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ANATOMICAL AND FUNCTIONAL FEATURES OF THE TEMPOROMANDIBULAR JOINT

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Abstract:

The article describes the current views on the structures of the temporomandibular joint, its biomechanics; it also describes temporomandibular disorders (TMD), methods of their diagnostics and treatment approaches.

Keywords: *Temporomandibular joint, masticatory muscles, intra-articular disc, TMJ dysfunction.*

Introduction

The temporomandibular joint (TMJ) differs significantly in structure and function from other human joints. In this joint, throughout life, there are constant movements of the parts that make up it, not only during meals and conversation, but also when emotions are reflected on the face, swallowing saliva, tongue movement, muscle tension.

The articular surfaces of the TMJ are the head of the mandible, and the mandibular fossa, the temporal bone. According to its structure, it belongs to diarthrotic or synovial joints, the heads located on both sides of the lower jaw perform movements simultaneously, each of the joints includes a complex of anatomical formations: the head of the lower jaw, the mandibular fossa and the articular tubercle of the temporal bone, the articular disc, capsule, ligaments and muscles (1,3) Incongruence (discrepancy in the size of the articular surfaces) of the mandibular fossa and the head of the mandible creates instability of intra-articular relationships, the complete dependence of these relationships on the closure of the dentition and the state of the masticatory muscles.

The incongruence of the mandibular fossa and the head of the mandible is eliminated by the fact that the articular disc (discus articularis), located in the form of a biconcave plate between the articular surfaces, repeats the shape of the head with the lower part, and the mandibular fossa with the upper part. The back of the disc is at 12 o'clock, if the semicircle of the head of the lower jaw is represented as the upper part of the dial. The articular disc has an anterior and posterior thickening

(poles) and consists of dense fibrous connective tissue similar to cartilage and containing cartilage cells, and has an oval structure in the form of a biconcave lens (Figure 1) (4)

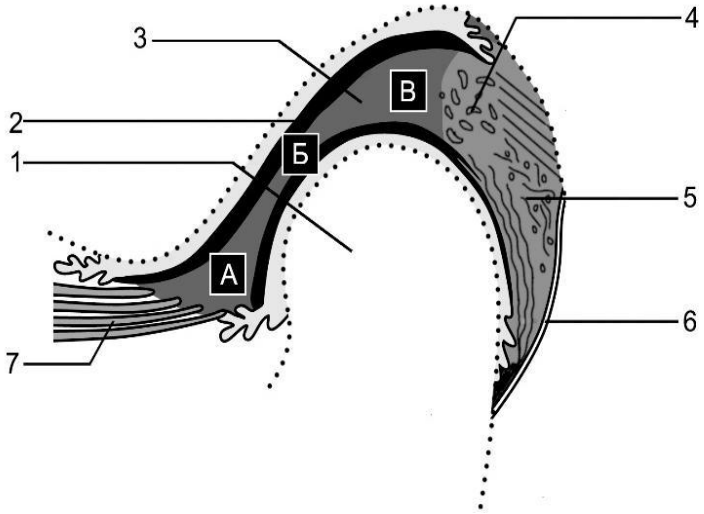

Figure 1 – Anatomy of the temporomandibular joint.

1 – the head of the lower jaw; 2 – the mandibular fossa of the temporal bone; 3 – the articular disc (A – the base (leg) of the articular disc; B — the thin non—blood-supplied part of the disc; C - the posterior thickened part of the disc), 4 - the bilaminar zone (the posterior cushion); 5 – loose connective tissue, vessels and nerves; 6 – the capsule of the joint; 7 - the upper part of the lateral pterygoid muscle.

The middle part of the disc is the thinnest (on average, up to 1.2 mm). It is believed that the rear part of the disk is thicker than its other parts (on average, up to 3.5 mm), although there is no consensus about the thickness of the front part of the disk. There is evidence in the literature that it is either equal to, or slightly more voluminous, but approximately equal in height to the back of the disc (4, 6)

The posterior part of the articular disc continues into the connective tissue laminar zone connecting the posterior part of the fossa and the posterior part of the articular area of the head. The articular disc is fused with the joint capsule throughout and divides the joint cavity into two non-communicating sections: upper and lower. In adults, the volume of the upper part does not exceed 1 - 1.5 ml, the lower - 0.5—0.8 ml (4.6)

The upper and lower cavities of the joint contain synovial fluid. The division of the joint cavity into two sections creates great compensatory possibilities. Significant restriction of movements in the joint occurs only with severe lesions accompanied by destruction of the disc. If only one part of the joint is affected, there is always the possibility of movement in another part of the joint. With closed teeth, the articular disc is located like a cap above the surface of the head of the woofer.

The tendons of the upper head of the lateral pterygoid muscle and the anterior part of the TMJ capsule are attached to the anterior edge of the disc. Blood vessels are present only in the anterior and posterior parts of the disc, the intermediate zone is powered by tissue fluid and lymph. Elastic bundles of ligaments run from the upper surface of the disc to the mandibular fossa, and thick fibrous connective tissue runs from the lower one. The upper elastic ligaments return the disc back when it is moved anteriorly, and the lower coarse ones help to keep it from anteriorly shifting.

In the posterior part of the joint between the bag and the posterior pole of the disc there is a loose connective tissue in the form of a trapezoid, the base of which is located at the bag, the top is at the articular disc. This anatomical formation was called the "posterior cushion", or the bilaminar zone, which was already mentioned when describing the articular disc. In some types of TMJ pathology,

the injury of the "rear cushion" of the posteriorly displaced head of the lower jaw leads to malnutrition and degeneration of articular tissues.

The ligaments of the temporomandibular joint can be divided into three groups: intracapsular ligaments, extracapsular ligaments and ligaments related to this joint, but not related to the articular bag. The intracapsular ones include two pairs of ligaments. One pair from the front and back strengthens the disc to the temporal bone, the other pair of ligaments also consists of fibers adjacent to the capsule of the joint from the inside, but they pass from the lateral edges of the disc to the lateral surfaces of the neck of the condylar process of the lower jaw. Extracapsular ligaments: lateral (temporomandibular) - the ligament is located laterally outside the articular bag and is the only articular ligament proper, as well as the wedge-mandibular and awl-mandibular (additional ligaments).

It should be borne in mind that the TMJ ligaments consist of fibrous inelastic connective tissue, therefore, after overstretching, their original length is not restored. And this is one of the main etiological factors of the development of internal TMJ disorders, Since both TMJ represent a single kinematic system and work synchronously, therefore, the development of a pathological process in one joint, as a rule, leads to a malfunction in the other TMJ (4)

The peculiarities of the TMJ structure make it possible to move the lower jaw in three planes: vertical, sagittal and horizontal (up, down, forward, backward and to the sides). The combination of these three main types of movements allows the lower jaw to occupy a variety of positions. Any muscle attached to the lower jaw can produce movement in the joint. The effective axis of movements around the head and the articular tubercle is located in the area of the mandibular opening. Therefore, this part of the lower jaw remains relatively inactive even with the full volume of movements of the lower jaw, and the neurovascular bundle is not injured even with its maximum movements.

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The position of the lower jaw, and, consequently, the head of the lower jaw, depends on the coordinated work of the masticatory muscles. The effective strength of the synergistic muscles is directed in such a way that the main load during chewing movements falls on the dentition and periodontal. The joint does not experience significant loads during normal operation. It should be noted that, in addition to the muscles listed above, the muscles of the neck (sternocleidomastoid, trapezoidal and occipital) and pharyngeal muscles take part in the movement of the lower jaw. These muscles change the shape and position of the tongue, pharynx, larynx, shift the lower jaw posteriorly and strain when moving the lower jaw forward.

When opening the mouth, the chin protrusion of the lower jaw moves downward and somewhat posteriorly, describing an arc facing concavity posteriorly and upward. In this movement, from the closing of the teeth to the maximum lowering of the lower jaw, three phases can be distinguished. In the first phase, at the beginning of opening the mouth, movement around the frontal axis occurs in the lower floor of the joint, the articular disc remains in the mandibular fossa. In the second phase, with a significant lowering of the lower jaw, simultaneously with the continuing rotational movement of the heads of the lower jaw in the lower floor of the joint, the articular disc together

with the head of the lower jaw slides forward and down the posterior slope of the articular tubercle and exits onto the articular tubercle.

The condyle of the mandible moves anteriorly by about 12 mm, and in some cases by 2 cm relative to the temporal bone. In the upper part there are mainly translational movements of the head of the lower jaw and the sliding of the disc along the slope of the articular tubercle, and in the lower part there are rotational movements of the head around the horizontal axis. The described movements occur simultaneously, the head of the lower jaw drags the disc with it, and this leads to pronounced changes in the configuration of both parts of the joint cavity. The disc is held between the condyle process and the articular surface of the temporal bone by means of intra-articular ligaments, the upper head of the lateral pterygoid muscle and the connective tissue bilaminar zone.

In the third phase, with the maximum opening of the mouth, movement occurs only in the lower floor of the joint around the frontal axis. The articular disc b is located on the articular tubercle. When closing the mouth, the considered stages of movement when lowering the lower jaw are carried out during movements of the lower jaw with coordinated muscle work, which is coordinated by the central nervous system, which receives information from the receptor apparatus of the entire complex of tissues related to the movements of the lower jaw, including the articular bag, articular ligaments, muscles and periodontal.

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