01 September 2025

Study Protocol

Title: Occlusal Sensitivity to Articulating Foils in Patients with Temporomandibular Disorders and Healthy Controls

Background

Occlusal sensitivity is defined as the ability to detect fine objects between antagonistic teeth during biting, i.e., in the position of maximum intercuspation. Two main methods are typically used to investigate occlusal perception and the threshold of periodontal sensation. The first measures the minimal detectable force applied to the teeth using monofilaments (Ryuhei K. et al., Osaka Dent Univ. 2020). The second evaluates the threshold of interocclusal thickness sensitivity, i.e., the ability to detect thin articulating foils between teeth (Suganuma T. et al., J Prosthet Dent. 2007).

In healthy individuals, the threshold of occlusal perception on natural teeth varies between 2 µm and 77 µm (average 24 µm), with a tendency to increase with age. Periodontal mechanoreceptors play a primary role in occlusal sensitivity, which has been demonstrated by significant impairment after local anaesthesia (Jacobs R. et al., J Periodontal Res. 1994). However, patients with implants or prostheses retain some degree of occlusal perception (Enkling N. et al., Clin Implant Dent Relat Res. 2012), suggesting the involvement of additional mechanoreceptors beyond those in the periodontal ligament.

Evidence also indicates that patients with pain-related temporomandibular disorders (TMD) demonstrate impaired occlusal perception (La Touche R. et al., J Oral Rehabil. 2019) and reduced adaptability to experimental occlusal interferences compared to healthy controls (Michelotti A. et al., J Orofac Pain. 2012; Le Bell Y. et al., Acta Odontol Scand. 2006). This supports the hypothesis that occlusal perception may be altered in patients with TMD.

Objectives

To evaluate differences in occlusal sensitivity between patients with pain-related TMD and healthy controls.

To assess the relationship between occlusal perception, psychosomatic characteristics, and clinical manifestations of TMD.

Study Design

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This is a case-control study designed to compare occlusal sensitivity in patients with temporomandibular disorders and healthy control subjects.

Participants

Case Group

Patients will be recruited from the Department of Removable Prosthodontics and the Department of Oral Medicine, School of Dental Medicine, University of Zagreb. Eligible participants will present with dysfunction of the jaw region and/or pain in the masticatory system. Diagnosis of pain-related TMD will be based on the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) (Schiffman E. et al., Oral Facial Pain Headache. 2014), assessed by a TMD specialist (Alajbeg IZ). Eligible diagnoses include myalgia, referred myofascial pain, and/or arthralgia.

Control Group

The control group will consist of healthy volunteers matched by age and sex to the case group, without evidence of neurological lesions that may affect sensory perception.

Inclusion Criteria:

- Reported pain in the temporomandibular joint (TMJ) and/or masticatory muscles persisting for more than 3 months.

- Spontaneous pain >30 mm on the Visual Analogue Scale (VAS) at the time of the first examination.

Exclusion Criteria:

- Posterior tooth loss resulting in loss of occlusal support zones.

- Posterior removable dentures.

- Poor oral hygiene or periodontal disease.

- Orofacial pathology unrelated to TMD diagnosis.

- Acute pain (<3 months duration).

- History of head and neck trauma.

- Headache not related to TMD (per ICHD-II criteria).

- Pain caused by fibromyalgia.

- Systemic diseases or diagnosed psychiatric disorders.

- History of pain medication abuse or current substance abuse.

Methods

The study will be conducted following approval from the Ethics Committee of the School of Dental Medicine, University of Zagreb. All procedures will comply with the ethical principles of the Declaration of Helsinki and STREGA guidelines. Participants will receive detailed oral and written information about the study and may withdraw at any time without consequence. Written informed consent will be obtained prior to participation. For underage participants, consent will be provided by a parent or legal guardian.

Occlusal perception will be tested by assessing the participant's ability to detect articulating foils of varying thicknesses placed between the upper and lower first molars. Each participant will undergo multiple trials, including a false test. The sequence of foil application will be randomised by computer software. After each trial, participants will report whether they perceive the presence of a foil. Responses will be recorded for statistical analysis.

Expected Outcomes

Primary outcome: Threshold of occlusal sensitivity in TMD patients vs healthy controls.

Secondary outcomes: Association between occlusal perception, psychosomatic characteristics, and clinical signs of TMD.