

Available online at www.sciencedirect.com

SciVerse ScienceDirect

journal homepage: <http://www.elsevier.com/locate/aob>

Jaw-motor effects of experimental jaw-muscle pain and stress in patients with deep bite and matched control subjects

Liselotte Sonnesen^{a,b,*}, Peter Svensson^{c,d}

^a Orthodontic Section, Department of Odontology, Faculty of Health Sciences, University of Copenhagen, 20 Nørre Allé, DK-2200 Copenhagen, Denmark

^b Orthodontic Section, Department of Dentistry, Faculty of Health Sciences, Aarhus University, 9 Vennelyst Boulevard, DK-8000 Aarhus C, Denmark

^c Clinical Oral Physiology Section, Department of Dentistry, Faculty of Health Sciences, Aarhus University, 9 Vennelyst Boulevard, DK-8000 Aarhus C, Denmark

^d Department of Oral Maxillofacial Surgery, Aarhus University Hospital, 44 Nørrebrogade, DK-8000 Aarhus C, Denmark

ARTICLE INFO

Article history:

Accepted 5 July 2013

Keywords:

Deep bite

EMG-activity

Jaw-muscle pain

Stress

ABSTRACT

Objective: The effect of experimental jaw-muscle pain and stress on masticatory muscle activity in TMD-patients has been discussed. Furthermore, associations between TMD and deep bite patients have been studied. Accordingly in the present study, comparison of EMG responses at rest, maximal clenching, during evoked pain and stress between deep bite patients and controls was investigated.

Design: In 30 deep bite patients and in 30 sex-/age-matched controls with neutral occlusion EMG activity was recorded bilaterally from masseter and anterior temporalis muscles before and during evoked pain and before and during a stress task. Evoked pain was induced by injections of glutamate into the masseter (local pain) and brachioradialis (remote pain) muscles and resting EMG activity was recorded before and after 1, 2, 3, 4, 5 and 10 min. A precision task was used to simulate a stressful condition and EMG activity was recorded twice during the task. Maximal EMG activity was recorded during maximal clenching.

Results: Resting and maximal EMG activity were significantly different between groups and age with no gender differences. EMG activity during local pain and during the precision task were significantly different between groups, gender, age and time, whereas no time effect was found for the EMG activity during remote pain.

Conclusions: Patients with deep bite have significantly different jaw motor responses to painful stimulation of the trigeminal region and manual precision tasks suggesting a differential integration of both somatosensory and behavioural stimuli.

© 2013 Elsevier Ltd. All rights reserved.

* Corresponding author at: Orthodontic Section, Department of Odontology, Faculty of Health Sciences, University of Copenhagen, 20 Nørre Allé, DK-2200 Copenhagen N, Denmark. Tel.: +45 35326670.

E-mail address: alson@sund.ku.dk (L. Sonnesen).

0003-9969/\$ – see front matter © 2013 Elsevier Ltd. All rights reserved.

<http://dx.doi.org/10.1016/j.archoralbio.2013.07.003>

1. Introduction

The aetiology and pathophysiology of temporomandibular disorders (TMD) are still unknown, but several putative risk factors have been suggested.¹ In particular, occlusal parameters continue to attract attention and are discussed in relation to their importance for TMD. Many studies have found no associations between TMD and deep bite.^{2–11} However, some studies have shown an association between TMD signs and symptoms and deep bite.^{12–15} Recently, TMD and psychological status were examined in adult patients with a deep bite referred for orthodontic treatment and compared with an age and gender matched control group with normal occlusion.¹⁵ The study found that tension-type headache, muscle disorders, disc displacement and other joint disorders occurred significantly more often in the deep bite group compared to the control group. Also, somatization scores were significantly higher in the deep bite group. Furthermore, the study indicated that subjects with a deep bite may be more pain sensitive due to injections of glutamate into jaw and arm muscles and may have disturbances in the somatosensory processing of thermal stimuli.¹⁶ Although the specific study design does not allow for generalized conclusions related to the importance of deep bite to TMD pain, it does suggest that subsets of deep bite patients may be more at risk of developing a TMD problem under certain conditions.

Many studies have also shown an association between electromyographic (EMG) muscle activity at rest and TMD severity,^{17–19} but most studies and reviews do not support a close link between increased EMG activity and TMD pain and the vicious cycle concept continues to remain unsupported. Traditional studies have tested the effect of mental stress on EMG activity at rest and demonstrated subtle increases in EMG activity. A recent study with paced auditory serial addition task (PASAT) found no significant increases in EMG activity.²⁰ However, it seems likely that multiple putative risk factors could interact, for example deep bite, TMD, increased sensitivity to painful stimuli, increased psychological load and perceived stress.

The overall hypothesis of the present study was that patients with deep bite would demonstrate more significant EMG responses at rest compared to a control group. The aim of the present study was first to compare patients with deep bite to age and gender matched control subjects with normal occlusion regarding EMG responses to painful injections of glutamate into a jaw muscle and arm muscle combined with a precision task.

2. Materials and methods

2.1. Subjects

The sample comprised 60 adults, 30 patients with deep bite (deep bite group) and 30 subjects with neutral occlusion (control group). None of the adults in the deep bite group or control groups had craniofacial anomalies or systemic muscle or joint disorders and none of the adults were specifically referred for TMD treatment. Symptoms and signs of TMD according to the

Research Diagnostic Criteria for TMD (RDC/TMD, Axis I), occlusal support, bite force and pain sensitivity in the same groups of patients have previously been described.^{15,16}

The deep bite group consisted of 20 women aged 22–42 yr (mean 30.3) and 10 men, aged 23–43 yr (mean 33.1), admitted for orthodontic treatment at the Department of Orthodontics, School of Dentistry, Aarhus University, Denmark. All patients between 20 and 45 yr with deep bite and at least 24 permanent teeth present who applied for orthodontic treatment in the period from March 2002 to December 2003 were included in the study. The Sonnesen and Svensson study showed that muscle disorders occurred in 50% of the females and 20% of the males, disc displacement occurred in 25% of the females and in 40% of the males and other joint disorders occurred in 35% of the females.^{15,16}

The control group consisted of 20 women, aged 23–40 yr (mean 29.4) and 10 men, aged 25–44 yr (mean 34.2), with neutral occlusion or minor malocclusion that did not require orthodontic treatment according to the Danish procedure for screening the population for malocclusions entailing health risks.²¹ The control group was selected from either students or staff at the Dental School, Aarhus University and were matched to the deep bite group with regard to age (± 1 yr) and gender. The Sonnesen and Svensson study showed that none of the controls had muscle disorders or joint disorders and that disc displacement occurred in 10% of the females.^{15,16}

2.2. Study design

The study involved one experimental session in order to investigate the effect of local and remote pain and the effect of a precision task on the EMG activity of the jaw muscles. One author (LS) performed all the recordings prior to orthodontic treatment of the deep bite group. The sequence of local and remote pain was randomized in a balanced way but always preceded the precision task.

2.3. EMG recordings

In each subject surface EMG activity was recorded from the left and right masseter and anterior temporalis muscles (MAL, MAR, TAL and TAR, respectively) with disposable bipolar surface EMG electrodes (4 mm \times 7 mm recording area, 720-01-k, Neuroline, Medicotest, Denmark). These electrodes (impedance less than 20 k Ω) were placed 10 mm apart along the central part of the muscle, midway between the anterior and posterior borders and the superior and inferior borders of the MAL and MAR, and the anterior part of the TAL and TAR, approximately 2 cm lateral to the eyebrow. Subjects were asked to blink in order to check that no visible EMG activity was recorded in the temporalis EMG electrodes. The skin over the recording positions was cleaned with alcohol. A ground electrode soaked with saline was attached to the left wrist. The EMG signals were amplified 2000–5000 times (Disa 15C01, DK), filtered in the bandwidth 20 Hz to 1 kHz, sampled at 4 kHz and stored for off-line analysis. The EMG activity at rest, maximal clenching, during evoked pain and during the precision task (stationary EMG signals) was quantified by calculation of the root-mean-square (RMS) amplitude in each of the 10 s epochs. Resting EMG activity was recorded before and during evoked

Download English Version:

<https://daneshyari.com/en/article/6051769>

Download Persian Version:

<https://daneshyari.com/article/6051769>

[Daneshyari.com](https://daneshyari.com)