

The temporomandibular joint: from classical anatomy to modern functional assessments

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The temporomandibular joint (TMJ) is a complex synovial articulation, made by the mandibular condyles and the squamous surface of temporal bones. The skeletal surfaces are highly incongruent and are separated by a fibrous disc, that reduces joint incongruence, increases joint stability, and allows mandibular movements with six degrees-of-freedom. In mammals, TMJ characteristics are so unique that are used to define the class Mammalia. TMJ development is strictly related to that of the middle ear, and it represents a complex modification of a phylogenetically older articulation found in non-mammalian vertebrates [1]. In particular, human TMJ possesses several differences from that of the other mammals, and animal models cannot be easily used to investigate its dynamic and kinematic characteristics. Several hypotheses have been proposed to describe TMJ movements and intra-articular force, but a major limitation lies in the difficulty in the actual assessment of condylar movements. Indeed, no current imaging system can provide a complete three-dimensional evaluation of TMJ motion: conventional radiographic images lack the third dimension and cannot inform about the behaviour of soft tissues; CT provides all three spatial planes but still cannot image the disc and related structures; magnetic resonance (MR), while providing adequate details of soft tissue structures, lacks the necessary dynamic information. Therefore, most of these studies are based on biomechanical models, where TMJ motion is recorded with three-dimensional motion analyzers, and mathematical and geometrical calculations provide the necessary background for the hypotheses about joint mechanical behaviour [2].

References

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Key words

Temporomandibular joint, phylogenesis, motion analysis.