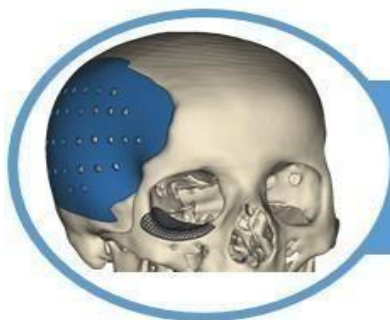




Use of magnetic resonance imaging in the diagnosis of temporomandibular dysfunction: an integrative review

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REVIEW ARTICLE

ABSTRACT

Introduction: Temporomandibular dysfunction (TMD) involves a variety of conditions that affect the temporomandibular joint (TMJ) and associated structures, generating symptoms such as pain, limited movement and joint noise. Given the anatomical complexity of the TMJ and the diversity of symptoms, accurate diagnosis is challenging. Magnetic resonance imaging (MRI) stands out as an effective test for assessing soft tissues, such as the articular disc, and can detect disc displacements, joint effusion and inflammation. **Aim:** This study aims to assess whether MRI is the most appropriate test for diagnosing temporomandibular disorders, taking into account divergent opinions among specialists and the scientific literature. **Materials and Methods:** An integrative literature review was carried out using PubMed, Scopus and Web of Science databases, as well as Google Scholar for gray literature. Controlled descriptors were used, combined with Boolean operators. **Results and Discussion:** Although MRI is effective for assessing soft tissues and disc displacements, it has limitations in detecting bone abnormalities, which can compromise a comprehensive diagnosis. Therefore, the combination of other imaging techniques is recommended for a complete evaluation. **Conclusion:** MRI is an important tool, but not sufficient on its own. The complementary use of other diagnostic modalities is essential for an accurate diagnosis of TMD.

KEYWORDS: Temporomandibular Joint Dysfunction Syndrome; Temporomandibular Joint; Diagnostic Imaging; Temporomandibular Joint Disc; Dentistry.

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INTRODUCTION

Temporomandibular dysfunction (TMD) encompasses a varied set of conditions that compromise the temporomandibular joint (TMJ), masticatory muscles and related structures. This dysfunction can cause symptoms such as pain, limited movement and joint noise, significantly impacting patients' quality of life. Given the anatomical complexity of the TMJ and the variability of clinical symptoms, accurate diagnosis of these conditions is a constant challenge in dental practice (FONSECA et al, 2022; BEAUMONT et al, 2020; SCRIVANI et al., 2018).

In the current context, magnetic resonance imaging (MRI) has been used as one of the main diagnostic tools to assess TMD, due to its ability to provide detailed images of soft structures, such as the articular disc, as well as detecting changes in disc morphology and position, joint effusions and inflammatory signs. Compared to other methods, such as computed tomography and conventional X-rays, MRI offers advantages because it is a non-invasive examination and does not use ionizing radiation (BALEL et al, 2023; CONG et al, 2021; XIONG et al., 2021; STIMMER et al., 2020).

However, despite its high sensitivity and specificity, the indication of MRI in the diagnosis of TMD still generates debate among professionals in the field. While many oral and maxillofacial surgeons consider MRI to be the exam of choice for assessing these conditions, others question its effectiveness in terms of cost, accessibility and the direct correlation of findings with clinical symptoms. These differences highlight the need for a critical analysis of the real contribution of MRI in the diagnosis of TMD (ABDALLA-ASLAN et al., 2021; KNEZEVIC et al., 2023; STASIAK et al., 2020; LÖVGREN et al., 2018).

Furthermore, it is important to consider that the use of MRI does not always translate into direct benefits for therapeutic planning, especially in cases where conservative treatment is prioritized. Therefore, understanding the relationship between MRI findings and clinical decisions is fundamental to optimizing the management of TMD and ensuring that the exam is used judiciously (SOMAY & YILMAZ, 2020; LU et al, 2022).

This study aims to assess whether magnetic resonance imaging is the most appropriate test for diagnosing temporomandibular disorders, considering the divergent opinions among oral and maxillofacial surgeons and the available literature on the subject.

MATERIALS AND METHODS

As this is an integrative literature review, this study did not require submission to the Research Ethics Committee, in accordance with the guidelines established by Normative Instruction No. 510/2016 of the National Health Council (CNS). The integrative review aims to gather and critically analyze the available literature on a specific topic, with the purpose of providing a comprehensive and evidence-based overview. This method allows data to be collected, synthesized, interpreted and compared in a structured way, offering relevant and consistent information on the problem being investigated.

To conduct this study, a protocol was drawn up which included identifying the research, defining the guiding question and the search strategy, as well as the databases to be used. The guiding question for this review was: “Is magnetic resonance imaging the most appropriate test for diagnosing temporomandibular disorders?”. The search was carried out in previously selected databases: PubMed, Scopus and Web of Science. In addition, Google Scholar was used to broaden the search for gray literature.

The search used controlled descriptors from DeCS/MeSH, such as Temporomandibular Joint Dysfunction Syndrome, Magnetic Resonance, Temporomandibular Joint, Diagnostic Imaging and Temporomandibular Joint Disc, combined by the Boolean operators AND and OR.

The inclusion criteria included original articles, systematic reviews and meta-analyses published in the last 10 years, available in English, Portuguese or Spanish, which addressed the efficacy of magnetic resonance imaging in the diagnosis of TMD. Studies such as dissertations, theses, editorials, conference abstracts and duplicate articles were excluded. The articles were screened and selected by two independent reviewers using the double-blind method. Divergences in the selection were resolved by a third reviewer. In total, 680 articles were initially identified. After removing duplicates and applying the eligibility criteria, 4 studies were included in the final analysis.

The data extracted included information on the methodology of the studies, the main findings and the conclusions related to the effectiveness of magnetic resonance imaging in the diagnosis of temporomandibular disorders. The results were analyzed descriptively in order to answer the guiding question and provide a critical view of the use of MRI in this condition.

RESULTS AND DISCUSSION

Magnetic resonance imaging (MRI) has established itself as one of the main imaging tests in the diagnosis of temporomandibular disorders (TMD).

The studies reviewed address the importance of MRI, but also highlight its limitations in specific aspects of diagnosis. The study by Loría Chami *et al.* (2014) highlights that MRI is effective in assessing structural changes in the temporomandibular joint (TMJ), such as disc displacements and degenerative changes. The study found that in 26 of the 35 patients analyzed, MRI detected TMD-related changes, demonstrating its ability to provide details in different planes, which is essential for proper visualization of joint structures (LAVINSKY *et al.*, 2020; AL-KHOTANI *et al.*, 2016).

In their study, Whyte *et al.* (2020) reviewed imaging findings in MRI and computed tomography (CT) for TMD, offering imaging protocols and reporting guidelines. Although they do not delve into direct comparisons, the study emphasizes the importance of using improved protocols, suggesting that the accuracy of MRI depends directly on the technical quality of the examination and the knowledge of the radiologist (JEON *et al.*, 2021; TALMACEANU *et al.*, 2018).

Liu *et al.* (2023) take a more critical approach by comparing MRI with cone-beam computed tomography (CBCT) in the detection of degenerative diseases of the TMJ (DJD). While MRI showed high sensitivity for detecting DJD (95.3%), its specificity was relatively low (43.1%), suggesting that it can generate false positives. Furthermore, the consistency of MRI in assessing the severity of bone abnormalities was considered only moderate. This suggests that although MRI is useful for initial detection, its accuracy in assessing the severity of bone changes is limited (SALAMON *et al.*, 2020; KILIÇ *et al.*, 2023; SAWADA *et al.*, 2018).

Similarly, Alkhader *et al.* (2010) reinforced this limitation by showing that although MRI has a high specificity (84-98%) in detecting TMJ bone abnormalities, its sensitivity is relatively low (30-82%). This indicates that MRI may fail to identify certain bone alterations, such as sclerosis or erosions of the condyle and articular fossa, which limits its application alone for the accurate diagnosis of these alterations (MILLÓN CRUZ *et al.*, 2024; MARANINI *et al.*, 2022).

Therefore, the studies analyzed suggest that MRI is a tool that can be used in the diagnosis of TMD, especially for the assessment of soft tissues and disc displacements. However, it should be used with caution to assess bone abnormalities, and it is often necessary to complement the diagnosis with other techniques in order to provide a comprehensive and accurate assessment of the TMJ.

CONCLUSION

Thus, magnetic resonance imaging stands out as an alternative in the diagnosis of temporomandibular dysfunction, especially in the assessment of soft tissue alterations and disc displacements. However, due to its limitations in accurately detecting bone abnormalities, its application alone may not be sufficient for a comprehensive diagnosis. Therefore, the combined use of other techniques is recommended to ensure a more complete and accurate assessment of the temporomandibular joint.

REFERENCES

ABDALLA-ASLAN, R. et al. **Diagnostic correlation between clinical protocols and magnetic resonance findings in temporomandibular disorders: a systematic review and meta-analysis.** Journal of Oral Rehabilitation, v. 48, n. 8, p. 955-967, 2021. DOI: 10.1111/joor.13179.

AL-KHOTANI, A. et al. **The associations between psychosocial aspects and TMD-pain related aspects in children and adolescents.** Journal of Headache and Pain, v. 17, p. 30, 2016. DOI: 10.1186/s10194-016-0622-0. Epub 2016 Apr 5.

ALKHADER, M. et al. **Diagnostic performance of magnetic resonance imaging for detecting osseous abnormalities of the temporomandibular joint and its correlation with cone beam computed tomography.** Dentomaxillofacial Radiology, v. 39, n. 5, p. 270-276, 2010. DOI: 10.1259/dmfr/25151578.

BALEL, Y. et al. **Does temporomandibular joint magnetic resonance imaging diagnosis support clinical examination diagnosis following diagnostic criteria for temporomandibular disorders?** Journal of Oral and Maxillofacial Surgery, v. 81, n. 7, p. 813-819, 2023. DOI: 10.1016/j.joms.2023.03.007.

BEAUMONT, S. et al. **Temporomandibular disorder: a practical guide for dental practitioners in diagnosis and management.** Australian Dental Journal, v. 65, n. 3, p. 172-180, 2020. DOI: 10.1111/adj.12785. Epub 2020 Jul 20.

CONG, N. et al. **Diagnostic significance of magnetic resonance imaging in distinguishing temporomandibular disorders: a retrospective chart review.** BMC Oral Health, v. 21, n. 1, p. 481, 2021. DOI: 10.1186/s12903-021-01826-3.

FONSECA, F. F. et al. **Prevalence of signs and symptoms of temporomandibular disorder in the metropolitan region of Rio De Janeiro: a population-based cross-sectional study.** *Cranio*, 2022, p. 1-7. DOI: 10.1080/08869634.2022.2091099. Epub ahead of print.

JEON, K. J. et al. **Analysis of three-dimensional imaging findings and clinical symptoms in patients with temporomandibular joint disorders.** *Quantitative Imaging in Medicine and Surgery*, v. 11, n. 5, p. 1921-1931, 2021. DOI: 10.21037/qims-20-857.

KILIÇ, S. C. et al. **Is magnetic resonance imaging or cone beam computed tomography alone adequate for the radiological diagnosis of symptomatic temporomandibular joint osteoarthritis?** *International Journal of Oral and Maxillofacial Surgery*, v. 52, n. 11, p. 1197-1204, 2023. DOI: 10.1016/j.ijom.2023.04.005. Epub 2023 May 17.

KNEZEVIC, M. J. et al. **High-field magnetic resonance imaging of the temporomandibular joint: low agreement with clinical diagnosis in asymptomatic females.** *Diagnostics (Basel)*, v. 13, n. 12, p. 1986, 2023. DOI: 10.3390/diagnostics13121986.

LAVINSKY, D. et al. **The role of magnetic resonance imaging of the temporomandibular joint to investigate tinnitus in adults with temporomandibular joint disorder: a comparative study.** *International Archives of Otorhinolaryngology*, v. 24, n. 1, p. e68-e72, 2020. DOI: 10.1055/s-0039-1688840. Epub 2019 Nov 4.

LIU, S. S. et al. **Diagnostic performance of magnetic resonance imaging for degenerative temporomandibular joint disease.** *Journal of Oral Rehabilitation*, v. 50, n. 1, p. 24-30, 2023. DOI: 10.1111/joor.13386.

LORÍA CHAMI, A.; BALCÁZAR VÁZQUEZ, R.; SÁNCHEZ VARGAS, K. **Utilidad de la resonancia magnética para el diagnóstico de disfunción de la articulación temporomandibular.** *Gaceta Médica de México*, v. 150, Suppl. 2, p. 255-8, 2014.

LU, S. et al. **Inter-examiner reliability of the Chinese version of Axis I diagnoses of the diagnostic criteria for temporomandibular disorders.** *Cranio*, 2022, p. 1-6. DOI: 10.1080/08869634.2021.2015087.

MARANINI, B. et al. **The role of ultrasound in temporomandibular joint disorders: an update and future perspectives.** *Frontiers in Medicine (Lausanne)*, v. 9, p. 926573, 2022. DOI: 10.3389/fmed.2022.926573.

MILLÓN CRUZ, A. et al. **Reliability of magnetic resonance for temporomandibular joint disc perforation: a 12 years retrospective study.** Journal of Craniomaxillofacial Surgery, v. 52, n. 5, p. 548-557, 2024. DOI: 10.1016/j.jcms.2024.04.005.

SALAMON, N. M.; CASSELMAN, J. W. **Temporomandibular joint disorders: a pictorial review.** Seminars in Musculoskeletal Radiology, v. 24, n. 5, p. 591-607, 2020. DOI: 10.1055/s-0040-1701631.

SAWADA, K. et al. **Diagnostic reliability of 3.0-T MRI for detecting osseous abnormalities of the temporomandibular joint.** Journal of Oral Science, v. 60, n. 1, p. 137-141, 2018. DOI: 10.2334/josnusd.16-0838.

SCRIVANI, S. J.; KHAWAJA, S. N.; BAVIA, P. F. **Nonsurgical management of pediatric temporomandibular joint dysfunction.** Oral Maxillofacial Surgery Clinics of North America, v. 30, n. 1, p. 35-45, 2018. DOI: 10.1016/j.coms.2017.08.001.

STASIAK, G. et al. **TMD diagnosis: sensitivity and specificity of the Fonseca Anamnestic Index.** Cranio, v. 41, n. 3, p. 199-203, 2023. DOI: 10.1080/08869634.2020.1839724. Epub 2020 Oct 27.

STIMMER, H. et al. **Lesions of the lateral pterygoid muscle: an overestimated reason for temporomandibular dysfunction: a 3T magnetic resonance imaging study.** International Journal of Oral and Maxillofacial Surgery, v. 49, n. 12, p. 1611-1617, 2020. DOI: 10.1016/j.ijom.2020.04.013.

WHYTE, A. et al. **Imaging of the temporomandibular joint.** Clinical Radiology, v. 76, n. 1, p. 76.e21-76.e35, 2021. DOI: 10.1016/j.crad.2020.06.020. Epub 2020 Jul 21.

XIONG, X. et al. **MRI of temporomandibular joint disorders: recent advances and future directions.** Journal of Magnetic Resonance Imaging, v. 54, n. 4, p. 1039-1052, 2021. DOI: 10.1002/jmri.27338. Epub 2020 Aug 31.