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Diagnostic Value of Static Functional Tests in Patients with Temporomandibular Disorders

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Abstract: ***Aims & Objectives: The goal of this study was to determine the diagnostic value of the static functional tests to induce pain in the masticatory muscles in patients with myogenic temporomandibular disorders (TMD). Materials & Methods: The study involved 39 patients ranging from 38 to 59 years of age (averaging 45.6 years). The results of the static tests to induce pain were recorded in a dichotomous scale. In order to create an isometric contraction in the tested muscles pressure was applied on the patients' lower jaw in a specific direction, while they were asked to hold the jaw immobile in an open, lateral or protrusive position (static tests). Results: Data analysis showed that there was a statistically significant difference ($p<0.05$) in the incidence of the invoked muscle pain using the methods of extraoral palpation (maximum movement limitation) versus functional manipulation. Conclusions: The static functional tests allow assessment of the muscles that are inaccessible to direct palpation due to their topographical location. The static functional test methods may be useful in diagnosing some temporomandibular disorders.***

Keywords: Temporomandibular disorders, Static pain tests, RDC/TMD

1. Introduction

The term "temporomandibular disorders" (TMD) is used to indicate a number of clinical conditions of the masticatory muscles, the temporomandibular joints (TMJs) and the structures associated with them. The three main symptoms of TMD are pain in the TMJ and masticatory muscles, joint sounds and limited range of motion of the lower jaw [5]. These symptoms may appear in various combinations and degrees. They may be accompanied by headaches, ringing in the ears, pain in the neck and shoulders, and are often influenced by psychosocial factors [11]. The most frequently reported symptom of these musculoskeletal disorders is pain. It usually increases during the normal daily functioning of the masticatory system (speech, laughing, chewing, swallowing, etc.) and is the main reason patients seek treatment [1, 11, 17]. As in many cases objective clinical findings in the myogenic disorders of the orofacial region are lacking, often the diagnosis is based on the signs and symptoms reported by the patients [13].

As objective diagnostic criteria to differentiate the specific muscle disorders have not been established, a number of disagreements exist among the experts in the field. A major goal for the expert groups is to achieve a consensus on the clinical criteria and diagnostic methods to be used for the diagnosis of myogenic TMD [5, 6, 8, 9, 16].

Recently some of the most frequently discussed issues have been related to the techniques for intraoral palpation of the masticatory muscles, which some authors consider to lack the required level of reliability [12, 3].

According to the research diagnostic criteria for TMD (RDC/TMD - Research Diagnostic Criteria for Temporomandibular Disorders), palpation tests play an important role in the diagnosis and classification of these disorders [5]. However, serious criticism exists in the literature on the use of palpation of some mastictory muscles because of their topographical location (m. pterygoideus medialis and m. pterygoideus lateralis). A systematic analysis of the literature lead Türp and Minagi [14] to the opinion that palpation tests, especially intraoral palpation of the muscle structures, often produce positive results in healthy populations (ie. the tests have low specificity). These findings are the reason to seek and evaluate the use of other manual procedures for the diagnosis of pain in these muscles in TMD. Normal function implies unrestricted range of motion without pain during muscle contraction. An assumption exists in orthopedic medicine that these muscles can be evaluated by a combination of functional isometric contraction tests [2, 4, 15]. These orthopedic tests have been modified and adapted for the orofacial region, and have been named static and dynamic tests inducing muscle pain [4, 5]. During the static tests the mandibular joint remains stationary, while the muscles generate significant forces without having to change their length (isometric contraction). Induction of pain by static tests which cause muscle strain but have no effect on the joint structures allows us to assume that the pain is of a myogenic origin [9]. The functional manipulation of the muscles which cannot be palpated directly can provide the necessary information regarding the source of the pain.

2. Materials and Methods

The study involved 39 patients with myofascial pain in the orofacial region including 23 women and 16 men, ranging in age from 38 to 59 years with an average age of 45.6 years (SD-4.94, SE-1.03). An informed consent was obtained from all participants in the study. The diagnosis was established by a routine examination for TMD, which included a standardized medical history and clinical evaluation in accordance with the procedures proposed by the RDC/TMD [5, 6]. In the cases where no specific diagnosis according to the RDC/TMD criteria was established, static tests were performed to induce pain in the masticatory muscles studied.

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In the static tests, the patients were instructed to hold his/her lower jaw still while the examiner applied gradually increasing pressure to move the jaw in a certain direction (inducing an isometric contraction). This effort was maintained for about 2-5 seconds and was stopped at the time of the patient reporting pain.

The test for the evaluation of m. pterygoideus medialis (resistive close) was conducted in an open position of about 15-20 mm measured interincisally (Figure 1a). The patient was instructed to keep his/her jaw still while the examiner applied force to attempt to open the jaw. During the evaluation test for m. pterygoideus lateralis (resistive protrusion), the starting position of the mandible was slight protrusion (about 5 mm), with no contact between the upper and lower teeth as the examiner aimed to retrude the mandible (Figure 1b). In the laterotrusive test differentiating the involvement of the left vs. right m. pterygoideus lateralis (resistive laterotrusion), the patient was placed in the lower jaw left or right laterotrusive position without contact between the teeth. The examiner then applied force in the medial direction (Figure 1c). The test was then repeated with the force applied in the opposite direction to evaluate the contralateral muscle. The positioning of the hands of the examiner and the direction of the applied force are shown in Figure 1.



Figure 1: Demonstration of the static test for pain in: a) resistive closure; b) resistive protrusion; c) resistive laterotrusion

During the implementation of the static tests repeated application of the isometric force was being avoided in order to prevent the possibility of superimposing residual pain. The statistical analysis of the results from all static tests was performed using the SPSS 19.0 software package. Probability levels of $p < 0.05$ were considered statistically significant.

3. Results

The comparative analysis of the incidences of myofascial pain established by both methods - extraoral palpation and functional manipulation, is shown in Table 1. The incidence of the pain established in the masticatory muscles was found to be significantly higher when using the static functional tests – 69.2% (n = 27) as compared to the method of extraoral palpation of the masticatory muscles according to the RDC/TMD criteria, where the incidence of pain induction was 30.8% (n = 12).

Table 1: Comparative analysis of the incidence of muscle pain established according to the test method applied

Method \ Gender	Female n	Female %	Male n	Male %	Total n	Total %
Extraoral palpation						
M. temporalis	n=2	5.13%	n=1	2.56%	n=3	7.69%
M. masseter	n=5	12.8%	n=4	10.3%	n=9	23.1%
Functional manipulation						
M.pterygoideus medialis	n=2	5.13%	n=1	2.56%	n=3	7.69%
M. pterygoideus lateralis	n=14	35.9%	n=10	25.6%	n=24	61.5%
Total	n=23	59.0%	n=16	41.0%	n=39	100%

The results of the relative frequencies of the identified painful muscle points by extraoral palpation and functional manipulation of all muscle disorders (n = 39) for both male and female patients are shown in Table 1. The analysis of the data showed the existence of a statistically significant difference ($p<0.05$) in the incidence of the induction of muscle pain according to the method used - extraoral palpation versus functional manipulation (Table. 2).

Table 2: Relative incidence of induced pain as established by the methods of extraoral palpation and functiona manipulation

Symptom \ Method	Extraoral palpation	Functional manipulation	p value
Pain in the muscles of mastication	12 (30.8%)	27 (69.2%)	0.001

4. Discussion

All patients with pain in the masticatory muscles were initially evaluated in accordance with the procedures proposed by the RDC/TMD, where the maximum limit movements were the only indicators providing information about the functional states of m. pterygoideus medialis and lateralis. Literature data on border movements of mandible are too variable, excluding the possibility of objective and reliable assessment.

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According to the criteria and requirements of the RDC/TMD 12 (30.8%) of the respondents (n = 39) were diagnosed with myofascial pain with or without limited opening (Ia or Ib according to the RDC/TMD classification). Twenty-seven subjects (69.2%), despite complaining of pain in the orofacial region, were not diagnosed by the methods and criteria of the most commonly used method for the diagnosis of TMD - RDC/TMD.

This fact was probably due to the lack of clinical methods in the methodology of RDC/TMD examination of m. pterygoideus medialis and m. pterygoideus lateralis. Intraoral palpation according to the literature [14] has not shown good reliability and has been removed from the clinical protocol of the RDC/TMD and other diagnostic methods. Instead of intraoral palpation, static clinical tests were conducted to induce pin in m. pterygoideus medialis and m. pterygoideus lateralis. When static tests were used pain in m. pterygoideus lateralis was reported by 24 (61.5%) of the patients who were not diagnosed using the RDC/TMD methods and criteria.

Three (7.69%) of the patients complaining of pain in the orofacial region reported myofascial pain of m. pterygoideus medialis when static tests were implemented.

The results of our study suggest that the source of pain in 2/3 of the patients with muscle disorders was m. pterygoideus lateralis. This high relative incidence of myofascial pain in m. pterygoideus lateralis emphasizes the role of static functional tests in the diagnostic workup of the patients with TMD.

5. Conclusion

The following conclusions can be made from the results of our study on the diagnostic value of the static functional tests used to induce pain in the evaluated muscle of mastication in patients with TMD:

1) The static functional tests allow assessment of the muscles that are inaccessible to palpation due to their topographical location. Errors specific to palpation can be avoided, such as provoking pain in superficially located structures (i.e. salivary glands).
2) Facilitated is the differentiation of myogenic versus arthrogenic conditions, due to the fact that during the static tests the mandible remains immobile while significant forces are generated in the evaluated muscles.

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