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Relationship between TMJ Disc Morphology and Early Oral Mucosal Inflammatory Disorders

Tehmina Marwat[1], Gulshad Aziz[2], Aisha Hameed[3], Asma Niaz Khan[4], Adeel Haidar[5], Bushra Sajid[6]

[1]Assistant Professor, Department of Oral Biology, KMU.IDS Kohat, Pakistan

[2]Department of Anatomy, KMU.IDS Kohat, Pakistan

[3]Associate Professor Pathology, Department of Pathology, Gujranwala Medical College, Gujranwala, Pakistan

[4]Head of Department Anatomy, Dean Basic Sciences, Chairperson Curriculum Committee, RAI Foundation Medical College, Sargodha, Pakistan

[5]Associate Professor, Oral Pathology and Oral Diagnostics, University College of Dentistry

University of Lahore, Lahore, Pakistan

[6]Assistant Professor, Department of Pathology, Isra University Hyderabad, Pakistan

Corresponding author:

Gulshad Aziz,

Department of Anatomy, KMU.IDS Kohat, Pakistan

Email ID : gulsahadaziz@yahoo.com

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ABSTRACT

Background: TMJ disorders and inflammatory disease of oral mucosa are common in dental practice, but can be assessed as distinct clinical entities. There is currently an increasing amount of evidence demonstrating that functional and structural changes in the TMJ could impact upon an inflammatory process in surrounding oral tissues, especially in the early stages.

Methodology: An analytical study, which is cross-sectional, was performed among 72 participants who presented with the symptoms of TMJ and/or early oral mucosal inflammatory changes. All participants underwent clinical oral examination and systematic TMJ examination. TMJ disc morphology could be assessed with MRI with respect to sagittal oblique closed-mouth images. The disc morphology was divided into the normal biconcave, thickened and folded and deformed types. The relationship between disc morphology and inflammatory disorders of oral mucosa was determined through statistical analysis.

Results: Over fifty percent of subjects showed early oral mucosal inflammation. TMJ disc morphology in individuals who had mucosal inflammatory lesions was much different in shape as compared to those of normal disc shape. Abnormal disc morphology and presence and severity of oral mucosal inflammation were found to have a statistically significant relationship.

Conclusion: The results demonstrate that there is a significant correlation between TMJ disc morphological changes and early oral mucosal inflammatory disorders. Acknowledgment of this relationship may stimulate the more comprehensive diagnosis of patients with initial inflammatory oral lesions..

Keywords: *Temporomandibular joint, disc morphology, oral mucosal inflammation, MRI, internal derangement*

1. INTRODUCTION

The temporomandibular joint is one of the most important joints in mandibular and speech functions and mastication and its disorders are some of the most frequent sources of orofacial pain. The changes in the TMJ structure, especially in the articular disc, may cause abnormal joint biomechanics and be one of the causes of pain, dysfunction, and neuromuscular activity. The reason behind using magnetic resonance imaging as a non-ionizing radiology has led to the preference as a modality of choice when assessing morphology of TMJ discs [1-3].

Oral mucosal inflammatory conditions are heterogeneous conditions that present both chronic immune-mediated disorders they include oral lichen planus, and transient lesions, including recurrent aphthous ulcers. These conditions usually can be found with ambiguous clinical symptoms in early stages, and distinguishing them and identifying risks can be quite problematic. Even though local irritants and systemic factors are largely established causes, the contribution of functional or

structural imbalances of related anatomical systems has received much fewer studies [4-7].

The anatomical and neurophysiological closeness of TMJ and oral mucosa give an acceptable reason of being interacting. The two areas are innervated by the same branches of the trigeminal nerve, have similar vascular and inflammatory pathways. The constant load on the joints or internal instability can change the local inflammation or pain-related sensations, and it can lead to the decreased tissue resistance and the risk of oral mucosa to undergo inflammation [8-10].

Even though these theoretical correlations have been drawn, very little research has specifically investigated the association between TMJ disc morphology and the inflammatory diseases of the mucosa of the mouth at an early age. The knowledge of this relationship may assist clinicians in assuming a more holistic standpoint of diagnosis especially in patients who present with mucosal lesions early, and TMJ related signs. Thus, the current research aimed at measuring the correlation between TMJ disc morphology, measured by MRI, and the existence of early oral mucosal inflammatory disorders.-

2. METHODOLOGY

A study was carried out to assess the relation between the morphology of temporomandibular joint disc with early oral mucosal inflammatory disorders. The research locations comprised the departments of Oral Medicine and Radiology, along with the tertiary care dental teaching hospital. The study would be one year long; January 2024 to January 2025. Prior institutional ethics committee approval was obtained and the procedures performed were in accordance with the accepted ethical standards.

Seventy-two subjects participated in the study. Test for eligibility PCV for clinical features and symptoms that suggest early oral mucosal inflammation and/or symptoms of the temporomandibular joint. Patients were cross-sectionally excluded for having a history of TMJ surgery, facial trauma, systemic inflammation or autoimmune illness, significant oral mucosal lesions, and contraindications to magnetic resonance imaging (MRI). Exclusion criteria were used to reduce confounding factors that influence the results. All participants consented to participate in the study after obtaining written informed consent.

A comprehensive intraoral examination of each of the subjects was conducted under standardized lighting conditions with the use of mouth mirrors and periodontal probes. The results of oral mucosal examination were documented as the outcomes of visual examination and palpation of the oral mucosa paying attention to the initial signs of inflammation, including erythema, topography anomalies and less severe ulceration. Clinical classification was performed by using lesions of recurrent aphthous stomatitis, early oral lichen planus, or erythematous candidiasis and nonspecific inflammatory mucositis. They were graded as mild, moderate, and severe in relation to extent, degree of symptoms and appearance.

TMJ assessment was performed based on structured clinical examination. This entailed evaluation of pain on palpation of a joint, presence of joint sounds during mandibular movements, deviation of opening of the mouth with a calibrated ruler and the maximum interincisal opening measured using a calibrated ruler. A short history was also assigned to record para functional habits like bruxism or clenching. All the findings were noted on a predesigned proforma to ensure uniformity.

The participants were lying in a supine position, and magnetic resonance imaging of the TMJ was conducted using a standard head coil. Sagittal oblique scans were made at right angles to the mandibular condylar long axis. Closed-mouth images were mainly employed in the evaluation of disc morphology because the closed-mouth position is the best one that maintains original contour of the disc. To have a good contrast between the articular disc, condylar and surrounding structures, T1-weighted and proton density sequences have been used. Additional pictures were taken of open mouth to aid in assessing disc position where necessary.

MRIs were assessed by an experienced oral and maxillofacial radiologist both independently and blinded on clinical observations. The disc morphology was defined into biconcave (normal), thickened, folded or deformed according to the existing radiological criterion. Position of the disc was observed to be normal, anterior displacement with reduction and anterior displacement without reduction.

All data obtained were analyzed using a statistical package. Descriptive variables were summarized using descriptive statistics (demographic, clinical, and imaging) variables. The Chi-square test was used to assess the association between TMJ disc morphology and oral mucosal inflammatory disorders. A p-value of smaller value than 0.05 was defined to be statistically significant. Findings were given in tables and figures to enable easy interpretation of relationships realized.

3. RESULTS

The study recruited 72 participants, which included equal distribution of different ages and sex, therefore, the study results did not show any demographic bias and meaningful comparison can be drawn. The majority of participants were young and middle-aged adults which is the age range in which early TMJ changes and oral mucosal inflammatory conditions are commonly seen. Inflammatory findings should be interpreted against the background of a large proportion of the subjects having habit-related factors like tobacco or areca nut use.

Table 1. Demographic and Baseline Characteristics of Participants (n = 72)

Variable	Frequency (%) / Mean ± SD
Age (years)	29.6 ± 7.8
18–25 years	24 (33.3%)
26–35 years	31 (43.1%)
>35 years	17 (23.6%)
Male	34 (47.2%)
Female	38 (52.8%)
Tobacco / areca nut use	29 (40.3%)
Poor oral hygiene	26 (36.1%)

Clinical examination revealed early oral mucosal inflammation in more than half of the participants. The most frequently noted finding was recurrent aphthous lesions, followed by early inflammatory presentations of oral lichen planus. Most of the lesions were classified as mild to moderate and consistent with an early inflammatory disease, rather than a severe one.

Table 2. Distribution of Oral Mucosal Inflammatory Disorders

Variable	Frequency (%)
Presence of mucosal inflammation	41 (56.9%)
Recurrent aphthous stomatitis	18 (25.0%)
Early oral lichen planus	9 (12.5%)
Erythematous candidiasis	7 (9.7%)
Nonspecific inflammatory mucositis	7 (9.7%)
Mild severity	19 (26.4%)
Moderate severity	15 (20.8%)
Severe severity	7 (9.7%)

Less than 50 percent of participants had normal biconcave disc morphology on MRI evaluation. Changes in the form of discs such as thickened, folded and deformed discs were most often seen. Positional abnormalities were also often present. Joint configurations included anterior disc displacement with or without reduction. More than half the configurations showed this condition.

Table 3. MRI-Based TMJ Disc Morphology and Disc Position

Variable	Frequency (%)
Disc morphology	
Biconcave (normal)	30 (41.7%)
Thickened	18 (25.0%)
Folded	14 (19.4%)
Deformed	10 (13.9%)
Disc position	
Normal	32 (44.4%)
Anterior displacement with reduction	24 (33.3%)
Anterior displacement without reduction	16 (22.2%)

There is a marked correlation between altered TMJ disc morphology and oral mucosal inflammatory disorders. Compared with participants having normal biconcave discs, subjects having thickened, folded, or deformed discs had a significantly higher frequency of mucosal inflammation. The relationship remained statistically significant, suggesting an association between early alterations in joint structure and inflammation in the mouth.

Table 4. Association between TMJ Disc Morphology and Oral Mucosal Inflammation

Disc Morphology	Inflammation Present n (%)	Inflammation Absent n (%)	p-value
Biconcave	10 (33.3%)	20 (66.7%)	
Thickened	13 (72.2%)	5 (27.8%)	
Folded	11 (78.6%)	3 (21.4%)	
Deformed	7 (70.0%)	3 (30.0%)	**0.002**

Chi-square test applied; $p < 0.05$ considered statistically significant.

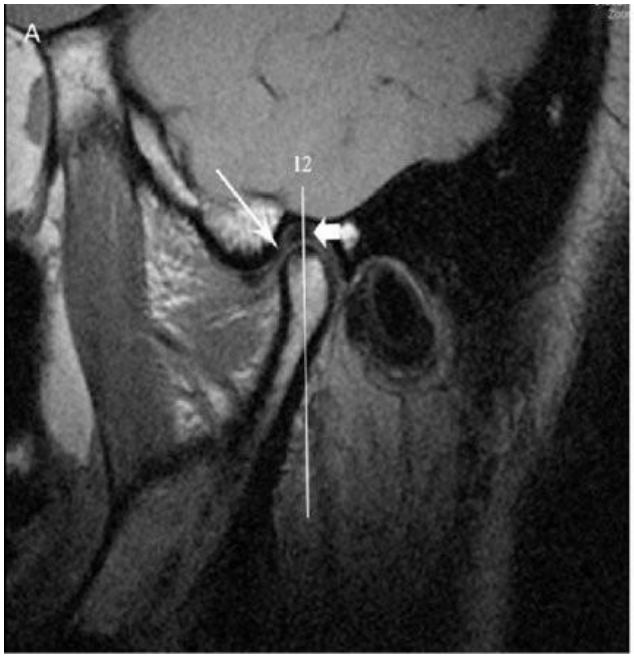

Figure 1. MRI appearance of normal TMJ disc morphology

Sagittal oblique magnetic resonance image of the temporomandibular joint in the closed-mouth position demonstrating a normal biconcave articular disc. The disc appears as a low-signal structure interposed between the mandibular condyle and the articular eminence, with well-defined anterior and posterior bands, representing the reference morphology used for disc shape assessment [11].

4. DISCUSSION

The current research examined the correlation between the morphology of the temporomandibular joint disc and early oral mucosal inflammatory disease, and the results indicate the presence of a significant correlation between the two areas of clinical investigation. The morphology of the discs especially those that were thickened, folded, and deformed was more commonly seen among those subjects who had early inflammatory changes of the oral mucosa. This is a trend that suggests that changes in the structure of the TMJ can take place with, or even represent a greater inflammatory response in the orofacial area [12-14].

The reason could be common biomechanical and neurovascular pathways. There is a dense innervation of the temporomandibular joint and oral mucosa and close interconnection of both by trigeminal nerve branches. Persistent joint stress, disc degeneration, or internal derangement can be a factor contributing to a change in neuromuscular activity and the release of local inflammatory mediators which might reduce the threshold to mucosal inflammation. This neuro-inflammatory cross-over has been recommended in previous research studies of TMJ-related pain and dysfunction, but has not been well studied in connection with mucosal disorders [15-17].

The clinical significance of the dominance of early inflammatory lesions, including recurrent aphthous stomatitis and early oral lichen planus, is clinically significant. These are usually multifactorial, susceptible to systemic stress, immune aberration and local irritants. These lesions are more prevalent in people with abnormal disc morphology and this may suggest that TMJ dysfunction is a contributing factor and not a causal agent. This strengthens the idea that there is a need to evaluate oral inflammatory disorders in the context of the wider functional framework other than as a stand-alone issue [18].

The MRI-based evaluation was also useful in detecting minor disc alterations which would otherwise not be noticed under a clinical examination. Closed-mouth sagittal images were used to obtain reliable classification of the disc shape that enhanced the observed associations. Nevertheless, the results of imaging should never be interpreted alone without clinical characteristics since not all disc changes are symptomatic. The current results add to the rising opinion that structural changes in the TMJ may extend their implications beyond the pain or mechanical discomfort of the joints [19, 20].

In spite of these observations, there are some limitations that are worth considering. The cross-sectional design limits causal inference, and the sample size, despite sufficient in testing associations, limits subgroup analysis. Moreover, the biochemical inflammatory markers were not determined, and this could have helped more clearly explain the underlying mechanisms. Longitudinal research that incorporates clinical, imaging, and molecular information would be beneficial in the future to establish whether TMJ disc alteration is a cause or a coincidence of the occurrence of oral mucosal inflammation.

5. CONCLUSION

Temporomandibular joint disc morphology is important in the development and the severity of early oral mucosal inflammatory disorders. Patients who have thickened, folded, or deformed discs exhibit more mucosal inflammatory burden than those with normal biconcave disc morphology. These results demonstrate the relevance of combined TMJ and oral mucosal assessment among patients with initial oral inflammatory lesions.

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