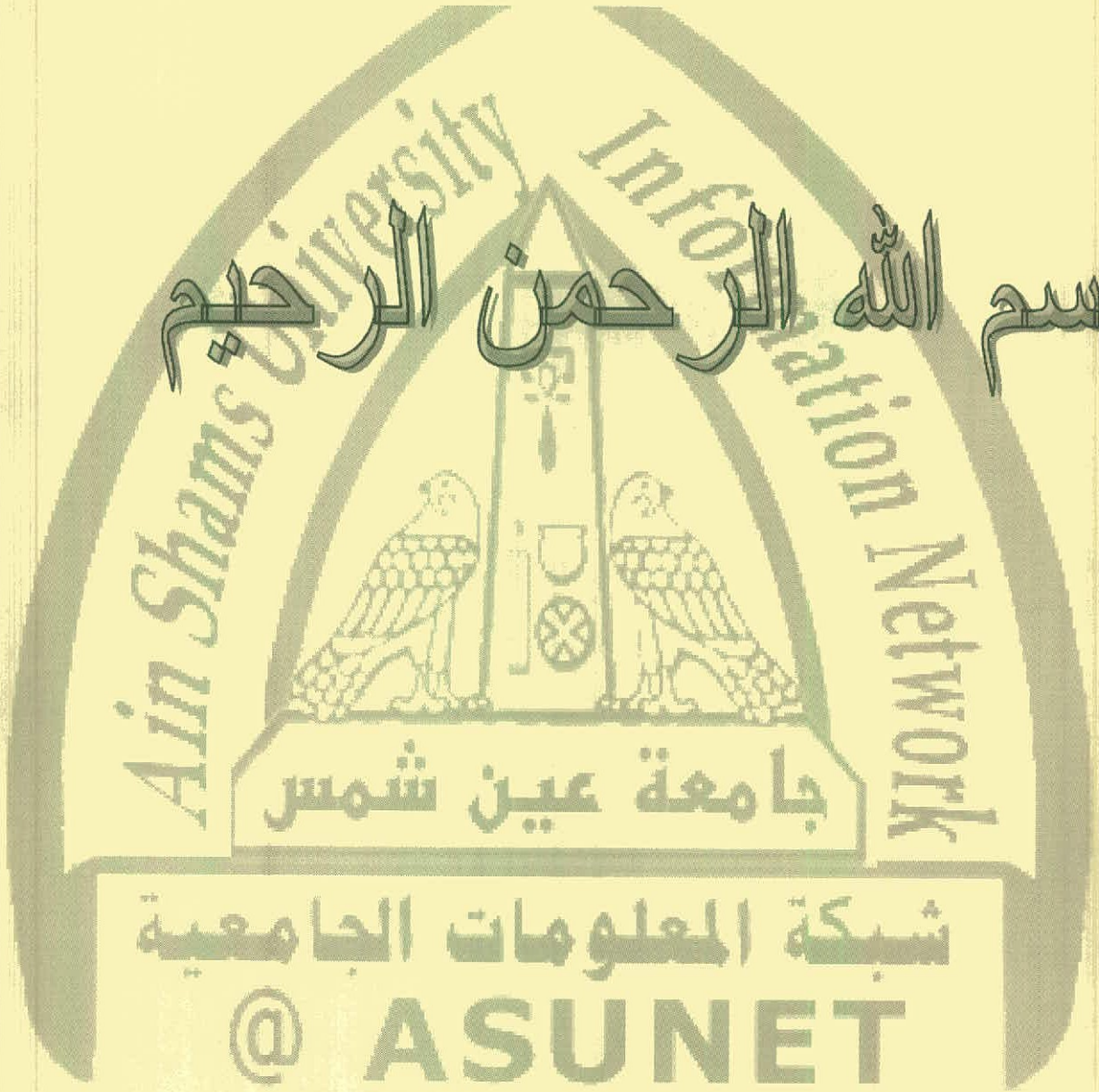
شبكة المعلومات الجامعية



بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

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بالرسالة صفحات لم ترد بالاصل

ETHMOIDAL LABYRINTH: AN ANATOMICAL AND COMPUTED TOMOGRAPHIC STUDY

Thesis
submitted to the Faculty of Medicine,
University of Alexandria,
in partial fulfillment of the requirements
of the degree of

MASTER OF ANATOMY

By

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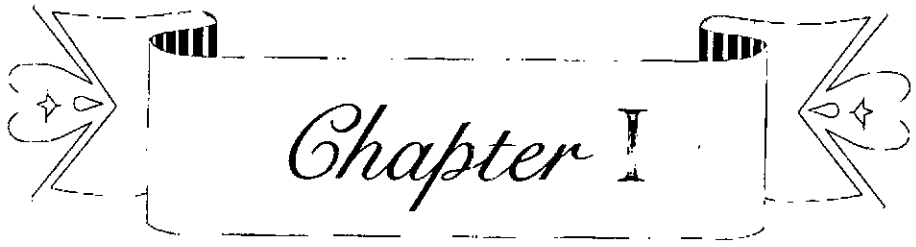

INTRODUCTION

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Historical Review

For an elaboration on the knowledge of anatomic detail, past investigations of the structure of the paranasal sinuses have helped to provide a firm groundwork.

Mosher[1] 1929 studied the shape of the ethmoidal labyrinth and he stated that it is shaped like a pyramid, with an anterior blunted apex and a broader posterior base. The anteroposterior length of the ethmoidal labyrinth is 4 to 5 cm. The vertical height is 2.5 to 3 cm. The width of the anterior labyrinth is 0.5 cm, while the width of the posterior labyrinth or base is 1.5 cm. However, the ethmoidal labyrinth can vary, and in patients with narrow heads it is possible to have a narrow ethmoidal labyrinth that is the same width throughout, in contrast to the wider, pyramidal shape.

Van Alyea[2] Segregated the ethmoidal cells on the basis of the bony partitions within the ethmoidal labyrinth. In this way, the ground plate or lamella of the middle turbinate is the most significant bony partition, dividing the cells into anterior and posterior groups. The remaining important bony partitions of the lateral nasal wall are the uncinate process, the ethmoidal bulla (anterior aspect), and the anterior sphenoid wall.

Ritter[3] studied the degree of pneumatization of paranasal sinuses and he stressed on the boundaries of the ethmoidal labyrinth.

Wigand[4] stressed several endoscopic landmarks within the nasal cavity. The orifice of the nasolacrimal duct lies in the inferior meatus, 2 mm below the attachment of the inferior turbinate and just behind its anterior end. The agger nasi is located in front of the anterior attachment of the middle turbinate. The out-flow tract of the frontal sinus is lateral to the agger nasi. The nasolacrimal duct is lateral to the lateral nasal wall, and it runs parallel to the agger nasi, often in the same coronal plane or 1 to 2 mm anterior to it. Wigand also stated that the middle turbinate is of central importance to endoscopic surgery and is incorporated to endoscopic sinus surgery.

Messerklinger[5] used endoscopes to study ciliary transport of nasal mucus. He developed the concept that mucus between contacting mucosal surfaces is retained because of impaired ciliary transport at these sites. This points to the mechanical, anatomic solution by which a narrowed area of the osteomeatal unit is opened. An example is a pneumatized head of the middle turbinate (concha bullosa), which can block and fill the entire middle meatus. Removal of the lateral wall of the concha bullosa relieves the chronic obstruction and allows aeration of the surrounding sinuses.

Function of the paranasal sinuses

The sinuses are lined with mucous membrane continuous with that of the nasal cavity through the ostium. It is of the pseudo-stratified columnar ciliated epithelium which rests on a tunica propria of the loose connective tissue and elastic fibers. It resembles the respiratory mucous membrane, but is thinner and less vascular while cavernous vascular spaces are not present.[6]

Numerous functions have been attributed to the paranasal sinuses including[6]:

1. ***Vocal resonance***:

Paranasal sinuses act as resonating chambers and affect the quality of the voice. Others claim that the position of the sinuses and their ostia prevents them from acting as efficient resonators. Moreover, there is no correlation between the resonance of voice and the size of the sinuses in the lower animals.

2. ***Air conditioning***:

They serve as supplementary chambers for conditioning the inspired air by heating and moistening. This function depends on the amount of air exchanged between the nasal fossae and sinuses, which was found to be a very small amount of air per each respiratory cycle (e.g 0.1% of the maxillary sinus volume per each cycle). So, the sinuses cannot be considered as additional humidifiers to any extent.

3. ***Defence mechanisms against infection***:

It can be made along lines: firstly, the mucous blanket formed by the goblet cells, secondly, the lysozyme content of the mucous and thirdly, the ciliary action which drains the sinus toward its ostium.

4. ***Vestigial olfactory organs***:

In lower animals, the sinuses contain complex olfactory organs and contribute a portion of the olfactory receptor surface.

5. ***Thermal insulators***:

They serve as temperature buffer protecting structures in the orbit and cranial fossae from the intranasal temperature variation.

6. ***Aid to balance of the head***:

Paranasal sinuses reduce the weight of the facial bones. However, even if they are replaced by bone, the resulting 1% increase in weight cannot be regarded as being significant.

Development of the Ethmoidal Labyrinth

The ethmoidal labyrinth begins development during the fifth month of intrauterine life. It appears as a small ectodermal evaginations which develop on the lateral nasal wall. It arises as a lateral pouch at the ethmoturbinal region. The cartilagineous tissue around the expanding sinus is resorbed and become well differentiated in the later foetal months. Till full term these diverticulae take a globular shape and they continue to grow until late puberty or until they meet compact bone or other sinus.[3]

Pneumatization of the ethmoidal labyrinth progresses in a posterior direction, enlarging the posterior air cells until the lateral and medial walls of the ethmoidal sinus are parallel to each other. The late phases of ethmoidal pneumatization may create convex medial and lateral walls. The posterior cells both larger and fewer than the anterior cells.[7] The cells that reside within the ethmoid bone are termed intramural

cells, whereas those whose expansion takes them into an adjacent bone such as the frontal, sphenoid, lacrimal bone, or maxilla are called extramural cells.[8]

Development of the nose and paranasal sinuses are directly linked with the development of facial bones and dentition.[9]

In the newborn the ethmoidal labyrinth is 8-12 mm long, 1-5 mm high and 1-3 mm wide, the anterior and posterior ethmoidal cells are almost completely developed in number but are under developed in size, with significant connective tissue found between the cells.[10] By the age of four years the ethmoidal labyrinth rapidly expands being 12-21 mm long, 8-16 mm high and 5-11 mm wide.[10] At the age of eight years the ethmoidal air cells become larger and there is continuous growth till the age of twelve years where it reaches the adult size which is 4-5 cm long 2.5-3 cm high and 0.5-1.5 cm wide.[10]

Anatomy of the nasal cavity

The nasal cavity extends from the external nares (nostrils) anteriorly to the posterior end of nasal septum posteriorly where it becomes continuous with the nasopharynx. the nasal septum is a midline partition which divides the cavity into two equal halves.[11] In the dry skull, the anterior opening of the nasal cavity presents as a single pyriform aperture because of the deficiency of the bony septum anteriorly. The cavity is wide across its floor, but narrows to a maximum of 5 mm across the cribriform plate in its roof.[11]