the functional status of the masticatory system as well as on subjective symptoms of TMD and chewing ability in the vast majority of patients treated.

Influence of occlusal factors on treatment outcome: a study of 109 consecutive patients with mandibular implant-supported fixed prostheses opposing maxillary complete dentures.

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Abstract

PURPOSE: This study was undertaken to investigate the relationship between occlusal variables and clinical and radiologic findings as well as patient response to treatment outcome in patients with mandibular implant-supported fixed prostheses opposing maxillary complete dentures.
MATERIALS AND METHODS: The study group consisted of 109 consecutive patients attending for annual control. They had received their mandibular implant-supported prostheses according to the Brånemark system on average 8 years previously (range 1 to 27 years). All patients were interviewed with standardized questions by one examiner, who also performed the clinical examination. The questions focused on the patients' opinion on masticatory and prosthetic function and problems. The clinical examination comprised occlusal and prosthetic factors and the health of the oral mucosa.

RESULTS: The great majority of the patients were very satisfied with their present dental situation and masticatory function. Two thirds reported no problems with their maxillary complete dentures at all. Balanced occlusion was found bilaterally in 61%, and a further 4% had balanced function on one side. More than one third thus lacked balanced occlusion. Only about 60% had optimal occlusion, and 8% had poor occlusion according to common prosthodontic criteria. This was interpreted as a continuing impairment of the occlusion with time. The mean bone loss was 0.5 mm, according to available radiographs, for a mean observation period of 54 months. There were no or only weak correlations between the variables examined.

CONCLUSION: The occlusal factors registered were of limited importance for patient satisfaction and treatment outcome recorded clinically and radiographically at follow-up examination of the actual prosthodontic rehabilitation.

The bases for using a particular occlusal design in tooth and implant-borne reconstructions and complete dentures.

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Abstract

OBJECTIVES: A systematic review identified randomised and other trials (1966-2006) of studies of occlusal design of crowns, complete (CRP) and partial (PRP) removable prostheses and implant-borne reconstructions, and whether occlusal design influenced diet, quality of life, bruxism and attrition.

METHODS: The search primarily included Cochrane Database of Systematic Reviews and Central Register of Controlled Trials, Database of Abstracts of Reviews of Effectiveness, Ovid Medline and PreMedline.
RESULTS: The search yielded 1315 studies: 20 on CRP --1 RCT, one systematic review, four clinical trials, 10 case series; 22 on PRP - one cohort study, two experimental studies, 15 case reports or case series, three clinical trials; 23 on implant superstructures, and 24 reports on implant failure, 37 on oral health related quality of life, eight on attrition; and four studies on masticatory function.

CONCLUSIONS: CRP--Studies of occlusal form and tooth arrangements, included balanced, lingualised and monoplane arrangements--lingualised posterior occlusion was preferred. Early studies on CRP design were observational as case reports, however data suggested that optimum function is achieved by modification of the maxillary occlusion, irrespective of the opposing mandibular occlusion. PRP--Edentulous ridge resorption is patient-specific, has a multifactorial aetiology and there is no objective data to confirm that mechanical factors cause bone loss; oral hygiene management is crucial for long-term health. Studies on distal extension PDs confirmed a link between bite force and masticatory function; preservation of two functioning posterior tooth units ipsilateral to the distal extension optimises function. Data indicate that patient-specific factors, rather than PD design-specific features, influence long-term PD outcomes. Implant superstructures--There is little scientific evidence specifying occlusal and superstructure design for fixed prostheses for teeth or implants. Occlusal scheme design and occlusal form have evolved through clinical experience, but there is no evidence to indicate that a particular design is superior. Complex neurophysiological mechanisms allow the jaw muscle system to accommodate to oral and dental changes.