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Original Article

The effects of clinical wear on the incidence of temporomandibular disorders among patients with complete dentures

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الملخص

أهداف البحث: قيّمت هذه الدراسة أثر التآكل السريري على نسبة حدوث اضطرابات في المفصل الصدغي الفكي في من لديهم أطقم أسنان كاملة.

طرق البحث: أُجريت دراسة سريرية عشوائية على مجموعتين: شملت المجموعة الأولى؛ ٣٠ مريضا تلقوا أطقم أسنان كاملة للفكين العلوي والسفلي مصنوعة من الراتين الاكريليكي المتصلب بالحرارة, وشملت المجموعة الثانية؛ ٢٩ مريضا تلقوا أطقم أسنان كاملة للفكين العلوي والسفلي مصنوعة من الخزف. تم تقييم كل من نسبة الحدوث والفحص السريري لاضطرابات المفصل الصدغي الفكي باستخدام مؤشر هيلكيمو للاختلال الادكاري، ومؤشر هيلكيمو للاختلال السريري على التوالي. وقُدر تآكل أسنان التركيبات بتقييم عمق التآكل باستخدام متوسط الفوارق بين صور المتابعة للشرفة اللسانية في كل زيارة. كان توقيت زيارات المتابعة لتقييم التآكل واضطرابات المفصل الصدغي الفكي عند ٦ و١٢ و ١٨ و ٢٤ شهرا.

النتائج: تعرض أصحاب أطقم الراتين الاكريليكي المتصلب بالحرارة لتآكل أكثر منه في مجموعة الأطقم الخزفية, وبشكل واضح, وذلك عند الشهور١٢ و١٨ و٢٤ من المتابعة. كما أن نسبة اضطرابات المفصل الصدغي الفكي في مجموعة أطقم الراتين الاكريليكي المتصلب بالحرارة، كانت أكثر منها في مجموعة الأطقم الخزفية عند الشهور ١٨ و٢٤ من المتابعة وبشكل واضح.

الاستنتاجات: نسبة الإصابة باضطرابات المفصل الصدغي الفكي عند من لديهم أطقم أسنان كاملة ومصنوعة من الراتين الاكريليكي المتصلب بالحرارة أكثر من نسبتها في أصحاب الأطقم الخزفية.

الكلمات المفتاحية: الراتين الاكريليكي؛ التآكل السريري؛ الأطقم الكاملة؛ الخزف؛ اضطرابات المفصل الصدغي الفكي

Abstract

Objective: This study evaluates the effect of clinical wear on the incidence of temporomandibular disorders in patients with complete dentures.

Methods: A randomized clinical trial was conducted on two groups; group 1 (30 patients) received complete upper and lower dentures with teeth made of heat-cured acrylic resin, and group 2 (29 patients) received complete upper and lower dentures with teeth fabricated of porcelain. The occurrence and clinical examination of temporomandibular disorders were evaluated using Helkimo anamnestic dysfunction index (Ai) and Helkimo clinical dysfunction index (Di), respectively. Clinical wear of denture teeth was estimated by the assessment of wear depth using the mean differences between tracing images of lingual cusps at each follow-up. The patients were followed up at 6, 12, 18 and 24 months for assessment of clinical wear and incidence of temporomandibular disorders.

Results: The acrylic resin group was subjected to significantly higher wear than the porcelain group at 12, 18 and 24 months of follow-up. The incidence of temporomandibular disorders was also significantly higher in the acrylic resin group than in the porcelain group at 18 and 24 months of follow-up.

Conclusion: There was higher incidence of temporomandibular disorders among patients who wore complete dentures with teeth made of acrylic resin than in patients who wore complete dentures with porcelain teeth.

Keywords: Acrylic resin; Clinical wear; Complete denture; Porcelain; Temporomandibular disorders

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Introduction

A complete denture is considered insufficient if there is a lack of stability, if it has poor retention or if there is a loss of vertical dimension. Loss of vertical dimension could be a result of inaccurate fabrication or of artificial teeth wear.[1] This disturbs the stomatognathic system because vertical dimension loss could be exacerbated with prolonged use of inadequate denture.[2] Additional vertical dimension loss and increased horizontal stress could affect the health of the masticatory system.[3]

Clinical wear of denture teeth is usually expected in patients after years of denture use. Posterior teeth seem to be more affected by food abrasion. Development of facets in the anterior teeth due to attrition (tooth to tooth contact) usually occurs. A positive relationship has been found between the duration of complete denture wearing and the incidence of temporomandibular disorder (TMD).[4] The patients wearing complete dentures could be subjected to unbalanced distribution of occlusal force as a result of abrasion affecting posterior teeth in addition to attrition, which usually occurs in anterior teeth. After five years of use, approximately half of complete denture patients require replacement.[5] Extensive wear of denture teeth could affect the patient's quality of life through harmful impact on the masticatory system.[6]

Denture teeth made of acrylic resin usually show progressive occlusal wear, which could lead to rapid loss of vertical dimension. Three types of wear have been suggested: frictional wear, adhesive wear and abrasive wear.[7] In vitro studies aiming to measure wear of denture teeth have the drawback of assessing abrasive wear only under a few conditions,[8,9] while clinical trials could yield more comprehensive assessment.

Artificial teeth are commonly made from two types of material: acrylic resin and porcelain. Porcelain is well known for its stability against wear and resistance against abrasive forces. Denture teeth made of porcelain can act as a control for acrylic resin teeth because they are highly resistant to abrasive forces and are considered to be more stable against wear.[10–13]

This study aims to assess the role of clinical wear in incidence of TMD among complete denture patients.

Materials and Methods

Randomized clinical trial, parallel arm design was conducted at the Faculty of Dentistry, University of Khartoum, Sudan, from January 2014 to January 2016.

The main inclusion criteria were edentulous patients in need of complete dentures. Patients with severe malocclusion or patients with the following diseases were excluded; systematic diseases affecting TMD like generalized fibromyalgia, rheumatoid arthritis or post-traumatic stress disorder. Eligible patients gave written informed consents in order to be included in this study. A post hoc power analysis conducted by Ogle and Davis indicates that a sample size of 27 patients in each study group is the minimum sample size required for detection of 0.05 mm at a 95% confidence level and statistical power equal to 0.80.[7] Therefore, 64 patients were included in this study (32 patients in each group) in order to provide sufficient statistical power and compensate for withdrawal rate. The patients who agreed to participate in this study were assigned to two groups using random table numbers. Group 1 represented the intervention group, where patients received complete upper and lower dentures with teeth made of heat cure acrylic resin (Meliodent, Bayer dental, Germany batch no 54105L-2). Group 2 represented the control group, where patients received complete upper and lower dentures with teeth fabricated of porcelain (dent supply, Germany batch no 43105L-1). Five patients who were non-compliant were excluded from final result analysis: two patients belonged to group 1, and three patients to group 2.

The patients were followed for two years at 6, 12, 18 and 24 months for assessment of clinical wear and incidence of TMD. The initial visits after denture insertion were devoted to denture modification until the patient became well adapted to the denture. After patients were well adapted to the denture, the following visit was considered a baseline assessment visit, where measurement of clinical wear and assessment of TMD started. The clinical examination of TMD was conducted according to the Helkimo clinical dysfunction index (Di). The occurrence of TMD was evaluated by a questionnaire based on the Helkimo anamnestic dysfunction index (Ai). Questions about demographic variables such as age, gender, income and educational level were added to the questionnaire. Confounding factors such as awareness of bruxism, complete denture wearing (either worn continuously or taking it off during the night), stressful life style and presence of preferred chewing side were included.

Clinical wear of denture teeth was evaluated in this study by assessment of wear depth. Although a computer graphic measuring system has been used by in vitro studies to measure volumetric loss, it was considered to be time-consuming for this study. Instead, the depth of tooth wear was measured. The method used by Satoh et al. was used because it was found to be more time and cost effective. The anatomy of the lingual cusp was traced in the buccolingual direction by an apparatus using tracing head speed equal to 0.3 mm/s with 50 pm diameter at 20 times magnification. Then, every traced image was analysed by a computerized system with a special camera with pixels of H512 × V512.[14]

The image of each follow up visit was analysed and compared with the image of the baseline measurement. The depth of wear affecting posterior denture teeth was calculated based on the difference between the two images, shown by a line drawn from the apex of palatal or lingual cusp in the baseline record to that of subsequent follow-up visits. Then, the lengths of all lines drawn in all posterior teeth were averaged to calculate the mean length for each follow up visit. This mean length was divided by 20 (the image enlargement ratio) to obtain the mean of overall depth of clinical wear per patient in each follow-up visit.

Two examiners, who conducted the questionnaire interview and the clinical examination of TMD, were calibrated with a Kappa index of 0.82, which is considered a good reliability level for examination results. Duplicate measurements of clinical wear were conducted at the baseline assessment of the study to estimate the measurement method's reliability. The resultant error of clinical wear