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Mandibular Development and Its Age Change

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Abstract:
The mandible is the lower jaw that provides structure to the chin and support for the lower teeth. It is also referred to as the inferior maxillary bone. It is the largest and strongest bone of the face and it has a curved, horizontal portion, the body, and two upright portions. The basic development and structures of mandible are reviewed and the age changes in human mandible is also reviewed. Using the age determination of mandibles they are used in forensic study which is also been reviewed in this article.

INTRODUCTION:

The mandible [1] (from Latin *mandibula*, "jawbone") or inferior maxillary bone forms the lower jaw and holds the lower teeth in place. In the midline on the anterior surface of the mandible is a faint ridge, an indication of the mandibular symphysis, where the bone is formed by the fusion of right and left processes during mandibular development. Like other symphysis in the body, this is a midline articulation where the bones are joined by fibrocartilage, but this articulation fuses together in early childhood.[2][4]

STRUCTURE:

The mandible consists of a curved, horizontal portion which is the *body or* base; two perpendicular parts, the ramus one one on each side unite with the ends of the body at the right angles. The angle formed at this junction is called gonial angle; Alveolar process, the tooth bearing area of the mandible present above the base of the mandible; Condyle present as a projection superior and posterior from the ramus,and makes the tempromandibular joint with the temporal bone; coronoid process is superior and anterior projection from the ramus. The coronoid process provides attachment to the temporalis muscle and the mandible articulates with the *two* temporal bones at the tmj joint.[5][6]

EXTERNAL SURFACE:

The external surface is found in the median line by a faint ridge, indicating the symphysis of the two pieces of which the bone is composed.

The ridge divides below and encloses a triangular eminence called as the mental protruberance with its base depressed at the center but raised on either side to form the mental tubercle.the incicsive fossa a depression found below the incisive teeth on either side of the symphysis gives origin to the mentalis along with a small portion of the orbicularis oris. The mental foramen that provides the passage of the mental vessels and nerves is present at the midway between the upper and lower border of the body on either side below the second premolar.[1,3]

The oblique sign of the mandible that runs backward and upward from each mental tubercle and continues with the anterior border of the ramus and provides attachment to the depressor labii inferioris, depressor anguli oris and the platysma.

INTERNAL SURFACE:

The internal surface is concave and has mental spines laterally at the lower part of symphysisand gives origin to genioglossus.Immediately below is the median ridge or an impressionthat gives origin to the geniohyoid.The mental spines are found fused forming a single emminence in some they are also absent and are indicated withirregularity of the surface.Median foramen and a furrow are seend above the mental spines.And an oval depression is found below the mental spines on either side providing attachment to the anterior belly of digastric.The mylohyoid line extending upward and backward gives origin to the mylohyoid muscle and the posterior part found near the alveolar margin, gives attachment to a small part of constrictor pharyngis superiorand the pterygimandibular raphae.Above the anterioir part the sublingual gland and the oval depression for the submaxillary gland is seen.[7][8]

BORDERS:

The **superior or alveolar border**, has ahollow cavity for the reception of the teeth.These cavities are sixteen in number,and vary in depth and size according to the teeth which they contain.The buccinator is attached outer to the superior border near the first molar tooth.The **inferior border** is rounded, longer than that of the superior, joins the lower border of the ramus of the mandibleat and forms a shallow groove for the facial artery.[9]

FORAMEN:

The mandibular foramen is paired, in the medial aspect of the mandible, superiorly to the mandibular angle in the middle of the ramus and laterally to the mental protuberance on the body of mandible lies inferior to the apices of the mandibular first and second premolars. As the mandible grows with age the mental foramen alters in direction of its opening from anterior to posterosuperior. The mental foramen allows the entrance of the mental nerve and blood vessels into the mandibular canal.Inferior alveolar nerve branch of the mandibular division of Trigeminal (V) nerve, enters the mandibular foramen and runs forward in the mandibular canal, supplying sensation to the teeth. At the mental foramen the nerve divides into two terminal branches: incisive and mental nerves. The incisive nerve runs forward in the mandible and supplies the anterior teeth. The mental nerve exits the mental foramen and supplies sensation to the lower lip.

Rarely, a bifid inferior alveolar nerve may be present, in which case a second mandibular foramen, more inferiorly placed, exists and can be detected by noting a doubled mandibular canal on a radiograph.[3,9]

DEVELOPMENT:

The ossification of the mandible refers to the Human mandible laying down new bone material in the fibrous membrane covering the outer surfaces of meckels cartilage.These cartilages form the cartilagenous bar of the mandibular arch, and are two in number one in right and a left. Their proximal or cranial ends are connected with the ear capsules, and their distal extremities are joined to one another at the symphysis by mesodermal tissue. They run forward immediately below the condyles and then, bending downward, lie in a groove near the lower border of the bone; in front of the canine tooth they incline upward to the symphysis. From the proximal end of each cartilage the malleus and incus, two of the bones of the middle ear, are developed; the next succeeding portion, as far as the lingula, is replaced by fibrous tissue, which persists to form the sphenomandibular ligament.Between the lingula and the canine tooth the cartilage disappears, while the portion of it below and behind the incisor teeth becomes ossified and incorporated with this part of the mandible.Ossification takes place in the membrane covering the outer surface of the ventral end of Meckel's cartilage and each half of the bone is formed from a single center which appears, near the mental foramen, about the sixth week of fetal life.[10]By the tenth week the portion of Meckel's cartilage which lies below and behind the incisor teeth is surrounded and invaded by the membrane bone. Somewhat later, accessory nuclei of cartilage make their appearance:a wedge-shaped nucleus in the condyloid process and extending downward through the ramus; a small strip along the anterior border of the coronoid process; smaller nuclei in the front part of both alveolar walls and along the front of the lower border of the bone. These accessory nuclei possess no separate ossific centers, but are invaded by the surrounding membrane bone and undergo absorption. The inner alveolar border, usually described as arising from a separate ossific center is formed in the human mandible by an ingrowth from the main mass of the bone.At birth the bone consists of two parts, united by a fibrous symphysis, in which ossification takes place during the first year.[11]

Males generally have squarer, stronger, and larger mandibles than females. The mental protuberance is more pronounced in males but can be visualized and palpated in females. The symphysis can be not fully fused which happens more in male, leaving an indentation.

CLINICAL RELAVANCE:

One fifth of facial injuries involve mandibular fracture. Mandibular fractures are often accompanied by a 'twin fracture' on the contralateral(opposite) side. There is no universally accepted treatment protocol, as there is no consensus on the choice of techniques in a particular anatomical shape of mandibular fracture clinic. A common treatment involves attachment of metal plates to the fracture to assist in healing.[4] The mandibular fractures are more frequent in road accidents.The mandible may be dislocated anteriorly (to the front) and inferiorly (downwards) but very rarely posteriorly (backwards).The mandibular alveolar process can become resorbed when completely edentulous in the mandibular arch (occasionally noted also in partially edentulous cases). This resorption can occur to such an extent that the mental foramen is virtually on the superior border of the mandible, instead of opening on the anterior surface, changing its relative position. However, the more inferior body of the mandible is not affected and remains thick and rounded. With age and tooth loss, the alveolar process is absorbed so that the mandibular canal becomes nearer the superior border. Sometimes with excessive alveolar process absorption, the mandibular canal disappears entirely and leaves the inferior alveolar nerve without its bony protection, although it is still covered by soft tissue.[2]

CONCLUSION:

The mandible is the only movable bone in the face its development is usefull iin forensic studies.The identified features of the mandible such as the weight of the mandible, and the positions of the mandibular foramen helps in identifying the age and sex of the person.The deposition of calcium in the development of the mandible changes the positions of the foramens in the bone according to the age.Variations occurs between the male and female bone in weight, size and positions of the features present in the mandible.Thus the development of the mandible is refered with the age according to the positions and alignment of the related features.[4]

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