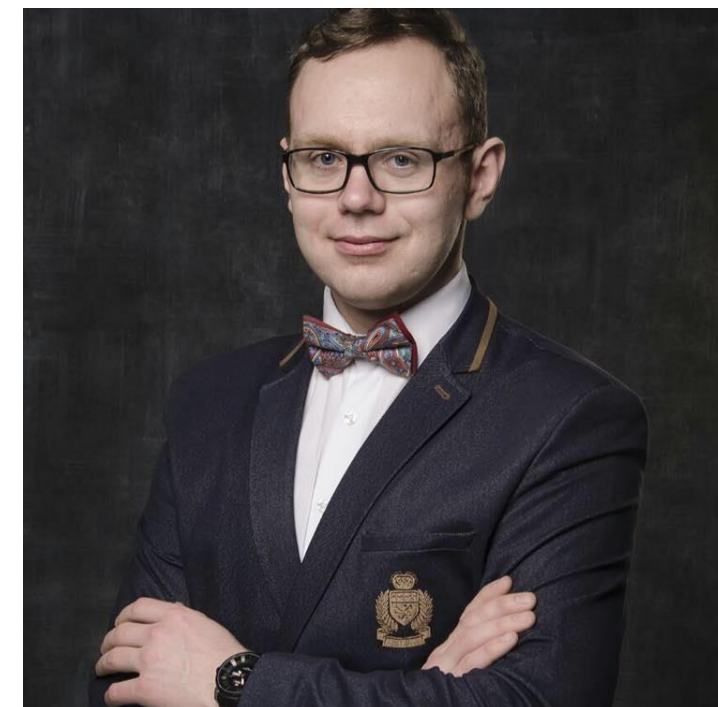


# FREQUENCY TEMPOROMANDIBULAR JOINT DISK DISPLACEMENTS

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# Relevance

Temporomandibular disorders (TMD) comprise a heterogeneous group of pathological conditions involving the temporomandibular joint (TMJ), masticatory musculature, and associated anatomical structures, often accompanied by pain, cephalalgia, and functional impairment [1]. Current epidemiological data indicate that TMD symptoms are present in approximately 41% of the global population, whereas clinical signs of at least one manifestation are detected in 56%. The prevalence of pain-associated forms is estimated at 23.4% in pediatric cohorts and 36.9% in adults [2,3]. Recent years have seen an increase in studies employing magnetic resonance imaging (MRI) to assess TMD in adult populations. It has been documented that 50–75% of individuals experience at least one symptom during their lifetime, while 20–25% report one or more subjective complaints [3]. Clinically significant forms associated with pain and/or pronounced dysfunction occur in 5–12% of adults [4].

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# Relevance

According to global epidemiological assessments, temporomandibular disorders (TMD) affect approximately 30–34% of the general population, with a nearly twofold higher prevalence in females compared to males [5,6]. This sex-related difference has been attributed to variations in pain sensitivity, anatomical differences, and potential hormonal modulation [7]. The highest incidence is observed in individuals aged 20–40 years, with TMJ pain being the most characteristic clinical symptom [4,8]. Reports indicate that joint sounds such as clicking, crepitus, or popping during mandibular movement occur in 15–25% of adults; for instance, a German cohort study documented such phenomena in 25% of examined subjects [9]. Notably, patient awareness of these symptoms is limited, as only 9–13% self-report clicking. Magnetic resonance imaging (MRI) has demonstrated that approximately 30% of asymptomatic individuals exhibit disc displacement or other intra-articular alterations [10], whereas among patients diagnosed with TMD, this proportion increases to 50–60% [11]. MRI is regarded as the gold standard for assessing disc position and evaluating the structural integrity of the temporomandibular joint [12].

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# Relevance

The most common internal joint change in TMD is disc displacement with reduction, which is found in 10–15% of the population and often causes no noticeable symptoms. This condition accounts for more than half of all TMD cases. Disc displacement without reduction occurs less frequently (1–3%), but among individuals diagnosed with TMD, it can reach 5–15%. In most cases, a non-reducing disc is associated with degenerative joint changes, observed in up to 66% of cases [13]. According to Tasaki et al. (1996), the most frequent types of disc displacement in clinical TMD include anterolateral (23.3%) and anterior displacement (22.6%). A normal disc position was found in only 18.1% of symptomatic patients, compared to 70.2% in the asymptomatic group. However, about one-third of individuals without symptoms also showed some form of disc displacement, demonstrating that such changes can occur without noticeable clinical signs [14].

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# Aim

To retrospectively assess the prevalence of temporomandibular joint disc displacement using data obtained from magnetic resonance imaging (MRI) evaluations.

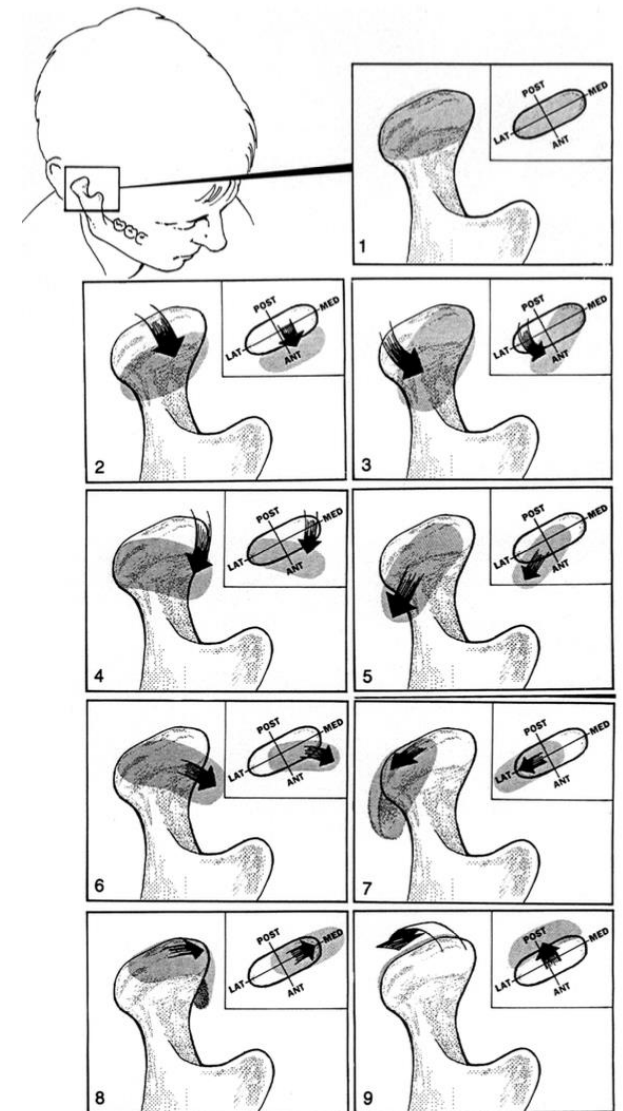
# Materials & Methods

This retrospective study included 244 consecutive MRI examinations of adult patients who presented with at least one clinical sign of temporomandibular joint (TMJ) dysfunction, such as pain, joint sounds, or limited jaw movement, and were referred for imaging prior to interdisciplinary treatment. Inclusion criteria: adult patients with clinical symptoms suggesting TMJ dysfunction and a referral for MRI. Exclusion criteria: previous TMJ surgery, recent maxillofacial trauma, congenital craniofacial anomalies, systemic inflammatory joint diseases (e.g., rheumatoid arthritis), and incomplete or inadequate MRI data. MRI examinations were performed using Siemens MAGNETOM Aera 1.5 T and Philips ACHIEVA 1.5 T scanners. The imaging protocol included T1-, T2-, and PD-weighted sequences in oblique sagittal and oblique coronal planes with 2 mm slice thickness, ensuring improved visualization of disc position and joint structures compared to standard planes. The study was approved by the Ethics and Academic Integrity Committee of Shupyk National University of Health of Ukraine. Disc displacement types were classified according to the criteria proposed by Tasaki et al. (1996), which allow detailed characterization of intra-articular changes.

Patients were divided into two groups based on the location of the disorder:

- Group 1 — unilateral TMJ involvement;
- Group 2 — bilateral TMJ involvement.

The analysis included the following disc position variants: anterior displacement, partial anterior displacement (lateral/medial), rotational displacement (anterolateral/anteromedial), lateral/medial displacement, posterior displacement, and normal disc position (no displacement).



Classification of TMJ disk displacements according to Tasaki MM (1996)

# Results

Analysis of 244 MRI examinations of patients with temporomandibular joint (TMJ) disc displacement, divided into unilateral (Group 1) and bilateral (Group 2) involvement, showed that anterior disc displacement was the most common type. In unilateral cases, anterior displacement was identified in 9.84% of right-sided and 8.61% of left-sided joints. In the bilateral group, the frequency was higher, reaching 17.21% on the right and 16.80% on the left. Partial anterior displacement was also common, occurring in 8.61–10.66% of cases in Group 1 and 15.16–15.57% in Group 2. Other types of displacements (rotational, lateral/medial, posterior) were less frequent, ranging from 0.41% to 13.11%.

The strongest association between disc displacement and the presence of joint effusion was observed in cases of anterior and partial anterior displacement. In Group 1, minimal or small effusion occurred most often with anterior displacement of the right joint and partial anterior displacement of the left joint (minimal 2.9%, small 1.6%, with isolated cases of moderate effusion at 0.4%). Rotational displacements were associated with effusion less frequently (minimal 1.6%, small 0.8%). In lateral, medial, and posterior displacements, as well as in normal disc position, effusion was usually absent or rare, and no severe cases were identified.

In Group 2, effusion was also most commonly observed in bilateral anterior displacement: minimal in 5.3% of cases, small in 2.5–2.9%, moderate in 1.2%, and isolated higher-intensity cases at 0.4%. A similar trend was noted for partial anterior displacement (minimal 4.9%, small 2.9%, with moderate or increased effusion occurring rarely  $\leq 0.8\%$ ). In rotational, lateral, medial, and posterior displacements, as well as with normal disc position, effusion was absent in most cases.

Importantly, the absence of effusion despite disc displacement was common. In Group 1, this was most frequently observed in partial anterior and rotational displacements (4.5–5.7% and 3.3%, respectively). Group 2 demonstrated a similar pattern (absence of effusion 6.1–6.6%, 5.3% in rotational, and 1.6–2.0% in lateral/posterior displacement).

Thus, effusion was most strongly associated with anterior and partial anterior displacement, whereas it occurred infrequently in other displacement types or in normal disc position. Additionally, the high number of disc displacements without effusion highlights a predominantly mechanical nature of dysfunction in this patient cohort (see Table ).

| Patients with unilateral temporomandibular joint involvement (Group 1, n=122) |                 |  |                |  |                            |
|---|-----------------|--|----------------|--|----------------------------|
| Displacement / feature  | Right TMJ n (%) | Effusion (right) n (%)   | Left TMJ n (%) | Effusion (left) n (%)  | n (%) normal disc position |
| anterior disk displacement  | 25 (20.5%)      | 0: 13 (10.7%),<br>1: 7 (5.7%),<br>2: 4 (3.3%),<br>3: 1 (0.8%),<br>4: 0 (0.0%),<br>5: 0 (0.0%). | 17 (13.9%)     | 0: 10 (8.2%),<br>1: 5 (4.1%),<br>2: 2 (1.6%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%).  | 27 (22.1%)                 |
| partial anterior disk displacement (lat/med)                                  | 15 (12.3%)      | 0: 10 (8.2%),<br>1: 4 (3.3%),<br>2: 1 (0.8%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%).  | 18 (14.8%)     | 0: 12 (9.8%),<br>1: 5 (4.1%),<br>2: 1 (0.8%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%).  | 20 (16.4%)                 |
| rotational anterolateral/anteromedial   | 10 (8.2%)       | 0: 5 (4.1%),<br>1: 4 (3.3%),<br>2: 1 (0.8%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%).   | 9 (7.4%)       | 0: 7 (5.7%),<br>1: 2 (1.6%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%).   | 10 (8.2%)                  |
| lateral/medial disk displacement  | 2 (1.6%)        | 0: 1 (0.8%),<br>1: 1 (0.8%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%).   | 3 (2.5%)       | 0: 2 (1.6%),<br>1: 1 (0.8%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%).   | 3 (2.5%)                   |
| posterior disk displacement   | 1 (0.8%)        | 0: 1 (0.8%),<br>1: 0 (0.0%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%).   | 1 (0.8%)       | 0: 1 (0.8%),<br>1: 0 (0.0%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%).   | 1 (0.8%)                   |
| normal disc position (no displacement)  | 64 (52.5%)      | 0: 62 (50.8%),<br>1: 2 (1.6%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%). | 64 (52.5%)     | 0: 62 (50.8%),<br>1: 2 (1.6%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%). | 0                          |

| Patients with bilateral temporomandibular joint involvement (Group 1, n=122) |                 |   |                |   |                            |
|--|-----------------|---|----------------|---|----------------------------|
| Displacement / feature   | Right TMJ n (%) | Effusion (right) n (%)  | Left TMJ n (%) | Effusion (left) n (%)   | n (%) normal disc position |
| anterior disk displacement   | 41 (16.8%)      | 0: 18 (7.4%),<br>1: 13 (5.3%),<br>2: 6 (2.5%),<br>3: 3 (1.2%),<br>4: 1 (0.4%),<br>5: 1 (0.4%) | 39 (16.0%)     | 0: 17 (7.0%),<br>1: 12 (4.9%),<br>2: 7 (2.9%),<br>3: 2 (0.8%),<br>4: 1 (0.4%),<br>5: 1 (0.4%) | 25 (10.2%)                 |
| partial anterior disk displacement (lat/med)                                 | 28 (11.5%)      | 0: 13 (5.3%),<br>1: 10 (4.1%),<br>2: 4 (1.6%),<br>3: 1 (0.4%),<br>4: 1 (0.4%),<br>5: (0.4%)   | 29 (11.9%)     | 0: 14 (5.7%),<br>1: 10 (4.1%),<br>2: 4 (1.6%),<br>3: 1 (0.4%),<br>4: 1 (0.4%),<br>5: (0.4%)   | 20 (8.2%)                  |
| rotational anterolateral/anteromedial  | 19 (7.8%)       | 0: 8 (3.3%),<br>1: 6 (2.5%),<br>2: 4 (1.6%),<br>3: 1 (0.4%),<br>4: 0 (0.0%),<br>5: 0 (0.0%)   | 21 (8.6%)      | 0: 10 (4.1%),<br>1: 6 (2.5%),<br>2: 4 (1.6%),<br>3: 1 (0.4%),<br>4: 0 (0.0%),<br>5: 0 (0.0%)  | 10 (4.1%)                  |
| lateral/medial disk displacement   | 6 (2.5%)        | 0: 5 (2.0%),<br>1: 1 (0.4%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%)   | 7 (2.9%)       | 0: 5 (2.0%),<br>1: 2 (0.8%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%)   | 4 (1.6%)                   |
| posterior disk displacement  | 1 (0.4%)        | 0: 1 (0.4%),<br>1: 0 (0.0%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%)   | 2 (0.8%)       | 0: 2 (0.8%),<br>1: 0 (0.0%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%)   | 1 (0.4%)                   |
| normal disc position (no displacement)                                       | 67 (27.5%)      | 0: 64 (26.2%),<br>1: 3 (1.2%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%) | 67 (27.5%)     | 0: 64 (26.2%),<br>1: 3 (1.2%),<br>2: 0 (0.0%),<br>3: 0 (0.0%),<br>4: 0 (0.0%),<br>5: 0 (0.0%) | 134 (54.9%)                |



# Conclusions

Anterior disc displacement represented the most prevalent displacement pattern in both groups. Among patients with unilateral involvement, it was identified in 9.84% of right-sided and 8.61% of left-sided joints, whereas in the bilateral group the respective frequencies reached 17.21% and 16.80%. Partial anterior displacement (lateral or medial) constituted the second most frequent variant, occurring in 8.61–10.66% of unilateral cases and 15.16–15.57% of bilateral cases. Other displacement types (rotational, lateral/medial, and posterior) were significantly less common, with frequencies ranging from 0.41% to 13.11%. The lowest rates corresponded to posterior (0.41–2.05%) and lateral/medial displacement (1.64–3.69%), while rotational displacement was somewhat more frequent, reaching up to 13.11% in bilateral involvement.

Joint effusion demonstrated the strongest association with anterior and partial anterior displacement, typically presenting in minimal or small volumes; moderate effusion was documented only in isolated cases ( $\leq 0.4\%$ ).

Absence of effusion in the presence of disc displacement was frequent, particularly in lateral, posterior, and rotational displacement patterns. In the unilateral group, effusion was absent in 75–88% of such cases, and in the bilateral group in 55–80%, indicating that effusion is not characteristic of most displacement types except anterior forms.

Both disc displacement and effusion were more prevalent in the bilateral group. Anterior and partial anterior displacement occurred in up to 17.2% and 15.6% of bilateral cases, compared to 9.8% and 10.7% in unilateral cases. Minimal or small effusion accompanying anterior displacement was also more common in bilateral joints (5.3% vs. 2.9%).

Overall, the findings support a predominantly mechanical etiology of disc displacement in this cohort: the predominance of anterior displacement, the high frequency of displacement without effusion, and the very low incidence of moderate or pronounced effusion ( $\leq 0.4\%$ ) indicate limited inflammatory contribution.



# Thank you for attention

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