

DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

ANATOMY OF THE TEETH AND JAWS, WITH SPECIAL REFERENCE TO ROENTGENOGRAM INTERPRETATION

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IN the passage of the roentgen rays through the tissues, the denser the tissue the greater the obstruction offered to the rays, and consequently the lighter will be the image in the negative.

In roentgenograms of the jaws, the substances depicted in the order of their density, beginning with the densest, and therefore the lightest in the negative, are:

1. Metallic crowns and fillings, and root canal fillings containing zinc or other metals.
2. Enamel of the teeth.
3. Dentine.
4. Cementum.
5. Cortical bone.
6. Cancellated bone.
7. Medullary spaces, canals, foramina in bone, and soft tissues.

In disease, the normal condition of a given tissue may be changed either to a lessening in density, meaning abstraction of lime salts, with consequent deepening of the shadow in the x-ray negative, or an increase in density, due to a deposit of lime salts, and indicated by a lessening of the shadow.

A familiarity with the anatomy of the teeth and jaw bones is one of the fundamental essentials for correct interpretation of roentgenograms. Lack of this knowledge is frequently a cause of mistaking of normal shadows for manifestations of disease.

The teeth are set in sockets in the alveolar process, being attached by the periodontal membrane. The alveolar process is composed of spongy or can-

cellated bone (Fig. 1), which appears in the roentgenogram as a fine interlacing network. The sockets of the teeth are lined with a thin plate of dense bone, which is shown in the x-ray negative as a fine white line around the tooth. Between this line and the tooth itself is a narrow dark space representing the peridental membrane. *These lines are important landmarks in the interpretation of roentgenograms, as their absence or deviation usually means some pathologic condition (Fig. 2).*

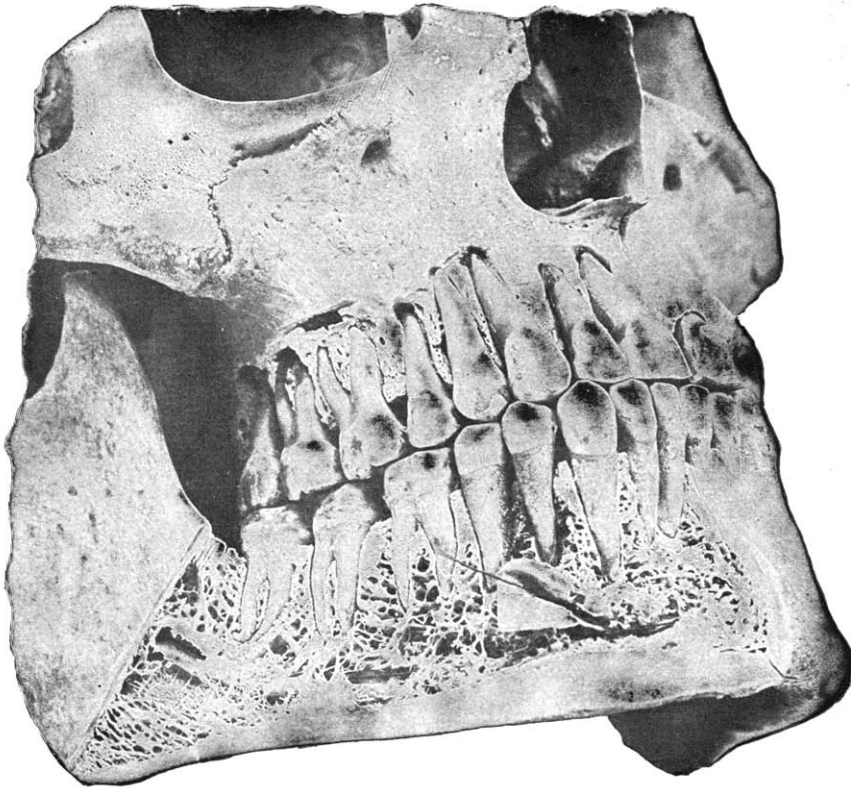


Fig. 1.—Showing cancellated bone of alveolar process. (Cryer.)



Fig. 2.—Upper right central, lateral, and canine. Pulpas vital, no periapical abnormality. Floor of nose and maxillary sinus barely shown as dark shadows above. The thin dark peridental line and dense white bony line are seen about roots. Fillings shown as dense white spots.

ROENTGENOGRAPHIC ANATOMIC LANDMARKS IN THE UPPER JAW

At a varying distance above the apices of the central and lateral incisor teeth is found the *floor of the nose* (Fig. 3), sometimes seen in the roentgeno-

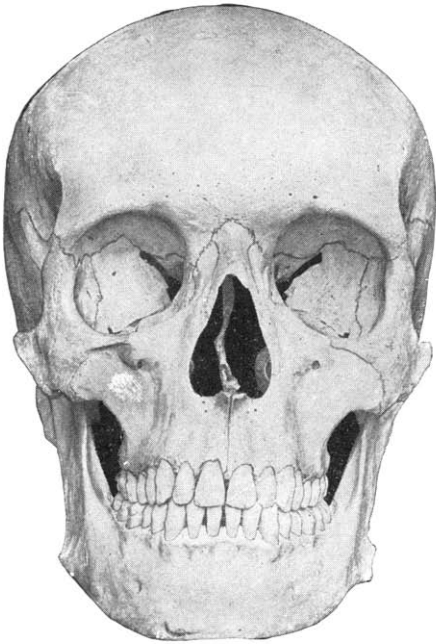


Fig. 3.



Fig. 4.



Fig. 5.

Fig. 3.—Anterior view of skull, showing anterior opening of nasal chamber. (Cryer.)

Fig. 4.—Upper right central forms abutment to poorly fitting bridge, which extends to left canine. Upper left central and lateral have been lost. No periapical abnormalities. The dark area above is the nasal fossa.

Fig. 5.—Upper right lateral incisor shows post for support of crown, no other root filling. Ill-defined dark area about apex due to chronic rarefying osteitis with suppuration. Nasal fossa with inferior turbinate well shown above.

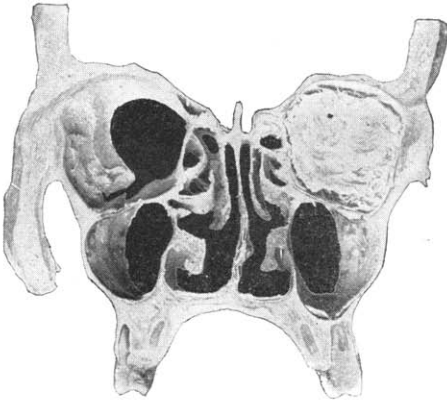


Fig. 6.

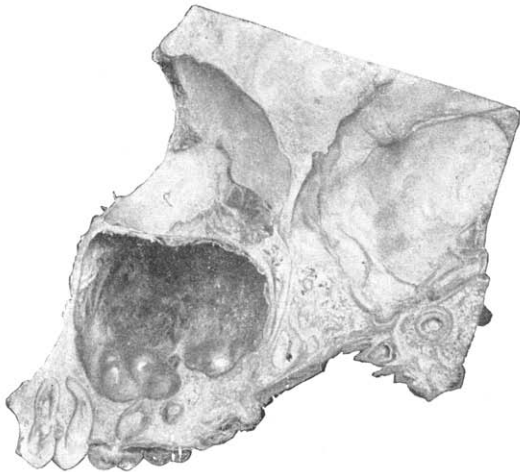


Fig. 7.

Fig. 6.—Showing considerable thickness of bone between the apices of the molar roots and the maxillary sinuses. (Cryer.)

Fig. 7.—Showing smooth prominences in floor of maxillary sinus overlying apices of roots of premolar and molar teeth. (Cryer.)

gram as a dark shadow which might be mistaken for a cystic or abscess cavity in the bone (Figs. 4 and 5).

Above the apices of the premolar and molar teeth is found the maxillary sinus or antrum of Highmore. This sinus varies very much in its extent, shape, and in the relation of its floor to the roots of the teeth. Sometimes there is



Fig. 8.—Showing floor of maxillary sinus dipping down between roots of molar tooth, the apices thus being above the level of the floor. (Cryer.)

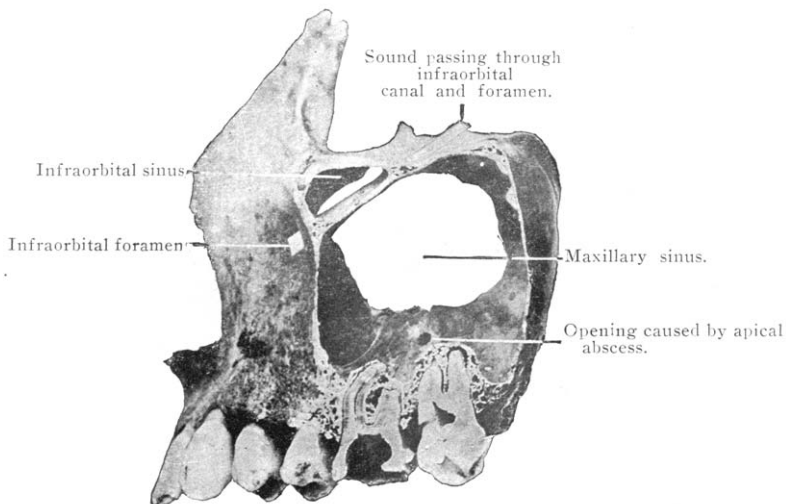


Fig. 9.—In this specimen the maxillary sinus does not extend much anterior to the first molar. (Cryer.)

a considerable thickness of bone between the tooth apices and the sinus (Fig. 6). In other cases the tooth apices come right up to the floor of the sinus, even forming projections into the cavity, though under normal conditions always

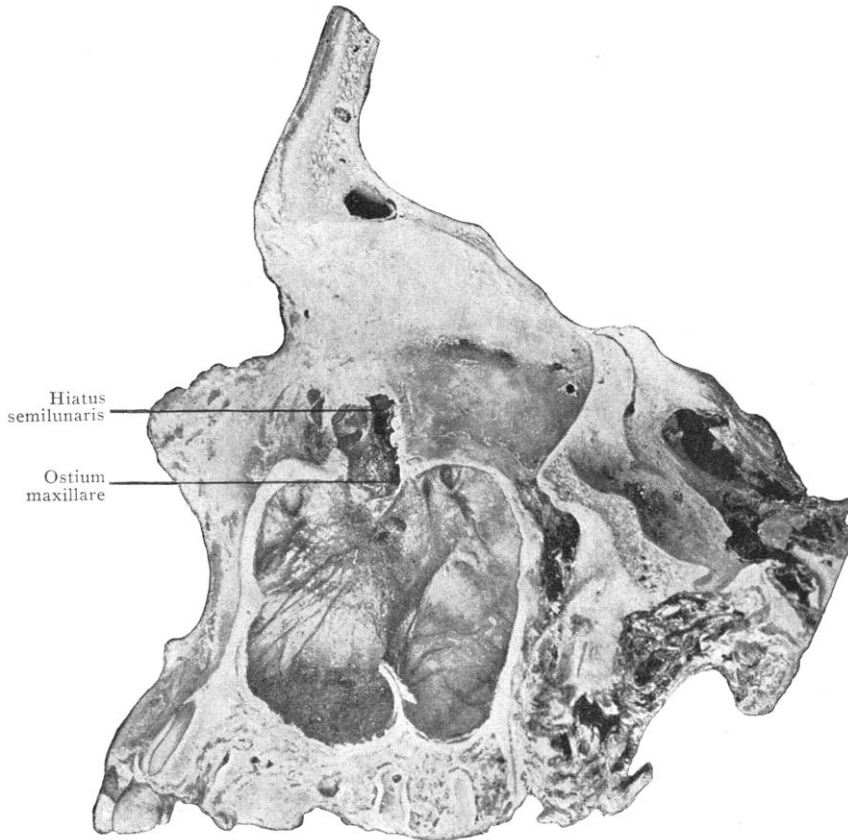


Fig. 10.—Here the floor of the maxillary sinus extends in front as far as the region of the first premolar tooth. (Cryer.)

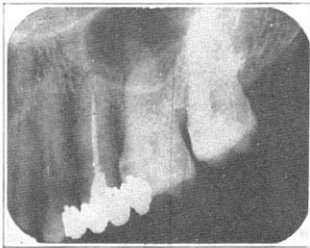


Fig. 11.

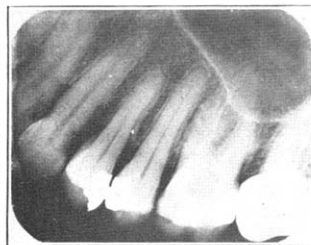


Fig. 12.

Fig. 11.—Upper right canine normal. First premolar good root filling, apex extends close to floor of maxillary sinus. First molar roots apparently project into maxillary sinus, but in reality are in the wall of the sinus; furthermore, this tooth has a vital pulp.

Fig. 12.—Upper right canine and premolar normal. First molar roots project above level of floor of maxillary sinus, but the normal dense line of bone can be seen surrounding the roots. The pulp of the tooth also is vital.

separated from it by a thin lamina of bone (Fig. 7). Sometimes the ends of the roots are found well above the most dependent portion of the sinus, but located in its wall (Fig. 8). The floor of the maxillary sinus is usually found in relation to the roots of the molar teeth (Fig. 9), but may extend as far forward as the first premolar or canine (Fig. 10). These varying relations of the floor of the antrum of Highmore to the roots of the teeth are well shown in x-ray negatives, the cavity of the antrum appearing as a dark shadow which must not be mis-

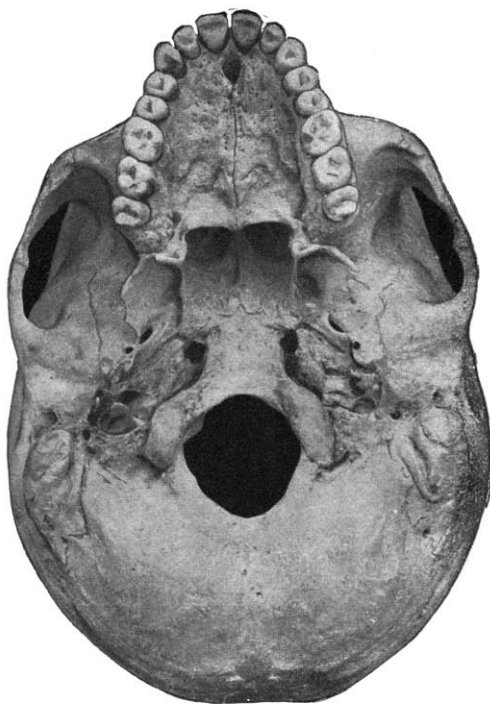


Fig. 13.



Fig. 14.

Fig. 13.—Showing anterior palatine fossa just behind and between the upper central incisor teeth. The posterior palatine canal is seen as a groove running parallel to and just within the line of the molar teeth. (Cryer.)

Fig. 14.—Upper central incisors. Sharply defined dark area between roots is anterior palatine fossa, somewhat resembling the appearance of bone destruction and cyst formation. Both teeth, however, contain vital pulps, and normal periodontal line can be followed around each root.

taken for a rarefied disease area. It is sometimes difficult in the study of roentgenograms of this region to determine whether or not the roots of the teeth project into the maxillary sinus and whether areas of absorption about the roots communicate with it. In the roentgenogram, where a root is projected above the level of the floor of the antrum, it is important to seek carefully the dark and light lines found around normal teeth in order to differentiate the normal condition shown in Fig. 8 from pathologic conditions in which roots communicate with the cavity of the sinus (Figs. 11 and 12).

In the upper jaw, on the palatal surface just behind and between the central incisor teeth is found the *anterior palatine fossa* (Fig. 13). This contains

foramina carrying blood vessels and nerves from the nose. In roentgenographic films of the anterior teeth this fossa is frequently seen as a dark shadow above and between the apices of the central incisors, and when in close relation to roots of teeth under suspicion, might be mistaken for rarefaction due to disease of the bone (Fig. 14).

The *posterior palatine canal* (Fig. 13), is found in the form of a groove running posteroanteriorly in the roof of the mouth mesially to the molar teeth. In the roentgenographic film it is occasionally shown as a dark shadow in the wall of the antrum in close relation to the palatal roots of the molar teeth.

ROENTGENOGRAPHIC ANATOMIC LANDMARKS IN THE LOWER JAW

Here the principal roentgenographic anatomic landmarks are the *mandibular canal* and the *mental foramen* (Fig. 15). The *mandibular canal* runs postero-

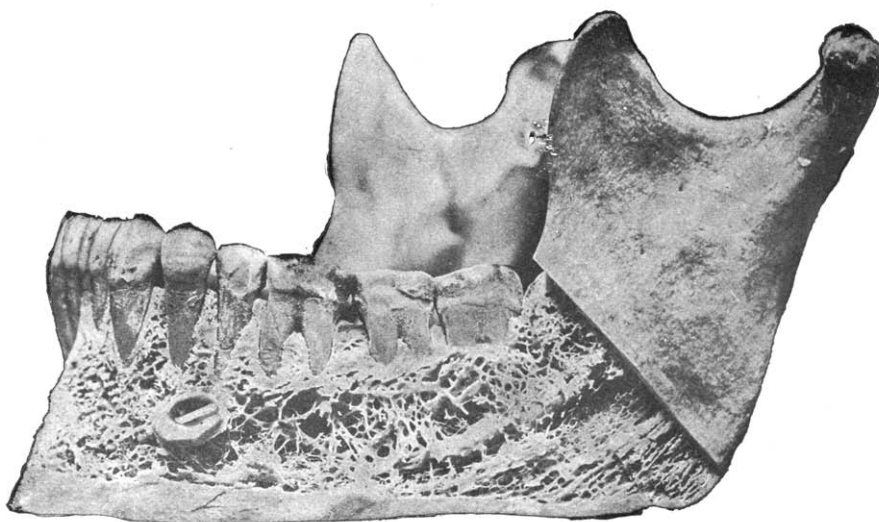


Fig. 15.—Showing cancellated internal structure of mandible, with mental foramen below and between roots of premolar teeth. (Cryer.)

anteriorly below the apices of the teeth, and sometimes in very close relationship with them (Fig. 21). In the roentgenogram the root of a lower molar may apparently project into the dark space representing the canal, yet in reality be situated to one side or the other.

The *mental foramen*, situated below and between the lower premolar teeth, may easily be mistaken for an area of disease associated with one of these teeth, particularly if there are clinical signs giving a suspicion of trouble (Fig. 16). Very frequently, however, the connection of the mental foramen with the inferior dental canal can easily be seen in the roentgenogram (Fig. 17).

In films of the upper premolar and molar region the overhanging malar bone frequently casts a shadow which obscures the roots of these teeth (Figs. 18 and 19).

ANATOMIC LANDMARKS IN ROENTGENOGRAPHIC PLATES OF THE JAWS

In a lateral roentgenographic *plate* of the upper and lower jaws, made with the head in the position shown in Fig. 20, attention is called to certain anatomic landmarks, which are shown in Figs. 21 and 23, and diagrammatically in Figs. 22 and 24. The upper and lower teeth of the side examined are usually well shown from the third molars forward to the canines. In the anterior portion of such a plate, the shadow of the opposite side of the jaws overlies that of

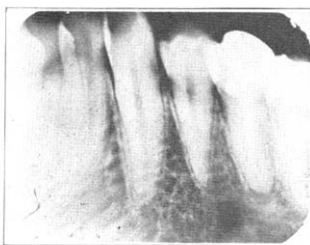


Fig. 16.

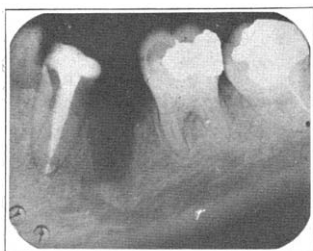


Fig. 17.

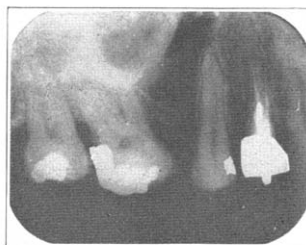


Fig. 18.

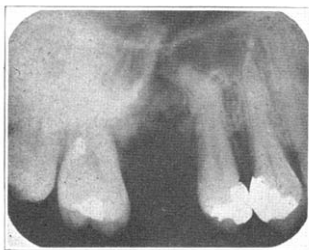


Fig. 19.

Fig. 16.—Lower right canine normal, first premolar normal; second premolar pulpless, imperfect root filling, periapical thickening of periodontal membrane. Between and below apices of premolars is seen a dark area due to mental foramen.

Fig. 17.—Lower right first premolar, pulpless, apparently good root filling, no periapical abnormality. Second premolar recently removed. Inferior dental canal seen curving up to mental foramen near socket of this tooth. First molar, large filling and caries of crown. No abnormality of bone.

Fig. 18.—First premolar crowned, two roots, one much foreshortened; good root fillings, apices normal. Other teeth normal. First molar missing. Second and third molar roots overshadowed by malar bone.

Fig. 19.—Upper left premolars, pulps vital, periapical regions normal. Circumscribed dark area about apex of second premolar somewhat resembling an area due to rarefying osteitis is only due to a recess in the maxillary sinus; the normal line of bone can be traced completely around the apex of this tooth. Light shadow in upper left corner is due to malar bone.

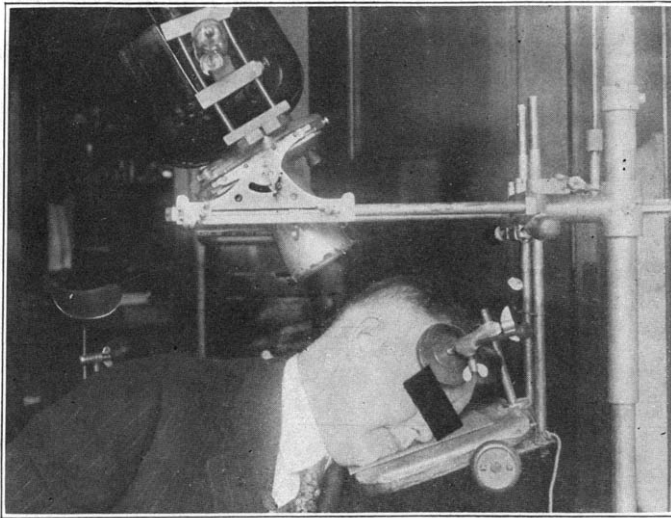


Fig. 20.—Position of head and angle for left side of jaws.

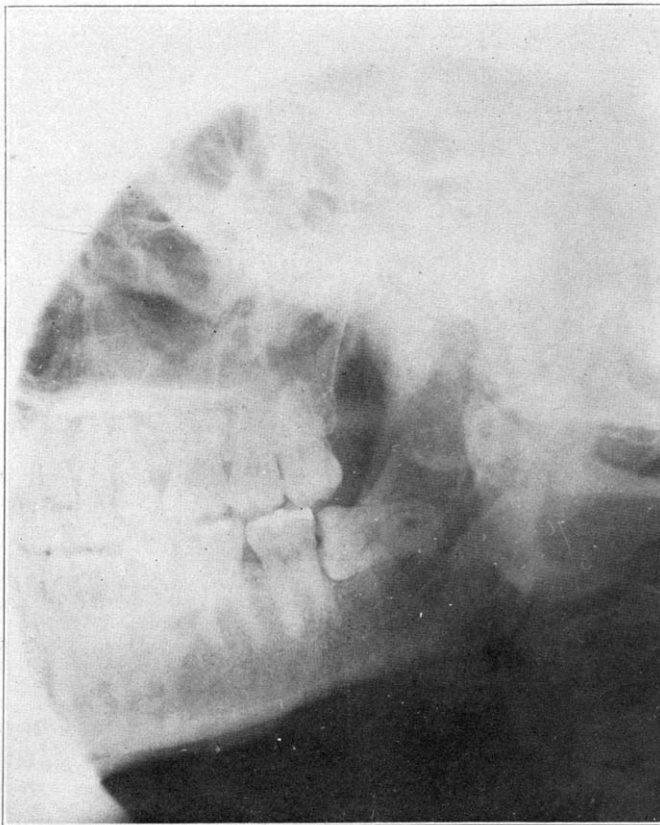


Fig. 21.—Plate of right side of face, with head placed especially to show molar region. Horizontal impaction of lower third molar. (See Fig. 22.)

the side nearest the plate, the amount of overlapping depending on whether the patient's nose is pressed down on the plate or slightly raised from it. In the same way the position of the head affects the overlapping of the molar region by the shadows of the vertebræ at the posterior portion of the plate. The dark space above the upper teeth is formed by the maxillary sinus and the nasal fossa. Into this space occasionally may be seen projecting the coronoid process of the opposite side of the jaw. Above the maxillary sinus and nasal fossa, the honey-combed appearance is due to the ethmoid cells. Below the roots of the lower

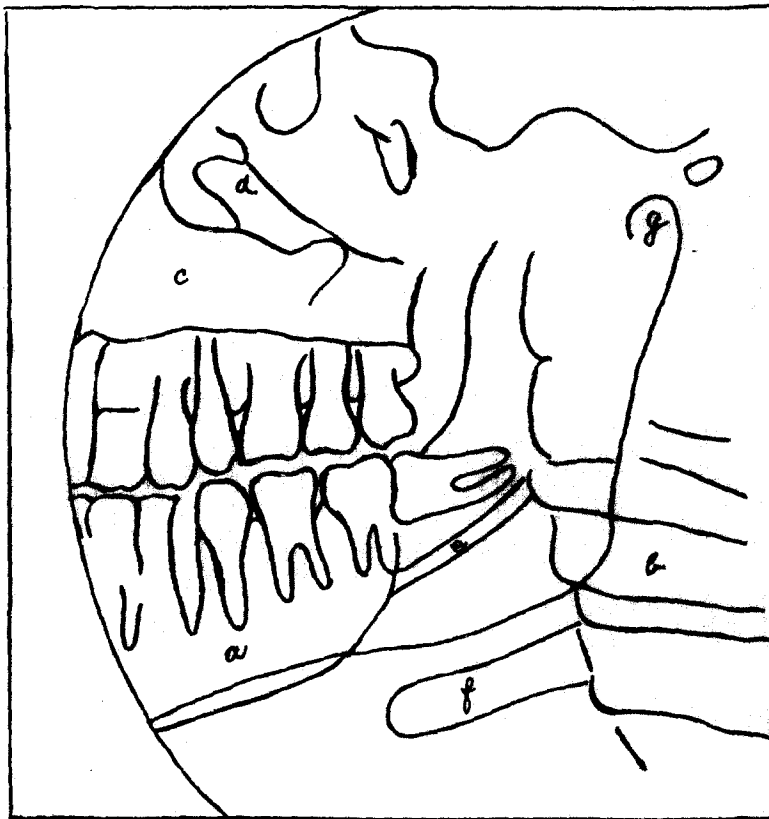


Fig. 22.—Diagrammatic illustration of Fig. 21.

- (a) Portion of lower jaw overlapped by shadow of opposite side.
- (b) Vertebræ.
- (c) Maxillary sinus and nasal fossa.
- (d) Region of ethmoid cells.
- (e) Mandibular canal.
- (f) Hyoid bone.
- (g) Condyle of mandible.

molar teeth may be seen the mandibular canal, running forward to the mental foramen between and below the apices of the premolars. Below the lower border of the mandible, extending in front of the vertebræ as far forward sometimes as the first molar, the hyoid bone is shown. In plates taken to show the molar region, the ramus and condyloid process of the mandible can frequently be traced up to the joint.

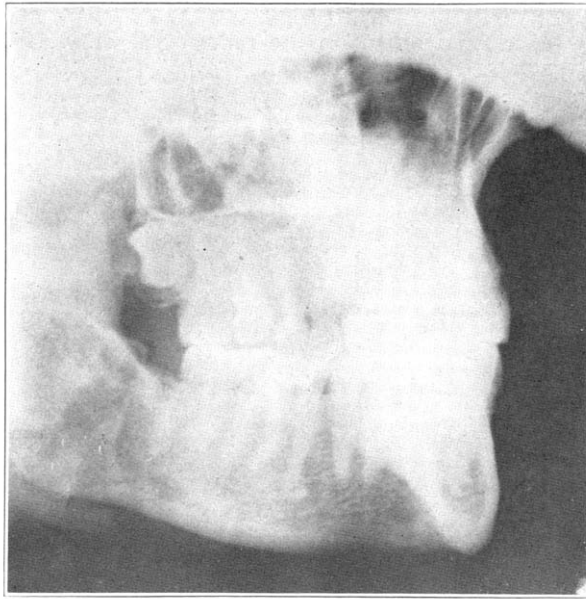


Fig. 23.—Plate of left side of face, showing normal anatomic landmarks and impacted upper third molar.
(See Fig. 24.)

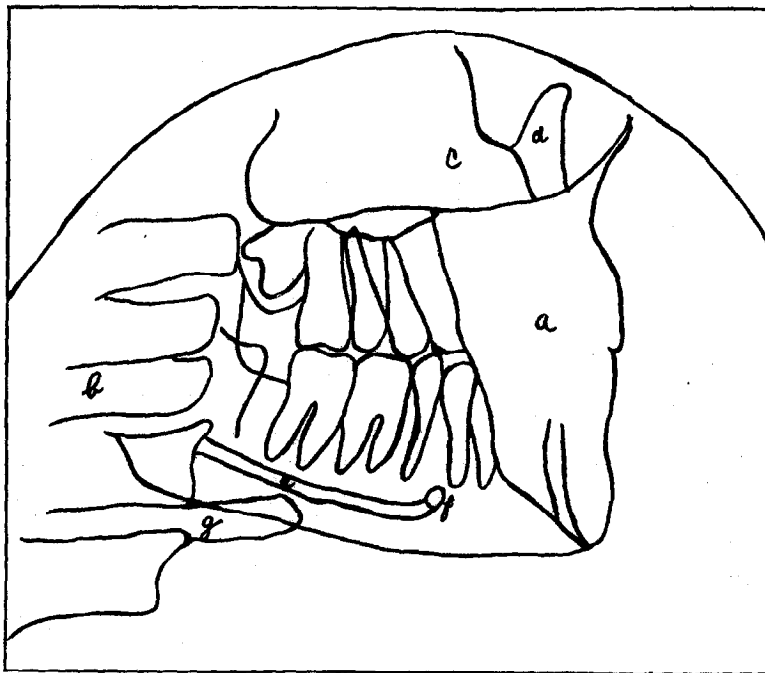


Fig. 24.—Diagrammatic illustration of Fig. 23.

- (a) Portion of upper and lower jaws overlapped by shadow of opposite side.
- (b) Vertebrae.
- (c) Maxillary sinus and nasal fossae.
- (d) Coronoid process of right side of mandible.
- (e) Mandibular canal.
- (f) Mental foramen.
- (g) Hyoid bone.