Validity of Diagnostic Criteria for Temporomandibular Joint Disorder in the Diagnosis of Disc Displacement Disorders of Temporomandibular Joint

Abstract

Objective: The objective of this study is to assess the validity Diagnostic Criteria for Temporomandibular joint Disorder (DC/TMD) in the diagnosis of disc displacement (DD) disorders of temporomandibular joint (TMJ). Study Design: It was a prospective study in which total of 55 patients accounting to 110 TMJ; with clinical diagnosis of DD disorder as per DC/TMD criteria and all above age of 18 years were included. All the patients with clinical diagnosis of DD disorder were advised MRI. All the MRI scans were read by single radiologist. Clinician and Radiologist were blinded to each others findings. MRI diagnosis and clinical diagnosis were compared and results were formulated. Results: The use of the Kappa statistic test indicated a good diagnostic agreement (k = 0.68) between the clinician and the radiologist. The DC/TMD criterion was found to have good validity and reliability in the diagnosis of DD disorders with sensitivity of 91.57% and specificity of 77.78%. The positive predictive value and negative predicted value calculated were 92.68% and 78%, respectively. The positive and negative likelihood ratio found was 4.12 and 0.11, respectively. Conclusion: DC/TMD is a simple, reliable, valid, cost-effective tool in the diagnosis of DD disorders.

Keywords: Diagnostic criteria, disc displacement disorder; magnetic resonance imaging

Introduction

Temporomandibular joint disorder (TMD) is a complex disease and does not have any simple explained classic etiologic pathways. Various attempts have been made in the past by the group of experts to come up with the comprehensive standardized classification for TMD. The American Academy of Orofacial Pain[1] published a general classification for clinical practice in 1993, since it was not assessed for validity, various other TMD classifications were put forth by the panel of TMD experts. Dworkin and LeResche in 1992 developed Research Diagnostic Criteria for TMD (RDC/TMD)[2] for the standardization of the diagnostic methodology for most common TMD. It included Axis 1 and Axis 2 which denote physical assessment and psychosocial assessment, respectively. However, on assessing its validity, it was identified that some parts of RDC/TMD requires major improvement to make it more reliable for the diagnosis of TMD worldwide.[3]

With the ambition to make improvements in the RDC/TMD while retaining its core features, RDC/TMD consortium published Diagnostic Criteria for TMD (DC/TMD)[4] in 2014. DC/TMD criteria has been updated multiple times with minor changes over the period of years with recent one been finalized in October 2015. Validation project four published by Schiffman et al. found DC/TMD to be simple valid and reliable criteria for the diagnosis of the most common TMD.

For the diagnosis of disc displacement (DD) disorders, DC/TMD has advocated history, clinical examination, and imaging as the standard approach for the diagnosis of DD disorders.

Here, in this study, we made an attempt to assess the validity of the DC/TMD criteria in the diagnosis of DD disorders comparing it with the gold standard magnetic resonance imaging (MRI).[5]
Materials and Methods

Study sample and design

It was a prospective study in which a total of 55 patients accounting for 110 temporomandibular joints (TMJ) all above 18 years of age, diagnosed clinically with DD disorders on the basis of DC/TMD protocol were included. Sample size of 55 patients was calculated considering the following estimates: Eighty percent power, dropout rate to be 5%, Type I error to be 5%, Type II error to be 20%, a null value of at least 40%, a minimum kappa agreement value to be 80%, proportion of positive ratings to be 70%, and attrition value 5%.

Clinical observer was a qualified oral diagnostian with 3 years of experience in diagnosing TMJ disorders, and pilot study was conducted before so that the clinical observer was well trained with DC/TMD protocol. A total of 13 males and 42 females participated in the present study. Overall, the mean age was 31.15 + 12 years. MRI was taken with standardized procedure in both open and closed mouth positions immediately for the patients. Pregnant patients, claustrophobic patients, patients with metallic devices in the body such as cardiac pacemakers, patients with life-threatening conditions such as malignancy, and other concurrent TMJ disorders other than arthralgia were excluded from the study. All the MR images were read by single radiologist holding 5 years of experience in reading MRI images. Clinical observer and radiologist were blinded to each other findings. MRI diagnosis and clinical diagnosis were compared, and the results were formulated.

Diagnostic criteria for temporomandibular joint disorder assessment

Clinical assessment was conducted as per the guidelines of the DC/TMD protocol. DC/TMD symptom questionnaire and examination format were downloaded from the Consortium website and used without copyright infringement.[10]

DD disorders are classified into four types by DC/TMD criteria:
- DD with reduction (DDWR)
- DDWR with intermittent locking (DDWR with IL)
- DD without reduction with limited mouth opening (DDWoR with LO)
- DDWoR without LO.

In the present study, we could not assess the validity of DC/TMD for individual DD disorders, due to low prevalence of DDWR with IL and DDWoR with LO in the study population.

DC/TMD axis 1 diagnosis of DD disorders is given as
- DDWR: Clicking sound on,
- Opening and closing of jaw OR
- Opening and lateral movements or on protrusion OR
- Closing movements and lateral movements or protrusion.

Disc displacement with reduction with intermittent locking
TMJ clicking plus history of close lock jaw which opens by slight maneuvering.

Disc displacement without reduction with limited mouth opening
History of prior close lock jaw severe enough to interfere with the ability to eat plus mouth opening <40 mm. TMJ click may or may not be present.

Disc displacement without reduction without limited mouth opening
History of close lock jaw severe enough to interfere with the ability to eat mouth opening >40 mm. TMJ click may or may not be present.

This is according to the recommendations of the diagnostic protocol and diagnostic tree provided by DC/TMD.

Magnetic resonance imaging

MRI scan was taken with the following specifications: Parameters-GE Signa HD 1.5 tesla machine, proton density (PD), and T2 algorithm images PD: TR-2000 TE‑17; T2: TR-2000 TE-102. All the images were studied in the sagittal section by the single radiologist [Figures 1 and 2].

Statistical analysis

Data obtained were compiled on a MS Office Excel Sheet (version 2010) and were subject to the statistical analysis using the Statistical Package for the Social Sciences (SPSS version 21.0, IBM [IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp, USA]).

Demographic characteristics of the population (number and percentage) of males and females, age wise distribution of participants has been presented. Data were coded as the presence or absence of the findings on MRI versus DC/TMD and the probability of agreement was checked using Kappa score as it generated a Table 1. Furthermore, taking into consideration, MRI as the gold standard and DC/TMD as a new test/protocol/method, sensitivity, specificity, positive likelihood ratio, negative likelihood ratio, disease prevalence, positive predictive value and

| DC/TMD | MRI | Total |
|--------|-----|-------|
|        | Normal | Disease |       |
| Normal | 21     | 7      | 28    |
| Disease| 6      | 76     | 82    |

DC/TMD: Diagnostic criteria for temporomandibular joint disorder; MRI: Magnetic resonance imaging
negative predictive value were calculated. For all the statistical tests, \( P < 0.05 \) was considered to be statistically significant, keeping \( \alpha \) error at 5\% and \( \beta \) error at 20\%, thus giving a power to the study as 80\%.

**Results**

The results of the study expressed in Tables 1 and 2.

The overall mean age of the participants was 31.15 +/− 12 years. The kappa value was 0.685, and thus showing good agreement between the DC/TMD and MRI.

**Discussion**

By examining 55 patients, i.e., 110 TMJ joints, we found a good agreement (k = 0.68) between the diagnosis based on DC/TMD criteria and MRI findings. Out of 110 TMJ studied, 28 were diagnosed normal by DC/TMD criteria and were used to calculate the specificity. The good validity of DC/TMD was confirmed for DD disorders with sensitivity of 91.57\% (95\% confidence limits of 57.74, 91.38) and specificity of 77.78\% (57.74, 91.38). The positive predictive value found was 92.68\% (86.18, 96.26), and negative predictive value found was 75\% (58.94, 86.24).

We could not compare the findings of this project with any other study as no other study is conducted till date to assess the validity of diagnostic criteria of DC/TMD except the validation project\(^4\) by RDC/TMD consortium to the best of our knowledge. The validation project suggested excellent agreement between DDWoR without LO (K = 0.84) and moderate agreement for DDWR (k = 0.58). The credibility of other type of DD disorders was not found valid by the validation project as only limited number of cases of DDWR with IL and DDWoR with LO were diagnosed in studied population.

While conducting the study, we encountered the certain areas in the symptom questionnaire which in our opinion needs to be addressed for clarification. Question 10 of symptom questionnaire asks “Was your jaw lock or catch was severe enough to limit your jaw opening and interfere with your ability to eat?” On this question, the statement “interfere with the ability to eat” needs clarification as it can be interpreted in two ways, i.e., (1) interfere with the ability to chew and (2) interfere with the ability to put morsel into the mouth. The interpretation varies from person to person and thus compromising with the sole purpose of DC/TMD criteria, i.e., standardization. The time period considered in symptom questionnaire is last 30 days, but it is also mentioned that it can be modified for a given patient as the circumstances dictate, this provision again compromises with the purpose of standardization.

During the study, we came across cases with double click on opening and closing of jaw, for which we did not find any provision in DC/TMD. As we see the diagnostic tree provided by DC/TMD, we realize that the patients complain of LO and interfering with the ability to eat directly directs the clinician toward the diagnosis of DD disorders. This prevents the clinician from considering other common causes of trismus such as muscular contracture, post injection trismus, and OSMF.

Furthermore, the choice of words used in diagnostic tree of DC/TMD criteria, which directs the clinician toward the diagnosis of DDWR with IL needs to be simplified.
to avoid wrong interpretation and thus compromising on standardization and diagnosis.

In the present study, it is identified that DC/TMD can be employed as a simple, reliable, standardized, and economical alternative to expensive imaging techniques such as MRI in the diagnosis of DD disorders. The present study is the first research project conducted to assess the validity of DC/TMD after validation project by RDC/TMD consortium to the best of our knowledge. This study can be used as reference for studying the validity of DC/TMD on the wider sample population in world; similar studies conducted on this topic will provide opportunity for better discussion on the validity of DC/TMD in future.

**Conclusion**

There is a good correlation \( (k = 0.68) \) between the clinical diagnosis based on DC/TMD protocol and reliable imaging modality magnetic resonance. Thus, DC/TMD can be identified as simple reliable economical tool for the diagnosis of DD disorders deferring the need of MRI.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. McNeill C, editor. Temporomandibular Disorders: Guidelines for Classification, Assessment, and Management. Chicago: Quintessence Books; 1993.
2. Dworkin S, LeResche L. Research diagnostic criteria for temporomandibular disorders: Review, criteria, examinations and specifications, critique, editors. J Craniomandibul Disord 1992;6:301-55.
3. Truelove EI, 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.
4. Schiffman E, Ohrbach R, Truelove E, Look J, Anderson G, Goulet JP, et al. Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: Recommendations of the International RDC/TMD Consortium Network* and Orofacial Pain Special Interest Group†. J Oral Facial Pain Headache 2014;28:6-27.
5. Tasaki MM, Westesson PL, Raubertas RF. Observer variation in interpretation of magnetic resonance images of the temporomandibular joint. Oral Surg Oral Med Oral Pathol 1993;76:231-4.
6. Available from: https://ubwp.buffalo.edu/rdc-tmdinternational/tmd-assessmentdiagnosis/dc-tmd/. [Last accessed on 2017 Aug 22].