RADIOGRAPHIC VALIDATION OF MANUAL FUNCTIONAL ANALYSIS OF TEMPOROMANDIBULAR JOINT OSTEOARTHRITIS

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SUMMARY – The finding of osteoarthritis of temporomandibular joint (TMJ) obtained by clinical diagnosis, i.e. manual functional analysis (MFA) and the finding obtained by magnetic resonance imaging (MRI) as the gold standard were compared in 30 patients (mean age 52.6) diagnosed with osteoarthritis, selected out of 140 consecutive patients diagnosed with a TMJ disorder by MRI. The clinical parameters were symptoms of pain in the TMJ region, crepitations, and absence of clicking, which was confirmed by manual examinations as part of MFA. A positive MRI finding included flattening, subchondral degenerative changes with or without intact cortical bone, osteophytes and subchondral degenerative cysts of joint surfaces. The validity of MFA for osteoarthritis was as follows: sensitivity 0.38, specificity 0.91, positive predictive value (PPV) 0.77 and negative predictive value (NPV) 0.65. MRI examination revealed disk displacement (DD) without reduction in 12 (40.00%) patients and DD with reduction in one (3.33%) patient. The finding of passive compressions for the osteoarthritis diagnosis depending on DD showed sensitivity of 0.29, specificity of 0.95, PPV 0.67 and NPV 0.78. Although MFA significantly improves validity of clinical diagnosis when differentiating a myogenic from TMJ disorder, clinical determination of osteoarthritis is not satisfactory. Nonspecific clinical signs and symptoms accompanied by predominant pain in the TMJ on dynamic but not on passive manual examinations cannot help differentiate DD from osteoarthritis.

Key words: *Validity; Osteoarthritis; Temporomandibular joint; Manual functional analysis; Magnetic resonance imaging*

Introduction

Temporomandibular disorders (TMDs) are a term denoting musculoskeletal disorders affecting the temporomandibular joint (TMJ), the masticatory muscles, or both, and they are the most common cause of orofacial somatic non-odontogenic pain. Osteoarthritis (OA) and disk displacement (DD) of TMJ belong to the arthrogenic group of TMDs[1].

The multifactorial etiologic theory of TMD has been described under various physical and psychological factors, which could be potentially significant in the development of TMD forms. Symptomatic TMJ with remodeling and degenerative cortical and bone changes is one of the most common sites of the occurrence of OA[2]. OA is a low-inflammatory arthritic condition that results in various degenerative joint changes clinically manifested as joint noises (crepitation), arthralgia, and limited opening of the mouth[3].

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Diagnostic value of orthopedic provocation tests was previously introduced for the recognition and evaluation of abnormal joint and muscle function[4]. Manual functional analysis (MFA) was presented by Bumann and Lotzman[5] to reach a tissue-specific diagnosis of TMJs and masticatory muscles. Although the validity of MFA was tested for differentiation of arthrogenic and myogenic forms of TMD by orthopedic tests, there is an additional challenge for clinical diagnosis including distinction between certain arthrogenic diagnoses[6-10]. In TMJ diagnostics, magnetic resonance imaging (MRI) is the gold standard compared with clinical diagnosis and other radiological methods (computerized tomography (CT), panoramic radiography) in arthrogenic diagnostics[11].

Clinical diagnoses of joint pathoses depend on clinical criteria as well as on the clinical diagnostics applied. Different diagnostic systems put TMDs under the same umbrella as different disorders (Research Diagnostic Criteria (RDC)/TMD Axis I by Dworkin and LeResche[12], Clinical Diagnostic Criteria (CDC)/TMD by Truelove *et al.*[13] or different tissue-specific diagnoses (Bumann and Lotzmann[5]).

Studies determining the validity of clinical criteria were also conducted within the standard algorithm for arthrogenic diagnoses differentiation as well as for redefining of clinical diagnosis of OA by MRI[14-16]. Several arthrogenic diagnoses can be simultaneously established in the same patient, while there is an additional difficulty in correlating clinical signs and symptoms due to their being unreliable in detection (sporadic occurrence or absence of pathologic noise) as well as the diagnosis of arthralgia *per se*[6,17-19].

Results of radiologically supported studies pointed to a controversy with respect to the relationship between DD, especially DD without reduction, clinically and radiologically confirmed signs of OA of TMJ and degenerative changes of TMJ[20-23].

The objective of this study was to compare clinical diagnosis achieved by MFA for OA with radiological findings achieved by MRI in consecutive patients with arthrogenic group of TMD.

Patients and Methods

This prospective study included a subgroup of 30 patients with OA of TMJ (median age 53, mean age 52.57±17.10, range: 19-82; 83% women) and a subgroup of 110 patients with DD (mean age 37.59±13.50, range: 12-84; 81% women). Between January 2001 and December 2008, all these patients were consecutively examined by MRI using MFA according to Bumann and Lotzman[5] at Department of Removable Prosthodontics, School of Dental Medicine, University of Zagreb. Definite selection of all study patients was performed on the basis of MRI diagnostics. All study patients were informed about the aims and methods of examination and they gave their written consent for participation according to the protocol approved by the Ethics Committee of the School of Dental Medicine, University of Zagreb.

Clinical diagnosis

The inclusion criteria for patients included two conditions: pain referred to the TMJ and/or crepitation, i.e. the 'gravel'-like or 'cracking' effect in the TMJ. Clinical diagnosis by MFA[5] included dynamic compression in the cranial region of the joint during which the patient performed the movement of protrusion and mouth opening. A painful sensation, pathologic noise and additional limitation of mouth opening were observed in the course of dynamic compression. By using passive compressions, the therapist performed condylar movements by manipulation of the mandible, thus checking if there is any pain in the retrodiscal tissue. Active movement of the maximal mouth opening was measured by a gauge in millimeters, between markings on the labial surface of the lower central incisor in the plane of the upper central incisor overbite.

In order to make clinical diagnosis of DD, the finding of clicking on active mouth opening was compared with MFA[5] procedures, which included dynamic compression and translation as well as passive compressions. Dynamic procedures implied compression of TMJ in the cranial region during which the patient opened the mouth as well as lateral compression of the body of the mandible during which the patient also opened the mouth. At the same time, medial translation of one joint and lateral translation of the contralateral joint were performed as well. Anterior DD with reduction was described as initial-intermediate clicking sound that was heard reciprocally during mouth closing. In case of medical history of previous

clicking, with only arthralgia on initial examination, the limitation of mouth opening accompanied by pain was determined by dynamic compression, which led to the diagnosis of DD without reduction. Additionally, passive compressions ('joint play') were used to determine painfulness of the bilaminar zone in joints with DD. By manipulation of the patient's mandible, the compressions of TMJ are performed cranially, dorsally, medially and laterally. Pain in the bilaminar zone due to anterior disk displacement and pathologic strain of the retrodiscal tissue result in a positive finding in case of DD, particularly in DD without reduction since repositioning cannot be performed and clinical signs of clicking are absent.

MRI diagnosis

Physiological disk position was confirmed in patient TMJ using the following criteria: the intermedial part of the disk was positioned within the shortest span of the osseous contours of the ventrocranial part of the condyle and the articular eminence.

The criterion for DD in closed mouth position was that the pars posterior of the disk did not reach the shortest span between the articular eminence and the condylar head. The physiological position of the disk on the condylar head is achieved in open mouth position, which corresponds to DD with reduction. On the contrary, if the disk is completely anteriorly placed with respect to the condyle in open mouth position, it is a case of DD without reduction.

MR scans were interpreted using the criteria for OA diagnosis[24] on every selected parasagittal slice of TMJ; with the presence or absence of the following degenerative bone changes: no osteoarthritic signs (normal shape and density), moderate shape loss/severe sclerosation, pronounced shape loss/severe sclerosation for articular eminence; no osteoarthritic signs (normal shape and density), deplaned shape, moderately sclerosed areas, pronounced sclerosed areas, and osteophyte formation and pronounced sclerosed areas (subchondral pseudocyst) for the condylar bone[24].

Bilateral MR images of the TMJs were obtained simultaneously on the individually established coronal and parasagittal planes of the images on the basis of a previously performed axial scout (TR 21/TE 6; matrix 256x128; 300x300 field of view). The MRI diagnostics of both TMJs of all subjects was performed by T1 weighted (TR 450/TE 12; matrix 256x192; 160x160 field of view) and T2 weighted images (TR 3000/TE 66; matrix 389x512; 190x190 field of view), and seven slices of images with a 3-mm thickness using the magnet on a Harmony (Siemens, Erlangen, Germany), at magnetic field magnitude of 1T.

Statistical analysis

Statistical analysis was performed by Statistica (StatSoft, Inc., 2010, STATISTICA data analysis software system, version 9.1. (www.statsoft.com)). Data were analyzed in the following two ways: one time the object of observation was the person and the other time it was the TMJ. On data analysis regarding joints, the left and the right TMJ of one person were presented as two entities.

Validity (a diagnostic test was used to describe the examined pathologic condition) and reliability (the same or different examiners at repeated use of the same diagnostic test reach the same diagnosis) of MFA use for clinical diagnosis of OA was applied to the entire group of patients (N=140). MRI results were used as the diagnostic standard. Validity of diagnostic procedure was described by its sensitivity and specificity.

In addition, the extent to which a positive finding of passive compressions could contribute to differential diagnosis of OA and DD without reduction was assessed in a subgroup of patients with OA (n=30), since the comorbidity of several arthrogenic diagnoses was expected (i.e. DD without reduction with OA).

Sensitivity is defined as the proportion of diseased subjects who tested positively. Specificity is defined as the proportion of healthy subjects who tested negatively. An important feature of a diagnostic test is its diagnostic probability, i.e. positive predictive value (PPV) and negative predictive value (NPV). PPV is defined as the proportion of test positive subjects who are diseased, and NPV as the proportion of test negative subjects who are healthy[25].

The reliability of MRI interpretation was tested for all subjects on the basis of two researchers' (a radiologist and a dentist) inspections, which were conducted independently of each other and of the patient's clinical signs in TMJs, and it was evaluated by Cohen's kappa index[25].

Results

Comparing the agreement of a dentist and a radiologist on the presence/absence of degenerative joint disease and disk position in the TMJs using Cohen's kappa values yielded the following results: Cohen's kappa value between 0.80 and 1.0 for matching of clinical diagnosis of OA and definitive OA diagnosis based on radiologic finding, and Cohen's kappa amounted to 0.72.

Comparison of MRI diagnoses of OA in all patients with diagnoses of OA and DD is shown in Table 1. The results refer to differentiation between the two clinical diagnoses, i.e. OA and DD, implying that none of these patients was without the arthrogenic diagnosis of TMD.

The reliability of MFA in making certain diagnoses of OA was assessed in patients (N=140) with arthrogenic diagnosis included in statistical analysis with MRI findings. Relations between the values of statistical validity of a diagnostic test for the diagnosis of OA were as follows: for clinical diagnosis of OA by MFA, sensitivity was 0.70 and specificity 0.65. The diagnosis of OA by MFA was confirmed in 23 (37.7%) patients with PPV of 0.38, while a clinically different diagnosis of DD was established in 38 (62.3%) patients with NPV of 0.91, compared with the diagnosis made by MRI (Table 1).

Further analysis included 30 patients with respect to the relation between the findings of passive compression and their joints with and without definitive diagnosis of OA (achieved by MRI). OA was diagnosed in 35 (58.3%) of all TMJs (in 5 (16.6%) patients, OA was bilateral). An additional finding was DD, which was determined in 13 (43.33%) patients, whereas another 17 (56.67%) patients had physiological disk position. Out of all patients with DD, only one had DD with reduction, while the others had DD without reduction.

Table 1. Correlation of MRI diagnosis and clinical diagnostic test by MFA for diagnosis of osteoarthritis in the general sample of patients with arthrogenic diagnosis (N=140)

	MRI diagnosis of OA		
MFA diagnosis of OA	Positive	Negative	Total
Positive	23 (37.7%)	38 (62.3%)	61 (100%)
Negative	7 (8.9%)	72 (91.1%)	79 (100%)
Total	30 (21.4%)	110 (78.6%)	140 (100%)

MFA = manual functional analysis; MRI = magnetic resonance imaging; OA = osteoarthritis

Table 2. Correlation of MRI diagnosis and clinical diagnostic test by MFA for positive findings of passive compressions in differential diagnosis of DD as joint OA comorbidity (n=35)

	MRI diagnosis of DD		
MFA diagnosis of DD	Positive	Negative	Total
Positive	2 (20.0%)	8 (80.0%)	10 (100%)
Negative	4 (16.0%)	21 (84.0%)	25 (100%)
Total	6 (17.1%)	29 (82.9%)	35 (100%)

DD = disk displacement; MFA = manual functional analysis; MRI = magnetic resonance imaging; OA = osteoarthritis

Two comparisons were made between positive finding of passive compression and the evaluation of the presence or absence of DD in the joint. The first joints to be analyzed (n=35) were those that had a definitive diagnosis of OA (Table 2). A positive finding of passive compression was found in only two joints, and the condition of DD was confirmed by MRI (sensitivity, 0.33). Conversely, DD finding by MRI was not confirmed in 4 joints based on passive compressions (specificity, 0.65). A positive finding of passive compressions was found in a number of joints (8 joints), which did not correspond to DD finding, i.e. the joints with OA had physiological disk position (PPV, 0.20). However, a much higher NPV (0.84) was determined since in most of the joints with OA neither passive compressions nor MRI confirmed DD (21 joints).

The second part of the analysis included a subgroup of joints (n=25) of patients with OA who were not diagnosed with OA. In their case, the findings of passive compressions were compared with the MRI finding of disk position (Table 3). Symptomatic DD was determined in only two joints both clinically (pain on passive compression) and radiologically (MRI).

Table 3. Correlation of MRI diagnosis of DD and positive findings of passive compressions in joints (n=25) not diagnosed as OA in the subgroup of OA patients

	MRI diagnosis of DD		
MFA diagnosis of DD	Positive	Negative	Total
Positive	2 (66.7%)	1 (33.3%)	3 (100%)
Negative	5 (22.7%)	17 (77.3%)	22 (100%)
Total	7 (28.0%)	18 (72.0%)	25 (100%)

DD = disk displacement; MFA = manual functional analysis; MRI = magnetic resonance imaging; OA = osteoarthritis

On the other hand, the remaining 5 joints had an asymptomatic finding of DD. Hence, the sensitivity was 0.29 and specificity 0.95, while PPV was 0.67 and NPV 0.78. Only one joint had a positive finding of passive compressions and MRI did not confirm any abnormality in it (neither OA nor DD and joint effusion). In most of the joints (n=18), there was correspondence between negative findings of passive compressions and physiological MRI of the joints.

Discussion

Osteoarthritis is a well-known public health problem, which has also been identified in the population of Croatian patients. According to Cvijetić *et al.*[26], epidemiological data from rheumatologic practice show that OA prevalence increases with age and has a tendency to involve several joints, in the sense of disease spectrum. However, TMJ pathology related to OA was not identified in that study, which implies partial isolation of TMD symptomatology with respect to the non-dental clinical practice. This study tackled a complex issue of differentiation of certain TMJ diagnoses. So far, a targeted study comparing clinical and MRI findings in patients with OA of TMJ has not been carried out, which is a less common diagnosis than DD in the population of TMD patients[25]. Generally, OA diagnosis remains a challenge for numerous medical specialist branches.

MFA is a collection of manual techniques which are common in orthopedics, rheumatology and physical medicine. A number of authors have already pointed to the usefulness of manual diagnostic tests for determining tissue specific TMD diagnoses, which includes differentiation between myogenic and arthrogenic (diagnosis DD and OA) subgroups of TMD[7-9].

A high level of correspondence was identified in as much as 95% of cases with different DD diagnoses by comparing the MFA and MRI findings[9,10]. The correspondence of diagnoses between the MFA and MRI findings amounted to 95% for certain types of DD. The sensitivity was up to 78%[9]. This study did not consider the level of correspondence between clinical and MRI diagnoses of DD, as it rather considered MFA contribution to OA diagnosis and differentiation from DD patients.

The RDC/TMD diagnostic system did not include additional use of MRI. Also, it did not consider group III, which specifically includes OA and uses the term osteoarthrosis, which is out of use. Another diagnosis is arthralgia, which is in fact a symptom related to all TMJ diagnoses, as critically observed by Palla[17] when publishing the criteria. Also, additional MRI diagnostics shows numerous TMJ diagnoses hidden under the diagnosis of arthralgia[18]. Such a diagnosis can be further clinically differentiated by use of MFA, which is mentioned in recent proposals for revision of the RDC/TMD criteria[27,28].

A similar study of validation according to CDC/TMD for degenerative joint disease found some difficulties in clinical differentiation and detection of OA and DD without the use of MRI, resulting in low validation parameters, as also shown in our study[15]. In order to avoid arthralgia as the only clinical finding, passive compressions can serve to detect bilaminar zones as the sources of pain due to straining of posterior attachment during anterior DD. Namely, pain in the TMJ is a dominant clinical finding both in OA joints and joints with DD[15,16]. Dynamic compressions cannot always detect crepitations as a characteristic noise symptom of OA. If pain and limited mouth opening on dynamic compression are present, and if clicking is also present in the patient's medical history, it can be concluded that DD without reduction is present. However, DD without reduction is a common finding in joints with OA, but this dual etiopathogenesis still remains unexplained, although it is considered that overloading along with excessive wear of joint surfaces without disk as a medium

between them leads to the development of OA[20-23]. Due to this, in this study, OA and DD diagnoses were differentiated in patients with definitive diagnosis of OA. It has been determined that passive compression as an additional test within DD diagnosis by MFA can attain greater validity. This is probably caused by the fact that in our targeted group of patients with OA, the OA symptoms were predominant and DD without reduction generally does not cause pathologic clicking noise, while limited mouth opening and pain are typical findings of all TMJ diagnoses[18,29].

MRI is the gold standard in TMJ diagnosis because it shows articular structures, including soft tissues, i.e. cartilaginous articular surfaces and the disk. Computerized tomography is certainly the gold standard for osseous tissues regarding the variability of osteoarthritic changes. A comparative study[11] showed different validity of radiologic diagnostic methods, MRI being the optimal one since it provides data on comorbidity with DD. In the validation of MRI finding of OA, it is possible to explain mild degenerative bone changes as false positive results[20].

In an epidemiological study of a non-patient population by MRI on the basis of several good definite criteria of functional disturbances addressed to TMJs, such as pain on palpation of the TMJs and at limitation of mouth opening less than 40 mm, OA changes were found in 25% of all subjects, unilaterally or bilaterally. Occlusion is considered to be a possible etiopathogenetic factor of DD and OA but the relationship among factors is complex and their mutual correspondence has not been completely clarified[30,31]. Also, it has been shown that MRI findings of osteoarthritic changes in TMJ and/or DD are not always supported by clinical manifestations, leading to a conclusion that clinical diagnostic methods are not sufficient for TMJ diagnosis[19].

The present study suffered from some limitations. MRI is not an ideal imaging technique for detailed detection of osseous changes[32]. Another limitation was that coronal images were not obtained, and they are important to define the mediolateral location of the disks[11]. In conclusion, this study showed that the use of MFA in clinical differential diagnosis of OA and DD resulted in higher sensitivity (0.70) for differentiation between OA and DD than on differentiation between their comorbidities (0.33 and 0.29, respectively). The specificity ranged between 0.65 and 0.95, PPV between 0.20 and 0.67 and NPV between 0.78 and 0.91. MRI is the recommended radiologic diagnostic method in differential diagnosis of TMJ disorders.

References

1. OKESON JP, de LEEUW R. Differential diagnosis of temporomandibular disorders and other orofacial pain disorders. Dent Clin North Am 2011;55:105-20.
2. SCHMITTER M, ESSIG M, SENEADZA V, BALKE Z, SCHRODER J, RAMMELSBERG P. Prevalence of clinical and radiographic signs of osteoarthrosis of the temporomandibular joint in an older persons community. Dentomaxillofac Radiol 2010;39:231-4.
3. BADEL T, KOCIJAN LOVKO S, PODOREŠKI D, SAVIĆ PAVČIN I, KERN J. Anxiety, splint treatment and clinical characteristics of patients with osteoarthritis of temporomandibular joint and dental students – a pilot study. Med Glas Ljek komore Zenicko-doboj kantona 2011;8:60-3.
4. DuPONT JS Jr, BROWN CE. Provocation testing to assist craniomandibular pain diagnosis. Cranio 2010;28:92-6.
5. BUMANN A, LOTZMAN U. TMJ disorders and orofacial pain – the role of dentistry in a multidisciplinary diagnostic approach. Stuttgart – New York: Thieme, 2002.
6. LOBBEZOO-SCHOLTE AM, STEENKS MH, FABER JA, BOSMAN F. Diagnostic value of orthopedic tests in patients with temporomandibular disorders. J Dent Res 1993;72:1443-53.
7. LOBBEZOO-SCHOLTE AM, de WIJER A, STEENKS MH, BOSMAN F. Interexaminer reliability of six orthopaedic tests in diagnostic subgroups of craniomandibular disorders. J Oral Rehabil 1994;21:273-85.
8. HESSE JR, van LOON LA, NAEIJE M. Subjective pain report and the outcome of several orthopaedic tests in craniomandibular disorder patients with recent pain complaints. J Oral Rehabil 1997;24:483-9.
9. BADEL T, MAROTTI M, SAVIĆ PAVIČIN I, DULČIĆ N, ZADRAVEC D, KERN J. Temporomandibular disorders – validity of clinical diagnostics compared to magnetic resonance imaging. Period Biol 2011;113;207-12.
10. BUMANN A, ZABOULAS D. Reliability of manual examination techniques for diagnosis of disc displacement. Eur J Orthod 1996;18:511.
11. AHMAD M, HOLLENDER L, ANDERSON Q, KARTHA K, OHRBACH R, TRUELOVE EL, JOHN MT, SCHIFFMAN E. Research diagnostic criteria for temporomandibular disorders (RDC/TMD): development of image analysis criteria and examiner reliability for image analysis. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2009;107:844-60.

12. DWORKIN SF, LeRESCHE, editors. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord Fac Pain 1992;6:301-55.
13. TRUELOVE EL, SOMMERS EE, LeRESCHE L, DWORKIN SF, Von KORFF M. Clinical diagnostic criteria for TMD. New classification permits multiple diagnoses. J Am Dent Assoc 1992;123:47-54.
14. BRANDLMAIER I, GRÜNER S, RUDISCH A, BERTRAM S, EMSHOFF R. Validation of the clinical diagnostic criteria for temporomandibular disorders for the diagnostic subgroup of degenerative joint disease. J Oral Rehabil 2003;30:401-6.
15. EMSHOFF R, BRANDLMAIER I, BERTRAM S, RUDISCH A. Comparing methods for diagnosing temporomandibular joint disk displacement without reduction. J Am Dent Assoc 2002;133:442-51.
16. EMSHOFF R, RUDISCH A, INNERHOFER K, BRANDLMAIER I, MOSCHEN I, BERTRAM S. Magnetic resonance imaging findings of internal derangement in temporomandibular joints without a clinical diagnosis of temporomandibular disorder. J Oral Rehabil 2002;29:516-22.
17. PALLA S. Research Diagnostic Criteria for Temporomandibular Disorders: review, criteria, examinations and specifications, critique. Part IV. Review and commentary. B. Clinical science. J Craniomandib Disord Fac Pain 1992;6:3350-5.
18. LIMCHAICHANA N, NILSSON H, EKBERG EC, NILNER M, PETERSSON A. Clinical diagnoses and MRI findings in patients with TMD pain. J Oral Rehabil 2007;34:237-45.
19. BERNHARDT O, BIFFAR R, KOCHER T, MEYER G. Prevalence and clinical signs of degenerative temporomandibular joint changes validated by magnetic resonance imaging in a non-patient group. Ann Anat 2007;189:342-6.
20. BARCLAY P, HOLLENDER LG, MARAVILLA KR, TRUELOVE EL. Comparison of clinical and magnetic resonance imaging diagnosis in patients with disk displacement in the temporomandibular joint. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1999;88:37-43.
21. MANFREDINI D, GUARDA-NARDINI L. Agreement between Research Diagnostic Criteria for Temporomandibular Disorders and magnetic resonance diagnoses of temporomandibular disc displacement in a patient population. Int J Oral Maxillofac Surg 2008;37:612-6.
22. KURITA H, UEHARA S, YOKOCHI M, NAKATSUKA A, KOBAYASHI H, KURASHINA K. A long-term follow-up study of radiographically evident degenerative changes in the temporomandibular joint with different conditions of disk displacement. Int J Oral Maxillofac Surg 2006;35:49-54.
23. SYLVESTER DC, EXSS E, MARHOLZ C, MILLAS R, MONCADA G. Association between disk position and degenerative bone changes of the temporomandibular joints: an imaging study in subjects with TMD. Cranio 2011;29:117-26.
24. BADEL T, MAROTTI M, KEROS J, KERN J, KROLO I. Magnetic resonance imaging study on temporomandibular joint morphology. Coll Antropol 2009;33:455-60.
25. BADEL T. Stomatološka protetika i temporomandibularni poremećaji. Zagreb: Medicinska naklada, 2007.
26. CVIJETIĆ S, CAMPBELL L, COOPER C, KIRWAN J, POTOČKI K. Radiographic osteoarthritis in the elderly population of Zagreb: distribution, correlates, and the pattern of joint involvement. Croat Med J 2000;41:58-63.
27. LOOK JO, SCHIFFMAN EL, TRUELOVE EL, AHMAD M. Reliability and validity of Axis I of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) with proposed revisions. J Oral Rehabil 2010;37:744-59.
28. TRUELOVE E, PAN W, LOOK JO, MANCL LA, OHRBACH RK, VELLY AM, HUGGINS KH, LENTON P, SHIFFMAN EL. The Research Diagnostic Criteria for Temporomandibular Disorders. III: validity of Axis I diagnoses. J Orofac Pain 2010;24:35-47.
29. BADEL T, SAVIĆ PAVIČIN I, PODOREŠKI D, MAROTTI M, KROLO I, GRBEŠA Đ. Temporomandibular joint development and functional disorders related to clinical otologic symptomatology. Acta Clin Croat 2011;50:51-60.
30. BADEL T, PANDURIĆ J, MAROTTI M, KROLO I. Klinička studija učestalosti artroze čeljusnog zgloba u mlađih muškaraca. Acta Stomatol Croat 2006;40:46-55.
31. BADEL T, MAROTTI M, KROLO I, KERN J, KEROS J. Occlusion in patients with temporomandibular joint anterior disk displacement. Acta Clin Croat 2008;47:129-36.
32. RIBEIRO-ROTTA RF, MARQUES KD, PACHECO MJ, LELES CR. Do computed tomography and magnetic resonance imaging add to temporomandibular joint disorder treatment? A systematic review of diagnostic efficacy. J Oral Rehabil 2011;38:120-35.

Sažetak

RADIOGRAFSKA PROCJENA VALJANOSTI MANUALNE FUNKCIJSKE ANALIZE OSTEOARTRITISA TEMPOROMANDIBULARNOG ZGLOBA

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Uspoređen je nalaz osteoartritisa temporomandibularnog zgloba (TMZ) dobiven kliničkom dijagnostikom provedenom pomoću manualne funkcijske analize (MFA) i magnetskom rezonancijom (MR) kao zlatnim standardom. Od uzastopno prikupljenih 140 bolesnika kojima je pomoću MR utvrđen poremećaj TMZ izabrano je 30 bolesnika prosječne dobi od 52,6 godina s dijagnozom osteoartritisa. Klinički parametri su bili simptomi boli u području TMZ, krepitacije, odsutnost škljocanja, što se je potvrđivalo manualnim pretragama u okviru MFA. Pozitivan nalaz MR obuhvaćao je deplanaciju, subhondralne degenerativne promjene s intaktnom kortikalnom kosti ili bez nje, osteofite i subhondralne degenerativne ciste zglobnih ploha. Valjanost MFA bila je za osteoartritis: osjetljivost 0,38, specifičnost 0,91, pozitivna prediktivna vrijednost (PPV) 0,77 i negativna prediktivna vrijednost (NPV) 0,65. Pregled pomoću MR utvrdio je pomak diska bez redukcije u 12 (40,00%) i pomak diska s redukcijom u jednog (3,33%) bolesnika. Nalaz pasivnih kompresija za dijagnozu osteoartritisa ovisno o pomaku diska bio je: osjetljivost 0,29, specifičnost 0,95, PPV 0,67 i NPV 0,78. Iako MFA znatno poboljšava valjanost kliničke dijagnostike u diferenciranju miogenog od poremećaja TMZ, kliničko utvrđivanje osteoartritisa ipak nije zadovoljavajuće. Nespecifični klinički znaci i simptomi uz dominantnu bolnost TMZ pri dinamičkim, ali i ne i pasivnim manualnim pretragama ne mogu diferencirati pomak diska od osteoartritisa.

Ključne riječi: *Valjanost; Osteoartritis; Temporomandibularni zglob; Manualna funkcijska analiza; Magnetska rezonancija*