

SOME REMARKS ON THE DEVELOPMENT AND ANATOMY OF THE SEPTUM NASI*

J. Dankmeijer, M.D., Leiden, Netherlands

In the human embryo one of the first signs of facial development is found in the development of the primary nasal cavities. As soon as, in an embryo

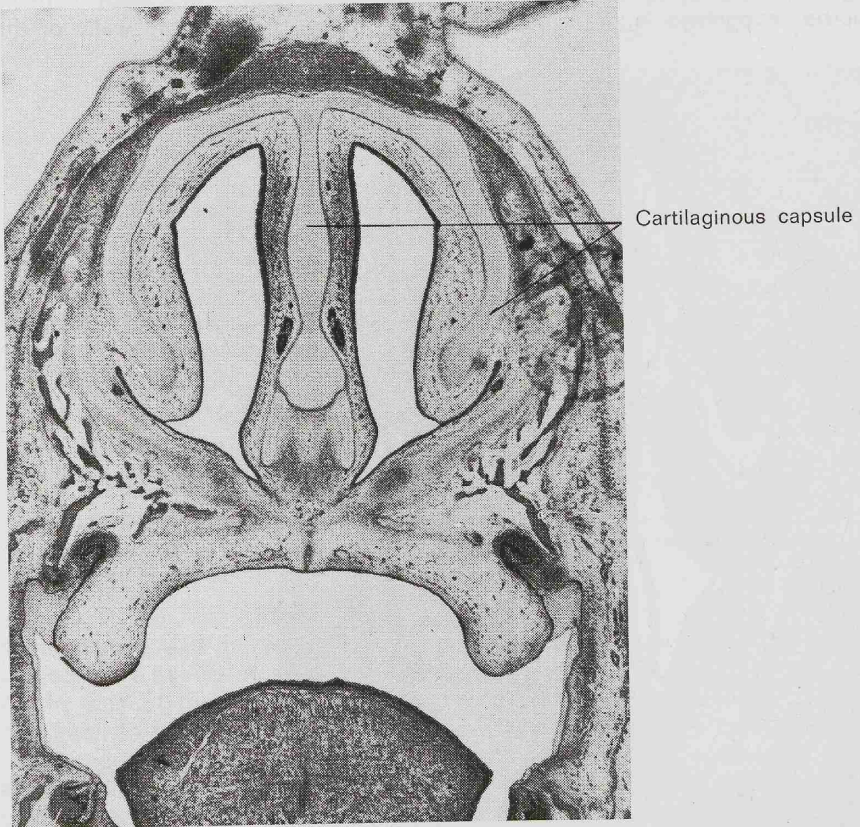
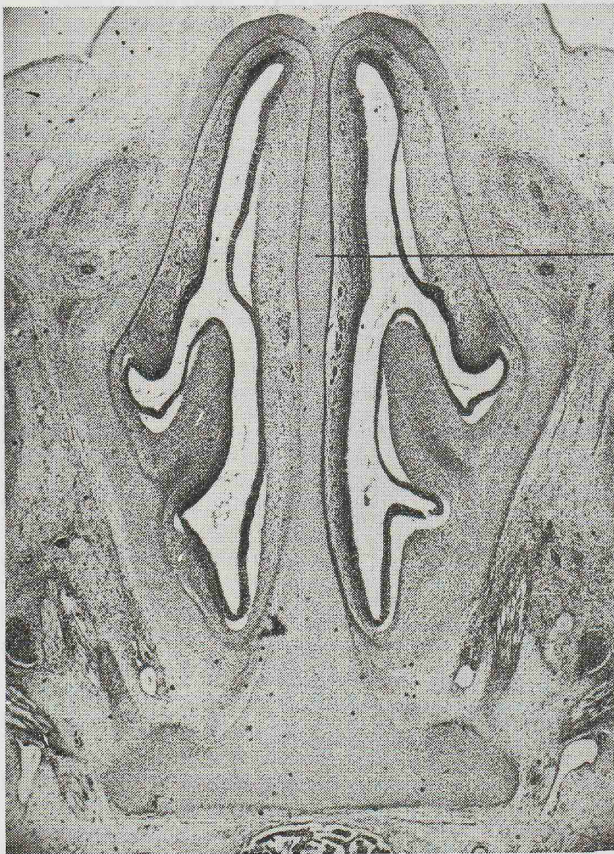


Figure 1. Frontal section through the nose and mouth of an embryo of 35 mm. Nasal septum and palatine processes have fused. 20 x.

* The author has much pleasure in dedicating this publication to his dear friend, the famous American rhinologist Maurice Cottle, on the occasion of his 70th birthday. The paper was read during the Course on Nasal Surgery, held at Leiden in the summer of 1965 under the leadership of Professor Cottle.

of 8 to 9 mm., the medial and lateral nasal processes on both sides have fused, the primary nasal cavities are formed. The region between both cavities is the region of the primary nasal septum. This rather broad area consists of loose mesenchymal tissue and is situated under the rostral part of the neural tube.

By the outgrowth of the primary cavities and the development and fusion of the palatine processes, giving rise to the palatum, the septal area thins out and gets a more sagittal shape (Fig. 1). Now in the region between the nasal cavities and in the areas cranial and lateral to them cartilage is formed, which gets a peculiar shape. In horizontal or frontal sections in two and three months old embryos one can observe that one piece of cartilage is formed which has a characteristic shape: it consists of a median sagittal plate, the primitive cartilaginous septum, a convex cranial part and two curved lateral wings (Fig. 2 and 3). In an adult situation the typical shape of this nasal capsule can be recognized in the anterior part of the nose, where the walls of the



Cartilaginous septum

Figure 2. Horizontal section through the nasal region in an embryo of about 30 mm. The posterior part is enlarged to give rise to the cartilaginous primordium of the sphenoid bone. 17 x.

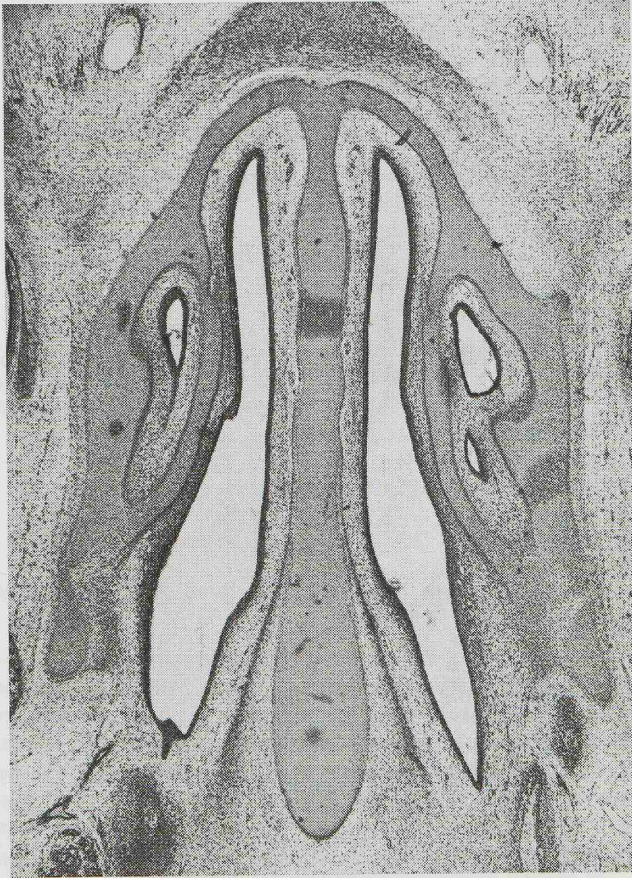


Figure 3. Horizontal section through the nasal region in an embryo of 50 mm., at a lower level than shown in fig. 2. Note the typical shape of the nasal capsule with anlage of the inferior concha. 20 x.

nasal cavities and the septum remain cartilaginous, although then the capsule has split into separate cartilages.

At the end of the third month of embryonic life the whole chondrocranium has been formed, including the complete nasal capsule. The cartilage of the nasal capsule is not only localized in the front-, side- and upperwalls of the nose and the caudally directed nasal septum, but dorsally it also extends uninterruptedly into the cartilage of the base of the skull giving rise to a large part of the sphenoid bone and the clivus. In the whole cartilage there is no distinction as yet between the future separate bones (Fig. 2, 5 and 6). It is important to be aware of the fact that in the base of the nasal cavities no cartilage develops. This base has been formed by the primitive palate and by the fusion of the palatine processes of the maxillary region in the median plane. With the completion of this fusion, in an embryo of about

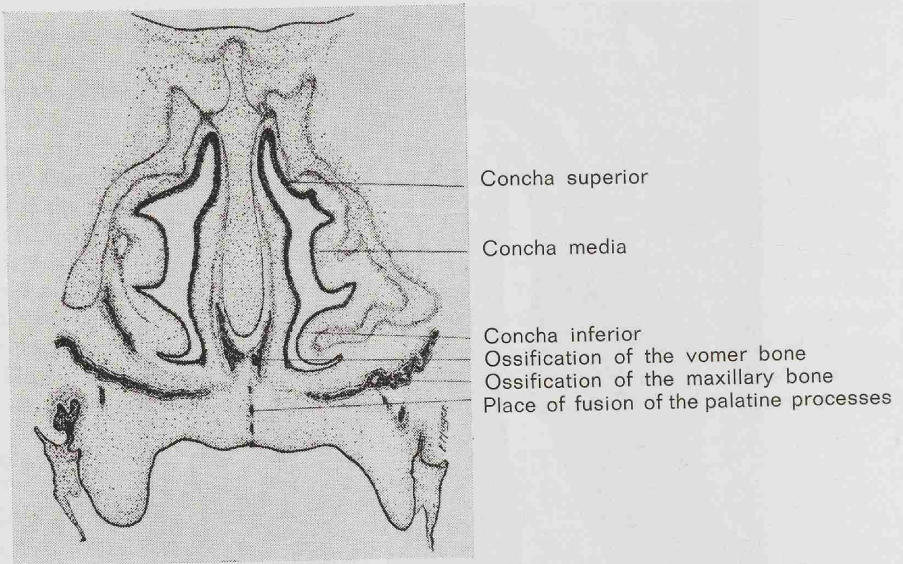


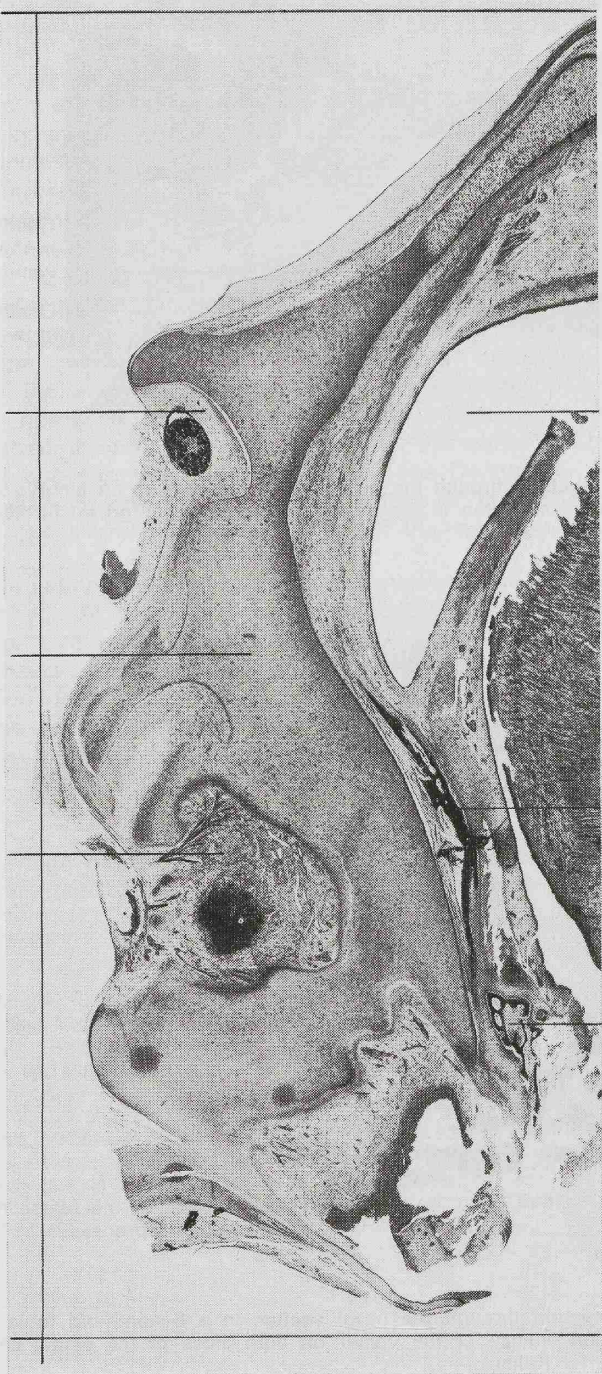
Figure 4. Frontal section through the nose of an embryo of 40 mm. Appearance of the ossification centres of the maxilla and the vomer. (After K. Peter).

30 mm., the newly formed secondary palate fuses with the free lower border of the nasal septum in the midline. This lower part of the septum does not consist of cartilage; the cartilaginous septum ends at some distance above the secondary palate and between them a mesenchymous tissue is found. It is in this mesenchymal region that the ossification center of the os vomer will appear in a later stage of the embryonic development (Fig. 1 and 4). Now the two secondary nasal cavities are completed; their bases being formed by the mesenchymal horizontal parts of the maxilla and the palatinum. In their development os maxillare and os palatinum have no cartilaginous primordium; the bones are formed by primary ossification of the mesenchyme (so-called desmal ossification). Already in the 7th and 8th week one can observe the first centres of ossification in these regions; soon already a layer of osteoid tissue can be found in the base of the nasal cavities but still there is no immediate connection with the cartilage in the nasal septum (Fig. 4, 5 and 6). In the development of the skull desmal ossification starts much earlier than chondral ossification. This can also be observed in the further differentiation of the cartilaginous nasal septum. The first signs of ossification appear in the region which corresponds to the later os vomer. Already in the beginning of the 3rd month two centres of ossification, one on each side of the median plane, appear in the postero-inferior part of the before-mentioned mesenchymal region beneath the cartilaginous septum (Fig. 4). These centres unite below the cartilage and thus a groove is formed in which the cartilage of the septum is lodged. The two bony lamellae extend upwards (Fig. 7) and the intervening plate of cartilage is gradually absorbed. In sagittal sections through the nasal septum in the human embryo one can clearly ob-

Mucosa with entering fila olfactoria

Cartilage

Sella turcica with hypophysis

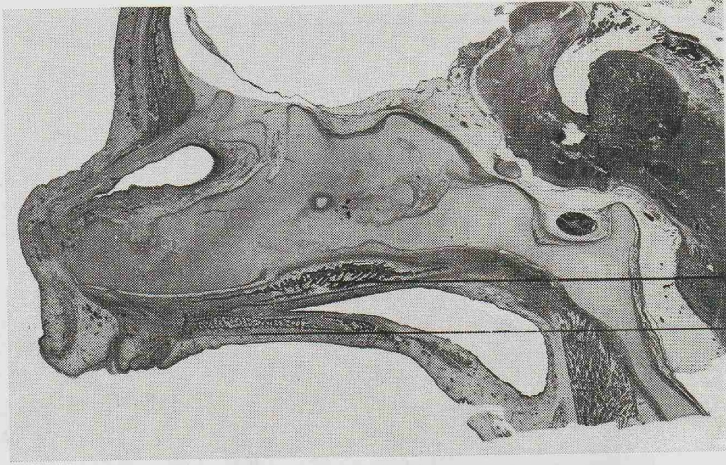


Ossification of the maxilla

Ossification of the vomer

Nasopharynx

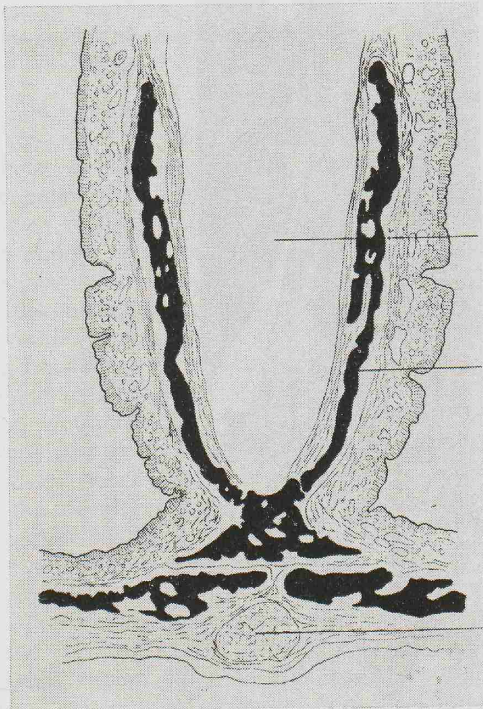
Figure 5. Sagittal section through the nasal septum. Human embryo of 8 cm. A single cartilage extends from the septum into the anlage of the sphenoid and clivus. Two layers of ossification in the base of the nose. 8 x.



Ossification
in the os
vomer

Ossification
in the palate

Figure 6. Sagittal section through the nasal septal cartilage in an embryo of 11 cm. The two layers of ossification in the base of the nose have grown further out 5x.



Septal cartilage

Ossification-lamina

Epithelial knot in the fusionline
of the palatine processes

Figure 7. Frontal section through the nasal septum in a 8-month-old fetus, showing the two ossification-laminae of the vomer on both sides of the septal cartilage. (From K. Peter, after Killian).

serve two ossification-regions; an upper one formed by the vomer center and a lower found in the palatum and maxilla (Fig. 5 and 6).

It is only at the age of puberty that the lamellae have almost completely united so that the unpaired vomer is formed.

The upper part of the cartilaginous septum will develop into the lamina perpendicularis of the ethmoid bone. Here ossification only starts shortly after birth and is completed at adult age, so that at birth the only part of the nasal septum in which ossification has started, is the region in which the ossification of the vomer has already begun.

The anterior part of the nasal septum keeps its cartilaginous character. Being split into separated cartilages, it consists of the cartilago septalis, the median part of the cartilago alaris major and two small cartilagine vomero-nasales. Between the inferior border of the lamina perpendicularis and the antero-superior border of the vomer the cartilago septalis pierces with a pointy prolongation, the processus sphenoidalis of the septal cartilage, in a posterior direction between the two bony plates (see Dankmeijer, 1964, Fig. 2). The septum is completed by the crista septalis of the sphenoid, maxillary and palatine bones and the crista incisiva of the maxillary bone.

The nasal septum changes considerably in shape and dimensions during post-natal growth. At birth the nose is low and the height of the septum is not more than about 18 mm. Within 6 months it grows out to 22 mm. height but then remains about the same until the age of 6, when a new short period of growth brings it to a height of 36 mm. A last period between puberty and adult age makes the height of the septum increase until about 54 mm. In the mean time there is a considerable change in the shape of the nasal cavities. Whereas between birth and adult stage length and breadth are doubled in size, the height increases thrice (Peter, 1938).

In a previous publication in this journal a description of the vascularisation and innervation of the nasal septum has been given (Dankmeijer, 1964).

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Prof. J. Dankmeijer, M.D.,
Anatomisch-Embryologisch Laboratorium
Universiteit van Leiden, Holland.