

# Critical Assessment of Temporomandibular Joint Clicking in Diagnosing Anterior Disc Displacement

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## SUMMARY

**Objectives.** The objective of this study was to compare temporomandibular joint (TMJ) findings from clinical examination and magnetic resonance imaging (MRI) for diagnosing anterior disc displacement.

**Material and methods.** 114 subjects with at least one sign of temporomandibular disorders (tenderness/pain on palpation of the joints or muscles, TMJ sounds, pain or deviation during maximum mouth opening (active/passive)) and 193 controls underwent MRI after proper history taking and assessment of clinical symptoms.

**Results.** 464 joints with no disk displacement (NDD), 114 joints with reducible displaced disk (RDD), and 36 joints with permanently displaced disk (PDD) were confirmed on magnetic resonance imaging (MRI).

**Conclusion.** The results suggest that anterior disc displacement of the TMJ can not be diagnosed with considerable accuracy through the use of clinical examination only.

**Keywords:** temporomandibular joint; temporomandibular disorders; internal derangement; clinical examination; magnetic resonance imaging;

## INTRODUCTION

Epidemiological studies have shown that, in adolescents and young adults, reported and recorded clicking sounds from the temporomandibular joint (TMJ) during active movements of the mandible range from 9-26% and from 8-36% respectively [1]. The most common causes of clicking are considered to be poor coordination in lateral pterygoideus muscle function, displacement of the articular disc, and irregularities in the articular surfaces. However, the etiology of and need for treatment of clicking have been controversial; it is not known whether clicking sounds indicate a harmless condition [2-3] or whether they are pathognomonic of progressive internal derangement of the TMJ [4-5]. Despite the high prevalence of clicking sounds found in cross-sectional epidemiological studies, severe internal derangement with painful locking is a rare condition, and it is unclear whether clicking is a reliable predictor of such locking.

Differential diagnostic considerations are especially important when examining patients with temporomandibular disorders (TMD), since pain in the orofacial region has many different causes. Recent guidelines for the diagnosis and treatment of TMD indicated the statement that the gold standard for diagnosing TMD is still based on evaluation of

the patient's history and findings from clinical examination [6-8]. However, the accuracy of this traditional approach for differentially diagnosing TMD subgroups has not been sufficiently examined [9-11]. Single items from typical clinical examination have proved disappointing in their predictive value from TMJ disc displacement. The guidelines also provide data regarding the diagnostic efficacy of the TMJ imaging [6-8]. Magnetic resonance imaging (MRI) is used to substantiate the clinically suspected existence of internal derangement of the TMJ caused by disc displacement [12-13]. Two significant factors affect the validity and reliability of an imaging technique: diagnostic accuracy and observer performance. Autopsy studies have indicated a diagnostic accuracy rate for MRI of 95% for TMJ disc position and configuration. This high accuracy rate was based on a combination of sagittal and coronal images [14]. However, such MRI evaluation may not always be available and also cost often limits the use of MRI. For this reason, several studies have been conducted to determine the accuracy of clinical diagnoses of the different stages of disc displacement.

In this study we evaluated the diagnostic accuracy of clinical clicking in comparison with MRI findings for diagnosing anterior disc displacement with or without reduction, because patients with this disorder are frequently observed among the TMD population.

## MATERIALS AND METHODS

### Subjects

From a population representative cross-sectional study - "Study of Health in Pomerania" (SHIP) there were 307 subjects (140 males and 167 females) selected for this investigation. The age of subjects ranged from 20 to 54 years old, with a mean age of 35, 4.

Due to the clinical diagnosis of „SHIP“ 114 subjects had at least one sign of temporomandibular disorders (tenderness/pain on palpation of the joints or muscles, TMJ sounds, pain or deviation during maximum mouth opening (active/passive)). 193 subjects served as controls. In this investigation we did subgroup analysis and for the inter-

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pretation of results do not rebuild the patient and control groups.

Standardization and calibration of clinicians was performed before the study started and took place twice a year while the study was running. Kappa values for detecting palpation pain of the masticatory muscles and TMJ varied from 0.53 to 0.63 in the final calibration session. All subjects underwent MRI after proper history taking and assessment of clinical symptoms. The clinical examination included tenderness on palpation and assessment of joint sounds together with history of joint symptoms.

*MRI diagnosis*

MRI was performed with 1,0-tesla scanner (Magnetom Impact Expert, Siemens, Germany) using a bilateral TMJ surface coil with 7cm diameter as described by Kobs et al [15].

Bilateral sagittal and coronal MR images were obtained subsequently to establish the corresponding diagnosis of degenerative TMJ disk displacement and changes.

The physiological disk position and groups of disk displacement was considered as described by Kobs et al [15, 16].

The MRI results were independently assessed by two experienced diagnosticians.

**RESULTS**

*Clinical examination*

The Figure 1 demonstrates the overall view of clinical examination findings.

From figure 1 it appears, that tenderness or pain of the TMJ or muscles are most frequent clinical symptoms. Limitation of mouth opening (<40mm) was found only in 11 subjects.

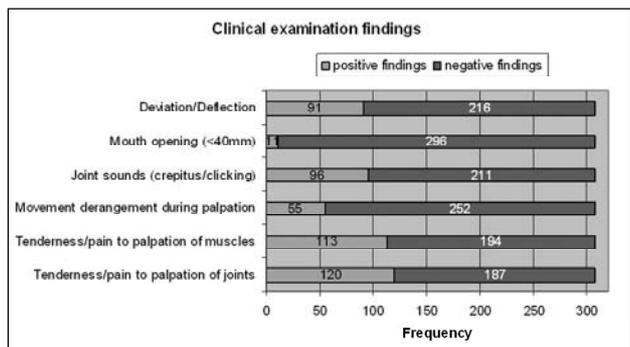
*MRI findings*

In assessing the disk position findings on sagittal plane, 464 joints were judged to have no disk displacement, 114 joints RDD, and 36 joints PDD. Delicate classification of disk displacement findings on sagittal plane is demonstrated in Figure 2.

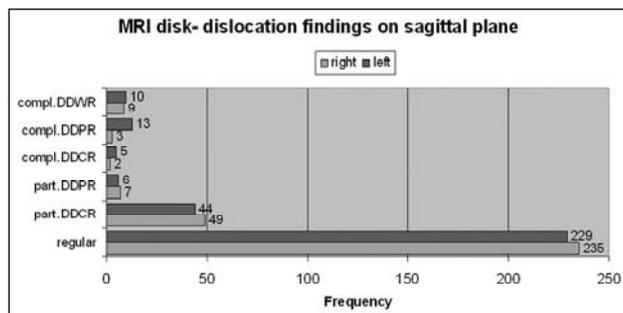
*Comparison of MR imaging and clinical findings*

The following figures from 3 to 6 demonstrate the distribution of clinical sounds in comparison with disc dislocation findings from MRI on the sagittal plane.

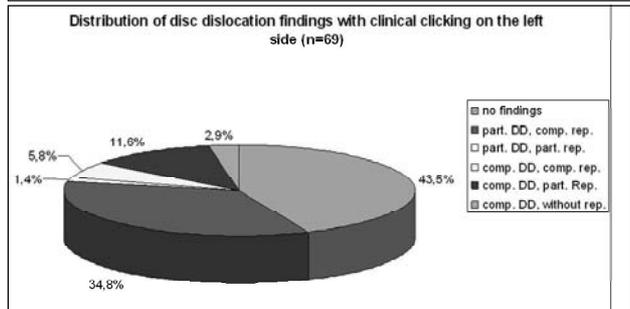
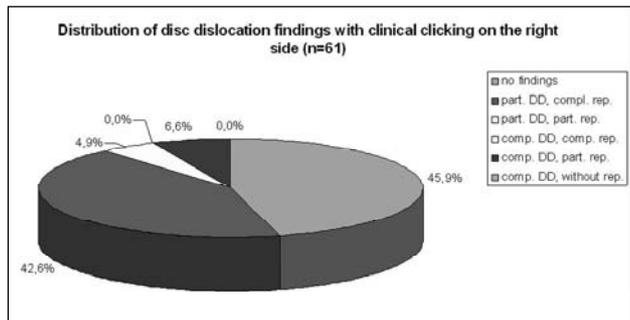
From Figure 3 and 4 it appears, that from 45, 9% of the joints on the right side and from 43, 5% on the left side with clicking phenomenon there was no disc dislocation finding. Schluger S, Yuodelis R, Page RC, Johnson RH, editors. Periodontal diseases. Basic phenomena, clinical management, and occlusal and restorative interrelationships. 2<sup>nd</sup> ed. Philadelphia: Lea Febiger; 1990.



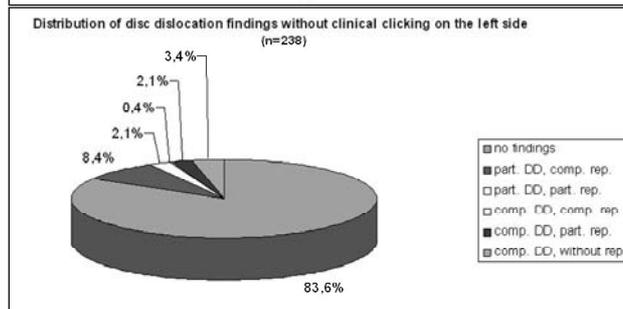
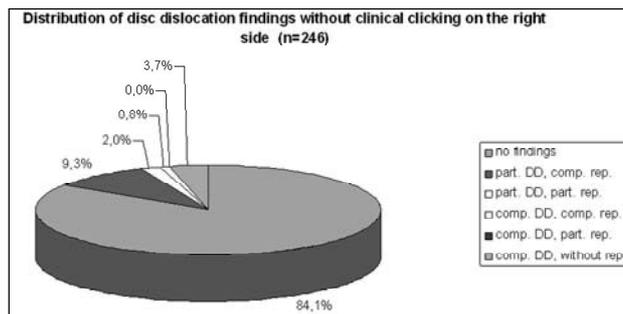
**Figure 1.** Graphic visualisation of absolute frequency findings from the clinical examination.



**Figure 2.** Presentation of disk – position changes on MRI sagittal plane for the right and left joint.



**Figure 3 and 4.** Graphic visualisation of disc dislocation findings from MRI on the sagittal plane in the patient group with clicking phenomenon on the right and left side.



**Figure 5 and 6.** Graphic visualisation of disc dislocation findings from MRI on the sagittal plane in the patient group without clicking phenomenon on the right and left side.

ings on the sagittal plane. There were two subjects with diagnosis complete disc dislocation without reposition on the left joint with clinical clicking.

Independent from the side, there were approx. 84% subjects without clinical clicking (Figure 5 and 6) and with no pathologic MRI findings (right n=207; left n=199). There were 12,1% of the subjects on the right side and 13% on the left side diagnosed on sagittal MRI plane with disc dislocations with complete or partially reposition.

## DISCUSSION

The accuracy of clinical examination for diagnosing the exact status of TMJ internal derangements has been investigated in several previous studies [9-11]. There is some controversy in the literature over this topic. These studies reported the overall accuracy of the clinical examination as 43% to 95% [9-11, 17]. False-positives diagnoses are related to over-classification of the disease, which might lead to overtreatment, while false negative diagnoses are related to under-classification and consequently under-treatment [18]. The evaluation of the intraobserver and interobserver agreement values revealed that disagreements in interpretation occurred mostly between the diagnoses of normal disc position and anterior disc displacement with reduction. Although the disc can displace in all directions, anterolateral, anterior disc displacements are the most common, and the displacements occur to varying degrees.

This study investigated the accuracy of clinical clicking in determining the presence or absence of anterior disc displacement. For disc displacement with reduction, clicking is one of the strongest predictors. However, it should be noted that it was not present in all joints with this diagnosis. In addition, clicking was also observed in a big percentage of joints without disc displacement on MRI (45, 9% on the

right side and 43, 5% on the left side) and in a small percentage of joints without reduction (0, 0% on the right side and 2, 9% on the left side). In the big percentage of clicking joints with normal disc position, the posterior band of the disc was positioned between the condyle and the eminence in some sagittal sections (only lateral or medial part), and this "functional disc displacement" might cause displacement in some joints. The other part of MRI findings with normal disc position led us to speculate that clicking might occur as a consequence of a frictional incompatibility between the disc and the eminence when the posterior band of the disc moves anteriorly or posteriorly beyond the apex of the articular eminence. In these joints, it was observed that the posterior band was deformed in convex form on the MRI obtained at the maximum mouth opening, and the clicking was not eliminated by mouth opening and clicking at a protruded position. Other authors [19-20] also describe clicking joints with a normal disc position in which the clicking seemed to occur in connection with a jump by the disc and condyle over the eminence. Other possible explanations include deviations in condylar form (remodelling), muscular incoordination, or adhesions [21]. We found that none of the clinical parameters assessed independently could predict the specific imaging stage of disc displacement with complete accuracy, as has been reported previously.

In conclusion, because clicking can be provoked by various causes, it might not by itself always be a valid predictor of anterior disc displacement with reduction. A combination of these tests may thus be useful to increase the diagnostic information available regarding patients management problems that cannot be resolved by a single test, as reported in several other studies [18, 22-23].

Within the limitations of this study we suggest, that single clinical diagnostic tests used in this study can not considerably enhance the practitioner's ability to accurately diagnose the status of anterior disc displacement with reduction through the use of a clinical examination only.

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