

Muscular activity may improve in edentulous patients after implant treatment

Abstracted from

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Address for correspondence: Ina von der Gracht, Department of Prosthodontics and Biomaterials, Center for Implantology, University Hospital, RWTH Aachen University, Pauwelsstr. 30, 52070 Aachen, Germany. E-mail: ina.gracht@rwth-aachen.de

Question: Is there an effect deriving from the choice of implant treatment on muscular activity when comparing implant overdentures and implant-retained fixed dental prostheses to dentates and edentulous during clenching and chewing?

Data sources Medline via Pubmed and the Cochrane Library were searched from January 1980 to September 2013. This was complemented by a manual search of the magazines *Deutsche Zahnärztliche Zeitung*, *Quintessenz*, *Zeitschrift für Zahnärztliche Implantologie*, *Schweizerische Monatszeitschrift and Implantologie*. Additionally, the list of references of all selected full-text articles and related reviews were further scrutinised for potential included studies in English or German.

Study selection Three review authors independently searched for clinical trials that assessed the muscular activity in the intervention groups: edentulous patients treated with implant-overdentures (IODs) and implant-supported fixed dental prostheses (ISFDPs) and the comparison groups: dentates and edentulous patients treated with mucosa-borne complete removable dental prostheses (CRDPs).

Data extraction and synthesis The primary outcome was the muscular activity (measured by electromyography [EMG]) in masseter or temporalis muscle of the participants during clenching and chewing. The data extraction of each included study consisted of author, year, age range, treatment, number of participants, number of implants inserted, arch treated, opposite jaw, kind and side of the muscles that were measured. EMG gain or loss (unit measured: volt) was considered by using the effect size. For the meta-analyses only the studies that included masseter muscle measured separately from temporalis were considered. Concerning the side of measurement (right and left side measured together or right and left side measured separately), only the dominant type in each category was included.

Results Sixteen articles, out of the initial 646 retrieved abstracts, were analysed. The muscular activity of edentulous subjects increased after implant support therapy during clenching (effect size [ES]: 2.18 [95% confidence interval [CI]: 1.14, 3.23]) and during chewing (ES: 1.45 [95% CI: 1.21, 1.69]). In addition, the pooled EMG data of IODs and ISFDPs were lower than that of dentate subjects during clenching (ES: -1.01 [95% CI: -1.37, -0.65]). However, the ISFDPs showed higher values than dentates during chewing. Among the edentulous patients the IODs and ISFDPs displayed higher pooled values during clenching (ES: 1.12 [95% CI: 0.7, 1.55]) and chewing (ES: 1.33 [95% CI: -0.57,

2.10]). Furthermore, the muscular activity during chewing correlated with the hardness of the food.

Conclusions Edentulous patients with CRDPs can achieve a greater degree of muscular activity after rehabilitation with implant-supported/retained prostheses during clenching and chewing. During clenching, patients with ISFDPs achieved higher EMG-values than those with dentates. The harder the food, the more muscular activity involved.

Commentary

In edentulous patients, implant supported/retained prostheses are the first choice of treatment due to the improved stability, retention, clenching (bite force), larger chewing cycles, masticatory ability and efficiency, patient satisfaction and oral health-related quality of life, as well as the reduced level of bone loss compared to CRDPs.^{1,2,3} The activation pattern of the jaw adductors can be measured with EMG since this method provides an estimate of the muscular energy used over time, and therefore might allow conclusion on parameters such as bite force.⁴ This review intended to analyse the influence of implant prostheses in fully edentulous subjects on the muscular activity measured as assessed by EMG.

Regarding the strengths of this review, three independent reviewers were involved for the study selection and data extraction. A comprehensive literature search was performed including the minimum numbers of databases (ie two) suggested by validated guidelines.⁵ Grey literature was partially explored by manual search of six German scientific journals. The characteristics of the included studies were satisfactorily defined. For example, the methods used to combine the studies were suitable since EMG gain/loss was calculated by using the effect size comparing different range scales of volts. Then, the weighted means were calculated with a random effects model allowing comparison of studies in spite of the variation of the effects. Pooled sampling variance facilitated the standardised mean differences calculation. The analysis of the outcomes only included the studies reporting the muscle EMG activity of the masseter separately from the temporalis. In addition, the dominant type in: 1) right and left side measured together, or 2) right and left side measured separately, was included.

As suggested by the PRISMA guidelines,⁶ this review could have provided the following items: the 177 references of the excluded full-text articles with their reasons for not fulfilling the criteria, the scientific quality scores of each of the included studies based

on a validated assessment tool/checklist, and the analysis and the conclusions of the review considering the methodological rigour and quality assessment.

The authors covered some of the limits of their review. They mentioned the possibility of other influencing factors on the muscular activity that were not covered. For example, the occlusal scheme of the old dentures was not given in any of the included studies.

Remarkably, this is the first review that reports the muscular activity differences in edentulous patients treated with IODs or ISFDPs. The EMG-values of the ISFDPs were even higher than dentates during chewing. This could be due to the significantly lower proprioception of dental implants compared to natural teeth.⁷ Consequently, technical complications (eg chipping, ceramic fractures) are higher in ISFDPs when compared with IODs.⁸ Overall, the main conclusion was that the muscular activation in edentulous patients with CRDPs increased after rehabilitation with implant-supported prostheses.

Due to the limitations and weakness of available evidence, it is not possible to draw a solid recommendation. Therefore, it is suggested to interpret the current evidence with caution. Furthermore, more randomised controlled trials on this topic but following standardised

reporting measurements of side and types of muscles separately should be conducted.

Kelvin I Afrashtehfar^a and Martin Schimmel^b

^a*Faculty of Dentistry, McGill, Montreal, Canada*

^b*School of Dental Medicine, University of Bern, Bern, Switzerland*

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