بسم الله الرحمن الرحيم

In the Name of Allah, the Beneficent, the Merciful.

ENDOSCOPIC NASAL SURGERY

رسالة

ESSAY

SUBMITTED FOR THE PARTIAL FULFILMENT OF THE REQUIREMENTS

OF THE DEGREE OF M.SC. (EAR NOSE & THROAT)

BY AMR AMIN EL KHODARY M.B.B.CH. (CAIRO)

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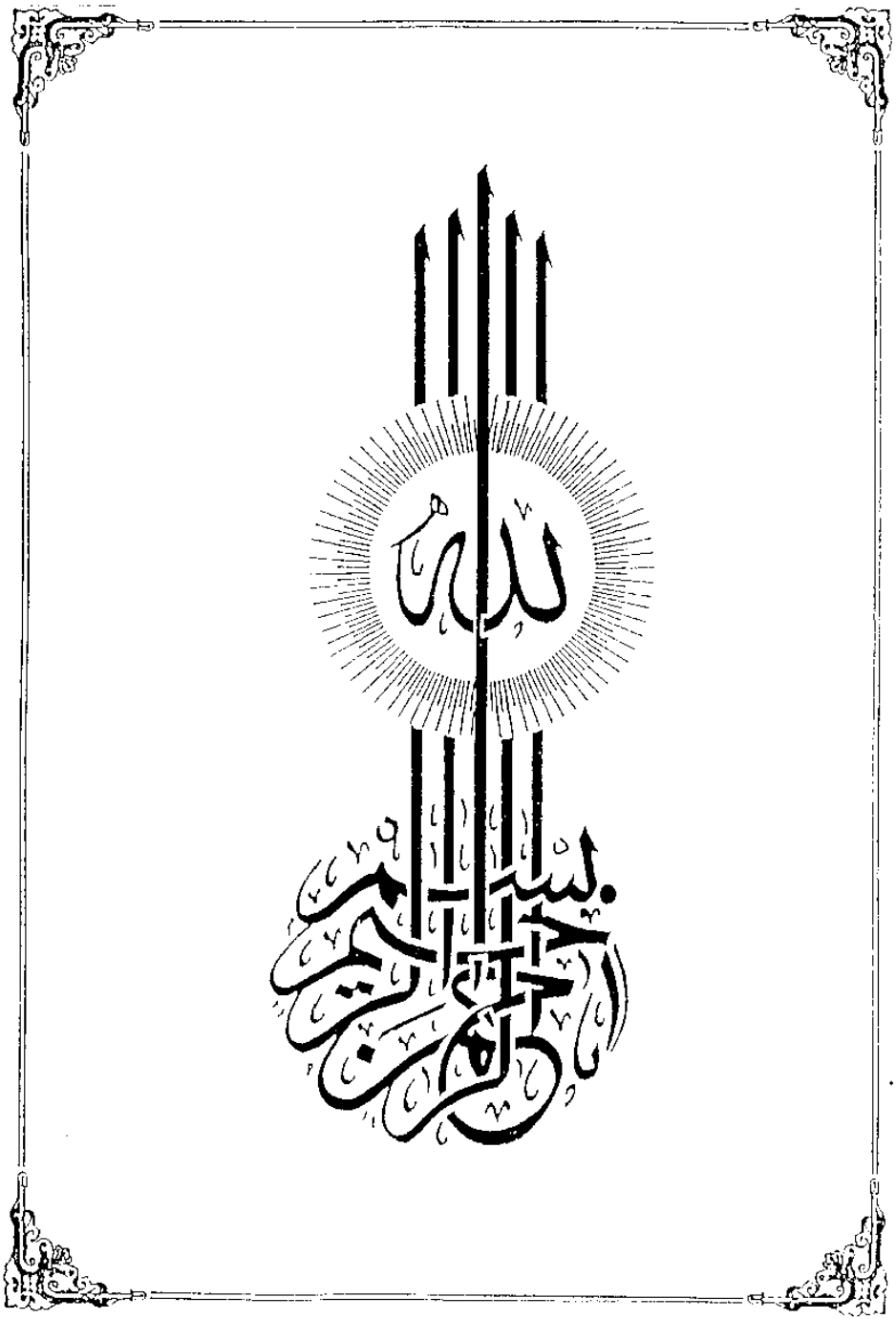

سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا ۖ إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

Be glorified ! We have no knowledge saving that which Thou hast taught us. Lo ! Thou, only Thou, art the Knower, the Wise.

سَنُرِيهِمْ آيَاتِنَا فِي الْآفَاقِ وَفِي أَنفُسِهِمْ حَتَّىٰ يَتَبَيَّنَ لَهُمْ أَنَّهُ الْحَقُّ ۗ أَوَلَمْ يَكْفِ بِرَبِّكَ أَنَّهُ عَلَىٰ كُلِّ شَيْءٍ شَهِيدٌ

We shall show then Our portents on the horizons and within themselves until it will be manifest unto them that it is the Truth. Doth not thy Lord suffice, since He is Witness over all things?

Introduction

Human inventions can reach perfection, but they can never reach idealism. Hence human tasks are always subject to criticism and modifications which frequently lead to improvement.

In otolaryngologic examination, inspection is much more important than palpation and auscultation. Similarly, in the great majority of otolaryngologic surgical procedures, good visualization is indispensable. The operating microscope as well as the Hopkins rigid telescopes [16,65], have proved to be very useful optical instruments for both: diagnostic and surgical procedures.

The operating microscope provides an excellent magnified image of the surgical field. Also, it allows the surgeon to work with both hands free. However, the surgeon is unable to visualize recesses. In addition, the microscope should be focused to a very limited depth of the field.

The rigid telescopes, on the other hand provide unlimited depth of field. Also they allow perfect visualization of the recesses; thus, endoscopic surgery is less invasive than microscopic surgery. The rigid telescopes provide no

magnification which is advantageous in some procedures as it allows a correct impression of the size of the object.

Both; the operating microscope and the Hopkins telescopes have been used successfully for examination and surgery of the nose and paranasal sinuses.

Aim of the Essay

The objectives of this essay is to review the literature dealing with the relatively recent subject of endoscopic sinus surgery with the purpose of defining the indications, limitations, techniques and complications of this type of surgery for the management of chronic inflammatory disease of paranasal sinuses.

CONTENTS

CHAPTER 1

Anatomy of the Paranasal Sinuses

The development of microscopic and endoscopic surgery of the para nasal sinuses, together with the introduction of C.T. scan and Magnetic Resonance Imaging [M.R.I.] in diagnosis of paranasal sinus disease; aroused the need for thorough knowledge of the detailed anatomy of these cavities.

The ethmoid sinus being the most neglected of the paranasal sinuses together with the well-known difficulty in understanding and teaching its anatomy [73,55,72], have led several authors to develop new approaches for its description.

Special effort has been done in this work to compose these anatomic descriptions in one article in a trial to acquire a more convenient and more integrated understanding of this labyrinth.

Embryology and Development of the Ethmoid Sinuses

The primordium of the ethmoid sinus develops as small slits in the lateral wall of the nose during the third [anterior cells] [40 a] to fifth month of fetal development. Then each slit grows into a tubular then a globular shape [73,55,72].

At term, each cell has expanded to such a degree that the bone separating it from its neighbours often is reduced to a thin plate [74].

At birth, the ethmoid labyrinth is the most fully developed of the paranasal sinuses. Consequently, the most common complications of sinusitis in children are related to ethmoiditis [73]. At that time, the ethmoids are fluid filled and difficult to recognize on routine radiography [82].

Dimensions of the ethmoid labyrinth at birth [82] are:

-anterior cells [anteromiddle in another classification]=2x2x5mm

-posterior cells = 2x4x5mm

At the age of one year, if well developed, the ethmoids may be consistently visualized [but not evaluated (83,42,88,109,37,65)] on routine radiography [82]. It is assumed that the ethmoid cells have a tendency to grow steadily in all directions until its growth is discouraged by the presence of hard compact bone or another sinus [55,73]. Normally, they extend to the lamina papyracea [of ethmoid bone] and fovea ethmoidalis [of frontal bone] [55].

By the second year of life, pneumatization extends more to invade the supraorbital plate of the frontal bone, the infraorbital plate of the maxilla, the middle turbinate, the sphenoid, and the lacrimal bone [55]. It is not uncommon to find ethmoid cells encroaching into frontal, maxillary, or sphenoid sinuses [55]. Frontal or posterior cells may even pass through the nasal septum to invade structures on the opposite side [55]. Rarely, expansion occurs downward into the palatine bone or maxilla creating double antrum [74]. The other sinuses rarely invade the ethmoid, probably because it develops first [55].

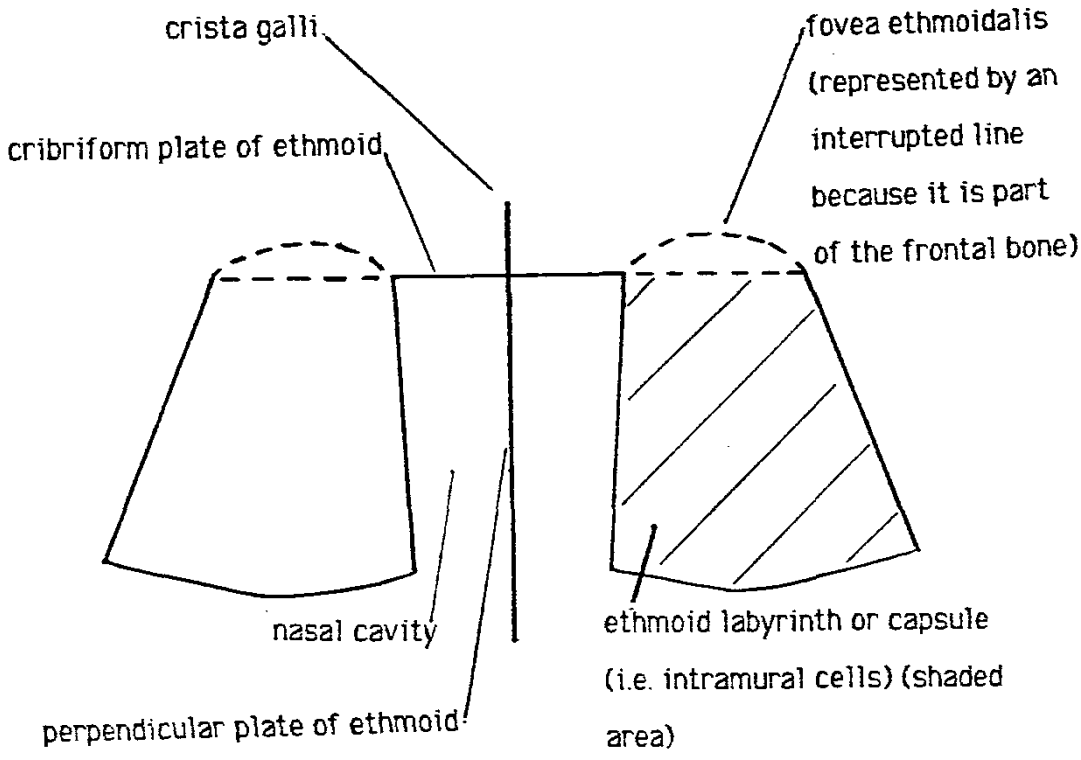

Fig 1.1 : Scheme of coronal section in the ethmoid bone.

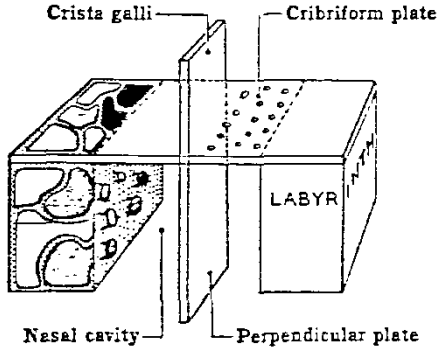

Fig 1.2 : Scheme of ethmoid bone. [From Grant (26)]

Expansile growth continues until early adolescence [74].

By the twelfth to fourteenth year, the ethmoid labyrinth has reached nearly adult size [100a, 72].

After that, the labyrinth enlarges only in proportion to the growth of the skull, although the other sinuses are still expanding [100a].

The ostium of each aircell is always located at the site of its initial embryologic evagination [74]. Yet the resultant cell is named for the bone in which it finally resides [73].

Cells that reside within the ethmoid bone are termed intramural cells, whereas those which grow beyond it are called extramural cells [73,74].

As the ethmoidal cavities develop, they search for room to expand in the mass of the ethmoid bone. Such growth results in one cell varying in size when compared to a neighbouring one. For this reason no one anatomical specimen will contain ethmoidal cells of the same size and in the same arrangement as another [73]. Thus variations or anomalies are the rule in the ethmoidal sinuses, so that the term "labyrinth" is applied to this group of paranasal sinus cavities to accurately describe their inconstant arrangement in size [73].

-N.B. [1]: Development of basal lamellae see p. 10

-N.B. [2]: Development of bullar cells see p. 20

Detailed Microanatomy of the Ethmoid Bone and Sinus

for Microscopic and Endoscopic Sinus Surgery

[4,74,73,55,2,72,8,40a,82,100a,26]

The ethmoid bone is more than a collection of air cells. It is composed of several parts which in coronal section resemble a diagram of a balance [fig.1.1] The crista galli and the perpendicular plate of ethmoid [part of nasal septum] represent the vertical parts above and below the horizontal bar [beam of the balance] respectively. The cribriform plate represents the beam of the balance. It contains many perforations which allow the passage of the olfactory filaments into the nasal chamber.

The mass of the ethmoid air cells [ethmoid capsule or labyrinth] is attached to the lateral edge of the cribriform plate and is located between the nasal fossa medially and inferiorly, the orbit laterally, the anterior skull base superiorly, the outer half of the front face of the corresponding sphenoid sinus posteriorly, the maxillary sinus inferolaterally and the lacrimal bone and the ascending process of maxilla anteriorly [see fig. 1.3 & 1.4].

The ethmoidal cell mass [capsule or labyrinth] is pyramidal in shape with its apex pointed anteriorly and its base ~~pointed~~ facing posteriorly.

Dimensions of the ethmoid labyrinth in adult [63b]:

[Antero-posterior] length = 4-5 cm

height = 2.5 cm

width anteriorly = 0.5 cm

width posteriorly = 1.5 cm

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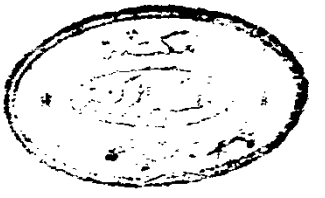

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