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Structural and Functional Disorders of the Temporomandibular Joint (Internal Disorders)

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Abstract

There are many factors that can cause damage to the temporomandibular joint (TMJ) structures or impair normal functional relationships between condyle, disc and eminence. The main symptoms associated with TMJ dysfunction are pain, limited mobility of the mandible, spasticity of the masticatory muscles and sound that is produced in the joint during mandibular movement. Pain originates from nociceptors located in soft tissue of the joint. If the soft tissue structures are not in inflammation, the pain is sharp, sudden and intense tightly connected to the movements in the TMJ. If the inflammation is presented, the pain is constant and increases with the movements in the joint. TMJ dysfunction is manifested by feeling stiffness of the joint, limited and/or altered opening of the mouth with deviation or deflection of the mandible. Individual or multiple sound produced by the TMJ are most often the consequence of the disturbed function of the condyle-disc complex, the morphological incompatibility of the joint surfaces or degenerative changes in them. The signs and symptoms of disease and dysfunction of TMJ are different and depend on the duration of the disorders and its chronicity as well as on the individual sensitivity of the patients. Proper identification of symptoms and precise diagnosis are therefore essential for future treatment.

Keywords: TMJ, internal disorders, signs, symptoms, therapy

1. Introduction

Temporomandibular joint (TMJ) is susceptible to various diseases affecting other synovial joints. Due to its position it is exposed to trauma, and its functional link with the occlusal complex which makes it very sensitive to any occlusal disorders. Any force that overloads the TMJ complex can cause damage to the joint structures or disrupt the normal functional relationship between condyle, disc and articular eminence, resulting in dysfunction or pain, or both. Systemic joint disorders may also affect TMJ.

Diseases and functional disorders of the TMJ can be globally divided into several categories:

- deviations in the form of articular surfaces,
- disorders in the functions of the condyle-disc complex,

- inflammatory diseases of the TMJ,
- degenerative TMJ disorders,
- ankylosis of TMJ.

This classification is based on the recommendations of the American Academy of Orofacial Pain 1993 [1].

The basic symptoms that accompany the diseases and dysfunction of TMJ are: pain, abnormal jaw movement, spasm of masticatory muscles and joint sounds produced by the joints during mandibular movements [2].

- a. The pain that originates from any joints including the TMJ, is called arthralgia.

Arthralgia is triggered by receptors located in the soft tissue of the joint. Such receptors (nociceptors) contain discal ligaments, retrodiscal tissue and articular capsule. Arthralgia from the soft-tissue structures of the non-inflammatory joint represents a sharp, sudden and intense pain that is closely related to the joint movements. If, however, the inflammation of the soft-tissue structures of the affected joint has occurred, the pain will be constant and increase during mandibular movements. Course of pain can be acute or chronic [2].

- b. Disturbed joint function is a common accompaniment to all joint disorders. TMJ dysfunction can occur in various forms but their major effects are the limitations and/or alterations of jaw movements. This is manifested by the feeling the stiffness of the joint, limited mouth opening with deviation or deflection of the mandible on the affected side and limited movement to the contralateral side [2, 3].
- c. The sound signals produced by the joint are the most common consequence of the dysfunction of the condyle-disc complex, the morphological incompatibility of articular surfaces and their degenerative changes. The sound signals produced by the joint may occur as individual short-duration sounds at opening or when opening and closing the mouth, referred to as clicking ("click") or as multiple, rough and scratched sounds, which are called as "crepitation" [2, 3].

2. Deviations in the form of articular joint surfaces

2.1 Defects on the articular joint surfaces

The most common defects on the articular joint surfaces occur in the upper joint compartment and affect the articular eminence or the upper surface of the disc, thus preventing normal translatory movements.

Causes. Irregularities of articular joint surfaces may arise as a result of trauma (e.g., a blow to the lower jaw in open mouth), or are the result of inflammatory processes in the joint, structural or development anomalies [2, 4].

Signs and symptoms. These disorders are usually not accompanied by pain. Opening or closing the mouth is difficult and limited due to the existence of mechanical obstructions on the articular joint surfaces. Due to an attempt to overcome an obstruction, the mandibular deviation to the affected side is observed in the opening of the mouth, which is directly related to the barrier position in the translatory cycle. As the obstacle is located at a certain location, the mandibular deviation always appears at the same opening or closing point.

Deviation can be followed by clear single sound—“click”, followed by normal opening or closing of the mouth. The click always occurs at the same level of opening or closing motion and should be distinguished from the reciprocal click in patients with disc displacement with reduction. In the disc displacement with reduction click is rarely heard at the same level of opening or closing the mouth [2, 4, 5].

Therapy. Patients education is very important in managed of these symptoms. Patients with defects on the articular joint surfaces should learn how to move the jaw to avoid the obstacle. Chewing predominantly to the side of the defect may be helpful in reducing intracapsular pressure in the affected joint. Stabilization splint recommended during the night and 1–2 hours during the day for at least 8–10 weeks, can reduce the pressure on the joint structure and the muscular hyperactivity, but does not usually remove the sounds. If dysfunction is significant and if pain occurs, the possibility of surgical therapy should be considered [2, 4, 5].

2.2 Thinning of articular disc and perforation of disc

Causes. Excessive and long-term load of the joint under the conditions of the closed mouth and the dental contacts may result in the thinning of the central zone of the disc. The constant excessive pressure in that zone can lead to perforation of the disc [2, 6, 7].

Signs and symptoms. The symptoms depend on the size of the defect and changes in the disc or articular surface of the condyle. In cases of perforated disc, movements in the joint were accompanied by characteristic crunching or cracking sounds (crepitations). Pain is usually an early companion of these disorders, but over time, as the defect increases, it may decrease or completely disappear. Joint sensitivity and muscle spasms most likely complement the clinical findings, and pain is related to mandibular movements. Disc thinning and perforation are difficult to diagnose clinically [5]. Diagnosis is best placed with some of the appropriate radiological methods, such as arthrography, arthroscopy, or magnetic resonance images (MRI) [8–10].

Therapy. If the joint and surrounding muscles are sensitive or painful to palpation, it is recommended to wear a stabilization splint during the night and 1–2 hours during the day for at least 8–10 weeks, that will reduce the joint load, muscular spasm and possible pain. If using medications is considered for pain reduction, it is recommended to use NSAID naproxen (Naprosyn) 500 mg two times per day minimum of 3 weeks [11]. As it is not possible to regenerate the disc, in cases of mandibular movements accompanied by permanent intensive pain, surgery is recommended [5].

3. Function disorders of condyle-disc complex

3.1 Disc derangements (mechanism of disorder)

These disorders are series of dysfunction that are most often the result of previous diseases, trauma, or occlusal disharmony. Disorders are caused by changes in the relationship between condyle and disc and the disturbance of their functional activity. In the normal joint the disc is bound to the medial and lateral condyle pole by discal ligaments. Therefore translational movement in the healthy joint is possible only between the condyle-disc complex and the articular eminence. The only physiological movement between condyle and disc is rotation. The amount of rotation of the disc in normal circumstances depends on the shape of the disc, the degree of interarticular pressure and the synergic function of the upper head of the lateral pterygoid muscle and the upper layer of the bilaminar zone [2, 10, 12–16].

In opening the mouth and moving the condyle-disk complex forward, the upper layer of the bilaminar zone is tensed and retracts (rotates) the disc in the posterior direction. The interarticular pressure increasing during the mouth opening maintains the condyle below the thin intermediate zone of the disc and prevented the thicker anterior disc border from being pulled between the condyle and eminence.

The upper layer of the bilaminar zone is the only structure that can pull the disc backwards. This force only works when the condyle is moved forward and it extends and tightens the upper layer of the bilaminar zone. There is no tension in the retrodiscal tissue during the closing of mouth. The disc rotates forward thanks to the function of the upper head of the lateral pterygoid muscle, when the mouth closing. This muscle part is activated and pulls the disc forward, while the condyle-disk complex slides back and up. The moderate rotation of the disc, which occurs in the normal joint under the mechanisms described, allows the disc and condyle to remain in intimate contact during all movements and all mandibular positions. In the healthy joint, the articular surfaces of the condyle, disc, and eminence are smooth and sliding, which ensures unobtrusive movements without any friction. The normal relationship between condyle and disc in mandibular movements is also maintained due to the specific form of disc.

The biconcave form of the disc and its thickening borders itself ensures the stability of the disc condition while the interarticular pressure increases during the opening of the mouth also helps to center the disc on the condyle. Medial and lateral discal ligaments support the maintenance of disc because they avoid any translatory movement between condyle and disc [2, 10, 12–16].

If, however, the form of the disc is changed and the discal ligament is elongated, the translatory movement between the condyle and the disc becomes possible. The amount of this movement depends on the change in the form of disc and the degree of elongation of discal ligament. Discal ligaments are not elastic and after elongation they retain that length.

Under the closed mouth, interarticular pressure is very low. If the disc ligaments are stretched, the disc can move on the articular surface of the condyle. Since in the closed mouths the upper layer of the bilaminar zone has no influence on the position of the disc, the tone of the upper head of the lateral pterygoid muscle may influence the disc to assume the anterior position on the condyle. Moving the disk forward is medially limited by the length of the discal ligaments and the thickness of the posterior disc border. If this condition lasts longer, the posterior disc border can be thinned, making it easier for its antero-medial dislocation. In such cases, the articular surface of the condyle no longer rests below the intermediate zone of the disc during closing mouths, but under its thinned posterior disc border or, even in the retrodiscal tissue.

This condition is referred to as a functional derangement of the disc and is initially difficult to register. Later, there is a pain, usually associated with chewing. If the anterior displacement of the disc is more pronounced, the joint function may be compromised. During the mouth opening, the condyle moves forward, a short translatory movement between the condyle and the disc is performed first, ensuring that the condyle takes its normal position below the intermediate zone of the disc. This relation of condyle and disc is then maintained during the further opening of the mouth under the action of interarticular pressure which increases at the opening of the mouth.

During the closing of the mouth the fibers of the retrodiscal tissue actively assist in restoring the condyle to the normal position, which it occupies when the mouth is opened. The interarticular pressure maintains intimate contact between the condyle and the disc during the translational closing movement and does not allow the anterior, thickened disc border to thread between the condyle and the articular eminence. However, when the closing movement is complete, the interarticular pressure decreases and the tension in the retrodiscal tissue is reduced, the tone in

the upper head of the lateral pterygoid muscle will have an effect on the anterior displacement of the disc [2, 10, 12–16].

The basic characteristic of this functional disorder is the presence of translational motion between the condyle and the disc at the beginning of the opening and at the end of the mouth closure, which does not exist in the normal joint. During this pathologic translation, increased interarticular pressure or deformed articular disc may prevent undisturbed crossing of articular surfaces. This raises the sudden, distorted movement of the condyle that skips the barrier to take normal position below the intermediate zone of the disc. This sudden skip of the condyle motion usually accompanies a characteristic sound, which is referred to as a “click” at the mouth opening. After this sound, normal relation between condyle and disc is established during further movement of the opening.

This condyle-disc interact is presented during mouth closing all the way till the very end. However, when the mouth is closed and the interarticular pressure decreased, the disc is again displaced forward (and medially) under the tone of the upper head of the lateral pterygoid muscle.

If the displacement is small this shift is usually not followed by a characteristic sound. A single “click” at the mouth opening indicates an early stage of dysfunction.

If the condition is prolonged, the dysfunction is increased. Continuously anteriorly displaced disc leads to permanent elongation of the discal ligaments, including the lower layer of the retrodiscal tissue. The posterior disc border continues to thinning, and the condyle lies practically on the retrodiscal tissue when the mouth closed. Morphological changes in the disc in the area where the condyle is now positioned may cause a secondary “click” in the final stages of closing the mouth just before the condyle takes the final position. Disc is most often moved forward, or anteromedial, but it also appeared the medial, lateral and even posterior displacement of the disc. Displacements of the articular disc represent a series of pathological conditions that progressively worsen over time. These conditions usually begin with disc displacement with reduction, which is usually not accompanied by pain or major function disorders. In some patients, this condition aggravates, takes a heavier form of dysfunction, disc displacement without reduction, while in others the level of the displacement of the disc is prolonged for long time (**Figure 1**). The reason for these differences is not always clear. The presence of various factors that may contribute to the development of dysfunction, such as loss of lateral teeth, systemic stability of the ligaments or the presence of parafunctional activities, has certainly a significant influence. In diagnosing disc displacement, clinical examination is not always sufficient to determine the actual condition, especially in cases where dysfunction does not cause greater discomfort. Special X-ray techniques, such as arthrography or MRI, are often needed to confirm a clinical diagnosis. However, it must be emphasized that the painless joint with mild mouth signaling is not an indication of the use of complicated and expensive X-ray methods. The clinician must determine whether arthrography or MRI is crucial for determining the correct treatment [8–10].

3.1.1 Disc displacement with reduction

In this disorder when the mouth is closed, disc does not take a normal position between condyle and articular eminence, but is displaced forward, or forward and medial, and during opening of the mouth it returns to approximately normal position on the condyle [2, 10, 12–17]. In some cases, this may be accompanied by increased muscular activity, pain, and limitation of mandibular movements.

Causes. The most common cause is trauma. Macrotrauma such as blow to the jaw or microtrauma associated with orthopedic instability and muscle hyperactivity.

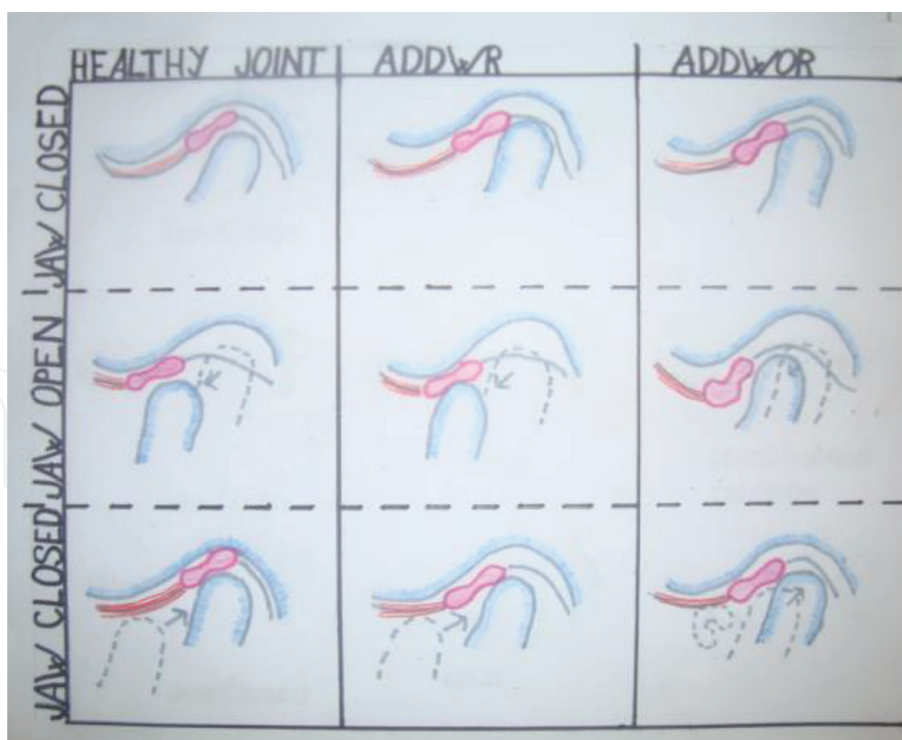


Figure 1.

The position of TMJ disc during mouth opening and closing in three different conditions: healthy joint, anterior disc displacement with reduction (ADDWR) and anterior disc displacement without reduction (ADDWOR).

Signs and symptoms. The characteristic signs of the disc displacement with reduction is clear individual sound (like skipping through an obstacle) during the opening of the mouth, or when opening and closing the mouth. This sound which is referred to as a “click” can be heard at any point in the translatory cycle, and it occurs when the condyle passes through the posterior disc border in order to lie beneath its intermediate zone. During the closing of the mouth it is also possible to detect a softer “click” resulting from the disc being returned to the displaced anterior position. This dual audible signal at the opening and at the end of the mouth closure is marked as a “reciprocal click” [5, 10, 12–17].

The following clinical sign that can be easily detected in these patients is the deviation of the middle line of the mandible to the affected joint at the earliest stage of mouth opening. This is because of the temporary blockade of condyle translation caused by disc displacement. When the disc takes a normal position in relation to the condyle, during mouth opening, the translational movement forward and down as well as the middle line of the mandible return to normal. The deviation from the deflection of the mandible should be distinguished. Deviation is the initial turning of the mandible to the affected joint due to a temporary obstacle. The mandible returns to the central position when the obstacle passes (**Figure 2**). In the deflection, the middle line of the mandible moves from the beginning to the end of the movement of the opening to the affected side and does not return to the center (**Figure 3**).

Pain is not always a companion to the anterior disc displacement. If present, it is usually stimulated by tensed disc ligaments or it is caused by the condyle pressure on the retrodiscal tissue.

The amount of mandibular movements in this disorder is usually normal and in fact the diameter of the maximum opening of the mouth may be greater than normal. Limited opening of the mouth, if present, is the most common consequence of muscular spasm caused by pain, rather than mechanical obstruction of the articular disc [5, 10, 12–17].



Figure 2.
Mandibular deviation during mouth opening associated with disc displacement with reduction.



Figure 3.
Mandibular deflection during mouth opening associated with disc displacement without reduction (affected right side).

Therapy. All cases of anterior disc displacement with reduction do not require treatment. Anterior disc displacement with reduction may persist for years without progression because of physiological adaptation of the TMJ structure. In many cases elongation of the retrodiscal fibers occurs, which then functions as a modified extension of the posterior disc border. In other words, modified retrodiscal tissue accepts the condyle load. If the patient does not complain of pain or significant

damage to the joint function (limited mouth opening) and the surrounding muscles are not sensitive to palpation, no therapy is required. These patients should, of course, be monitored and periodically monitored in order to detect possible progression of the disease.

Sensitivity of the joint to palpation in patients with single or reciprocal click, even in the absence of pain, indicates that there was no adaptation of the joint tissue to this condition. The patient should be aware that the dysfunction has a progressive course and that painful sensations may also occur, especially when it comes to patient with parafunctions [16–18].

If the disc displacement with reduction is accompanied by pain, all management measures should be taken to alleviate or eliminate pain and second to improve function.

The benefit of the use of some intraoral devices in the management of patients with disc displacement with reduction is still subject of discussion. Most commonly applied intraoral devices are repositioning splint and stabilization splint [18–23]. Recently in the literature, the modified mandibular splint has been mentioned, which achieves significant success rate in eliminating joint sounds and patients had no complications because of occlusal changes [24].

The basic aim of the repositioning therapy is to temporarily stabilize the mandible in an appropriate anterior position that allows the disc, if possible, to take a normal position on the condyle, and that the retrodiscal tissue releases the pressure and thus eliminates the pain and clicking sounds of the joint. Much more important is moving the condyle forward, which should enable the adaptive and regenerative processes in the retrodiscal tissue. Why this adaptation occurs in some patients, and in others not, it is not yet clarified. The goal of repositioning therapy is, therefore, to eliminate pain and allow relaxation and regeneration, actually transformation of the retrodiscal tissue [10, 18–20, 22, 23] (**Figures 4–6**).

Repositioning therapy may, however, also have some consequences. Therefore, repositioning therapy can be considered as a temporary treatment that reduces pain and joint sounds in a relatively short period of time. The results of long-term use of the repositioned splint are, however, not encouraging, especially in terms of eliminating the sound signals. In spite of these shortcomings, repositioning therapy has its place within the noninvasive (conservative) methods of treating patients with anterior disc displacement with reduction [18–20, 22, 23].

Some authors recommend that treatment begins by introducing a stabilization splint during a certain time because adverse long-term effects are minimized. A

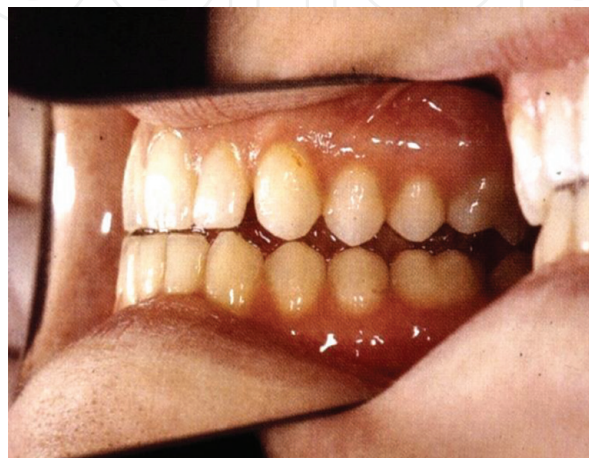


Figure 4.
Mandibular protrusion position, about 2–3 mm in front of the maximal intercuspal position, the reciprocal sounds are unheard in patient with disc displacement with reduction.



Figure 5.
Stone cast model with repositioning splint (contact position).



Figure 6.
Stone cast model with repositioning splint.

stabilization splint is applied in the upper jaw at night and, preferably, 1–2 hours during the day for several weeks (**Figures 7 and 8**). If there is no symptom reduction during stabilization splinting therapy, repositioning therapy should be continued. Before performing a repositioning splint, it is good to perform a test that will show whether the mandibular repositioning eliminates the sounds and the amount of propulsion required. This is done by maximizing the mouth opening in order to reduce the disc to a normal position. At the upper dental arch, place several layers of wax for the shaping, then the mandible is easily brought to the protrusion position, about 2–3 mm in front of the maximal intercuspal position. If the sounds are heard when reaching the mandible in that position, it is unlikely that the repositioning therapy will be successful in correcting the condyle-disc relationship. Clicking in the early (initial) mouth opening phase has a better prognosis than clicking at later stages. It indicates a minor disorder, a smaller amount of disc displacement, and less damage to the discal ligaments.

After 2–3 months of application the repositioning splint worn 24 hours a day including when the patient is eating (if possible), if the pain is significantly reduced or eliminated, the anterior repositioning splint should be reconverted to the stabilization splint. Treatment is considered successful if the patient does not have any pain, regardless of whether the joint sounds are present. If pain occurs again, the treatment with anterior reposition of mandible should be repeated. However, before



Figure 7.
Stabilization splint in patient with disc displacement with reduction.



Figure 8.
Fabricated stabilization splint.

recreating the repositioning splint, it is necessary to check whether there are additional factors that jeopardize treatment (bruxism, harmful habits) and whether the patient wears a splint as instructed by the physician. Certainly, the patient should be warned of the need for maximum control of parafunctional activities, eliminating bad habits, avoiding strong and long-lasting chewing, hard food, etc. [12, 20, 22, 23].

Disc displacement with reduction sometimes requires immediate treatment, even though the patient does not complain on pain. In patients with intermittent joint blockades, treatment should begin immediately, as such conditions can lead to serious injuries to the joint, most often the disc displacement without reduction. All pain-related disc displacements require treatment.

3.1.2 Disc displacement without reduction

This condition is characterized by anterior or antero-medial disc displacement in closed mouth conditions, where the disc does not return to the normal condyle relationship during mouth opening or condyle translation. Translational movements of the condyle are limited or disabled as it cannot pass under the dislocated and deformed disc. Pressed disc changes its shape, from biconcave to biconvex, and the anterior disc connection is relaxed. The contact between the condyle, the disc, and the articular eminence is lost, the space which normally occupies the disc is reduced, and the deformed disc is below the condyle. This results in restricted translation of the condyle in the affected joint, limited opening of the mouth, and sometimes with complete blockade of the mouth opening (“closed lock”).

Causes. Except of cases where this occurred immediately after some trauma, anterior disc displacement without reduction was a consequence of the gradual, progressive degeneration of the joint structure preceded by symptoms of anterior disc displacement with reduction [5, 12].

Due to more efficient approach to therapy and overall prognosis, the state of anterior disc displacement without reduction can be divided into two stages—acute and chronic.

3.1.2.1 Acute disc displacement without reduction

Signs and symptoms. The most prominent clinical sign of acute disc displacement without reduction is very limited mouth opening, maximum about 25–30 mm (**Figures 9 and 10**). When opening the middle line of the mandible, it suddenly turns to the affected side. The protrusion of the mandible is also limited and associated with the deflection of the mandible on the affected side. Since the displaced disc represents a mechanical barrier for each translatory motion of the condyle, the lateral movement of the mandible to the opposite side is also limited. However, for differential diagnosis it is important that the lateral movement of the mandible to the affected side is not limited and that it takes place within normal range. The lateral movement restriction on the affected side may, however, occur later because of pressure of the condyle on inflamed retrodiscal tissue, not due to mechanic obstruction. This situation is characteristic for disc displacement without reduction resulting in trauma. Acute disc displacement without reduction, due to the accompanying inflammation of the capsule, retrodiscal connective tissue and the discal ligaments, is always followed by pain. The activity of master and temporalis muscles on the affected side is also disturbed. The spasm of these muscles increases the pain and still limits the opening of the mouth. Acute condition has no sounds, as its function is practically blocked, but when the disc displacement becomes chronic, degenerative changes may occur on the articular surfaces of the joints causing the characteristic crepitations.

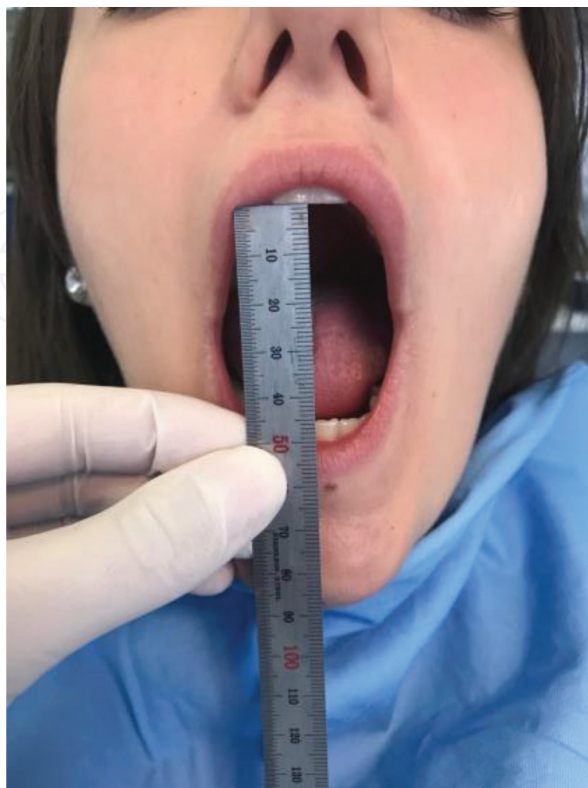


Figure 9.
Normal range of mouth opening in healthy person.

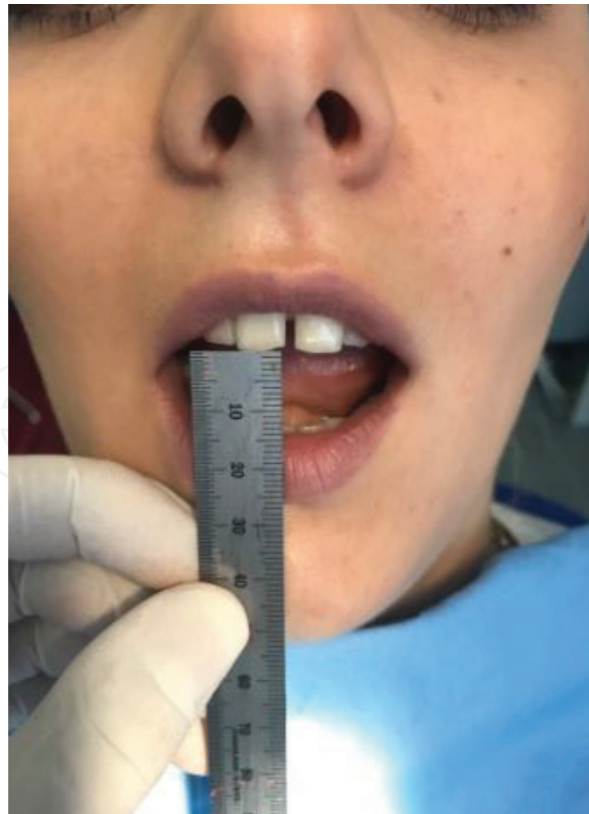


Figure 10.
Limited mouth opening in patient with disc displacement without reduction.

Since limited mouth opening can be the result of muscular spasm, differential diagnosis should determine the true cause of this occurrence. It is known that contraction of the mandibular elevator muscles may limit vertical movements of mandible but does not significantly affect the lateral and protrusive range of motion. On the contrary, the intracapsular cause of mandibular movement restraints, such as disc displacement without reduction, leads to obstruction of all translational motion of the condyle in the affected joint and thus to the limitation of mouth opening, propulsion and lateral movement to the opposite side. If the movements of the mandible are not limited by the presence of strong pain, the intracapsular cause of mandibular obstruction usually permits the opening of the mouth by a pure rotation range of 25 mm. In cases of spasms or painful contraction of the mandibular elevator muscles, mouth opening may, however, be limited to several millimeters [5, 12, 25, 26].

Therapy. In the acute stage, the initial therapy is directed to repositioning the dislocated disc by manual mobilization. This procedure should allow the separation of the condyle from the articular eminence by manual traction (pulling the mandible downwards), to provide space for returning the dislocated disc. To do this, the upper layer of the bilaminar zone must be healthy and functionally capable of retracting the disc backwards [25–27]. Prior to manual reposition, it is good to start with medication combination such as anxiolytic agent diazepam (Valium) 2.5 mg four times per day for 1 week than 5 mg four times per day for 2 weeks to alter the patient's reaction to the stress and NSAID Ibuprofen 600 mg four times per day for 3 weeks that will reduce pain and inflammation. If a secondary muscle spasm is present, it is good to prescribe some muscular relaxation cyclobenzaprine (Flexeril) 10 mg every night [11].

The manual rearrangement therapist performs it by pressing the thumb to the lower teeth or the lower alveolar ridge of the affected side pulling the lower jaw downwards and separating the condyle from the articular eminence, thus providing a space for restoring the disc. If the reposition succeeds, as it can be seen from the considerably increased range of mouth opening, propulsion, and movement on the

contralateral side, immediate repositioning splint should be introduced to prevent disc re-displacement. This splint should be made in advance and now modified so as to stabilize the mandible in the propulsive position 2–3 mm in front of the maximal intercuspal position. The patient needs to carry a splint constantly during the day and night, even during the meal, for the first 2–4 days before beginning only night-time use for at least 10 days. Also, a diet with only soft food should be prescribed. The patient should report at least once a week to evaluate the condition and eventually adjust the splint. If the disc is in the optimal position after this period, the repositioning splint can be replaced by a stabilization splint. If the joint blockade is repeated in spite of applied therapy, it is necessary to reanalyze the degree of dysfunction (the amount of disc displacement, possibility of its restoration) in order to establish a definitive therapy plan. The frequency of temporary joint blockades or long period disc displacement without reduction significantly reduces the chance for successful treatment (reposition) due to irreversible changes in joint tissue. Single, sudden joint blockade accompanied by limited mouth opening and intense pain has a much better prognosis, especially if the blockade is a consequence of a sudden trauma that has affected a healthy joint. The patient should be advised to use soft food and to maximally reduce the range of mandibular movements. If the attempt of manual reposition of the disc displacement fails, other alternatives should be considered [5, 12, 25–27].

The diagnosis of the dislocated disc is also confirmed by some radiographic methods that allow the analysis of soft tissue of the joint (arthrography, MRI) [8–10].

3.1.2.2 Chronic disc displacement without reduction

In patients with chronic disc displacement without reduction, the disc is deformed and its last attachment is non-functional, so returning it to normal position is impossible.

Signs and symptoms. The pain, if it exists, is not of such intensity as in acute cases. Auscultation can be used to detect crepitations due of the mandibular movement, indicating the presence of degenerative changes in the joints. Patients with chronic disc displacement without reduction often report data on the progressive course of the dysfunction, the sounds produced by the mouth opening, and the occasional blockades of the joint followed by limited mouth opening and pain. Exceptions are patients in whom this condition is caused by trauma [25, 26].

Therapy. The procedure for returning the disc to normal position by manual mandibular mobilization is indicated if this condition does not last too long. In most patients with chronic disc displacement without reduction, manual mandibular mobilization does not provide satisfactory results. In such cases, a decision on possible therapeutic procedures should be made. One possibility is to introduce stabilization splint therapy during the night and, preferably, 1–2 hours during the day for 8–10 weeks regardless of the position of the disc that will allow the transformation and adaptation of the retrodiscal tissue and the other alternative is surgical therapy. The decision basically depends on the pain intensity that follows the dysfunction. It is advisable not to undertake surgical intervention if it is possible to try different types of reversible occlusal therapy, e.g., with a stabilization splint, which will stimulate regeneration and transformation of the retrodiscal tissue. Transformation and adaptation of the retrodiscal tissue to increased loads in some patients passes painless while others are accompanied by painful symptoms and limited joint function. Certain systemic or local factors such as episodes of bruxism, poor oral habits, and emotional stress may contribute to this condition. The existence of such alterations is best determined by arthrography, arthroscopy or MRI [8–10]. If the pain cannot be eliminated by the conservative therapy and the movements of the mandible are very limited, surgery is indicated [10, 15, 25, 26].

3.2 Joint hypermobility (subluxation)

This disorder was previously referred to as “subluxation”.

Pathogenesis. During the normal mouth opening while the condyle-disc complex moves forward along the articular eminence, the disc performs a rotational motion on the head of the condyle directed backwards. If the opening of the mouth continues beyond the normal limits of the translatory cycle of the condyle-disc complex, the further posterior rotation of the disc can be disabled and further opening of the mouth occurs without rotation of the disc. This can cause the condyle to skip the top of the articular eminence, with a characteristic sound, and put itself in front of it [4, 5, 28, 29].

Causes. Hypermobility is most commonly caused by the inherited weakness of the discal ligaments. This condition, however, can appear after intubation for general analgesia, after long-lasting dental interventions at lateral teeth or may be the result of sudden trauma. The diameter of mandibular motion during yawning or taking food in some people is also habitually higher than the average. The joint hypermobility is often associated with too steep articular eminence, which is common in patients with skeletal class II [30, 31].

Usually both joints are included, but hypermobility may be unilateral if it is the result of the joint hypomobility of the opposite side.

Signs and symptoms. Immediately in front of the end of the mouth opening, there is a short delay in the movement of the condyle, after which they skip the top of the articular eminence and move forward and upward. Initially, this movement was irregular and accompanied by a characteristic joint sounds. Hypermobility is usually not accompanied by pain if the condition does not become chronic. In differential diagnosis, joint hypermobility which is usually accompanied by extreme opening of the mouth and characteristic sounds (skip), should be distinguished from the joint “click” at the opening of the mouth which indicates the disc displacement with reduction. The sound created by the joint hypermobility is heard at the time of the maximum opening of the mouth [4, 5, 28, 29].

Therapy. It is very important to educate patient regarding the cause and movement that create the interference. A large number of patients can reduce and control this disorder by simply reducing the mouth opening range. They are used to taking smaller snacks, limiting mouth opening or supporting the mandible during yawning or visiting a dentist. Exercises that strengthen the elevator of mandible can also reduce the joint hypermobility [4, 5, 28, 29]. If hypermobility is accompanied by pain, arthroscopic surgery is recommended [32].

When the hypermobility of TMJs is part of the general (systemic) hypermobility of all the joint structures, it can be considered benign and no intervention should be undertaken [28, 29]. However, the joint hypermobility can lead to more difficult conditions, such as recurrent mandibular dislocation.

3.3 Spontaneous dislocation

In the literature, it is referred as a mouth closure or “open lock” [2, 33, 34].

Pathogenesis. This disorder is characterized by the inability of the patient to spontaneously close his mouth after an excessive opening and it is the result of a blockade of condyle under the articular eminence. This usually happens in patients with a longer history of joint hypermobility, but it can also occur spontaneously after a strong yawning or mouth open for a long time.

Causes. Dislocation arises due to the excessive and irregular movement of the condyle in front of the articular eminence and the subsequent spasm of the mandibular elevators.

Signs and symptoms. The mandible is blocked in the opened mouth position and the patient is anxious because of the inability to close the mouth. This can be followed by a pain that is most commonly due to mandibular elevators spasms and overstretched discal ligaments. There is acute malocclusion with contacts only on the last molars and with open bites in the front. Condyles are in the anterior position compared to the articular eminence, and in some patients there is clearly the presence of depression in the preauricular area previously filled with condylas” [2, 4, 5].

Therapy. Patients with dislocation of the condyle-disc complex are terribly frightened and often have strong pains. That it why they need to approach them very gently and encouragingly. Any attempt to coarse or violently mouth closure should be avoided because it can enhance the spasm of elevators. The patient should be advised to calm down and relax if possible, and then open his mouth as much as possible to relax the mandibular elevator (the effect of reciprocal inhibition). By placing the thumb of one and the other hand behind the molar and energizing the pressure first downwards, and then back until the patient opens his mouth as much as he can, the doctor tries to return the blocked mandible. In some cases, it is recommended to give an injection with a solution of a muscular relaxant or to give mandibular anesthesia.

If manual repositioning fails in the attempt, it is recommended to trigger the vomiting reflex by touching the soft palate by mirror. This inhibits the activity of the elevators and increases the chances of its manual repositioning. If the dislocation of the condyle-disc complex often repeats (becoming a chronic phenomenon), it is best to train the patient how to bring the mandible back to normal position using exercises like joint hypermobility [2, 33, 34].

Surgical intervention can be undertaken if this condition is often repeated and accompanied by pain. It usually consists of eminectomy (reduction of peak articular eminence) or eminoplasty (a surgical increase in inclination of the articular eminence) to prevent subsequent dislocations [35, 36].

4. Inflammatory and degenerative diseases of the temporomandibular joint

4.1 Inflammatory diseases in TMJs

Depending on the tissue in which the process takes place, inflammation of the TMJ is referred to as capsulitis, synovitis and retrodiscitis.

Pathogenesis. Excessive damage to the TMJ which comes because of parafunctions, trauma or infection may cause an inflammatory response in the fibrous capsule, the synovial membrane or the retrodiscal tissue. Continuous pain, sometimes while resting, which increases during function, is the main symptom of inflammatory processes in the TMJ. As soon as the inflammation calms down, the pain stops. In addition to continuous pain, a secondary central excitatory effect, such as muscle spasm, hyperalgesia (excessive sensitivity to external stimuli), allodynia (a painful reaction to light stimuli of the affected area), often follow inflammatory processes in the TMJ [37].

4.1.1 Capsulitis and synovitis

Capsulitis (inflammation of the external fibrotic layer of the joint capsule) and synovitis (inflammation of the synovial membrane) have almost the same clinical picture and are considered to be a unique clinical entity.

Causes. These inflammatory processes can occur secondary as a result of trauma or after sudden and excessive stretching of the capsular and discal ligaments.

Long-term keeping of mouth open during dental interventions can also cause these processes. Capsulitis and synovitis are often associated with internal disorders in the TMJ, such as disc displacement, hypermobility or dislocation of the mandible [36–39].

Signs and symptoms. Pain during the resting which increases during the function or after load is the main symptoms of capsulitis and synovitis. The mandibular mobility is limited. The lateral polar region of the condyle is susceptible to palpation, and the mild swelling area is often noticeable. Generally there are no changes in the bone structure of the joint when observed radiographically. Magnetic resonance imaging can provide information on the presence of inflammatory edema of some joint tissue. Laboratory analyzes show the presence of inflammatory process [11, 37–39].

Therapy. Therapy depends largely on the etiology of an inflammatory process. If macrotrauma initiates the process, NSAID naproxen (Naprosyn) 500 mg two times per day for minimum of 3 weeks [11], ultrasound therapy are provided, with advice on maximum control and reduction of the mandibular movement, wet warm meals with soft, almost liquid nutrition. In cases where the patient is relieved, cold pack is used for pain and swelling reduction. It may be applied three or four times a day for 10–20 minutes. To make a cold pack, put ice cubes in a plastic bag, wrap the bag in a clean, thin towel or cloth. Never put ice or a cold pack directly on the skin.

In the case of acute persistent pain, injection of corticosteroids (methylprednisolone 5–20 mg with 0.5 ml local anesthetic using 23–27 gauge, 0.5–1 inch needle) into the joint or joint area can reduce the pain and the inflammation. It should be cautious with corticosteroids because of the potential for damage to joint tissue. It is not recommended to administer more than three injections at short intervals [11]. Corticosteroids should not be given if acute purulent infection is present.

If the inflammation is a consequence of chronic, repeated microtrauma or it has been secondary due to disc displacement, specific therapy is used to remove the source of the microtrauma or to allow the replacement of the dislocated disc [11, 37–39]. The use of stabilization splint for several weeks during the night, in these cases, reduces bruxism, reduces pressure on the joint and eliminates muscular spasm. Reposition splint therapy can help in cases where the primary cause is anterior disc displacement. This therapy minimizes the trauma of the discal ligaments.

4.1.2 Retrodiscitis

Condyle pressure on richly vascularized retrodiscal tissue with a lot of nerves located behind an articular disc can lead to inflammation and swelling with significant functional disturbances.

Causes. Retrodiscitis may be caused by a sudden blow in the chin which suppresses condyle to the retrodiscal tissue. It may also be the result of chronic microtrauma caused by a non-physiological position of the condyle in people with anterior disc displacement. [11, 37–41].

Signs and symptoms. The main symptoms are the continuous pain and sensitivity of the lateral and posterior region of TMJ to palpation. Pain increases when teeth are in occlusion or when the mandible is moved to the affected side, or whenever condyle presses the retrodiscal tissue. If the swelling is presented, the condyle can be moved anteriorly, resulting in acute loss of contact between the lateral teeth on the affected side [41]. Since chewing on the opposite side can increase pressure and cause pain, the patient should be advised to chew on the affected side.

Therapy. If retrodiscitis is a consequence of sudden trauma, the treatment is the same as for capsulitis or synovitis. It is recommended to use NSAID naproxen (Naprosyn) 500 mg two times per day for minimum of 3 weeks [11]. The patient is advised to limit mandibular movement, soft, almost liquid nutrition, and various forms of physical therapy are most often used in the treatment. The initiation of

stabilizing splint reduces the load of retrodiscal tissue and promotes its recovery. If retrodiscitis is caused by anterior disc displacement, the application of the repositioning splint is indicated. In cases of severe pain, corticosteroids can be moderately used. The therapy primarily aims to eliminate inflammation and then to normalize the function of the joint [5, 11, 40, 41].

4.2 Arthritides

Degenerative diseases of the TMJ differ significantly from those that have been written since they primarily damage bony articular surfaces of condyle and fossa. Some classifications characterize these diseases commonly referred to as arthritides [42]. The different types are: osteoarthritis, osteoarthrosis, polyarthritides.

Degenerative diseases of the joint systems may be of local character, then they only affect specific joint structures such as TMJ or may, however, be part of the general systemic disease of all joints in the body (polyarthritis).

Pathogenesis. The articular surfaces of the TMJ have great potential for adaptation to numerous functional procedures. During the course of life, progressive remodeling processes of articular surfaces maintain a constant balance between shape and function. However, if the joint structures are permanently exposed to excessive non-physiological damage, the repairing abilities of the joint tissue can be overcome, and then the articular surfaces of the joints lose the ability to adapt to an increased load and become softened followed by resorption of subarticular bone. This can lead to permanent damage to the articular surfaces of the joint over time. The problem of maintenance of homeostasis can also occur under normal TM load in cases where the defensive abilities of the body and total adaptive capacity are weakened due to aging or numerous systemic disorders [42–46].

4.2.1 Osteoarthritis of the TMJ

Osteoarthritis is one of the most common arthritides affecting the TMJ. Osteoarthritis usually develops gradually and is limited in character. Degenerative processes in the TMJ even without a certain therapy end in about 3 years. The pain is reduced and the joint function somewhat regenerates, the volume of mandibular movements increases, and the creptions become less expressive. However, structural changes in the bone components of the joint are definitive. This stabilized condition is sometimes referred to as osteoarthrosis after the inflammatory process retreated and when pain is no longer present [11, 37, 39, 40, 42–46].

Causes. It is related to the secondary inflammation of the synovial joint membrane and is therefore accompanied by pain. In some patients, the inflammatory process develops as a result of overload of the joint for reasons that are not fully clarified.

Signs and symptoms. The main symptom of osteoarthritis of the TMJ is constant localized pain. In the initial stage of the disease, the pain is very intense, especially during the function, and it calms down at the resting mandibular position. Later the pain is present during the rest, too. The patient wakes up with a stiff joint. When opening and closing the mouth, creptions are present. Cold and wet weather often increases the pain. Due to the pain, the mandibular mobility is limited and its turning on the affected side during mouth opening, as well as the lateral movement restriction on the opposite side are noticeable. The area of the joint is painfully sensitive to palpation, and pain occurs at each joint load. A swelling is often present in the joint area, especially if trauma is one of the etiologic factors. Myalgia and spasm of masticatory muscles usually accompany osteoarthritis of the TMJ and are part of the protective mechanism. Muscular response can also be due to CNS irritation by deep pain and inflammation of the joint [11, 12, 37, 39, 40, 42, 43].

Changes in TMJ in lateral phases of disease can be observed on radiographic images, especially on the articular surfaces of the condyle in the form of the flattened surface, the presence of osteophytes, the cystic formation in the subchondral bone and the reduction of the joint space [12, 44].

Therapy. Initially therapy should be focused on treating the patient about the behavior in the acute phase of the disease. The course of the disease is of limited character (self-limiting) and the various models of therapy are mainly focused on the reduction of pain and the stimulation of the repair processes.

The patient needs to take soft, almost fluid food; to avoid any function during the painful stages of the disease. Antirheumatics, NSAID, naproxen (Naprosyn) 500 mg two times per day for minimum of 3 weeks [11] or combination anxiolytic agent diazepam (Valium) 2.5 mg four times per day for 1 week than 5 mg four times per day for 2 weeks to and NSAID Ibuprofen 600 mg four times per day for 3 weeks are prescribed to reduce the pain and inflammation of the joints. The use of muscle relaxants cyclobenzaprine (Flexeril) 10 mg every night or sedatives clonazepam (Klonopin) 0.25 mg every night, increased by 0.25 each week to a maximum of 1 mg per day in patients with muscular spasms is suggested. Corticosteroid injections (methylprednisolone 5–20 mg with 0.5 ml local anesthetic using 23–27 gauge, 0.5–1 inch needle) help in cases of intense pain [11, 12, 37, 39, 40, 44]. Since mechanical overload of the joint is the main cause of osteoarthritis, it is recommended to use a stabilizing splint during the night and, preferably, 1–2 hours during the day for 6–8 weeks [12]. If the pain is unbearable, if it does not decrease after the above mentioned treatment, the possibility of surgery is considered.

4.2.2 Osteoarthrosis of the TMJ

Osteoarthrosis is a non-inflammatory degenerative process that changes the morphology of joint components and mainly affects the articular surfaces of the TMJ and the subchondral bone. When bony changes are active, the condition is called osteoarthritis. As remodeling occurs the condition can become stable, yet the bony morphology remains altered [12, 45, 46].

Pathogenesis. Fibrocartilaginous overlay loses high-elastic properties and therefore the load is transmitted directly to the subchondral bone. As the degenerative process progresses, enhanced osteoclastic activity can lead to the thinning and perforation of the articular cortex on condyle. In addition, cystic formations in the medullar areas of the subcortical bone of the condyle are developed. After the decay of the fibrocartilaginous overlay, the subchondral bone remains without cover and there is generalized erosion of the condyle surface and changes in its surface. The proliferation of bone tissue at the edges of the condyle results in the formation of osteophyte.

Causes. It is the most common consequence of the long-term non-physiological load of the joint surfaces. Repeated strong pressure on the TMJ structure results in degeneration of fibrocartilaginous tissue covering the condyles. Osteoarthrosis of TMJ may arise secondary as a consequence of disc displacement, or as the loss of the amortizing function of the articular disc. However, osteoarthrosis may also be due to mechanical overload of the joint, when it occurs before the disc displacement. Since changes in articular joint surfaces can lead to degenerative changes in the disc, in some cases disc displacement may be the result of osteoarthrosis rather than its cause [12, 45–47].

Signs and symptoms. Osteoarthrosis is characterized by the absence of painful sensitivity to joint palpitation. The mobility of the mandible is, however, limited by turning on the affected side during mouth opening. Crepitations (multiple scarring sign), caused by changes in the joint surfaces, are usually presented at the opening and closing of the mouth and are much more expressive in the late stages

of the disease [12, 45–47]. In addition to the clinical examination, radiography that provides data on structural changes in the subcortical bone of the condyle confirms the diagnosis of osteoarthritis [8–10].

Therapy. In the absence of pain, osteoarthritis represents a stable adaptive phase, no special therapy is indicated. However, if the changes in the joint surfaces are so severe that they change the occlusal relationships, an occlusal therapy that will stabilize occlusion is desirable [12, 45–47].

4.2.3 Polyarthritis

Systemic polyarthritis can also involve the TMJ. The clinical picture is similar to that of localized osteoarthritis of TMJ.

Pathogenesis. Diseases are manifested by degenerative changes in the fibro-cartilaginous cover of condyle and subchondral bone, and inflammation of the joint capsule and synovial membrane. Changes in TM joints begin on the periphery of a nonspecific inflammatory process leading to degeneration of synovial tissue. Hypertrophic synovial tissue fills the synovial spaces, disabling normal functioning of the joints, followed by pain. Enzymes released from synovial tissue lead to destruction and erosion of bone structures of condyles and temporal bone. Over time, these processes cause fibrous ankylosis of the joint followed by occlusofacial deformities.

Causes. In the category of polyarthritis, many diseases of different etiologies are included: rheumatoid arthritis, juvenile rheumatoid arthritis, psoriatic arthritis, Lyme disease, infectious arthritis, ankylosing spondylitis as well as metabolic disorders, hyperuricemia [12, 45–48]. In the case of polyarthritis, both TMJ are affected.

Signs and symptoms. The acute stage of the disease is characterized by the pain and sensitivity of the TMJ on palpation. Other inflammatory signs, such as the swelling, redness in the joint area, increased temperature and, of course, limited functions may be present. There are often crepitations. Symptoms usually occur with parafunctions, strong chewing, and sometimes during normal function. Expressed degenerative changes in condyles that accompany rheumatoid arthritis may result in displacement of the condylar attachments up and down, within the fossa articularis, resulting in acute occlusion disorders. This is manifested by a repositioning of mandible and occlusal contacts only in the area of the last molars. The radiographic finding usually indicates strong destructive changes in the bone structure of the joints, starting from irregular bone erosion to severe and complete destructions of the condyle. Flatness of articular eminence and other changes in bone structure of fossa articularis are also often present.

Therapy. Since the TMJ disorder is secondary, it is important to establish a proper diagnosis of the systemic illness and treat it. Definitive diagnosis is based on laboratory tests, anamnestic data and physical examination. If the condition of the organism as a result of general therapy improves, signs and symptoms of the TMJ diseases can also be withdrawn.

Therapy of TMJ disease in these cases is palliative. It is recommended to rest the joints, take antiflogistics, analgesics and sedatives to relieve pain. The most common recommended drugs are NSAID, naproxen (Naprosyn) 500 mg two times per day for minimum of 3 weeks [11] or combination anxiolytic agent diazepam (Valium) 2.5 mg four times per day for 1 week than 5 mg four times per day for 2 weeks to and NSAID Ibuprofen 600 mg four times per day minimum for 3 weeks. In some patients, treatment may be attempted by stabilization occlusal split during the night for several weeks, which significantly reduces muscle hyperactivity, which relieves pain. Although there is an obvious occlusion instability, the use of irreversible occlusal therapy should be considered well and, of course, do not undertake anything to relieve the underlying disease and eliminate the inflammation in TM joints.

If occlusal therapy is necessary because of the occlusion stabilization, the position of the condyle in relation to the articular eminence should be well analyzed. In cases of extreme damage of the TM joints and complete occlusion disorders, orthognathic surgery is indicated [12, 45–48].

5. Ankylosis of the TMJ

Ankylosis is defined as immobilization or concretion of the joint structures, caused by degenerative diseases, hemarthrosis secondary to joint injuries or surgical interventions. Inability or restriction of movement in the TMJ may be caused by fibrosis or bone tissue, which is less frequent [49, 50].

5.1 Fibrosis ankylosis

Hyperplasia of the fibrous tissue in the joint can lead to the ankylosis of the condyle, disc or retrodiscal tissue for the posterior wall of the joint capsule, articular fossa or the articular eminence.

Causes. The most common cause of fibrous ankylosis of the TM joint is hematoma resulting from trauma. Ankylosis can also occur as a result of extensive synovitis, but also as a result of surgical intervention. Adhesions inside the joint can also cause fibrosis ankylosis. They are usually a result of long-term load of the joint structures, for example in people with parafunctional activities. In such situations, normal lubrication of the joint surfaces is reduced, resulting in intermittent disc adhesion on the articular eminence. In this stage, the adhesions are relatively easily removed by condyle movement (mouth opening exercises). However, if their maturation is allowed, fibrous tissue hyperplasia may occur which leads to permanent fixation of the articular surfaces. Although most of the adhesions occur in the upper joint space, between the disc and the articular eminence, the adhesion is also noticeable in the lower joint space, between the disc and the condyle. Arthroscopic finding indicates that pathological adhesions are most commonly found in the lateral third of the joint. This condition is referred to as “lateral blockade syndrome”.

Fibrosis may also occupy the joint capsule (capsular fibrosis), forming the binder fibers of the fibrous tissue inside the capsule, and may also cause general capsular thickening. This condition is characterized by a painless limitation of the mandible movement on the opposite side.

Signs and symptoms. If the disc is fixed for fossa or articular eminence, there is limited translation of condyle-disc complex. Mouth opening is limited. During the opening, mandible turns to the affected side, and the lateral movements are limited on the opposite side. If there is pain, it is variable, and it is caused by tightening of discal ligaments. The limitations of the mandibular movement caused by fibrotic ankylosis should be distinguished from the restriction of motion caused by anterior disc displacement without reduction because these two conditions require different therapies. Arthroscopy, arthrography and MR that indicate the condition of soft joint tissues can greatly assist in differential diagnostics [8–10].

Therapy. Treatment depends on the presence of pain and degree of dysfunction. If the patient has a satisfying function with little discomfort, treatment is not necessary. If the condition, however, is unbearable with pain and drastic reduction of function, the choice treatment is arthroscopic surgery and subsequent physical therapy. When there is a significantly reduced opening of the mouth, the method of choice is open joint surgery, which involves removing entire fibrous tissue and primary reconstruction of the joint [49].

5.2 Bone ankylosis

Causes. This condition is caused by the proliferation of bone tissue, which results in the concretion of the bone structure of the joint and its complete immobilization. It can be distinguished as a result of infection, fracture, or chronic inflammatory process in the joint [50].

Signs and symptoms. Clinically, the condition is very similar to fibrous ankylosis. The movements of the mandible are almost completely blocked, with the turning of chin center on the affected side when trying to open the mouth. Lateral movements on the opposite side are practically limited. Native radiography provides the best data on the size and location of the bond between the articular surfaces. Bone ankylosis, as well as fibrosis, is usually not accompanied by pain.

In a clinical finding, one-sided ankylosis is dominated by a poorer development of the affected side—the middle of the chin and the bite center are moved to that side. In the case of bilateral ankylosis, there is a so-called “bird’s face” appearance. The lower jaw is generally undeveloped. Due to the inability to open the mouth, hygiene is usually poor, with a consequent set of teeth caries [50].

Therapy. Treatment depends on the condition in each case and the degree of dysfunction, as this ankylosis type is usually not followed by pain. In patients with severe dysfunction, the only treatment that can give good results is surgical removal of bone attachment and formation of new articular surfaces. Both fibrosis and bone ankylosis are most often followed by contractures of mandibular elevators, which must be taken into account within the overall therapy program [50].

6. Conclusion

The signs and symptoms of disease and dysfunction of TMJ are different in various disease groups and depend on the duration of the disease and its chronicity and as well as on the individual sensitivity of the patient. Proper identification of symptoms and precise diagnosis are therefore essential for future treatment.

Conflict of interest declaration

I confirm that there is no conflict of interest.

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