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Diseases of the Nose, Throat, and Ear

INCLUDING BRONCHOSCOPY AND ESOPHAGOSCOPY

Edited by

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and

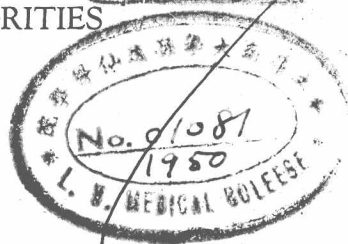
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With the Collaboration of

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934 Illustrations on 581 Figures
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W. B. SAUNDERS COMPANY

PHILADELPHIA AND LONDON 1946

62

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Reprinted November, 1946

MADE IN U. S. A.

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W. B. SAUNDERS COMPANY
PHILADELPHIA

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PREFACE

In the preparation of this textbook it has been our purpose to present the various phases of modern otorhinolaryngology and bronchoesophagology in a form most practical for those interested in these specialties, be they students, teachers, specialists, or general practitioners. In order that the book should be authoritative, contributors have been chosen from among those who are not only thoroughly acquainted with the literature of their respective subjects but who have had extensive clinical and teaching experience as well as active part in the epoch-making developments of recent years.

• Text matter and illustrations have been planned with the thought in mind of rendering accepted facts and opinions of today quickly accessible. Except for a few classics, new illustrations have been specially prepared, and, as far as the respective subjects would permit, labels, rather than letters or figures referring to explanations in the appended legends, have been placed directly on the drawings. For lucidity, eighteen of the illustrations have been selected for full-color reproduction.

In the text the time-proven plan of organization has been followed. The anatomy and physiology of the various organs have been discussed, followed by a description of the method of examination. The diseases, disorders, malformations, anomalies, and other conditions, such as those due to trauma or the presence of foreign bodies, have been covered under the

headings, wherever appropriate, of "etiology," "pathology," "symptoms," "diagnosis," "complications," "treatment," "sequelae," and "prognosis," the emphasis being placed throughout on what to do and how to do it. On controversial subjects, overlapping of text matter has been utilized to present fairly two or more contributors' viewpoints. Procedures that have not stood the test of clinical experience have been omitted, except when mention is needed to indicate pitfalls; recent therapeutic adjuncts, however, whether of proven worth or of promise, have been given emphasis. The articles on endoscopic photography, aviation otolaryngology, and chemotherapy in otolaryngology will, we believe, be of particular general interest.

No attempt has been made to give any historical notes. The history of medicine is intensely absorbing, but it calls for an entirely different type of book. The reader interested in historical matters, or in literary research, will, doubtless, be interested in consulting the list of references following each article.

Our thanks are due to each and every contributor for invaluable cooperation, and to the personnel of W. B. Saunders Company for unflinching courtesy and kind helpfulness.

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PHILADELPHIA, PA.

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PART I. NOSE AND NASAL ACCESSORY SINUSES

ANATOMY OF THE NOSE AND PARANASAL SINUSES

THE NOSE

For purposes of description, the nose is usually divided into an external nose and an internal nose.

The External Nose.—The external nose or outer nose is familiar to all in its many variations in size and shape. The more or less pointed tip is known as the *apex*. The aspect directed caudally or inferiorly and between the apex and the upper lip is the *base*, in which are the two openings into the nasal cavities called the *anterior nares*. Where the nose merges with the forehead is the *root* of the nose and extending from the root to the apex is the *dorsum* of the nose, the portion of this near the root being the *bridge*. The rounded eminence to the side of each naris is called the wing of the nose or the *ala nasi*.

Framework of the External Nose.—The framework of the external nose is partially bony and partially made up of cartilages of the hyaline type. The aperture of the bony part of the external nose is somewhat the shape of an inverted, blunt-pointed valentine heart, the lower two-thirds of this aperture being bounded by the maxillae and the upper third by the two nasal bones which are interposed between the frontal processes of the two maxillary bones. The nasal bones (Fig. 1) form the framework of the bridge of the nose and are, of course, subject to variation which ranges to occasional complete absence.

The cartilaginous portion of the framework of the external nose consists of five major cartilages—the right and left *greater alar cartilages*, right and left *lateral nasal cartilages*, and the margin of the unpaired *septal cartilage* which to a varying extent is interposed between the lateral nasal and greater alar cartilages of the right and left sides along the dorsum of the nose—and of several smaller cartilaginous bits, some called *lesser alar cartilages*, which are posterior to the greater alar cartilage and supe-

rior to the fibrofatty tissue of the *ala nasi*, and others called *sesamoid cartilages* which may be present between the greater alar cartilage and the lateral nasal cartilage. The relationship which these cartilages have to each other as they contribute to the framework of the external nose is shown in Figures 1 and 2. The five major cartilages may be variously fused to one another and have been interpreted by some as being all one piece.

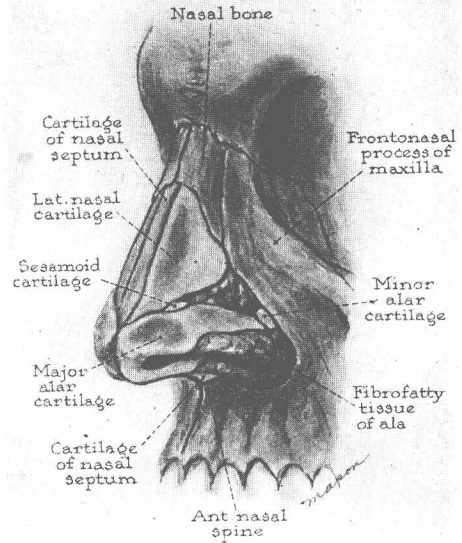


Fig. 1.—The framework of the external nose.

Muscles of the External Nose.—The musculature of the nose varies a great deal in its degree of development and is described differently by various authors. The right and left *procerus muscles* are usually combined into one muscle running from the lower part of the nasal bones and adjacent parts of the lateral cartilages to the skin at the root of the nose where it blends with the medial fasciculi of the frontalis muscles, thereby being able to produce horizontal wrinkling of the skin on the bridge of the nose. Arising from the maxilla, near the apices of the incisor and canine teeth, are the *depressor septi* (medially) and the *nasalis* (laterally), the former

inserting into the mobile part of the septum and the posterior part of the margin of the naris, and the latter inserting partly into the ala nasi and partly continuing superiorly to expand into an aponeurosis which joins the one of the opposite side on the dorsum of the nose. The name "depressor septi" indicates the action of this muscle. Most of the nasalis apparently tends to depress the ala and press it medially. However, probably some fasciculi, which run from the aponeurosis over the dorsum of the nose downward to end in the ala, together with some fasciculi of the angular head of the quadratus labii superioris which also end in the ala, tend to elevate the ala. There is *dilator musculature* described which is thin and indefinite.

Skin of the Nose.—Over the bony portion of the external nose the skin is thin and since it rests upon a loose subcutaneous tissue contain-

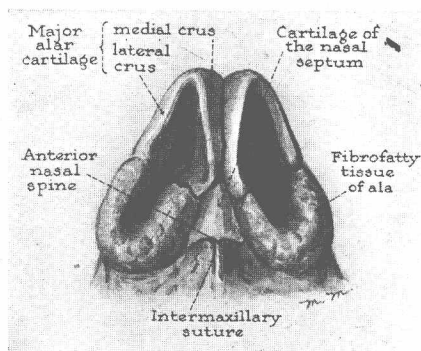


Fig. 2.—The framework of the external nose as seen from below.

ing very little adipose it is freely movable. As the tip and base of the nose are approached, the skin becomes a little thicker and the subcutaneous tissue is much denser, becoming fibrofatty in nature, which means that the skin loses its movability. It also acquires many more large sebaceous glands, the openings of which in relation to the very fine hairs are readily seen with the unaided eye.

Blood Supply of the External Nose.—Probably to compensate for its exposed position, the arterial network supplying the external nose is a rich one, which is contributed to from several sources. Coming onto the nose near its root, is the *dorsal nasal* branch of the ophthalmic branch of the internal carotid artery. From the side comes a small branch of the infra-orbital of the internal maxillary branch of the external carotid. The *lateral nasal* branch of the external max-

illary branch of the external carotid comes onto the nose just above the ala and the *angular* branch of the external maxillary runs superiorly at the side of the nose to anastomose with the dorsal nasal artery. A small *external nasal* branch comes through onto the dorsum just below the nasal bone from the anterior ethmoidal artery (p. 8). From below, the nose receives an *alar* and a *septal* branch from the superior labial branch of the external maxillary artery.

There is some venous drainage accompanying all of the arteries just described but the chief drainage is by way of the *anterior facial vein* which has tributaries corresponding to the branches of the external maxillary artery. The anastomosis of the angular vein with the ophthalmic vein may become of significance since the ophthalmic vein empties into the cavernous sinus.

Lymphatics of the External Nose.—There are rich lymphatic capillary networks in the skin, muscles, periosteum, and perichondrium of the external nose, particularly dense at the apex, alae, and root. The principal drainage from these networks is by way of vessels which follow the anterior facial vein to the submaxillary group of nodes. Additional drainage from the region of the root and side of the nose has been described as taking place by way of vessels passing laterally through the upper and lower eyelids to get to the parotid nodes, but this drainage is denied (Rouvière). There is anastomosis with the lymphatics of the mucous membrane of the nasal fossae.

Nerve Supply of the External Nose.—The muscles of the external nose are supplied by branches from the buccal branches of the facial or seventh cranial nerve. The skin is supplied by the trigeminal or fifth cranial nerve through the *infratrochlear* (region of the root) and *external nasal* (onto the dorsum just below the nasal bone from within the nose) branches of the nasociliary branch of the ophthalmic division and through the nasal branches (much of side of nose, ala, and region of anterior naris) of the infra-orbital branch of the maxillary division.

The Internal Nose.—The internal nose comprises the cavity of the nose and, of course, the walls of the cavity. The general cavity is divided by a septum into a right and a left *nasal fossa* (nasal chamber or nasal cavity). Each fossa is usually described as having a floor, a roof, a medial wall (nasal septum), and a lateral wall

and it opens by way of an *anterior naris* or nostril to the exterior and by way of a *posterior naris* or choana into the nasopharynx. The shape of the fossa as seen in a coronal section is roughly that of a rather long and narrow right-angle triangle, with the right angle at the junction of the medial wall and floor and with the superior angle blunted by the roof of the fossa. The general shape of the fossa as seen in a sagittal section is obvious in Figure 3.

Anterior Naris and Vestibule.—The anterior nares are in the base of the nose and therefore look caudalward. They present many individual

skin which is tightly adherent to the underlying cartilage and fibrofatty tissue and contains, in the lower part of the vestibule, coarse hairs known as *vibrissae* which curve downward to guard the entrance. There are sebaceous glands related to these hairs.

Posterior Naris.—Each posterior naris or choana is a roughly oval opening approximately an inch in its vertical diameter and a half inch in its transverse diameter in the adult. It is completely bounded by bone covered by mucoperiosteum. Above is the body of the sphenoid and ala of the vomer; medially, the

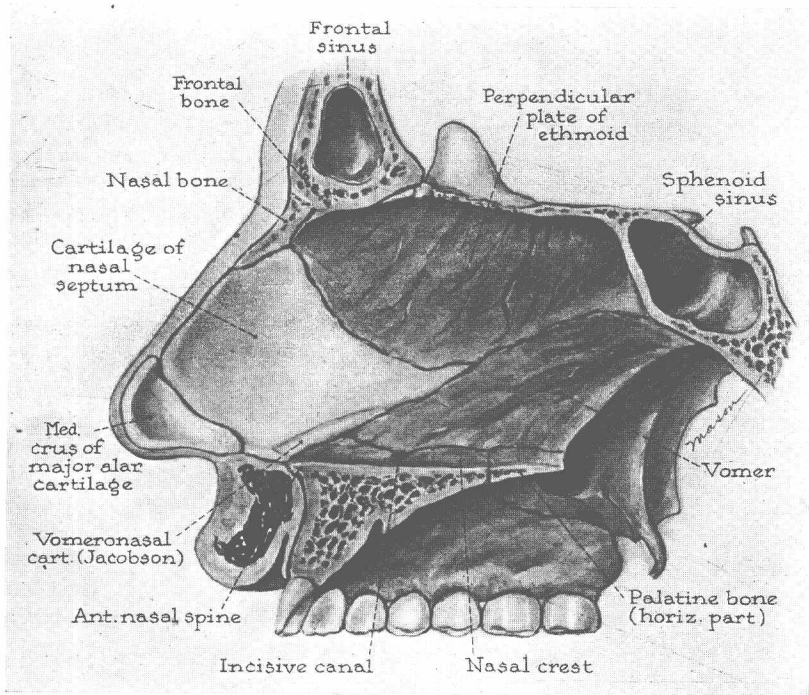


Fig. 3.—The framework of the septum of the nose.

and racial variations in size, shape, and the exact plane which they occupy. Directly above the naris is the slightly expanded part of the nasal cavity which is called the vestibule. The naris and vestibule are bounded by the medial and lateral crura of the greater alar cartilage and the fibrofatty tissue of the ala (Fig. 2). Corresponding to the lower border of the lateral cartilage of the nose is a slight elevation on the lateral wall of the nasal cavity called the *limen* which forms a superior limit of the vestibule. A *recess of the vestibule* extends into the apex of the nose anterior to the anterior margin of the anterior naris. The vestibule is lined by a thin

posterior free margin of the vomer; laterally, the medial pterygoid plate of the sphenoid bone and below, the posterior border of the horizontal part of the palatine bone.

The posterior nares are remarkably equal in size as the septum does not deviate in this region. There are, however, occasional instances of congenital atresia.

Roof of the Nasal Fossa.—The roof, as usually considered, is in the form of an arch extending from the tip of the nose to the superior limit of the posterior naris. It is little more than a groove for most of its extent but does widen to 4 or 5 mm. in its posterior part. The struc-

tures forming the framework of the roof are shown in Figure 3. Some authors have named only that portion formed by the cribriform plate of the ethmoid as the roof, with the other parts as anterior and posterior walls of the fossa respectively.

Floor of the Nasal Fossa.—The floor of the nasal fossa has a bony framework formed for about its anterior three-quarters by the palatine process of the maxilla and for its posterior quarter by the horizontal process of the palatine bone. It occupies approximately a horizontal plane but it may slant downward in its posterior portion and frequently there is an elevation of the anterior margin of the bony floor. Laterally and medially the floor curves upward as it meets the lateral and medial walls of the fossa. The bony framework diminishes in thickness from the anterior to the posterior portion.

There is a bony canal transmitting anastomotic connections between blood vessels of the nasal and oral cavities which begins very close to the septum, a centimeter or so from the anterior limit of the floor and runs downward and forward to end in common with the one of the other side in the incisive foramen. In the early development of the individual, there is a canal of mucous membrane (the incisive duct) connecting the nasal and oral cavities but this usually becomes obliterated early leaving only a cord of cells and, at times, a depression in the mucous membrane at the nasal end of the canal, the *nasopalatine recess*. A smaller bony canal, usually in common with the one of the other side and posteromedial to the one just described, transmits a branch of the nasopalatine nerve.

It probably should be pointed out that the width of the floor of the fossa is to an extent dependent on the size of the maxillary sinus.

Medial Wall of the Nasal Fossa or Nasal Septum.—The three main constituents of the framework of the nasal septum—the *vomer*, the *perpendicular plate of the ethmoid bone*, and the *septal cartilage*—are related to each other, in general, as shown in Figure 3. Contributing slightly to the margin of the septal framework are the anterior nasal spines of the maxillae, the nasal crest of the maxillary and palatine bones, the rostrum and crest of the sphenoid bone, the nasal spine of the frontal bone, and the crests of the nasal bones, all of which are for the articulation of the three main constituents of the septum named above. In relation to the caudal border of the septal cartilage on each

side of it, there is a narrow strip of cartilage, the *vomeronasal cartilage* which in man has no close relation to the rudimentary organ of that name to be described presently. Beyond the antero-inferior margin of the septal cartilage, the medial crura of the greater alar cartilages (Figs. 1, 2) are the chief framework of this small portion of the septum and they together with the adjacent soft tissue can be pulled downward and wiggled around, hence the name *mobile part of the septum* is frequently applied.

In the mucous membrane of the septum not far from the floor and a centimeter or a little more posterior to the posterior margin of the anterior naris, there is a minute opening into a blind pouch 2 to 9 mm. in length running backward from the opening. This is the rudimentary *vomeronasal organ of Jacobson*. There is usually a thickening of the mucous membrane of the septum opposite the anterior end of the middle concha called the *tubercle of the septum* and early in life there are 4 to 6 obliquely running ridges on the postero-inferior part of the septum called the *folds of the septum*.

In the majority of older children and adults, there is some degree of asymmetry of the septum either in the form of a deflection or the presence of ridges or spurs. Since this asymmetry is not as a rule present in the infant, it may be due either to trauma, perhaps slight, or to developmental factors, possibly, such as buckling due to overgrowth.

Lateral Wall of the Nasal Fossa.—As previously described (p. 3), not far above the anterior naris there is an elevation on the lateral wall of the nasal fossa called the *limen* which indicates the boundary between the vestibule and the rest of the nasal fossa or what is frequently referred to as the *nasal fossa proper*. The lateral wall of the nasal fossa proper presents several elevations or projections (Fig. 4) all with bony foundations, which are thought of as subdividing the nasal fossa proper for purposes of description. Four of them running more or less horizontally and diminishing in length from the lowest to the highest are named the *inferior*, *middle*, *superior*, and *supreme nasal concha* or *turbinate* respectively. The portion of the nasal fossa overlapped by each concha is called a *meatus* of corresponding designation. The part of the fossa above the supreme concha is called the *spheno-ethmoidal recess*; the part between the conchae and the septum, the *com-*