IV. *The Formation and Early Growth of the Bones of the Human Face.*

By GEORGE W. CALLENDER, *Lecturer on Anatomy at St. Bartholomew's Hospital. Communicated by* J. PAGET, *F.R.S.*

Received June 2,—Read June 18, 1868.

I PROPOSE in the following notes to relate some observations respecting the formation and growth of the bones of the human face. It is not my purpose to consider minutely the process of ossification, but simply to mention such of my experiences as differ from the commonly received statements, or which seem to supply information regarding some few points with which we are as yet imperfectly acquainted, such as the growth of the maxillæ, and the formation and eventual obliteration of the intermaxillary bones.

Of the cartilaginous and membranous structures of the cranium, before ossification has commenced, two processes of cartilage, trabeculæ cranii of RATHKE, extend into the anterior division of the skull, forming by their union the frontal nasal process, and from between which the internasal cartilage is derived. Lateral masses, inflected lateral cartilages, represent the future ethmoid and inferior turbinate bones.

The internasal cartilage bending or arching over on either side forms plates on which the nasal bones are developed, and is connected in front with the cartilages of the nose. In a fœtus nine-tenths of an inch long* it is joined to the lateral cartilages by

* This and all the specimens subsequently referred to are in the Museum of St. Bartholomew's Hospital. The figures, 3·5 for example, are used to indicate the length of a fœtus in inches and tenths of an inch. It seems best to distinguish each fœtus by its length; the following Table gives, as nearly as it is possible to determine it, the corresponding age in days and weeks in twenty cases.

Length of fœtus, in inches.	Age, in weeks.	Age, in days.
·12	3	7 to 14
·4	6	35 to 42
·5	7	42 to 49
·7	8	49 to 56
·9, 1·1	9	56 to 63
1·5	10	63 to 70
2·3, 3, 3·5, 3·7, 3·8, 4, 4·3, 4·7	12 to 16	84 to 112
6·5, 6·7, 7	16 to 20	112 to 140
9, 10	22 to 24	154 to 168

membrane, which extends from the lower edge of the internasal plate, with the perichondrium of which it is continuous, to the inner side of either lateral mass over which it is prolonged. By such membrane the passage of either nostril is completed, the anterior orifice being bounded by the cartilage of the nose above, by the extremity of the internasal cartilage in the middle line, and between these structures by the connecting membrane. Where the latter passes off from the septum, there is an elevation of tissue on either side of a central depression.

In a human fœtus four-tenths of an inch long the frontal-nasal process is still distinct; the lateral-nasal and the maxillary lobe, united, approach it on either side, most nearly above, and the maxillary lobe can be traced back as a slight elevation, the palate, towards the middle line (Plate XIII. fig. 1). On raising the frontal-nasal process the central part of its under surface is found to form two thickened masses, and represents the nasal cartilages, and from either side of this central part a narrow ridge curves downwards, the cartilage for the future ethmoid and turbinate bones (Plate XIII. fig. 2). These central parts growing forward are joined, beginning from above, to the maxillary lobes in a fœtus nine-tenths of an inch long, the union of opposite sides to form the palate taking place gradually from before backwards. In a fœtus 1·5 the union of the maxillary lobes is not yet complete, a fissure still extending through the soft palate.

If in a fœtus nine-tenths of an inch long the superficial parts are removed, that portion which forms the superior maxilla is seen to occupy the position, and to have the shape of the future bone, the orbital, palatal, and alveolar parts being defined, whilst two considerable projections indicate the position of the nasal and of the incisor processes, the last named lying immediately above the elevation, or thickening, at the anterior extremity of the internasal cartilage. The mass of the superior maxilla consists of cells crowded together, having well-defined outlines, and being filled with granular matter. After the development of the bone its subsequent growth is effected in the membrane which covers its various surfaces, and in the membranous part of the nasal wall.

Ossification and Growth of the Superior Maxilla.

No ossification has taken place in the superior maxilla of a fœtus nine-tenths of an inch long, but in a fœtus 1·1 numerous bony deposits are visible. These independent bone formations appear in that portion of the maxillary lobe which has been described as moulded to the shape of the upper jaw. The most conspicuous are ranged below the infraorbital plate, and stud the alveolar border and the nasal process; but although ossification commences at many distinct points in these parts of the bone, the rapidity with which the separate ossifications are fused makes it undesirable to name each as a distinct centre. In a fœtal pig 2 inches long (Plate XIII. fig. 3) the superior maxilla, besides a well-formed palatal portion, consists of osseous deposits which seem to radiate from a line corresponding with the base of the alveoli, and from a centre situated immediately below the infraorbital notch. A somewhat similar condition is observable in the mammary fœtus, nine-tenths of an inch long, of a Kangaroo.

There is no evidence in the human fœtus that the palatal-alveolar is ever a distinct process, although its ossification occurs a little less early than that of the other portions. In a fœtus 1·5 bone-granules are seen ranged along the edges of the alveolar plate, which they surrounded like a ring, and extend into the back part of the palatal process; but whilst the nasal and orbital portions of the bone are comparatively well shaped, the palate is but a ridge standing in towards the middle line, and is separated by a wide angular notch, the base of which is towards the middle line, from the incisor process.

In a fœtus 2·3 the bone presents the following appearances. Taking a point below the infraorbital notch as a centre, three processes are traced from it:—(1) The nasal forms a thin plate having the permanent shape of the process, but the ridge for the turbinate bone, the vertical thickening of its lower nasal surface, and the nasal groove are wanting. From its base a smooth plate of bone passes forward, the centrebit, as it were, of the incisor portion, chief part of the roof of which it ultimately forms, and to this hitherto, I believe, unrecognized portion the name of incisor process may be rightly given (Plate XIV. figs. 5 & 7). A channel or groove ascends from, and is continuous with, the fissure between the incisor process and the front edge of the palatal, and ends about halfway up the inner surface of the nasal process. (2) The palatal-alveolar extends with a slight slope inwards and backwards. Its nasal surface has no distinguishing mark, but on that of the palate a slight ridge indicates the situation of the base of the inner alveolar wall. (3) The orbital, divided on the upper surface from the palatal-alveolar process by a deep groove (narrow in front, where it forms the infraorbital fissure, and comparatively wide posteriorly), and continued backwards above the alveolar plate to end in an articular surface for the malar bone.

Below and anterior to the infraorbital fissure the maxilla is deeply notched to form the roof of the canine socket; but there is no such notch, the lower border being uniformly level in the maxilla of a fœtus 1·5.

A fœtus 4·7, a second 6·7, and a third 9 inches long may be selected as illustrating the changes which occur during the early growth of the bone (Plate XIV. figs. 5 to 11).

The outer surface of the nasal process becomes thickened and strengthened by bone deposits, which spread out above and laterally, forming in a fœtus 4·3 the anterior wall of the sockets for the incisors, covering the canine notch, and reaching posteriorly beyond the margins of the infraorbital fissure. In a fœtus 6·7 they constitute a ridge below the facial portion of the orbital plate for the outer wall of the alveoli of the molars, which gradually deepens but only reaches the posterior part of the alveolar plate in a fœtus 9 inches long. In the same order the inner wall of all the sockets is formed, but the inner and outer walls have not quite united posteriorly in a fœtus 9 inches long. These plates of bone, excepting the inner and median walls of the incisor sockets, are produced in membrane continuous with that in which the gums are formed.

The canine socket is isolated by lateral partitions of bone in a fœtus 4·3, the incisors begin to be separated in a fœtus 6·7, but the division between the lateral and middle

sockets is far from perfect in a fœtus 9 inches long, although the plate forming the inner wall of the middle incisor is complete in a fœtus 6·7. In the latter, too, the division between the bicuspids and molars begins to be apparent.

The canine socket is formed in the body of the bone, the incisor sockets grow down below the incisor process, those of the bicuspid and molar teeth are alone connected with the distinct aveolar plate.

The palatal-alveolar process in a fœtus 4·3 has lost its uniform appearance on the nasal side. Plates of bone in waving lines have thickened the upper surface of the palate, and ascend the posterior margin of the groove on the inner side of the nasal process, and assist in forming the nasal duct. By the turning up of some of these bone plates, which are formed in the membrane extending from the ethmoid and inferior turbinate cartilage to the septum, that portion of the maxilla which is the inner wall of the antrum is now formed. A second plate, constituting the outer wall of the antrum and part of the floor of the orbit, rises with an inward slope from the inner edge of the orbital process, whilst deposits of bone are accumulating on the orbit, chiefly on either side of the infraorbital fissure. The growing down of the alveolar walls alone marks the increase of this part of the bone on its palatal surface. The infraorbital fissure is still open in its entire length in a fœtus 9 inches long, but in the anterior half of the orbital plate it forms a deep canal in consequence of the deposits of bone on its either side.

The antrum is at first of large comparative size. In a fœtus 4·3 its greatest width is nearly one-tenth of an inch, the palate being at this period just over one-tenth of an inch wide. In the adult, owing to the rising of the orbital plate and the hollowing out of the zygomatic process, the antrum is 1·2 inch wide to ·7 for the palate. In a fœtus nine inches long, in consequence of the rapid increase in the width of the palate, the antrum is only as ·1 to ·2, but a deep fissure (Plate XIV. fig. 8) shows where the orbital plate is to be lifted up to allow of the lateral and vertical expansion of the cavity of the antrum.

Of the Vomer and Intermaxillary Bones.

These bones are developed in the membrane which covers the internasal cartilage, and forms part of the boundaries of the sides of the nostrils, Ossification is commonly said to commence in the posterior part of the vomer. This is not the case. In a fœtus 1·5 this bone consists of a keel from which spicula bud like ribs on either side of the cartilage of the septum. Those in front are most advanced in their development, those behind diverge from each other as they pass backward, as is shown in fig. 4, Plate XIII., which represents the vomer of a fœtus 2·3.

At the anterior extremity of the vomer the process of ossification extends to form the intermaxillary bones.

These bones, though their appearances vary in different mammals, have amongst these animals certain common features. (1) The line of articulation with the superior

maxilla is in front of the canine socket when the latter is present, when absent the relation of the suture to the maxilla virtually remains unaltered. (2) The præmaxilla, as it is more correctly named for these animals, is prolonged superiorly to a point which ascends to a varying distance, or is cut short abruptly. In any case, whatever be the length of the posterior margin, a groove is found in the anterior edge of the superior maxilla; and into this the wedge-shaped margin, broad or narrow (sometimes almost incisive, as in the sheep), of the præmaxilla is inserted, and is thus embraced, as it were, by the front border of the upper jaw. (3) The præmaxillæ carry the incisor teeth, when present. (4) They articulate in the middle line, sometimes leaving a notch in front for a continuation forward of the septum. (5) They form more or less of the front of the palate, of the boundaries of the incisive foramina, and of the complete or partial septum which separates them (see Plate XIII. figs. 9 & 10, Plate XIV. figs. 1, 2, 3, 4).

On the superior maxilla during fœtal life there may be seen in many animals, in front of the canine socket, a slight projection which appears to be analogous to the incisor process of the corresponding human bone. This may be observed in a fœtal Pig (Plate XIII. fig. 3). In the mammary fœtus of a Kangaroo also there is a short thick process which projects considerably forwards and downwards in remarkable contrast with the corresponding but elongated portion of the adult bone (Plate XIII. fig. 5).

Passing to an examination of the human fœtus, it is evident, from the shape and direction of the incisor process (which is best examined in a fœtus 4·3, being then easily detached from the intermaxilla), that it passes across the anterior boundary of the nostril as the latter is continued forward to the middle of the lip (Plate XIV. figs. 5 & 7). This boundary above is partly covered by the nasal process, below the palatal portion of the superior maxilla ends abruptly behind it, and between the two it is that the incisor process crosses, and indents the orifice of the nostril.

The membrane inflected by the incisor process extends from the middle line (where it is continued forward to be connected with the process of the maxillary lobe which joins it on either side to complete the upper lip), partly below and then behind the incisor process, fills the fissure between that and the palatal, and is continued up behind the nasal process; the groove on the inner surface of this process corresponds with the edge formed by the bending in of the anterior membranous boundary of the nostril, and in the membrane continued back from the angle thus formed there is developed the plate of bone which constitutes the anterior inner or nasal wall of the antrum and the channel for the nasal duct, whilst in the membrane which lies anterior to the groove the intermaxilla of either side originates.

In a fœtus 2·3 the intermaxilla consists of deposits of bone about the posterior edge of the incisor process, which subsequently grow down to form the plate of bone on the inner side of the middle incisor socket, and the posterior wall of the incisor sockets below and internal to the course of the incisor branches of the dental nerve. The front

wall of the middle and lateral incisor sockets is continuous, as previously stated, with the plate of bone which covers in the canine notch.

In a fœtus 4·3 the intermaxilla is completely formed and may be traced as a distinct bone (Plate XIV. fig. 6). It consists of the parts already described, which are continued backwards to form the front of the palate, filling up the notch between the incisor and palatal processes (Plate XIV. figs. 5 & 7), and of a narrow portion which ascends and fits by a convex surface into the groove of the nasal process, ending above at the ridge for the turbinate bone, part of which ridge it forms. In a fœtus 2·3, and also in one 3 inches long, two sets of bone-deposits are seen immediately in front of the vomer, one consisting of a fine process which projects in the middle line, the other formed of blocks, one above the other, which lie over the incisor process and add to its depth and strength. In a fœtus 9 inches long these bone-formations have made but little progress, and may easily escape detection.

In a fœtus 9 inches long, either intermaxillary bone is in great part fused with its corresponding upper maxilla. The anterior edge of its nasal process has united to the nasal process of the maxilla, and its horizontal portion is inseparably attached to the upper surface of the incisor process, but the outline of the bone is preserved by a fissure (Plate XIV. figs. 9 & 10), which is traced along its posterior margin from the middle of the nasal process of the maxilla, and which deepens as it reaches the palate through which it extends, often permanently. At its upper extremity this line, widening into a groove, contains the remains of the bent edge of the anterior boundary of the nostril, which can be traced downwards for some distance along a kind of canal, and which in a fœtus 6·5 retains its connexion with the soft structures lying beneath the nasal process, reaching up towards the nasal bone.

Lastly, in a fœtus 9 inches long, the boundary of the intermaxilla is still distinctly marked on the under surface of the palate, extending outwards to the posterior half of the outer wall of the lateral incisor, which it forms as far as the margin of the foramen for the nerve, thence it extends, as a fissure occupied by the nerve for the middle incisor, and crossing the septum between the incisors is lost in the plates of bone which have joined the incisor process.

The preceding observations account for the absence of all trace of the human intermaxillary bone on the facial aspect of the upper jaw in the adult, whilst the permanent fissure through the palate and on the inner side of the nasal process are equally explained. The bone, in fact, is shut off from the face by the nasal and incisor processes of the superior maxilla. Distinctly outlined (Plate XIV. fig. 6) at the close of the fourth month, it is joined to the superior maxilla during the latter part of the fifth or beginning of the sixth month; its nasal process, as it may conveniently be termed, is buried in that of the upper jaw, the apex assisting to form a permanent ridge for articulation with the inferior turbinate bone. In a fœtus 1·5 I notice a slight cleft in the nasal process of the superior maxilla corresponding with the top of the groove on its inner surface, but

I have never seen anything like an approach to the formation of a distinct anterior plate of bone, such as forms part of the præmaxillæ of mammals.

Yet, despite the peculiarity which results from the formation of the incisor process and the shutting in of the intermaxillaries in Man, these bones closely resemble those corresponding with them in mammalia. They have a similar wedge-shaped articular surface, fitting a groove in either superior maxilla; they extend towards the middle line and articulate there; they form the anterior extremity of the palate; they bound and divide the incisive foramina; they assist in forming no inconsiderable portion of the sockets for the incisor teeth; that they do not completely form them is a fact occasionally confirmed by the imperfect character of the sockets which lodge these teeth in those cases of cleft palate which have the intermaxillary bones isolated from the superior maxillæ.

Another interesting point may be noticed. In some mammals having a slight upper jaw, a Sheep for example, the outer wall of the nostril is smooth, there is no vertical ridge, such as that which in Man rises to the turbinate bone. In other mammals with strong upper jaws the præmaxillæ thicken towards their articulation with the superior maxillæ, and here is the most prominent vertical line on the nasal surface; beyond this the superior maxillæ recede somewhat. There is no such distinct ridge on the upper jaw itself. In Man the corresponding ridge is placed about the middle of the inner surface of the ascending process of the upper maxilla, but it results from, and marks none the less the junction of the nasal process of the intermaxilla with that groove on the inner surface of the upper jaw with which it originally articulated.

A few words may dispose of several of the bones of the face, as there is little that is new to be said respecting them. In a fœtus 1·5 ossification has commenced in the nasal bones; in a fœtus 2·3, and still better in one 3·7, the outer lower angle is seen to be prolonged downwards, and is in connexion with the fold of membrane continued up from the apex of the intermaxilla. The lachrymal bones are incompletely ossified in a fœtus 2·3 They are formed in membrane, covering a prolongation of cartilage from that which eventually forms the ethmoidal plate of the orbit. One of these bones is seen in position in a specimen from a fœtus 4·7. The ossification of the malar and of the palate-bones progresses with that of the upper jaw. That of the palate-bones takes place in the inner and back part of the maxillary lobe. In a fœtus 1·5 the palatal portion is represented by a slightly incurved ridge, the vertical is proportionately much larger. The bones are in the earliest stage remarkable for the large size of the posterior nasal foramen, around which ossification appears to commence. The remarkable size of the opening for the malar nerve and the early bone-deposits around it, the formation of the nasal bones over branches from the ophthalmic nerves, the building-up of the superior maxilla about the infraorbital and its branches, and of the inferior maxilla about the dental nerve, are points worth noticing with reference to the formation of these bones of the face. In a fœtus 9 inches long the palate-bone is completely outlined, with the exception of the surfaces which mark its upper processes.

The Inferior Maxilla.

This bone is developed partly in MECKEL'S cartilages, partly in membrane which covers them. In the human fœtus the cartilages are prolonged to the middle line in the first visceral arch, where the two are loosely connected by membrane. These outgrowths of cartilage taper as they pass forward, but expand behind the incisor portion of the jaw into a lobed extremity (Plate XIII. fig. 6 (2)), the front lower surface of which, unlike in this respect the remainder of the cartilage, is not covered by bone in a fœtus 1·5 (Plate XIII. fig. 6 (1)). Ossification commences in a fœtus ·9 by deposits along the lower middle border of the maxilla on either side, and extends thence in all directions in the membrane which covers MECKEL'S cartilage, so that the bone is well defined in a fœtus 1·1, and is then one-tenth of an inch long.

Each half of the maxilla may be said to grow from four centres, formed (1) by the cartilage which tips the condyloid extremity, (2) by the layer of membrane in front of MECKEL'S cartilage, (3) by the ossification of the anterior extremity of MECKEL'S cartilage, (4) by deposits of bone in the perichondrium of the anterior and middle thirds of the same cartilage from which is derived the plate of bone which forms the base of the dental canal.

In a fœtus 2·3 the outer surface of the bone has a uniformly smooth appearance, marked only by the opening for the mental nerve. The ascending ramus rises from the horizontal at an obtuse angle. The angle formed by the anterior (coronoid) border measures 169° in a fœtus 2·3, 156° in a fœtus 3·5, 129° in a fœtus 8 inches long. The angle formed by the posterior (condyloid) border measures 165° in a fœtus 2·3, 153° in one 3·5, and 144° in a fœtus 8 inches long. In a fœtus 1·5 the angles formed between the rami are scarcely appreciable (Plate XIII. fig. 6 (1)).

The alveoli are deepened by deposits in the membrane from which the gums are also formed; the canine socket, which is open on its outer side in a fœtus 9 inches long, is separated by a posterior septum in a fœtus 2·3, and from the lateral incisor in one 3·5, and the last-named from the middle incisor in a fœtus 3·7, in which also a partition is beginning to form between the sets of teeth behind the canine socket.

Whilst little is to be observed in the growth of the outer surface of either half of the inferior maxilla, the inner surface presents for examination, (1) the formation of the floor of the dental canal, (2) the changes in the anterior extremity of MECKEL'S cartilage.

In the immediate covering of the anterior half, or thereabouts, of the cartilage of MECKEL a plate of bone begins to be formed at a very early period. It stands out, in a fœtus 1·5, from the inner surface of the horizontal ramus, and at first, as it grows, it follows the curve of the cartilage beneath, and is consequently convex on its upper surface, upon which the dental nerve is situated. This plate, or ridge, extends from the future position of the dental foramen, and, in front, turns up to between the canine and incisor sockets. Gradually this ridge becomes concave on its outer surface, grows up to constitute the boundary of the dental canal and part of the posterior or inner wall of the sockets for the teeth, and in a fœtus 8 inches long its lower border is recog-

nized as the mylo-hyoidean ridge, the posterior extremity of which is turned upwards and outwards to join the inner surface of the ascending ramus, and thus forms the inferior dental foramen, whilst the shallow groove beneath this ridge is occupied by the remains of the cartilage of MECKEL (Plate XIII. fig. 8, *d* and *b*).

The extremity of MECKEL'S cartilage is ossifying in a fœtus 2·3 to form the inner triangular block of bone (below the anterior part of the ridge) which determines the size and shape of the lower anterior portion of each half of the jaw, beneath, that is to say, the incisor sockets (Plate XIII. figs. 6 (3), 7, & 8). To the twist acquired in this portion of the bone the prominence of the front of the maxilla, known as the mentum, or chin, appears to be due. In a fœtus 3·5 the cartilage is ossified as far back as the junction of the middle with the anterior third of the body of the bone; behind this point it gradually shrinks during the subsequent growth of the ramus. In a fœtus 4·7 the block of bone formed in the anterior extremity of the cartilage of MECKEL is still clearly defined.

EXPLANATION OF THE PLATES.

PLATE XIII.

Fig. 1. Part of human fœtus (four-tenths of an inch long): *a*, plates for ethmoid and turbinate cartilages; *b*, maxillary lobe prolonged towards the middle line to form the palate (3 linear).

Fig. 2. The same as the preceding: *a*, *a*, plates for ethmoid and turbinate cartilages; *b*, maxillary lobe showing its irregular inner surface; *c*, frontal-nasal process turned back to expose the nodules on its under surface and the continuation of the ethmoid plates.

Fig. 3. Part of superior maxilla from fœtal Pig (2 inches long): *a*, process in the situation of the human incisor portion (5 linear).

Fig. 4. Vomer of human fœtus (2·3 inches long): *a*, anterior extremity of the bone (15 linear).

Fig. 5. Part of skull of mammary fœtus of Kangaroo (2 inches long): *a*, process in the situation of the human incisor portion (3·5 linear).

Fig. 6. (1) Outer surface of left inferior maxilla from human fœtus (1 inch and five-tenths long): the mental extremity is sharply bevelled off below; the situation of the mental foramen is indicated. (2) Anterior extremity of MECKEL'S cartilage and a layer of membrane lying beneath it, from the same fœtus. (3) Right inferior maxilla, inner surface, from human fœtus (2·3 inches long): *a*, ossified anterior extremity of MECKEL'S cartilage; *b*, plate of bone overlying the groove for the cartilage and separating it from that for the dental nerve (3·5 linear).

Fig. 7. Left inferior maxilla, inner surface, from human fœtus (3·5 inches long): *a* and *b* refer to the same structures as in the last figure; *c* points to the convex upper surface of the plate of bone bounding the dental canal (3·5 linear).

Fig. 8. Right inferior maxilla from human fœtus (8 inches long), inner surface: *a* and *c* as before; *b*, groove for the remains of MECKEL'S cartilage; *d*, mylohyoidean ridge (3·5 linear).

Fig. 9. Front of palate from the skull of a Monkey, showing the relations of the præmaxillary bones (natural size).

Fig. 10. The same parts of the skull of a Dog (half natural size).

PLATE XIV.

Fig. 1. Front of palate from the skull of a Hare, showing the relations of the præmaxillary bones (natural size).

Fig. 2. The same parts of the skull of a Sow (one-quarter natural size).

Fig. 3. The same parts of the skull of a Sheep (one-third natural size).

Fig. 4. The same parts of the skull of a Kangaroo (natural size).

Fig. 5. Right superior maxilla from human fœtus (4·7 inches long): *a*, inner wall of antrum; *b*, incisor process; *c*, fissure for intermaxillary bone (3·5 linear).

Fig. 6. Left superior maxilla from human fœtus (4·7 inches long): *a*, inner wall of antrum, continuous with the palate; *b*, incisor process; *c*, intermaxillary bone (3·5 linear).

Fig. 7. Incisor process (*b*) and fissure for intermaxillary from the same specimen as fig. 1, viewed from the front; *e*, infraorbital notch (3·5 linear).

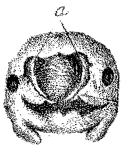
Fig. 8. Right superior maxilla from human fœtus (9 inches long): *d*, fissure extending into the orbital portion of the bone, and indicating the line of extension of the cavity of the antrum (3·5 linear).

Fig. 9. Left superior maxilla from human fœtus (6·7 inches long): *c*, intermaxillary bone joined, with the exception of its apex, by its front border to the maxilla the posterior margin is free (3·5 linear).

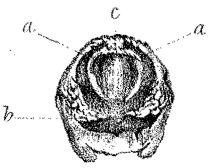
Fig. 10. Left superior maxilla from human fœtus (9 inches long): *c*, intermaxillary bone completely united in front to maxilla; *g*, canal which extends for a short distance beneath the intermaxilla; *h*, plates of bone belonging to the intermaxilla, which assist in bounding the incisor sockets (3·5 linear).

Fig. 11. Front view of right superior maxilla of human fœtus (9 inches long), showing the plates of bone which form the front wall of the incisor and canine sockets and which extend to the alveolar plate: *f*, canine notch; *e*, infraorbital notch or fissure (3·5 linear).

1.



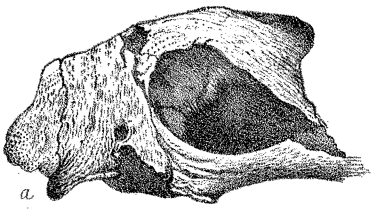
2.



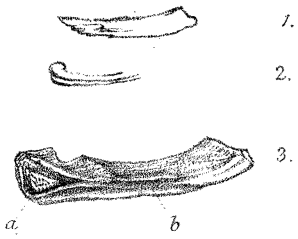
3.

4.

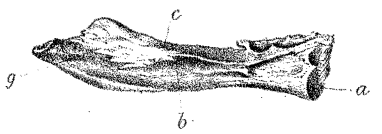
5.



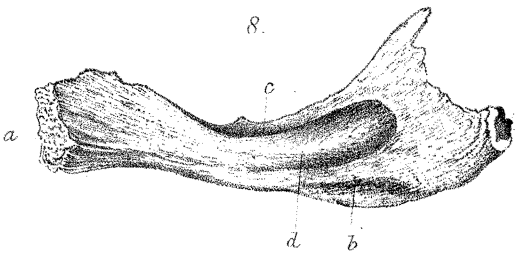
6.



7.

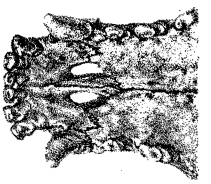


8.

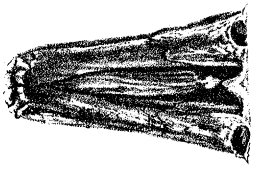


9.

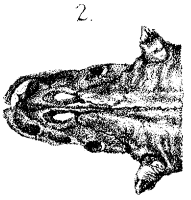
10.



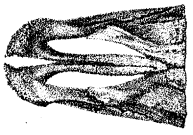
1



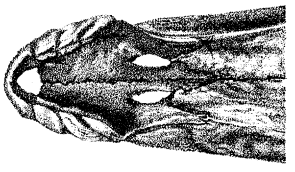
2.



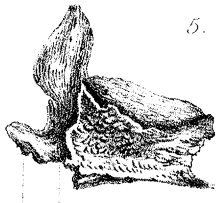
3.



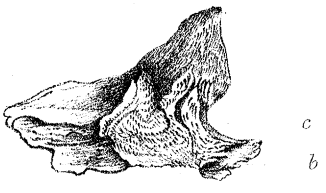
4.



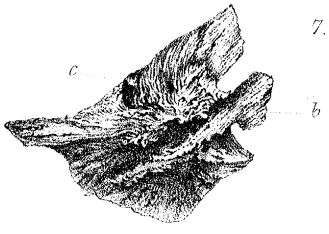
5.



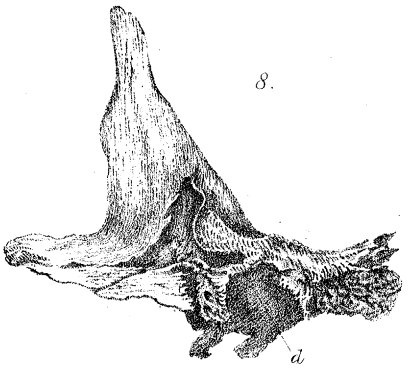
6.



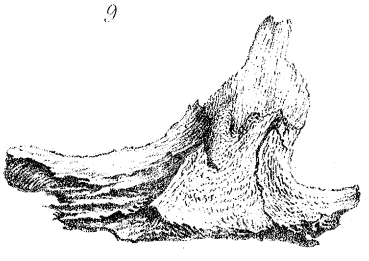
7.



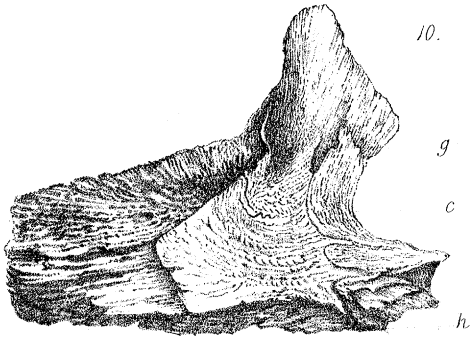
8.



9



10.



11.