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DISEASES
OF THE
MOUTH, JAWS, FACE, TEETH,
AND
ASSOCIATE PARTS.

CHAPTER I.

SURGICAL ANATOMY OF THE HEAD.

ORAL surgery, viewed as a specialty in medicine, claims to treat of the various lesions associated directly and indirectly with the mouth, jaws, face, teeth, and associate parts.

Studies in special medicine are properly preceded by education in medicine at large, particularly as such education considers the relation and application of principles to practice. The present work assumes, in the treatment of its subjects, that certain required preliminary study has been accomplished; otherwise, that general text-books are at hand for convenient reference; it accepts, however, that plainness and simplicity in description are high attributes in any written page, and that to combine elements and practice is in the present volume markedly a desideratum.

Of foundational matter, assumed to be elementary, knowledge of anatomy asserts itself as of primary importance. Another direction refers to physiology. Still another relates with pathology. These subjects understood, or otherwise contemporaneously studied with the topics of the volume in hand, full comprehension of the details herein treated is arrived at easily.

Special parts require to be specially considered in order that special practice be directed with that absolute expression of intelligence which is the presumed virtue of specialism. Recognizing such necessity, and reminding the student that oral surgery deals with the head, the work is commenced by directing attention to what is known as the "surgical" anatomy of the region.

In presenting pictures, here shown, of parts associated with the specialty, the suggestion is to be urged that a skull, and disarticulated bones, be pro-

cured, and that these be kept in fit relation with the study-chair. It is important, too, that a specialist dissect extensively with close regard to minutiae. It is necessary that he establish clearly in his mind the correlative relations of localities and phenomena.

A human head consists of a cranial and a facial portion; it is divisible also into soft and hard parts. The cranial portion is the superior and posterior aspects; it accommodates and protects the brain. The facial portion is the inferior anterior division; it supports, and as well relates, the organs of expression.

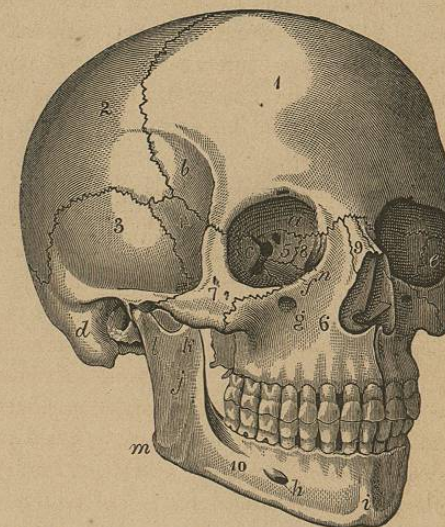
The hard framework of a head is called the skull; it is made up of twenty-two different bones. Of these bones eight pertain to the cranial, fourteen to the face portion. The names of the bones are as follows: Belonging to the cranium—sphenoid, ethmoid, frontal, occipital, two parietal, two temporal. Belonging to the face—inferior maxilla, two superior maxillae, two nasal, two malar, two inferior turbinated, two lachrymal, two palate, and a vomer. The teeth, and the six bones associated with the auditory apparatus, are not commonly numbered.

The bones of the head are related with each other by means of sutures; these are known as articulations, and vary somewhat in character. Articulations find names in the relating bones, as, for example, temporo-maxillary, maxillo-malar, inter-maxillary, naso-frontal, etc.; that is to say, the lower jaw,—maxilla,—to make an example, relates with the temporal bone; hence the name of articular association, temporo-maxillary, maxillo-temporal; either being, of course, right and expressive. As character of articulation is concerned, the naming is directed to the peculiarity. The temporo-maxillary joint admits of a gliding movement, its peculiarity being the relation of two free surfaces, one convex, the other concave; it belongs to diarthrodal, or movable joints; its special feature of gliding places it in the subdivision Arthrodia. The relation of the parietal with the frontal bone is by indentations interlocking with each other,—*sutura*, a seam; peculiarity puts it in a special subdivision called *Limboza*, meaning that the edges are bevelled and that there are dentated processes. Gomphosis is a term signifying the relation of a conical process with a socket; teeth in the articulation of their roots with the alveoli of the jaw-bones come under this signification. Harmonia refers to the apposition of rough contiguous surfaces; the two upper jaw-bones as they come together at the median line of the face furnish illustration. Schindylesis distinguishes articulations where the thinned or bevelled edge of one bone is received into a fissure existing in another; the relation of rostrum of sphenoid with free edge of vomer is illustrative. Dentata signifies teeth-like surfaces; the parietal bones fit into each other as the cutting faces of two saws might do; hence *sutura dentata*. (See *General Anatomy*.)

Fig. 1 represents the lateral region of a skull; this is seen to form, almost accurately, an oblong square. A modification on such a square, however, is

found to exist in childhood, where the ramus of the inferior maxillary bone is at a more obtuse angle with the body; also in the case of an adult with prominent os frontis; in either of these cases this aspect is triangular. Bounded circumferentially by the supraorbital ridge of the frontal bone, the nasal process of the superior maxillary, and by the malar bone, we find a pyramidal cavity, the orbit, for the accommodation of the organ of sight. Examining this cavity attentively, no less than seven pieces are observed entering into its composition, some of which pieces, in their relations, closely affect proceedings in oral surgery. It is seen, for example,

FIG. 1.—LATERAL—AND FRONT—REGION OF THE SKULL.



THE SKULL SEEN PARTLY IN FRONT, AND ON THE RIGHT SIDE. 1, frontal bone; 2, parietal bone; 3, temporal bone, its squamous portion; 4, sphenoid bone, temporal surface of its great wing; 5, ethmoid bone, its orbital surface; 6, superior maxillary bone; 7, malar bone; 8, lachrymal bone; 9, nasal bone; 10, inferior maxillary bone. *a*, orbital plate of the frontal bone; *b*, temporal surface; *c*, orbital surface of the great wing of the sphenoid bone; *d*, mastoid portion of the temporal bone; *e*, orbital surface of the malar bone; *f*, orbital plate of the superior maxillary bone; *g*, infraorbital foramen; *h*, mental foramen; *i*, symphysis; *j*, ramus; *k*, coronoid process; *l*, neck supporting the condyle; *m*, angle; *n*, lachrymo-nasal duct.

carries the tears from the orbit to the nose. The outer wall of this duct is made up by the inner face of the nasal process, Fig. 3 (5), another portion of the superior maxillary bone. Diseases of the sinus not infrequently react on the eye; this to such extent that blindness of several months' standing has been cured by so simple a proceeding as the extraction of a diseased tooth-root which had affected the antrum to its engorgement. Closure of the tear canal, Fig. 3 (8), is almost certain to occur if the nasal process become

inflamed. Such inflammation is frequently met with as the result of an odontocele.*

Immediately below the inferior boundary of the orbit a foramen is seen, the infraorbital, Fig. 1 (*g*), for transmission of the infraorbital branch of the fifth nerve. Passing a bristle through this foramen, it is found to emerge in the groove marked on the floor of the orbit,—the infraorbital groove. This groove and this canal are both in the maxillary bone, and, alike with the ductus ad nasum, are influenced by its diseases.

The canine fossa, seen back of and above the canine tooth, has, as its floor, a thin plate of bone, which plate is the external face of the antrum, and through which, if it be found necessary, the cavity is easily to be entered.

The tuberosity of the bone, occupied in part by the wisdom-tooth, is a point of surgical interest,—it being not at all uncommon to have necrosis of this portion, the result of an otitis, induced and kept up by an imprisoned dens sapientiæ. Standing, as it is seen to do, tubercle-like, it is plainly evident that neither deformity nor harm would result from its separation as a sequestrum.

The alveolar processes (see stippled portion, Fig. 6) are remarked to constitute quite a large part of both the superior and inferior maxillæ. These processes, vascular and spongy, accommodative of the roots of the teeth and being subject to all irritations residing in their presence, are, without doubt, more liable to take on pathological action than any other portion of the ossa corporæ. From the alveolo-dental periosteum spring epulic outgrowths of various signification. Sarcomatous degeneration finds here a favorite seat: simple and compound cysts are familiar; degenerative otitis is not uncommon, while abscess is found in almost every mouth. The mental foramen, Fig. 1 (*h*), seen upon the inferior maxilla, a little anterior to the middle of the body, is the outlet of a canal traversing the centre of the bone, a canal conducting, beneath the teeth, the dental artery and nerve. The size, general character, and inlet of this canal are to be thoroughly studied, as not infrequently injuries to the artery require that it be plugged, either as foramina are concerned which exist beneath each tooth, or as the channel proper is interfered with in operations for removal of tumors or sequestra.

Neuralgia of some of the peripheries of the inferior dental nerve makes necessary, occasionally, its section within the canal. To get at this nerve, requires either that some tooth be extracted, and the section be made from the base of the socket, or otherwise that entrance is had from the outside. The easiest mode of performing such operation is to be observed, as relation is had to location, and to character of the bone.

The association of the teeth with their spongy processes, Fig. 6, is a matter which is to receive close attention, the operation for the extraction of these organs being an every-day matter. These processes, if examined in a number

* Odontocele. An eneysted tooth.

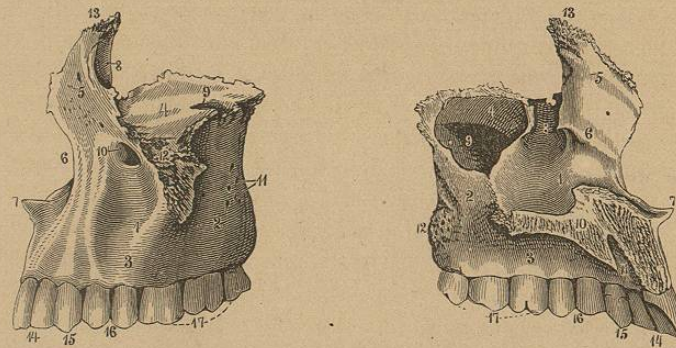
of bones, will be found to vary greatly in character: in some being of such loose structure that the teeth are capable of easiest separation; in other instances being so firm and unyielding that it is quite an impossibility to make such extraction without more or less fracture.

The number and shape of the roots of the teeth are to be fully examined. A knowledge of their relations and curyes contributes much to ease in their removal. Indeed, no one but the experienced can appreciate how much easier it is to extract teeth with than without the advantages of such knowledge. (See chapter on *Extraction*.)

The nasal bones, resting upon the nasal processes of the maxillæ, forming in the conjunction the nasal arch, are to be examined in their relation to each other and to neighboring pieces. Articulating above with the perpendicular plate of the ethmoid, it has not infrequently happened that the depression of this arch from a blow received upon it has carried the crista galli into the substance of the brain, and thus produced fatal consequences. The nasal bones are frequently the seat of syphilitic degeneration. Their destruction allows the falling in of the arch, thus yielding the flattening of the bridge occasionally observed,—one of the most repulsive of deformities.

The incisive fossa, observed between the anterior nasal spine, Fig. 2 (*7*),

FIGS. 2, 3.—SUPERIOR MAXILLARY BONE.



SUPERIOR MAXILLARY BONE OF THE LEFT SIDE, outer view. 1, body; 2, tuberosity; 3, alveolar border; 4, orbital plate; 5, nasal process; 6, nasal notch; 7, nasal spine; 8, lachrymal groove; 9, entrance of the infraorbital canal; 10, infraorbital foramen; 11, orifices of the posterior dental canals; 12, malar process; 13, articulation for the internal angular process of the frontal bone; 14, incisor teeth; 15, canine tooth; 16, premolar teeth; 17, large molar teeth.

SUPERIOR MAXILLARY BONE OF THE LEFT SIDE, inner view. 1, nasal surface of the body; 2, surface for the palate bone; 3, alveolar border; 4, orbital plate; 5, nasal process; 6, ridge for the articulation of the turbinated bone; 7, nasal spine; 8, groove contributing to form the lachrymo-nasal duct; 9, maxillary sinus; 10, palate plate, its articulating border for the right maxillary bone; 11, incisive foramen continuous with the naso-palatine canals; 12, tuberosity; 13, articular extremity for the internal angular process of the frontal bone; 14, incisor teeth; 15, canine tooth; 16, premolar teeth; 17, large molar teeth.

and central incisor teeth, frequently yields its floor to the ravages of necrosis or caries. There would seem to be just here less vital resistance than in other

parts of the bone, as necrosis of a tooth is almost necessarily associated with disease of the superficial surface of its alveolus. This plate is, however, quite thin, and its loss seldom seems of consequence.

The position of the groove for the passage of the facial artery, seen on the inferior maxilla, is to be noticed, as location and distance from the angle of the jaw are concerned,—the control of hemorrhage about the lips and cheeks being here secured through simple pressure on the vessel as it passes over the base. Here, too, is the place of election for ligation. The number (10) marked on the line designates the position of the notch.

With such observation of the surgical features of the general facial osseous region, we pass to a close study of the parts referred to, which study is to be made by examining the bones in their separate capacities.

SUPERIOR MAXILLARY BONE.

The superior maxilla consists of a series of processes, so grouped as to form, or rather to enclose, a cavity so large that the apparently solid body is seen to be simply a shell. This cavity of the shell is called the maxillary sinus, or the antrum of Highmore, Fig. 3 (9). It is a very irregular cavity, differing, indeed, in shape in almost every bone; generally, however, being found as a single cave, but not infrequently divided into two or more parts by septa of bone vertically placed. How far, in the mean of cases, the cave runs forward and how far backward; what, in the mean, is its relation to the roots of the various teeth; which of its boundaries are the thinnest; are matters which, because of their very practical signification, prove worthy of being attentively studied, the information being derived only by an observation of many bones. Abscesses of the roots of teeth frequently void themselves into this cavity; we are to understand how and why, anatomically, such accidents occur. Engorgements of the cavity, puruloid or dropsical, bulge outward some part or other of the circumferential walls, throwing, perhaps, the eye upon the cheek, projecting the canine fossa, or making a tumor on the palatal aspect of the mouth; we are to appreciate why such bulging, from a common cause, is found so variously situated, and why the accumulations exist.

If such a section be made of the superior maxillary bone as exposes the antral cavity, we find that in many cases, not indeed in all, its floor is studded with little hills. Break into one of these, and it is found to be a very thin crust, concealing the root of some tooth. In infrequent cases, a root or roots is found projecting into the cavity entirely uncovered, save with the membrane which had existence in the living part. Such a view explains satisfactorily the discharge of dental abscess within this sinus.

The processes which, in their conjunction, make up the bone, are four in number: the alveolar, Fig. 2 (3), the palate, Fig. 3 (2), the nasal, Fig. 2 (5), and the malar, Fig. 2 (12).

The alveolar process, wedged in between the malar and palate, constitutes

the bulk of the bone. Looked at from below, this process is found excavated into cavities, or pits, corresponding with the character and number of the roots of the teeth; these pits are termed alveoli, and, in the recent bone, are lined with periosteal tissue, which tissue is simply periodontal membrane; a bond of union between teeth and jaw. (See *Extraction of Teeth*.) In some bones, the structure making up this process is exceedingly loose and spongy; in others it is condensed, and cortical-like. After the loss of the teeth, it is removed through absorption; hence the approximation, in old people, of chin and nose. Fractures of this process, the result of falls, blows, or attempts at tooth extraction, are quite common. (See *Fractures of Jaw*.)

The tuberosity of the bone is to be esteemed as the posterior extremity of the alveolar process, being, indeed, not infrequently excavated for the accommodation of the wisdom-tooth. This tubercle, as implied in its name, is simply a bulb of bone; it is quite vascular, and its relation to the posterior tooth subjects it to sources of irritation which not infrequently results in its inflammation, death, and exfoliation.

The malar process, seen projecting from the middle of the maxilla, is a rough, serrated facet for articulation with the malar, or cheek, bone. This process, in front, is somewhat concave; behind it has similar curvature, and forms part of a fossa known as the zygomatic. The chief point of surgical interest connected with it lies in the character of the suture which unites the maxillary with the malar bone, this being the place of separation in removal of the maxillary.

The nasal process, Fig. 2 (5), well represented in the drawing, but infinitely easier of study and understanding from observation of the bone itself, is seen standing above the orbital surface. Rising from the anterior facial aspect, this process continues upward and somewhat backward, until it ends in a rough facet, which articulates the maxillary with the frontal and ethmoid bones, and assists in closing in the anterior ethmoidal cells. Lined in the recent state with mucous membrane, which membrane is continued into the cells of the ethmoidal and frontal bones, a moment's reflection recognizes the meaning of that sense of fulness so common about the anterior base of the cranium, when congestion exists in the nasal canals. Externally, the face of the process is concave, thus assisting in carrying out the natural curve of the lateral aspect of the nose; numerous foramina are also observed on this face, for the passage of vessels. The tendo oculi has its attachment on this surface, while near, on the same plane, is a line giving origin to the levator labii superioris alæque nasi and orbicularis palpebrarum muscles. Anteriorly, the border of the process is thin, and is serrated for articulation with the nasal bone. Posteriorly, it is thick, and hollowed into a groove for lodgment of the lachrymal sac and duct. When in position, in the articulated skull, this groove is converted into a canal by annexation with the lachrymal bone. The canal, traced downward, is found to have somewhat of an hour-glass shape, being considerably contracted in the centre, and finally terminating at the inferior

meatus in a bell-shaped opening. A little tubercle, the lachrymal, Fig. 1 (*n*), is seen where the anterior lip of the groove joins the orbital surface; this is a guide, directing the bistoury of the surgeon into the canal, when operations for its stricture are demanded.

The orbital surface of the bone, seen in Fig. 1 in its articulative position, is here observed separate; falling at an almost direct right angle from the facial aspect of the bone, it is remarked by such relation to form a large part of the floor of the orbital cavity; while looked at from the cave of Highmore, it is seen to form as well the roof of that vault. When broken, or held against the light, it is found to be almost a scale in thinness. The infra-orbital ridge is simply the rim made by the bending downward of this orbital surface. Running along the free edge three distinct articular faces are to be seen: the outer, for the palate bone, the two inner for the orbital, or plane plate, of the ethmoid and lachrymal bones. Below the rim, or infra-orbital border, is seen the orbital foramen, Fig. 2 (10). Passing a bristle into this opening, we find it directed to the groove on the orbital face, the infra-orbital. Thrusting the bristle now from the groove toward the foramen, we learn it may take some other track, and not appear at the opening. Searching for an explanation, we find the groove, soon after entering the ridge, dividing into two canals, one of which passes to the face, as observed; the other enters the antrum, and transmits across that cavity the nerves and vessels designed for the nutrition of the anterior teeth.

The osseous boundary of the nose is seen to advantage in this drawing. It is a complete curve, and gives attachment by its continuous crest, or edge, to the cartilaginous wings.

The zygomatic surface, seen back of the malar process, enters into the formation of the fossa of that name. This surface is, to a degree, convex, and more or less rough. Dotted its face a number of foramina are observed; these are entrances to canals, posterior dental they are called, and they transmit vessels to certain teeth; to all situated back of the canines. At the lower part of this surface, that is, to the nasal aspect of the tuberosity, a groove is seen, destined to be converted into a canal through an articulation with the palate bone; posterior dental groove is its name, Fig. 2 (11). This groove, or canal, transmits vessels to the palatal face of the bone, and is seen to terminate on the under side of the tuberosity.

The muscles of expression, to which the outer surface of the bone gives origin, are numerous. From the second bicuspid tooth back to the tuberosity, is a rough line for the trumpeter's, or buccinator (a similar line existing on the inferior maxilla). Above this first line, and below the malar process, certain fibres of the masseter are attached. Above the canine fossa is the origin of the levator anguli oris; while without this, toward the concavity of the nose, is the line for the compressor naris. In the incisive, or myrtiform, fossa is seen the origin of the depressor ala nasi.

Turning now toward us the inner face of the bone, we remark the fourth

process, the palate. This process starts out from the middle of the bone, and divides it into two unequal parts. Like the orbital plate, it is related at right angles with the body, and, when the maxilla is articulated, the plate is seen to separate the nose from the mouth, constituting the floor of the first cavity and the roof of the second. Posteriorly, it is quite thin, and articulates with a process of the palate bone. Running forward, it grows thicker and heavier, and ends in the anterior nasal spine. Viewed on its nasal surface it is slightly concave. Externally, it becomes merged into the body of the bone; internally or mesially, it rises into a ridge, which ridge is the one side of a groove receiving into articulation the vomer. A bristle passed through an opening in the thick part of the process shows the position of a canal, the anterior palatal, transmitting vessels of that name, which vessels find entrance into the oral cavity through the incisive foramen seen just back of the centre tooth. Fig. 3 (11). A nerve, the naso-palatine, having considerable surgical significance, enters the mouth at the orifice of this canal; it is not, however, transmitted by it, but has a canal of its own existing in the intermaxillary suture. The three marked points of surgical interest in this process are—first, the fact of its forming the boundary between the mouth and nose; a break in its continuity, and which, unfortunately, is not an infrequent accident, throwing these two cavities into one; second, the nature and the relation of suture—harmonial, it is called—with the palatine process of the palate bone, this being the line of separation in ablation; third, the position of entrance of the naso-palatine nerve, paralysis of the parts supplied by this nerve being a frequent result of ill-applied pieces of dental apparatus. To these three might be added a fourth; the position of the artery occupying the posterior palatine canal, an artery which is sometimes of considerable size, and which might easily be cut by the slip of a lancet applied to the gum of a wisdom-tooth, or in the act of dividing the tendon of the flexor palati where it curves around the hamular process.

The other features observable on this aspect of the bone are without special surgical interest. Above the inferior meatus, which is the space between the floor of the nares and the inferior turbinated bone, Fig. 11 (21), is seen a crest for the attachment of that scroll. Still higher, on the nasal process, are the crests for union with the superior and middle scrolls (see also Fig. 11). The middle meatus (20), into which the antrum opens, is observed to be quite a large space, particularly when compared with the superior meatus (19), which is the slit lying between the upper and middle crests. The opening of the antrum, seen in the back part of the middle meatus, Fig. 3, is portrayed of a natural size,—that is, natural to the disarticulated bone. In Fig. 11 (26) it is shown as in articulation. It is to be known, however, that in the articulated skull this opening is intruded on by various bones, which intrusion reduces the opening to an outlet not larger than an ordinary probe. The bones closing in this cavity are the ethmoid, palate, and inferior turbinated. (See descriptions of these bones.)