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ORAL
BIOLOGY

DEVELOPMENT AND GROWTH OF THE MANDIBLE



Ass. Prof. Dr. Heba M. Elsabaa

Development and Growth of the Mandible

DEVELOPMENT OF THE MANDIBLE

The Mandible

Is the largest and strongest bone of the face, serves for the reception of the lower teeth. It consists of a curved, horizontal portion, the **body**, and two perpendicular portions, the **rami**, which unite with the ends of the body nearly at right angles.

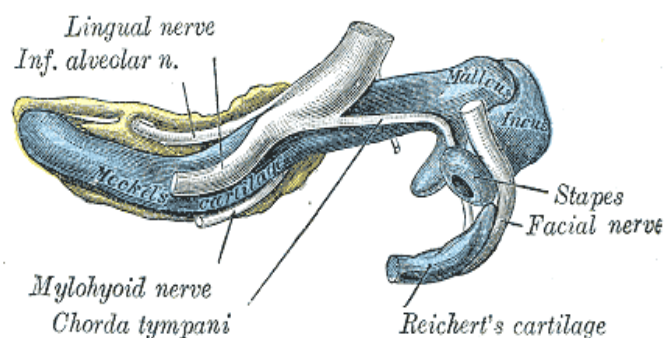
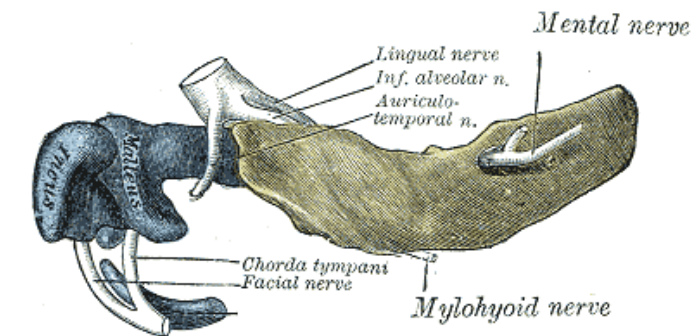
For better description development of the mandible will be divided into:

1. Body of the mandible.
2. The rami
3. The alveolar process

I. THE BODY OF THE MANDIBLE

The mandible is ossified in the fibrous membrane covering the outer surfaces of Meckel's cartilages. These cartilages form the cartilaginous bar of the mandibular arch and are two in number, a 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.

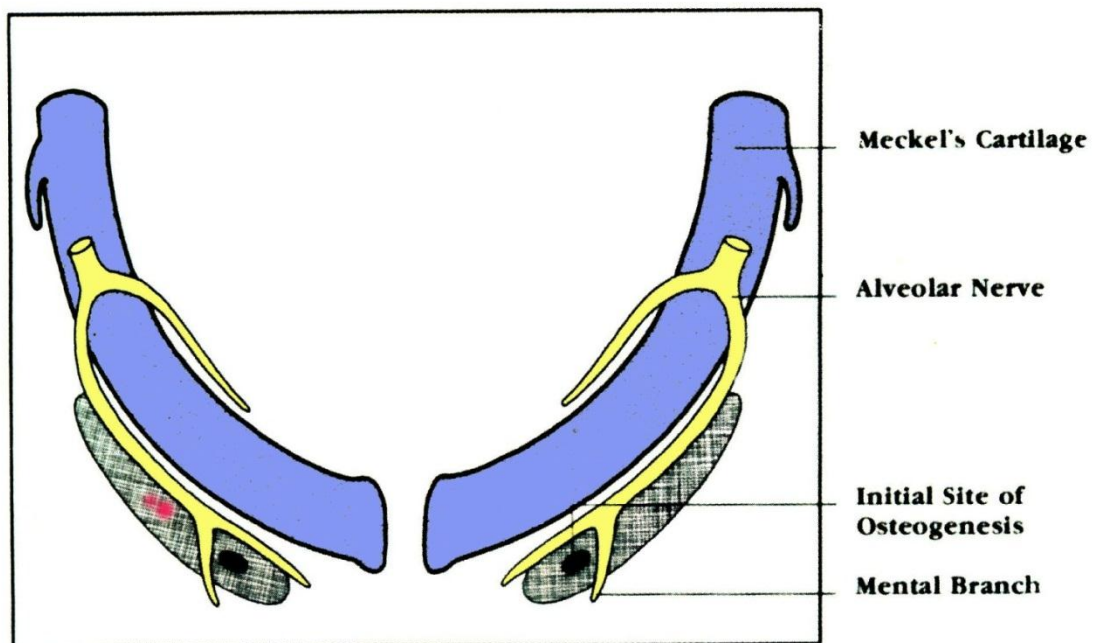


Meckel's cartilage has a close relationship to the mandibular nerve, at the junction between proximal and middle thirds, where the mandibular nerve divides into the lingual and inferior dental nerve. The lingual nerve passes forward, on the medial side of the cartilage, while the inferior dental lies lateral to its upper margins

& runs forward parallel to it and terminates by dividing into the mental and incisive branches.

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 & the perichondrium of the cartilage persist as sphenomallular 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. The mandible first appears as a band of dense fibrocellular tissue which lies on the lateral side of the inferior dental and incisive nerves. For each half of the mandible.

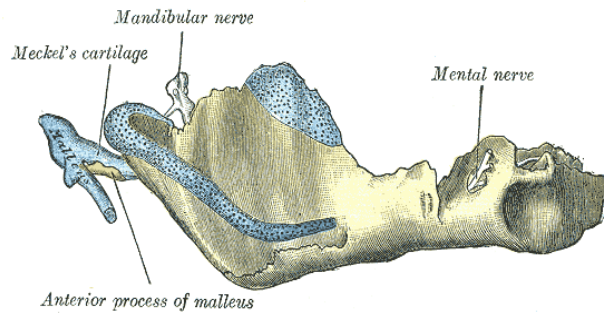


Ossification takes place in the membrane covering the outer surface of Meckel's cartilage and each half of the bone is formed from a single center which appears, in the region of the bifurcation of the mental and incisive branches, about the sixth week of fetal life.

Ossification grows medially below the incisive nerve and then spread upwards between this nerve and Meckel's cartilage and so the incisive nerve is contained in a

trough or a groove of bone formed by the lateral and medial plates which are united beneath the nerve.

At the same stage the notch containing the incisive nerve extends ventrally around the mental nerve to form the mental foramen. Also the bony trough



grow rapidly forwards towards the middle line where it comes into close relationship with the similar bone of the opposite side, but from which it is separated by connective tissue.

A similar spread of ossification in the backward direction produces at first a trough of bone in which lies the inferior dental nerve and much later the mandibular canal is formed. The ossification stops at the site of future lingula. By these processes of growth the original primary center of ossification produces the body of the mandible.

II. THE RAMI OF THE MANDIBLE

The ramus of the mandible develops by a rapid spread of ossification backwards into the mesenchyme of the first branchial arch diverging away from Meckel's cartilage. This point of divergence is marked by the mandibular foramen.

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.

A. The condylar cartilage:

Carrot shaped cartilage appears in the region of the condyle and occupies most of the developing ramus. It is rapidly converted to bone by endochondral ossification (14th. WIU) it gives rise to:

1. Condyle head and neck of the mandible.
2. The posterior half of the ramus to the level of inferior dental foramen

B. The coronoid cartilage:

It is relatively transient growth cartilage center (4th. - 6th. MIU). it gives rise to:

1. Coronoid process.
2. The anterior half of the ramus to the level of inferior dental foramen

These accessory nuclei possess no separate ossific centers, but are invaded by the surrounding membrane bone and undergo absorption.

III. The alveolar process

It starts when the deciduous tooth germs reach the early bell stage. The bone of the mandible begins to grow on each side of the tooth germ. By this growth the tooth germs come to be in a trough or groove of bone, which also includes the alveolar nerves and blood vessels.

Later on, septa of bone between the adjacent tooth germs develop, keeping each tooth separate in its bony crept. The mandibular canal is separated from the bony crypts by a horizontal plate of bone. The alveolar processes grow at a rapid rate during the periods of tooth eruption.



GROWTH OF THE MANDIBLE

This process occurs with:

1. Growth by secondary Cartilage.
2. Growth with the alveolar process
3. Subperiosteal bone apposition and bone resorption.

1. Growth by secondary Cartilage.

It occurs mainly by secondary cartilages (mainly condylar cartilage), this helps in:

- Increase in height of the mandibular ramus
- 
- Increase in the overall length of the mandible
- 
- Increase of the inter condylar distance

2. Growth with the alveolar process

- Due to the increase in the space between the upper and lower jaws (why?) a space created between the opposing teeth to erupt.
- At the same time bone apposition occurs at the crest of the alveolar process and the fundus of the alveolus.
- The deposited bone at the fundus of the alveolus counts later to the body of the mandible. this process also responsible for the distance between the mandibular canal and the apices of the premolars and first two molars.
- This means that bone deposition contributes to the growth of the body of the mandible in height.

3. Subperiosteal bone apposition and bone resorption.

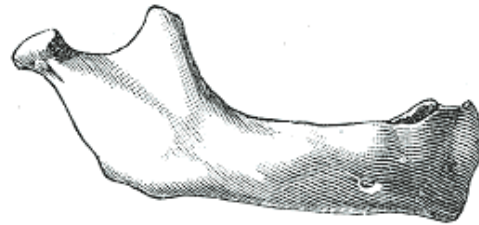
Subperiosteal bone apposition and resorption help in mandible growth giving rise to different results according to the place of resorption and deposition:

Bone deposition	Bone resorption	Result in
External surface of the mandible	Inner surface of the mandible	Increase the transeverse dimension
Posterior border of the ramus	Anterior border of the ramus	Adjust the thickness of the ramus
Anterior border of the coronoid process	Posterior border of the coronoid process	Displacement of the coronoid process
Chin region	—————	Modeling of the lower face

Age changes in the mandible

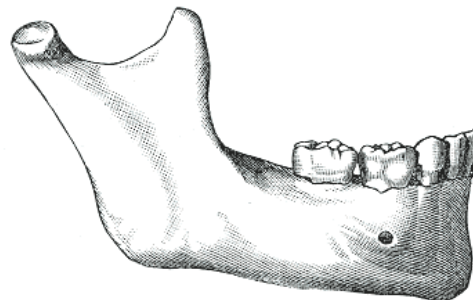
❖ At birth

The body of the bone is a mere shell, containing the sockets of the two incisor, the canine, and the two deciduous molar teeth, imperfectly partitioned off from one another. The mandibular canal is of large size, and runs near the lower border of the bone; the mental foramen opens beneath the socket of the first deciduous molar tooth. The angle is obtuse (175°), and the condyloid portion is nearly in line with the body. The coronoid process is of comparatively large size, and projects above the level of the condyle.



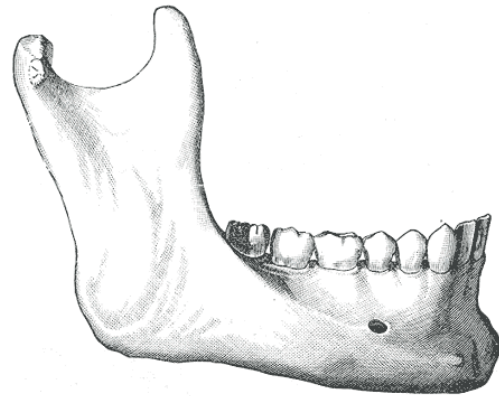
❖ Childhood

The two segments of the bone become joined at the symphysis, from below upward, in the first year; but a trace of separation may be visible in the beginning of the second year, near the alveolar margin. The body becomes elongated in its whole length, but more especially behind the mental foramen, to provide space for the three additional teeth developed in this part. The depth of the body increases owing to increased growth of the alveolar part, to afford room for the roots of the teeth, and by thickening of the subdental portion which enables the jaw to withstand the powerful action of the masticatory muscles; but the alveolar portion is the deeper of the two, and, consequently, the chief part of the body lies above the oblique line. The mandibular canal, after the second dentition, is situated just above the level of the mylohyoid line; and the mental foramen occupies the position usual to it in the adult. The angle becomes less obtuse, owing to the separation of the jaws by the teeth; about the fourth year it is 140° .



❖ Adulthood

The alveolar and subdental portions of the body are usually of equal depth. The mental foramen opens midway between the upper and lower borders of the bone, and the mandibular canal runs nearly parallel with the mylohyoid line. The ramus is almost vertical in direction, the angle measuring from 110° to 120° .



❖ Old age

The bone becomes greatly reduced in size, for with the loss of the teeth the alveolar process is absorbed, and, consequently, the chief part of the bone is below the oblique line. The mandibular canal, with the mental foramen opening from it, is close to the alveolar border. The ramus is oblique in direction, the angle measures about 140° , and the neck of the condyle is more or less bent backward.

