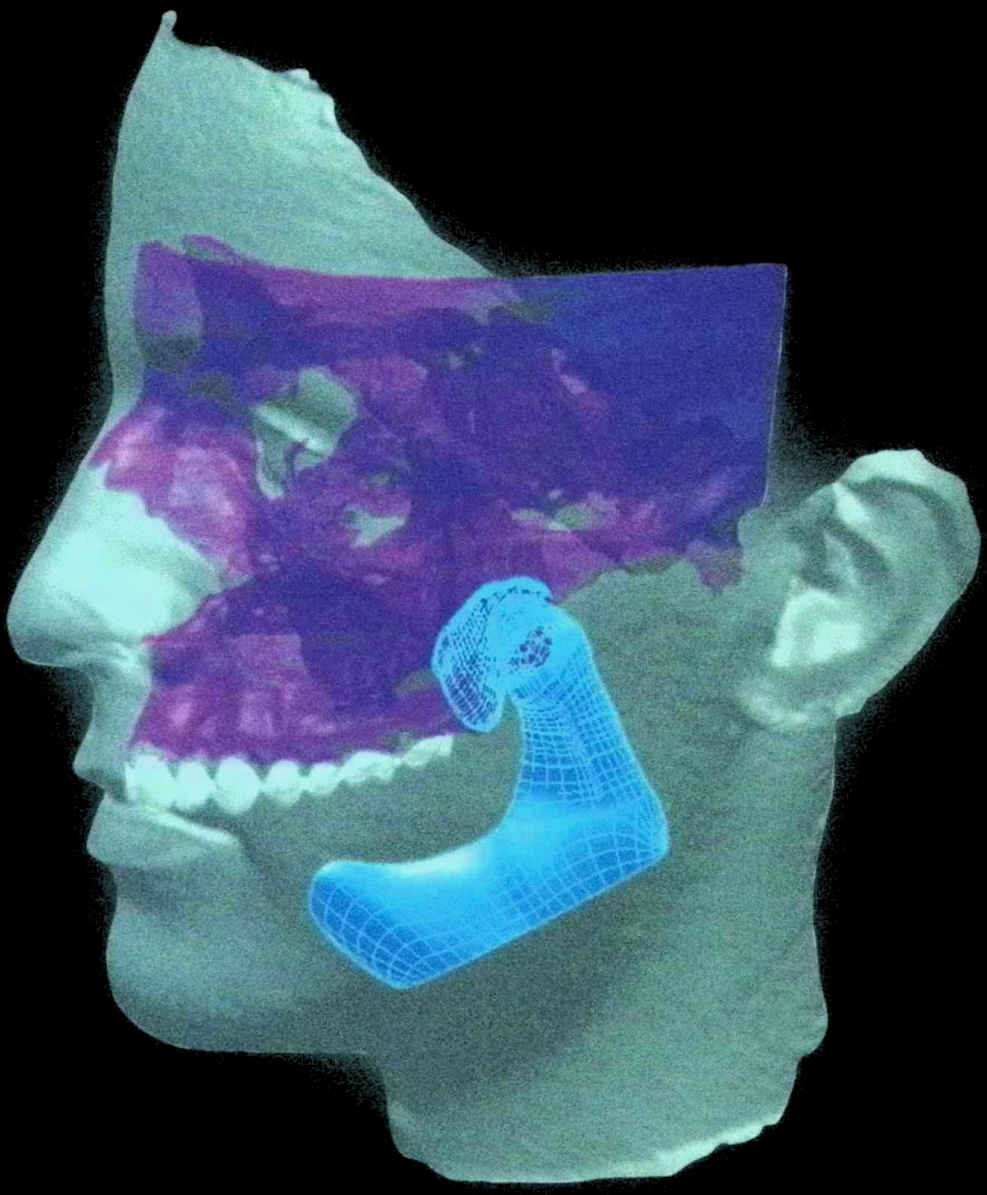
Daniele Manfredini

Current Concepts on Temporomandibular Disorders



QUINTESSENCE PUBLISHING

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QUINTESSENCE PUBLISHING

London, Berlin, Chicago, Tokyo, Barcelona, Istanbul, Milan, Moscow,
New Delhi, Paris, Beijing, Prague, São Paulo, Seoul and Warsaw

British Library Cataloguing in Publication Data

Current concepts on temporomandibular disorders.
1. Temporomandibular joint--Diseases--Diagnosis.
2. Temporomandibular joint--Diseases--Treatment.
3. Temporomandibular joint--Pathophysiology.
I. Manfredini, Daniele.

617.6'43-dc22

ISBN-13: 9781850971993



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Printing and Binding: Elbe Druckerei Wittenberg

ISBN: 978-1-85097-199-3

Printed in Germany

Preface

When the idea to bring together some of the most renowned experts in the field to give form to a work on the state-of-the-art knowledge of temporomandibular disorders (TMD) came to my mind, I was inspired to pursue that dream. But then I realized how difficult a task I was undertaking and doubts started to cloud my mind.

Classically, the TMD field has been characterized by a paradigmatic contrast between the guidelines provided by the scientific community and beliefs of clinical practitioners, who still look at dental occlusion as the main etiopathogenetic factor and the primary therapeutic target. The ambitious aim of this work is to keep on seeking a synthesis between these two cultures, as has already been attempted by some other recent textbooks on this subject. So the focus of all the contibutors has been on the need to present scientifically sound information in a clinically useful manner.

This book will probably be one of the last in which the term "temporomandibular disorders" is used, since terminological specifications will hopefully be introduced in the near future, as soon as there is an improvement in knowledge about the pathophysiology of these disorders. Indeed, the absence of a validated pathophysiological model for many TMD symptoms has led to the adoption of this generic term to group together signs and symptoms with different etiopathogenesis and, more importantly, to adopt a symptomatic and common approach towards the management of diseases of the temporomandibular joint and muscles. For this reason, the part of the book dedicated to etiology of TMD is the only one in which specific chapters are devoted to the supposedly different groups of disorders, namely muscle disorders, disc displacements, and arthrosis/arthritis. The parts on diagnosis and management reflect the current view that the approach to TMD patients is seldom different for joint and muscle symptoms, to the point that only a minority of treatment modalities are exclusively indicated for a specific disorder.

Along with this underlying premise, the main thrust of the book is the medically based view of TMD, which cannot be considered pertinent to the dental profession alone.

All the chapters reflect the considerable efforts of the contributors to capture the reader's attention without abandoning their roles as academicians, scientists, and researchers. I have learnt that the greatest personalities are also the most modest ones, and this adventure has confirmed this for me. I have had the honor to work with 45 outstanding world-renowned authors in the TMD and orofacial pain field, and none of them has ever refused to exchange opinions, accept advice, or provide suggestions. To all of them I give my most grateful thanks for agreeing to be part of this project, one of the most exciting of my professional career to date.

Together we hope that our efforts will be appreciated by the heterogeneous community of TMD readers and practitioners.

To Debora, Aurora, Giacomo

Love, Life, Smile

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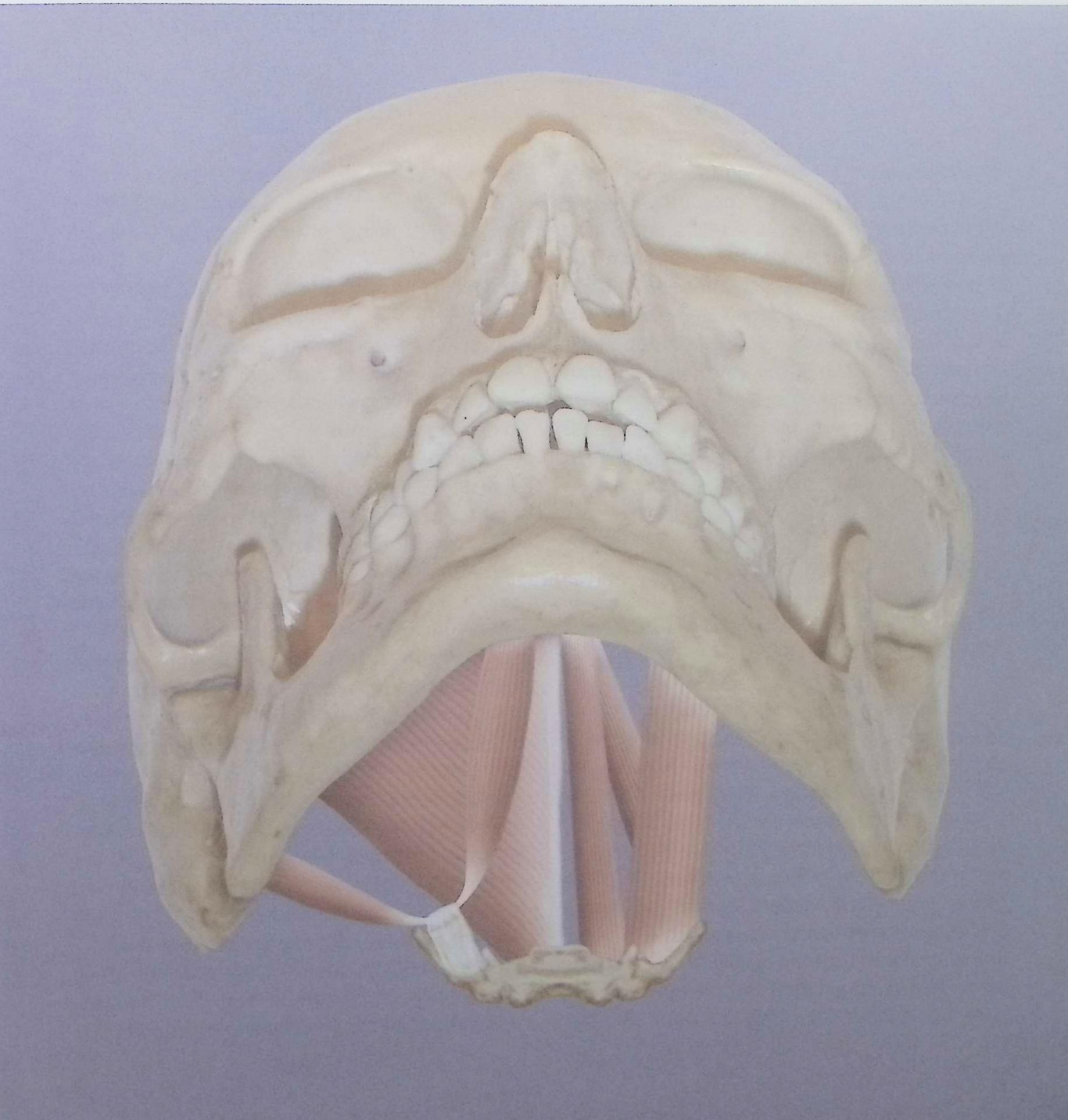
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Part I
Fundamentals



Chapter 1

Anatomy of the Temporomandibular Joint and Masticatory Muscles

Ambrosio Bermejo-Fenoll

A full understanding of the disorders discussed in this book requires a brief description of the stomatognathic system, to which they are related.

"Stoma" is the Greek word for "mouth",[1] and the temporomandibular joint (TMJ), the masticatory muscles, and the dento-periodontal complex are the three closely interrelated components of the stomatognathic system.[2] These three elements, in turn, are related to the central nervous system and are influenced by a number of both direct and indirect factors, the foremost of which are psychosocial factors. These factors have a major role in the occurrence and perception of pathologies of the stomatognathic system.

The "stomatognathic system" may be defined as the combination of structures that are involved in: the production of speech; the reception, chewing, and swallowing of food; and other non-functional activities of these structures.[3]

The most recent definition of the stomatognathic system was given in 2008 by the American Academy of Orofacial Pain: "the functional and anatomic relationships among the teeth, jaws, TMJs, and muscles of mastication".[4]

Thus, considering that the signs and symptoms affecting the TMJ and masticatory muscles are the focus of this book, this chapter will provide an overview of the basic anatomic structures involved in the clinical manifestations of temporomandibular disorders. In addition, some of the author's contributions relating to new concepts about functional anatomy of the TMJ are also mentioned at the end of the chapter. A conscious decision has been taken not to describe extensively the so-called functional anatomy of the stomatognathic system here, as there are several comprehensive textbooks available that cover this issue, and readers are referred to those for more details on this topic.[5,6]

General Aspects and Types of Joint

A widely accepted definition of a joint is that it is the joining of two or more bony or cartilaginous elements,[7] even though sometimes the term is used with a broader meaning, ie the joining point of two or more parts.[8]

Joints are divided into three groups (Box 1-1):[9] fibrous joints, if the joint surfaces are joined by fibrous tissue; cartilaginous joints, when the surfaces are joined by cartilage; and synovial joints or diarthroses, which offer the greatest degree of mobility. Synovial joints typically consist of two joint surfaces (of bone

Box 1-1 Classification of joints

Fibrous	
Cartilaginous	
Synovial or diarthroses:	
Flat or arthrodial Trochoid Trochlear	allow movement in one axis
Reciprocal	allows movement in two axes
Condylar Spheroidal or enarthrosis	allow movement in three axes

or cartilage), a capsule, and a synovial membrane.

Synovial joints can further be classified into different categories according to their degree of mobility. Those that allow uniaxial movement: the trochoid and trochlear joints; those that allow movement in two axes: reciprocal joints; and those that allow movement in three axes: condylar and spheroidal joints. Articulations between flat surfaces are referred to as flat or arthrodial joints; their movements are very limited and involve the sliding of one surface over the other.

The Temporomandibular Joint

Classically, the mandible has been considered to be joined to the skull by means of two synergically acting joints: the right and left TMJs. Both of these joints are condylar synovial joints (diarthroses) that enable the characteristic anterior displacement.[10–12] Because of this displacement, the TMJ has been regarded as an atypical joint.[13] Each TMJ is composed of the elements listed in Box 1-2.[7,14–17]

Box 1-2 The temporomandibular joint (TMJ)

The mandible is related to the skull by means of two joints (left and right TMJ) that act synergically.
The TMJ is classically regarded as a "condylar synovial joint with characteristic anterior displacement".
The TMJ consists of:
- Two joint surfaces:
  - Head (also called the mandibular condyle)
  - Mandibular fossa and temporal articular tubercle
- Joint disc with a retrodiscal bilaminar area
- Capsule – this is fused with the disc, dividing the joint space into upper and lower compartments
- Two synovial membranes (one for each joint space)
- Intrinsic and extrinsic ligaments
- Three movement axes: transversal, sagittal, and vertical.

The mandible is a third-order lever.

The Joint Surfaces (Fig. 1-1)

Mandibular Surface

This is composed of the head or condyle of the mandible. It constitutes an ellipsoid measuring 20 × 8 mm in size, with a medial and a lateral pole. Its long axis is oriented obliquely from lateral to medial, and anterior to posterior, forming an angle of 15 to 25 degrees with the transverse plane. The condyle has an anterior surface and a posterior surface, which are separated by a transverse crest or ridge. The joint surface is convex in all directions and is covered by connective tissue – which is not cartilage as in the case of other load-bearing joints. The condyle rests on a narrower portion of the mandibular ramus, known as the neck of the mandible, in the anterior part of which is located the pterygoid fossa, the point of insertion of the inferior belly of the lateral pterygoid muscle.



Fig. 1-1 **a** Articular structures of the mandibular part of the TMJ. **b** Articular structures of the temporal part of the TMJ. **c** Articular structures of the two parts of the TMJ facing each other.

Temporal Surface

The temporal surface has two parts. The posterior part is represented by the mandibular fossa, an ellipsoid depression with a greater transverse axis. The mandibular fossa is further divided into two parts by the fissure of Glaser: an anterior articular part covered with connective tissue, and a posterior non-articular part. The anterior part of the temporal surface of the TMJ is represented by the temporal articular tubercle (transverse root of the zygomatic process). This bony prominence has a cylindrical and convex shape in the anteroposterior direction and is slightly concave from medial to lateral. The surface is covered by connective tissue like the mandibular surface.

Human autopsy studies appear to indicate the existence of geometric interdependency between the orientation of the muscles (which is different in dolichocephalic and brachiocephalic subjects) and joint morphology.[18] Other authors, likewise on the basis of autopsy studies, have found that the relationship between joint morphology and temporomandibular signs and symptoms is complex. Important morphologic alterations may exist in the absence of pain and dysfunction.[19] Other attempts to establish a relationship between temporomandibular signs and symptoms and the morphologic features of the joint structures have failed to record significant differences between patients and healthy volunteers in the angular and linear measurements of the mandibular fossa and temporal joint tubercle.[20]

Lastly, it should be mentioned that pneumatization (generally bilateral) of the joint tubercle may be a finding unrelated to tumor or cystic disease.[21]

Joint Disc (Fig. 1-2, Fig. 1-3)

The joint disc is an elliptical structure composed of dense connective tissue located between the head of the mandible and the mandibular fossa of the temporal bone. Its entire margin is continuous with the joint capsule and divides the joint space into two compartments: upper and lower.

The two joint surfaces of the disc are covered with fibrous connective tissue. The anterosuperior surface is concave anteroposteriorly and slightly convex from medial to lateral. The posteroinferior surface consists of a posterior articular portion that is entirely concave and an anterior portion. The lateral and medial extremities of the disc are joined to the respective poles of the mandibular head by strong connective tissue bands. The posterior edge of the disc is separated into two narrow intracapsular laminas with elastic tissue, one of which is directed upwards and the other downwards. In the posterior portion of this area and between the two laminas, there are blood vessels, lymphatics, and nerves. Fibers from the superior

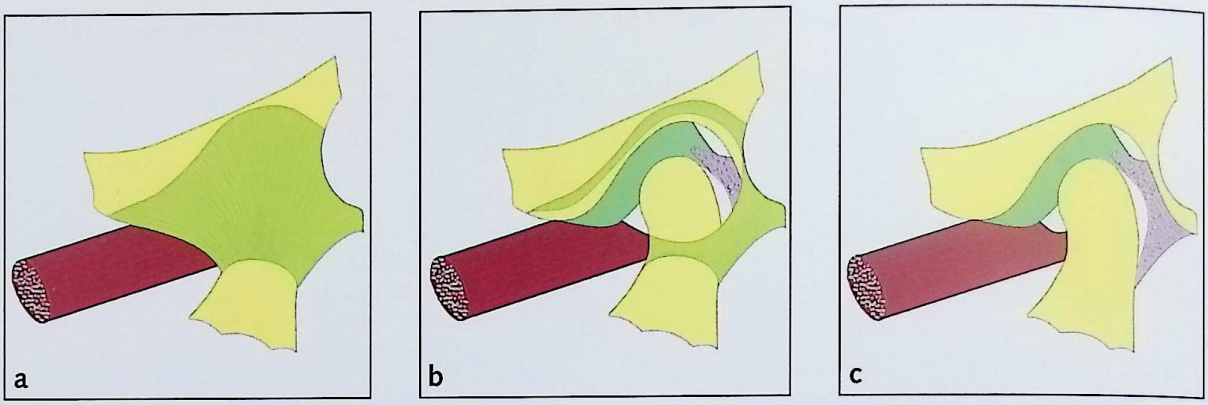


Fig. 1-2 **a** Schematic representation of the TMJ with the whole capsule. **b** The capsule has been cut to show internal structures of the TMJ, including the disc and retrodiscal area. **c** Joint with the capsule removed, except for its most posterior portion.

belly of the lateral pterygoid muscle insert in the anterior edge of the disc.

In general, the disc is on top of the condyle and shaped like a gaucho hat. The anterosuperior joint surface is approximately double the posteroinferior joint surface in size. The different parts of the disc are of different thicknesses. Two thick bands have been identified: an anterior lateromedial band and a somewhat thicker posterior lateromedial band, with a thin intermediate zone between them.

In 1954, Leonard A. Rees published his classic descriptive study of the structure and function of the temporomandibular joint.[22] He performed 12 autopsies and found the joint disc consisted of an anterior band, a thinner intermediate zone, and a posterior band – all converging medially and laterally and inserted via dense collagen tissue into the medial and lateral condylar poles, respectively. Rees also described a posterior thick bilaminar region with an upper portion composed of fibroelastic tissue, inserting in the mandibular fossa and in the squamotympanic fissure, and a barely elastic lower portion, inserting in the posterior region of the condylar neck. These upper and lower fibers of the bilaminar region seem to be well differentiated and extend into the posterior portion of the capsule – the latter being composed of fibers coming directly from the temporal bone to the mandible.

The upper and lower fibers of the bilaminar region described by Rees seem to correspond to what Testut called short fibers of the joint capsule, while those corresponding to the posterior portion of the capsule – extending from the temporal bone to the mandible – seem to be the long fibers of the temporomandibular joint capsule.[23]

Later studies[24] have questioned the existence of the bilaminar zone as described by Rees and attribute scant functional importance to the elastic fibers.

The disc is composed of very dense fibrous tissue that is characterized by collagen fibers distributed in the three spatial planes. In the case of the anterior and posterior bands, the fibers run mainly in a lateromedial direction, while the fibers of the intermediate zone are oriented mainly in an anteroposterior direction.[25] This central portion seems to be structured to resist functional forces.[26] The composition of the disc is between that of cartilage and tendon, with a predominance of type I collagen (85% of global dry weight).[27] Its elastic properties are derived from proteoglycans[28] and traces of type II collagen and elastin.[29] Chondrocytes appear within the disc only in pathologic conditions.[30]

Although the central collagenous zone of the disc is vascularized in the human fetus,[31] it is avascular in the adult but with a richly vascularized peripheral zone.[8]

Electron microscope studies have shown that the central zone consists of superficial folds oriented in the direction of condylar dis-

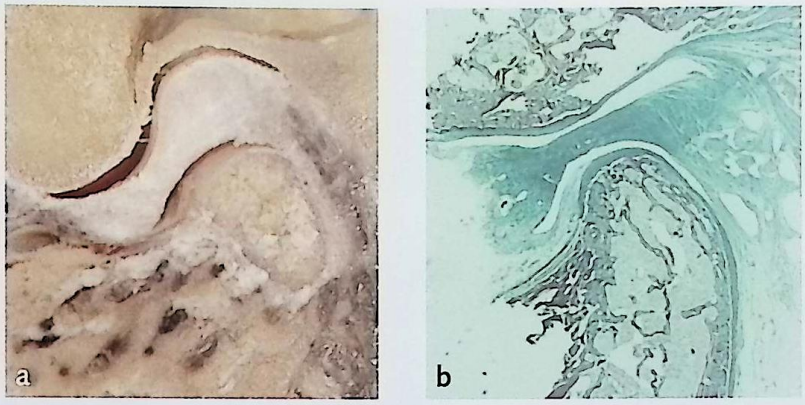


Fig. 1-3 **a** Macroscopic section of the human TMJ. The hard and soft structures are seen. **b** Longitudinal histologic section of the human TMJ (trichromic stain). Two distinct cavities can be seen, each lined by a synovial membrane. Abundant retrodiscal vascular tissue is also seen.

placement; these folds are more regular and narrower on the lower surface.[32]

Recent studies have shown that during function, the lateral area of the disc is subjected to an increased intensity of mechanical forces.[33]

Capsule (Fig. 1-2, Fig. 1-3)

The literature describes a single capsule for each TMJ. The internal surface of the capsule is continuous with the entire edge of the joint disc. The capsule is shaped like an inverted cone, ie with the base located superiorly. Its upper margins insert into the anterior edge of the temporal joint tubercle (the transverse root of the zygomatic process), the base of the sphenoidal spine, the anterior edge of the fissure of Glaser, the longitudinal root of the zygomatic process, and the zygomatic tubercle. Inferiorly, the capsule inserts into the contour of the neck of the mandible: anteriorly above the pterygoid fossa, and, posteriorly, it descends further along the mandibular neck.

The capsule is composed of fibrous fascicles with a more or less vertical distribution: the long fascicles descend from the base of the skull to the neck of the mandible. A series of short fascicles in the more internal portion of the capsule in turn extend from the base of the skull to the joint disc, and from here to the neck of the mandible. Elastic fascicles or bundles also extend from the anterior edge of the fissure of Glaser to the posterior portion of the mandibular neck.

Rees reported[22] that in the anterior portion of the joint the capsule is missing, since fibers from the superior belly of the lateral pterygoid muscle are inserted in the anterior edge of the disc. In this area, the superior and inferior synovial spaces are only covered by the joint between upper and lower portions of the disc. He also reported that in the posterior portion, the capsular tissue closely mingles with the surface tissues of the superior and inferior regions of the bilaminar zone of the disc, extending directly from the temporal bone to the mandible.

Synovial Membranes

The joint possesses one superior and one inferior synovial membrane. The superior membrane, corresponding to the upper joint compartment, is lax. In contrast, the inferior membrane, corresponding to the lower joint compartment, is less lax but extends further behind into the neck of the mandible.

The superior and inferior synovial spaces only intercommunicate when the meniscus is pathologically perforated.

Currently, particular importance is attached to correct lubrication of the joint surfaces in order to avoid dysfunction. Phospholipids are bound to the joint surfaces and hyaluronic acid

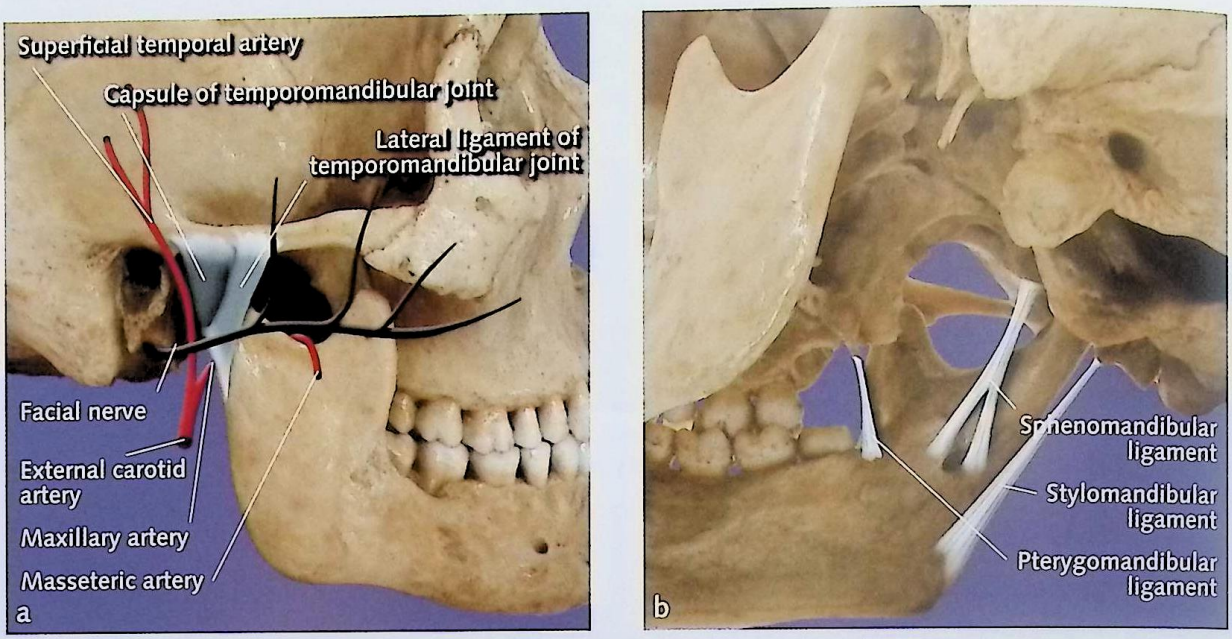


Fig. 1-4 **a** Lateral ligaments of the TMJ and their relations. **b** Extrinsic joint ligaments.

adheres to these phospholipids, protecting the joint surfaces and allowing gentle displacements. The degradation of these lubricating mechanisms may contribute to joint pathology.[34,35]

Ligaments (Fig. 1-4)

No definitive consensus has yet been reached among researchers as to the number, features, and functions of the TMJ ligaments. For the readers' convenience, the ligaments, as commonly described in classic textbooks, are briefly mentioned below.

Intrinsic Ligaments

- **Lateral and Medial Temporomandibular Ligaments.** The short, thick lateral temporomandibular ligament affords important joint reinforcement. It extends from the posterolateral surface of the condyle towards the temporal bone, where it is inserted in the form of two fascicles – posterior and anterior.[10]

The medial temporomandibular ligament, in contrast, is thin and weak. It extends from the posteromedial surface of the condyle to the internal edge of the mandibular fossa and sphenoidal spine.

- **Posterior Temporomandibular Ligament.** In the classic concept of the TMJ, this ligament was regarded as the posterior portion of the joint capsule. It is composed of long fibrous fascicles that may be regarded as connective tissue reinforcements extending from the squamotympanic fissure and its proximities to the posterior and inferior region of the neck of the condyle.

- **Discomalleolar Ligament (Pinto's Ligament).** This ligament affords reinforcement of the posterior region of the TMJ and extends from the posterior edge of the articular disc to the handle of the malleus through the petrotympanic fissure.

Extrinsic Ligaments

These are not true joint ligaments since they have no direct relationship with the joint, but

help to limit the mandibular movements. In some cases, they constitute embryonic remains. The following extrinsic ligaments have been described:[10–12]

- **Pterygomandibular ligament or buccopharyngeal raphe**. This ligament extends from the hamulus to the retromolar area of the mandible.
- **Sphenomandibular ligament**. This ligament forms the posterior portion of the interpterygoid aponeurosis and extends to the malleus via a fascicle that runs through the petrotympanic fissure.
- **Stylomandibular ligament**. This ligament extends from the external edge of the styloid process to the posterior edge of the mandibular angle.

Between 1897 and 1995, some 42 articles were published on ligaments associated with the temporomandibular joint, but still many controversies and unanswered questions remain.[36] The integrity of these ligaments appears to be essential for correct joint function, and disturbances of them often constitute a trigger factor for articular disorders.[37]

The ligaments are mainly passive structures and appear to play a predominant role during function only at the limits of mandibular movement.[38]

The discomalleolar ligament, which is not currently included in the international anatomic nomenclature, has merited special attention among investigators in recent years.[39] In many cases this ligament has demonstrated to be active in relation to malleolar movement.[40,41] This might explain the relationship between temporomandibular disorders and otological symptoms.

Blood supply

The blood supply of the TMJ is provided by the internal carotid artery through its posterior auricular, ascending pharyngeal, and superficial temporal branches, and by the internal maxillary artery through its middle meningeal, middle deep temporal, and tympanic branches.[10,42]

Innervation

The nerve supply of the TMJ originates from the mandibular nerve (the third division of the trigeminal nerve), the masseteric branch of the temporomasseteric nerve, and the auriculotemporal nerve.[11,42]

Anatomical Relationships (Fig. 1-4a, Fig. 1-5)

Each TMJ is related to the branches of the maxillary artery and internal carotid artery, and to the auriculotemporal, masseteric, and tympanic cord nerves.[10,17]

The relationship of the TMJ with the tympanic cord should be examined in order to understand certain symptoms and signs that are sometimes found in temporomandibular disorders. The tympanic cord is an anastomosis between the facial nerve and the lingual nerve, and is related to retrodiscal structures. It carries vegetative fibers that innervate the submandibular and sublingual glands, as well as sensory taste fibers.

Embryology

The formation of the TMJ starts in two different blastemas:[8,43–46] a temporal blastema and a condylar blastema, which are well differentiated. The condylar blastema develops towards the eighth week of intrauterine life. A concentration of mesenchymal cells appears in the most dorsal and final area of the mandible. These cells proliferate and form the condylar cartilage. The temporal blastema likewise develops around the eighth week in utero, giving rise to the temporal component of the joint. Between the two blastemas, through the condensation of cells related with the lateral pterygoid muscle, the development of the future

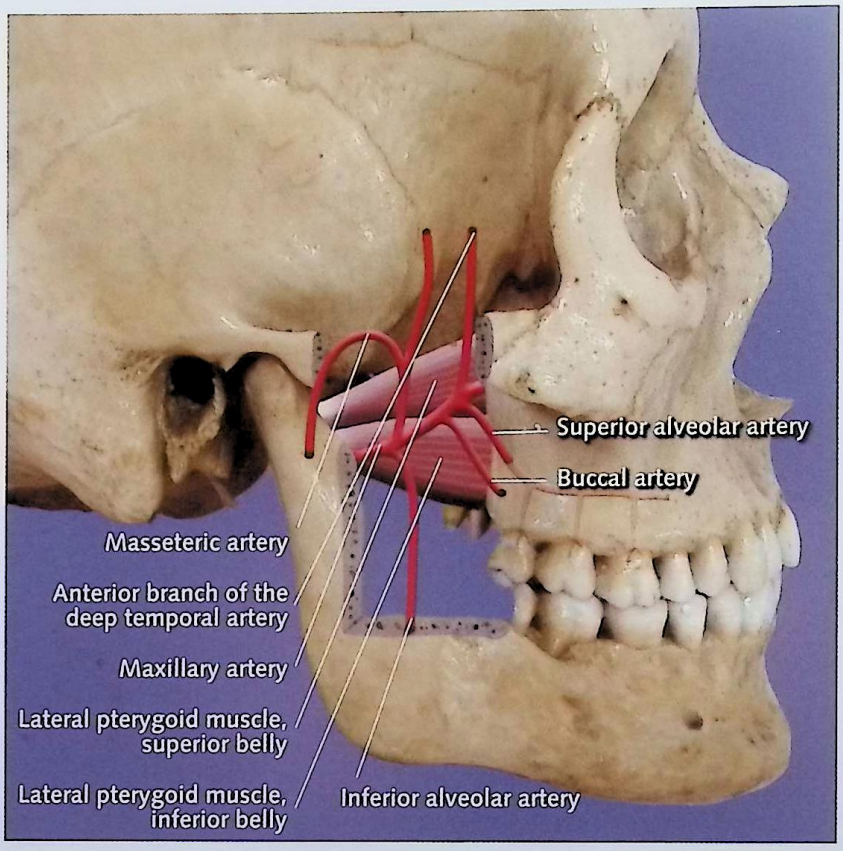


Fig. 1-5 Lateral pterygoid muscle and arterial relationships.

joint disc begins. Around the twelfth week in utero, all these structures are closely related, and maturation phenomena start to occur, first giving rise to the lower joint space and, posteriorly, to the upper joint space. A clear distinction between the two blastemas results from their ossification. Thus, the condylar blastema undergoes intramembranous ossification, while the temporal blastema undergoes endochondral ossification in the joint tubercle and intramembranous ossification in the anterior and posterior regions of the temporal bone.

At 16 weeks of intrauterine development, the disc maturation and structural strengthening processes are complete.[47]

Mandibular Axes and Movements

According to the classical descriptions,[48] the movements of the mandible are: opening and closing, protrusion and retrusion, and lateral shifts. These movements take place in three axes in relation to the base of the skull: a sagittal axis, a transverse axis, and a vertical axis. These axes are known as instantaneous movement axes, which means that they displace with each condylar movement (Fig. 1-6a).[49]

In addition, the mandible shows Bennet movements, which consist of slight lateral displacement with respect to the skull base.[50]

The result of the condylar movements are the so-called mass movements of the mandible. Each mandibular or dental point moves through a given volume with its movement. Figure 1-6b shows the volume known as a Posselt figure, which is the volume of the figure traced by the point located at the lower interincisal edge,[51] whereas Figure 1-7 shows the sequence of joint movements.

The lateral movements appear to be limited by the ligaments, while the maximum opening is influenced by the masticatory muscles.[52]

The described axes have been questioned on several occasions. Thus, instead of the intercondylar transverse axis, several axes have

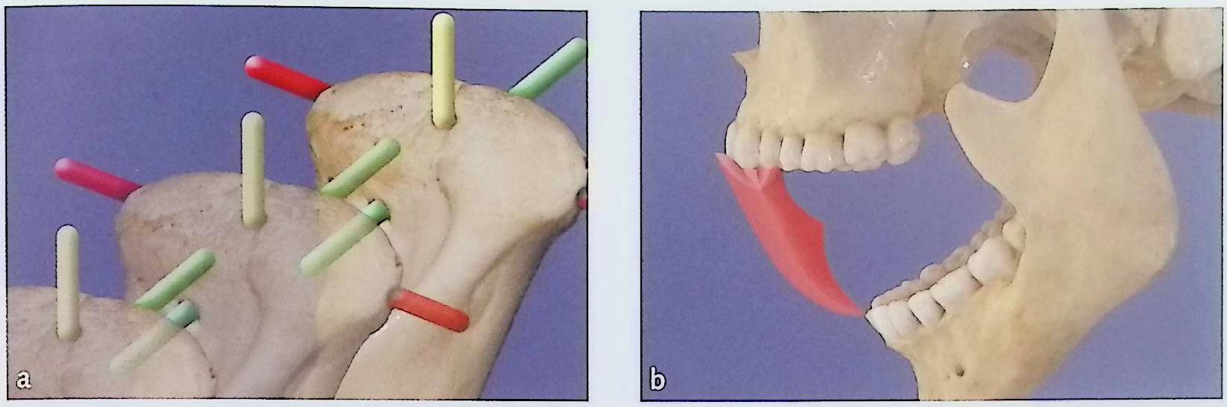


Fig. 1-6 **a** Longitudinal (green), transverse (red), and vertical (yellow) axes: these axes are displaced with movements of the condyle. **b** Posselt's banana.

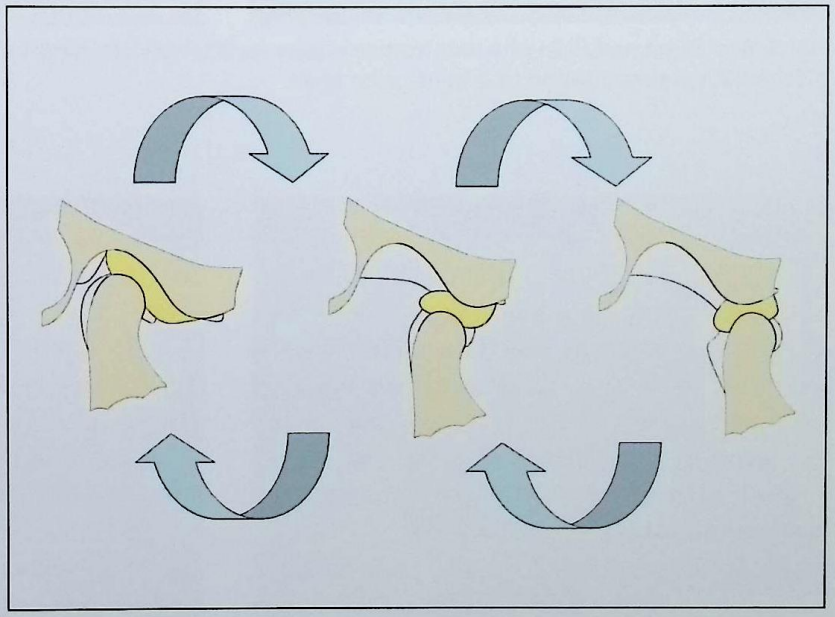


Fig. 1-7 Sequence of joint movements under normal conditions.

been proposed: an intra-fossa transverse axis,[53] a second transverse axis passing through the center of the ascending ramus of the mandible during opening of the mouth,[54] and a retrocondylar vertical axis.[55] A condylar kinematic center has also been described, which is more stable in response to variations in mandibular movement,[56] within the concept of cardan diarthrosis. Recently, the existence of the kinematic center has been questioned, on the basis that its trajectories are more cranial on closing than during opening.[57]

All these descriptions – sometimes clearly incompatible with each other – contribute little to explain mandibular movements, even with the use of mathematical models.

The physiologic amplitudes of the main mandibular movements are 50 ± 6 mm for the opening movement, 7.5 ± 1.5 mm for protrusion, and 9.6 ± 1.8 for lateral shifts.[58]

Based on magnetic resonance imaging studies, it has been shown that under normal conditions, at 50 mm opening, the mandible displaces about 16 mm and the disc approxi-

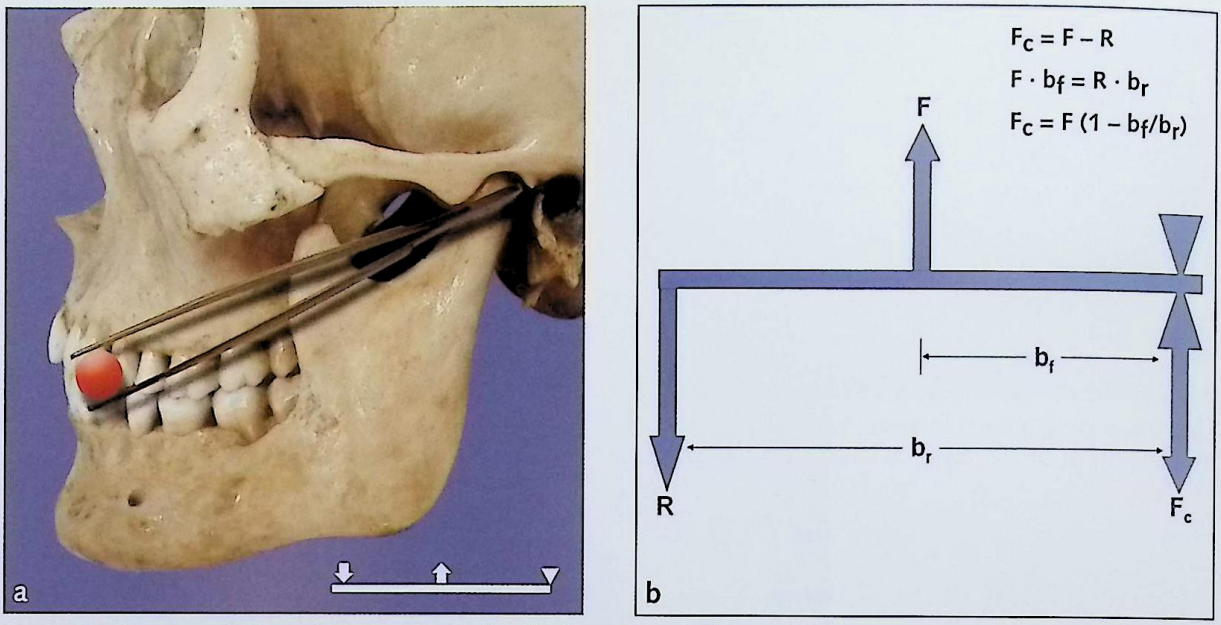


Fig. 1-8 **a** Representation of a vise, or third-order lever, classically used for comparison with the mandible. **b** Schematic representation of a third-order lever.

mately 10 mm – the maximum rotation of the mandible being 34 degrees.[59]

According to some classic descriptions, the mandible functionally operates as a third-order lever (as tweezers) in which the fulcrum – and thus the force – is located within the TMJ itself; the power at the center is represented by action of the elevator muscles and the resistance at the extremity is represented by food between the teeth[25] (Fig. 1-8).

Masticatory Muscles (Fig. 1-9)

The paired masticatory muscles are also involved in functions other than chewing, such as swallowing and speech. Although none of the muscles involved in mandibular movements exhibits pure action, and all present some type of synergism with other muscles,[60] they can be classified according to their predominant function into three groups:

Elevators of the mandible: temporal muscle (innervated by temporal branches of the mandibular nerve), masseter muscle (innervated by the masseteric branch of the mandibular nerve), and medial pterygoid muscle (innervated by pterygoid branches of the mandibular nerve) (Fig. 1-10 to Fig. 1-12).

Depressors of the mandible: these act when the hyoid bone becomes fixed by the action of the infrahyoid muscles. The depressors are the mylohyoid muscle (innervated by the mylohyoid nerve), the anterior belly of the digastric muscle (innervated by the nerve mylohyoid), and the geniohyoid muscle (innervated by the hypoglossal nerve) (Fig. 1-11, Fig. 1-13, Fig. 1-14).

Muscles involved in lateral and protrusive movements of the mandible: these actions are carried out by the lateral pterygoid muscle with its two classically described bellies – superior (inserted in the anterior half of the posteroinferior surface of the articular disc) and inferior (inserted in the neck of the condyle) – the innervation being provided by the pterygoid branches of the mandibular nerve. Some fibers of the superior belly have a common insertion with fibers of the inferior muscle belly (Fig. 1-5, Fig. 1-12, Fig. 1-15, Fig. 1-16).

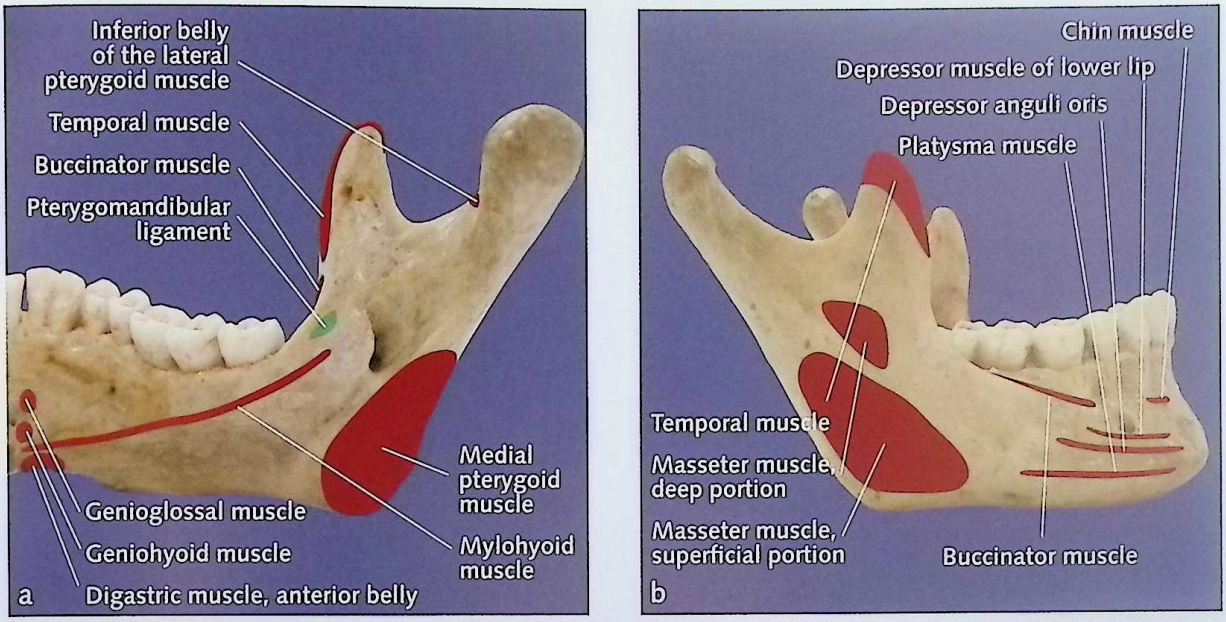


Fig. 1-9 **a** Muscle insertions on the medial surface of the mandible. **b** Muscle insertions on the lateral surface of the mandible.

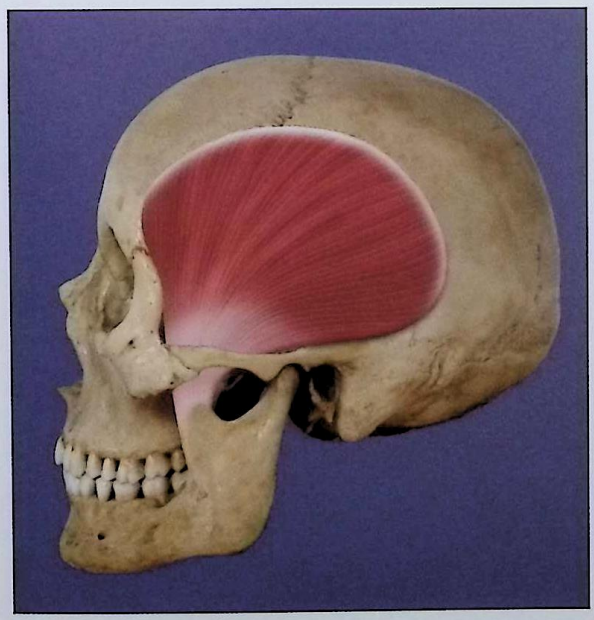


Fig. 1-10 Temporal muscle.

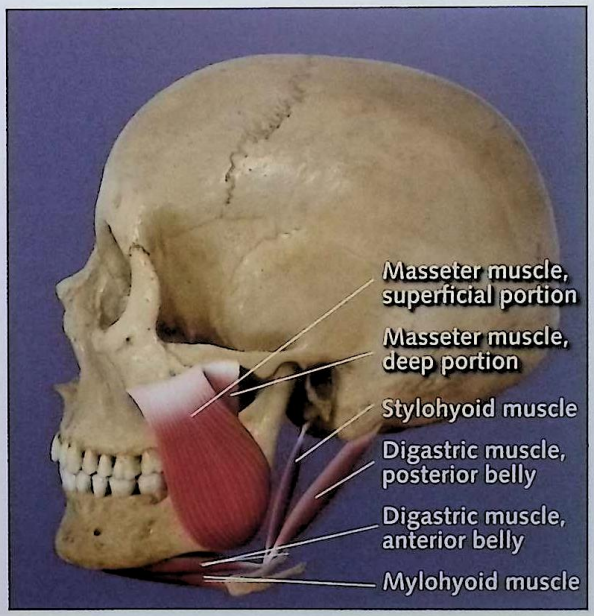


Fig. 1-11 Craniomandibular and suprahyoid muscles: lateral view.

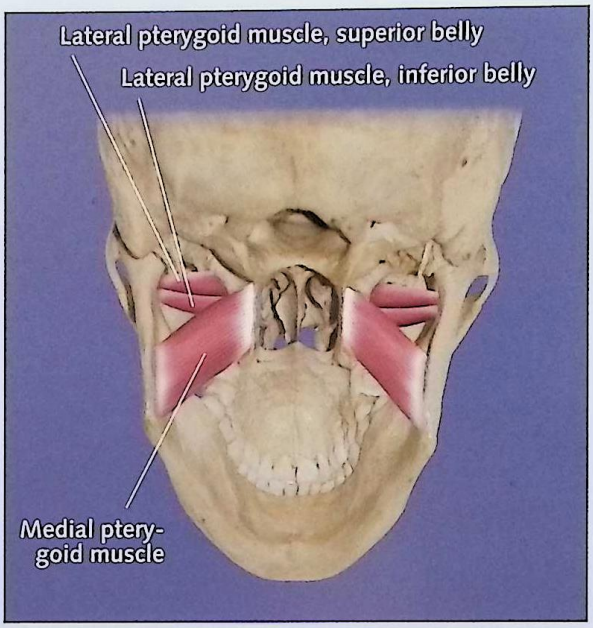


Fig. 1-12 The pterygoid muscles.

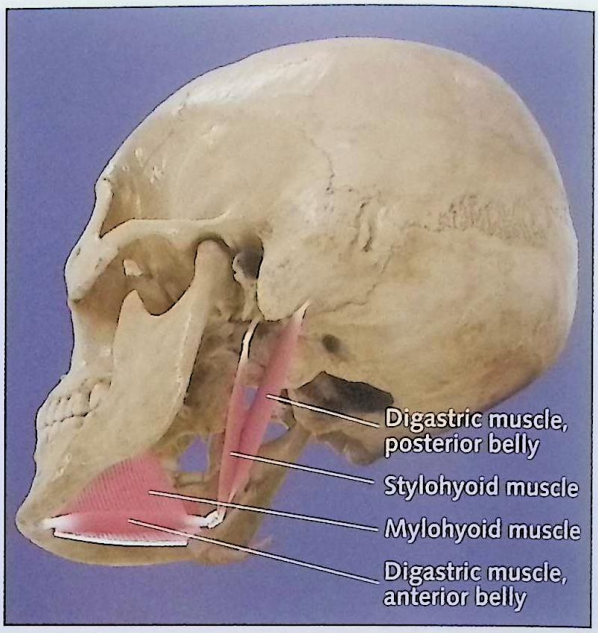


Fig. 1-13 Suprahyoid muscles: lateral view.

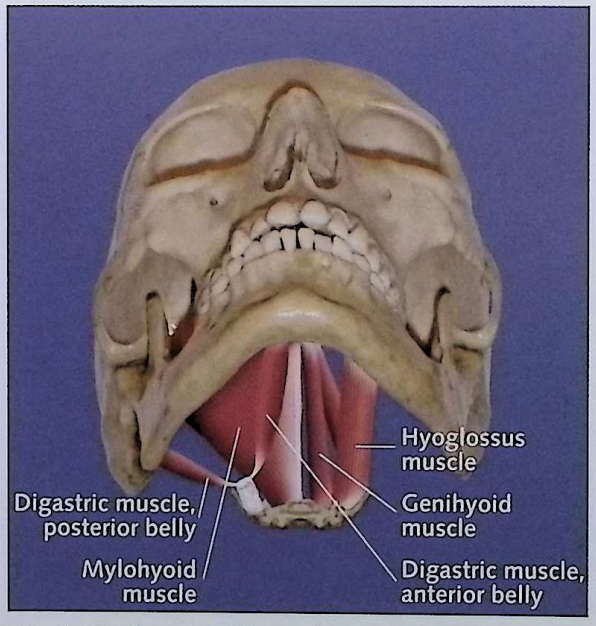


Fig. 1-14 Suprahyoid muscles: anterior view.

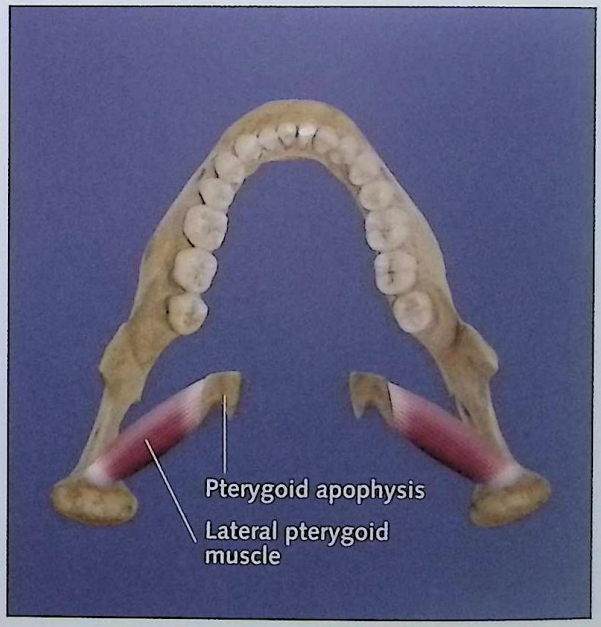


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The issues of temporomandibular disorders (TMD) etiology, diagnosis, and management are some of the most intriguing fields of contemporary dentistry. Old paradigms relating the onset of TMD symptoms to supposed abnormalities of dental occlusion, and suggesting the need for occlusal therapies to treat TMD patients, have been progressively challenged by the scientific literature.

Over the years, evidence has accumulated to suggest that TMD are a major cause of orofacial pain requiring a comprehensive interdisciplinary approach that focuses on the many facets of the complex pain experience. High-quality literature supports the abandonment of biomechanical and instrumental approaches to TMD diagnosis and management in favor of an exhaustive biopsychosocial assessment.

The importance of some signs and symptoms has been revisited in the light of multiple clinical and imaging studies that dismantle, for example, the role of joint click sounds as a pathognomic sign of TMJ dysfunction. Pain, and not equivocally defined "dysfunctions", became the guiding symptom on the path to diagnosis and treatment.

Notwithstanding, difficulties in making a differential diagnosis with other orofacial pain, and in identifying those subjects at risk of chronic pains, are still present, and, importantly, it seems that the view of TMD as occlusion-related is hard to eradicate from the primary practitioner community.

These premises led to the idea of a multi-authored, evidence-based text that is, hopefully, clinically oriented enough to raise interest in all clinicians treating TMD, and to convince all readers that high scientific, ethical, and professional standards are now required in many fields of TMD practice.

All diagnostic and management procedures have been described, with a twofold emphasis on their clinical significance and evidence to support them, thus providing a useful guide for the everyday decision-making and treatment-planning process. Such an approach makes the book an essential tool for both specialist and non-specialist practitioners, as well as dental students seeking a deeper insight into current concepts on TMD.



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ISBN 1-85097-199-4

9 781850 971993

www.quintpub.co.uk