

MRI Findings in Patients with Bilateral Anterior TMJ Disc Dislocation

Ulugbek Nuritdinov¹, Ravshan Fattakhov^{2,*}

¹Samarkand State Medical University, Samarkand, Uzbekistan

²Tashkent State Dental Institute, Tashkent, Uzbekistan

Abstract The article presents data on an MRI study of patients with bilateral anterior dislocations of the temporomandibular joint discs and changes occurring in the discs in comparison with healthy individuals. In patients with bilateral anterior TMJ disc dislocation, on the right side, the TMJ discs with the mouth closed are 0.17 mm longer and 0.04 mm narrower than with the mouth open; on the left side, with the mouth closed, they are 0.13 mm longer and 0.01 mm narrower than with the mouth open. In patients with bilateral anterior TMJ disc dislocation the TMJ discs with the mouth closed are longer and narrower than with the mouth open on both sides.

Keywords TMJ, TMD, MRI

1. Introduction

To identify “internal disorders of the TMJ”, a non-invasive, safe diagnostic method is mainly used - magnetic resonance imaging (MRI). This study makes it possible to obtain an accurate image of the periarticular tissues of the TMJ without radiation exposure, which makes its use particularly informative not only during direct examination. MRI provides additional information about the condition of the adjacent soft tissue structures of the head and neck [1,3].

Use of MRI diagnostics has significant advantages in identifying organic or structural disorders even in muscle, fat and cartilage tissues [2,4]. This method allows you to successfully visualize the elements of the TMJ at all phases of joint movement in the closed and open mouth stage, identify pathologies of the articular disc, synovial membrane, intra-articular ligaments, bilaminar zone, ascertain the presence of exudative-proliferative, degenerative-dystrophic, destructive manifestations in cartilaginous and fibrous tissues. structures (Badel T. et al., 2009; Imanimoghaddam M. et al., 2016).

2. The Purpose of the Study

The goal was study the topographic and anatomical features of TMJ disc dislocations using magnetic resonance imaging.

3. Materials and Methods

This group of patients consisted of 38 individuals diagnosed with bilateral anterior TMJ disc dislocation. Their distribution by age is presented as follows (Table 1).

Table 1. Distribution of patients with bilateral anterior TMJ disc dislocation depending on age

№	Age groups, years	Abs.	%
1	25-44	12	31.6%
2	44-60	26	68.4%
Total		38	100%

By the time of examination, the patients' oral cavity was sanitized, the installed fillings and crowns fully met the clinical requirements. No manifestations of systemic diseases, periodontal tissue pathology and mucosa were detected.

When applying for an objective examination, the main clinical signs were clicking and pain in the TMJ. Patients complained of pain in the area of the TMJ projection on both sides when opening the mouth and its intensification when eating. In some cases, the pain sometimes radiated to other parts of the head or neck. When opening the mouth wide, when palpating through the anterior wall of the auditory canal, and sometimes during a long conversation, more noticeable pain arose. In most cases, it was short-term or passed within a few seconds or minutes after the cessation of movements of the lower jaw. From the medical history it was found that all patients in this group had clicking and pain in the TMJ. Of the total number of patients examined in this group, in 7 patients (18.4%) these symptoms arose as a result of a previous injury to the facial area, in 9 patients (23.7%) -

* Corresponding author:

ravshan.fattakhov@yandex.com (Ravshan Fattakhov)

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as a result of wide mouth opening, in 14 patients (36.8%) - as a result of occlusal factors, which were subsequently eliminated during prosthetics. It was not possible to accurately determine the factor that could provoke the occurrence of clicking in 8 patients (21.0%).

A comprehensive dental examination of patients with bilateral anterior TMJ disc dislocation revealed that 5 patients (13.2%) sought treatment from the moment of the first manifestations of clicking until the onset of pain in a period from several days to two years, and in 33 patients (86.8%) the time interval ranged from 1 to 9 years.

The direction of disc displacement according to MRI data was assessed relative to the center of the articular head. During the study, two states of disc arrangement were observed: without pathological displacement (central arrangement) and anterior dislocation. When studying the results of the MRI study, it was revealed that the anatomical and topographic changes in the arrangement of the TMJ disc in patients of this group have certain features. The displacement of the TMJ disc in 100% of patients was divided into central and anterior arrangement. No other forms of displacement were found after the examination. Anterior dislocations were classified by the degree of displacement amplitude: one-third of the disc length, half of the disc length, 2/3 of the disc length, complete dislocation, and complete dislocation with lateral displacement. Anterior disc displacement by 1/3 was not detected.

To assess topographic-anatomical changes in the TMJ, we used aT2 TSE ax, cor 5/1 mm. T1 TSE and T2 TSE oblique 3/0.3 mm, with mouth open and closed.

To determine the maximum physiological displacement of the intra-articular disc and articular head, scanning began with the mouth closed (in the position of habitual occlusion), and then with the mouth open 3 cm. To hold the open mouth in a stable position, clamps made of non-magnetic material were used.

T1-weighted images made it possible to clearly differentiate the shape, structure, and degree of disc degeneration, and to identify changes in bone structures. After obtaining T1-weighted images, T2-weighted images were performed similar to the scanning geometry (the direction of the scanning plane, the thickness of the slices and the spaces between them, the size of the field of view). T2-weighted images allowed a clear examination of the length and width of the TMJ articular disc of the patients. The study results were assessed according to two criteria: changes in the position of the TMJ articular discs and changes in the shape of the TMJ articular discs in the subjects examined.

The studies were assessed according to the criteria for comparing the results of the position and shape of the articular discs of the TMJ. Considering that the TMJ is a paired joint, at the stage of parameter analysis the right and left sides of the joint were determined.

4. Results and Discussion

Anterior displacement of the TMJ disc by half its length

was found in 3 studies with the mouth closed: on the left side 2 studies (5.26% of patients in the group); on the right side 1 study (2.63%).

In 21 studies (55.26% of the cases), on the right side with the mouth closed, a forward displacement of the TMJ disc by 2/3 of its length was found. On the left side with the mouth closed - in 26 studies (68.4% of the cases).

Anterior displacement of the TMJ disc along its entire length was detected: on the right side with the mouth closed - in 14 studies (36.8% of the number of disc displacements on the right side with the mouth closed); on the right side with the mouth open - 2 studies (5.26% of the number of disc displacements on the right side with the mouth open); on the left side with the mouth closed - 9 studies (23.6% of the number of disc displacements on the left side with the mouth closed); with the mouth open on the left side - 1 study (2.63% of the number of disc displacements on the left side with the mouth open).

Anterolateral complete displacement of the TMJ disc was detected with the mouth open on the left side - 2 studies (5.26% of the number of left-sided disc displacements with the mouth open).

According to MRI study, it was revealed that the anatomical and topographic changes in the location of the TMJ disc in patients of this group have certain features that were observed in all 38 examined. The central location of the TMJ disc on the right side with a closed mouth was observed in 1 study - 2.63% of the total number of examined in the group, with an open mouth in 37 studies - 97.36% of those examined in the group; with a closed mouth on the left side was observed in 1 study - 2.63%, with an open mouth in 35 studies - 92.1% of those examined in the group.

The anterior location of the TMJ disc on the right side with the mouth closed was observed in 37 studies - 97.36% of the total number of subjects in the group, with the mouth open in 1 study - 2.63% of the subjects in the group; with the mouth closed on the left side was observed in 37 studies - 97.36% of the total number of subjects in the group, with the mouth open in 3 studies - 7.9% of the subjects in the group.

In 31 cases - 81.5% of the total number of this group examined subjects on the right side and in 30 studies - 78.9% on the left side, the shape of the discs remained unchanged. Changes in the shape of the disc (thinning) were determined in 6 studies - 15.8% on the right side, on the left side in 8 studies - 21.0%. Degenerative changes in the disc on the right and left sides were not observed.

According to the results of the MRI study, the sizes of the TMJ articular discs were also measured and compared with the open and closed mouth in patients with bilateral anterior TMJ disc dislocation and the control group. It was found that with the closed mouth on the right side, patients with bilateral anterior TMJ disc dislocation had a decrease in disc length by an average of 1.07 mm compared to the disc length in the control group; with the closed mouth on the left side, a decrease in disc length by 1.24 mm was also observed compared to the disc length in the control group. With the

open mouth on the right side, a decrease in disc length by 0.71 mm was observed compared to the disc length in the control group. With the open mouth on the left side, a decrease in disc length by 0.88 mm was observed compared to the disc length in the control group.

Comparing the sizes of the TMJ articular disc widths in patients of the control group and patients with bilateral anterior TMJ disc dislocation, it was found that on the right side there was a decrease in the disc width by 0.52 mm, and it was 1.17 times smaller compared to the disc width in patients of the control group with the mouth closed. On the left side there was a decrease in the disc width by 0.44 mm, and it was 1.14 times smaller compared to the disc width in patients of the control group with the mouth closed. With the mouth open, on the right side there was a decrease in the disc width by 0.47 mm, and it was 1.14 times smaller compared to the disc width in patients of the control group. With the mouth open, on the left side there was a decrease in the disc width by 0.38 mm, and it was 1.12 times smaller compared to the disc width in patients of the control group.

Analysing the data on the average sizes of the TMJ articular discs, it can be stated that in patients in the control group, the TMJ discs are longer and wider with the mouth closed than with the mouth open on both sides.

Comparing the average sizes of the TMJ articular discs in patients with bilateral anterior TMJ disc dislocation, it was found that with the mouth closed, the left side had a 0.17 mm decrease in disc length compared to the right TMJ disc; with the mouth open, the left side had a 0.13 mm decrease in disc length compared to the right TMJ disc. At the same time, the right side of the TMJ had a 0.08 mm decrease in disc width compared to the left side of the TMJ with the mouth closed; with the mouth open, the right side had a 0.05 mm decrease

in disc width compared to the left TMJ disc.

In patients with bilateral anterior TMJ disc dislocation before treatment, on the right side, the TMJ discs with the mouth closed are 0.17 mm longer and 0.04 mm narrower than with the mouth open; on the left side, with the mouth closed, they are 0.13 mm longer and 0.01 mm narrower than with the mouth open.

Analysing the data on the average sizes of the TMJ articular discs, it can be stated that in patients with bilateral anterior TMJ disc dislocation before treatment, the TMJ discs with the mouth closed are longer and narrower than with the mouth open on both sides.

The sizes of the TMJ articular discs in the control group and in the group with bilateral anterior TMJ disc dislocation are shown in Table 2.

5. Conclusions

Thus, summarizing the results of studies on the management of patients with bilateral anterior TMJ disc dislocation, which were covered in this section, it should be noted that the inclusion of general clinical studies and proposed additions in the diagnostic and therapeutic measures made it possible to achieve normalization of the ratios of the structural elements of the TMJ, a significant improvement in the clinical situation and quality of life. The proposed method of treating patients with bilateral TMJ disc dislocation made it possible to improve the clinical situation, which was reflected in the improvement of the overall quality of life in patients with unilateral TMJ disc dislocation by 95.3%, and the health status – by 91.6%, compared with data before treatment. After 6 months, all patients had no clinical symptoms.

Table 2. Average sizes of TMJ articular discs in patients of the control group and in patients with bilateral anterior TMJ disc dislocation

Indicator	Mouth position	Examination side TMJ	Objects of measurement	
			Disc length	Disc width
Control group (n=30)	Closed	without DD, right	11.70±0.11	3.50±0.11
		without DD, left	11.70±0.11	3.50±0.11
		DIM	0	0
	Open	without DD, right	11.34±0.12	3.45±0.11
		without DD, left	11.34±0.12	3.45±0.11
		DIM	0	0
Patients with bilateral anterior TMJ disc dislocation (n=38)	Closed	with DD, right	10.63±0.11	2.98±0.06
		with DD, left	10.46±0.13	3.06±0.07
		DIM	0.17	0.08
	Open	with DD, right	10.46±0.12	3.02±0.08
		with DD, left	10.33±0.11	3.07±0.09
		DIM	0.13	0.05
DD – disc dislocation; DIM – difference in measurements				

Note: significant compared to the control group, $p < 0.05$.

Limitations

There are some limitations to this study. Although the study was carried out during 3 years, the sample size was small. Future studies could consider broadening the recruitment range to account for potential influences of all factors on participants' TMD. Even though a certain degree of bias exists in any randomized clinical trial, we tried to minimize major potential biases. In particular, an independent statistician who was not aware of the name of the participants and group assignment analyzed all our results.

Practical Implications

The obtained research results, relevant for different age groups, can be used to analyze the development and treatment of TMJ disc dislocations.

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