RADIOLOGICAL STUDY OF THE PARANASAL SINUSES

Thesis
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(Radio- diagnosis)

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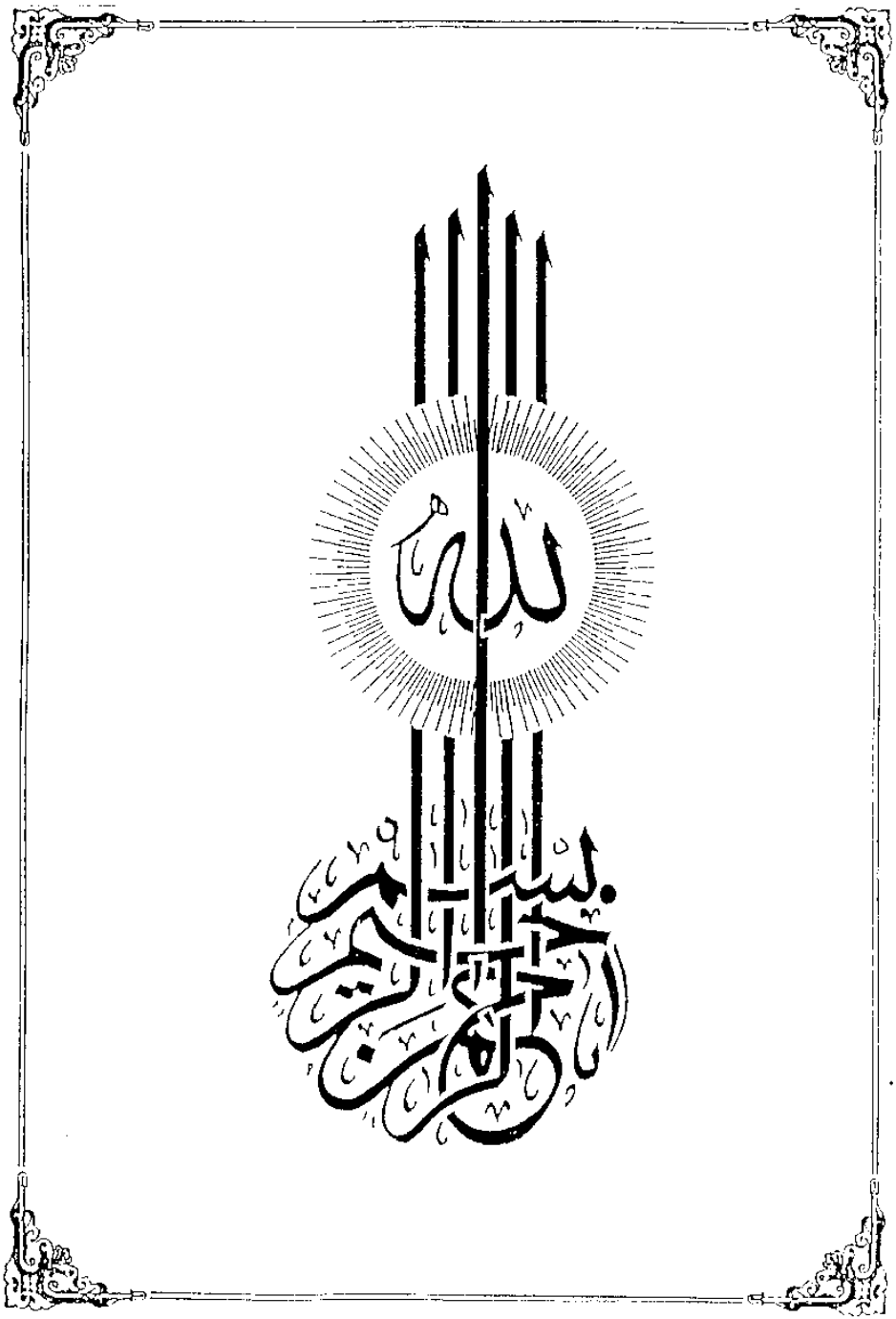

C O N T E N T S

INTRODUCTION AND AIM OF THE WORK

Diseases of the paranasal sinuses are now very common. The clinical diagnosis of such diseases involves various difficulties since symptomatology of such disorders are similar in may essentials. The specific cause of the disease, being inflammatory, neoplastic, or anatomic cannot be approached by clinical syptoms and signs alone, but by congoind radiographic studies in addition to the clinical data, more informations and accurate diagnosis can be reached.

Recently with the introduction of C.A.T. in the field of clinical investigations, more informations are definitly added and high percentage of accuracy in diagnosing diseases of the paranasal sinuses are reached.

The aim of this work is to show the value of radiological study of the paranasal sinuses in diagnosing their diseases, so adding weight to the clinical diagnosis.

BASIC ANATOMY OF THE PARANASAL SINUSES

The paranasal sinuses are developed early in foetal life as small diverticulae projecting from the nasal cavity and invade the surrounding bones of the skull.

At birth, the maxillary, sphenoid and ethmoid sinuses are already present. During the first few weeks of life these sinuses are gradually drained of amniotic fluid and become aerated.

Only the frontal sinus diverticulum is not present, but during the first year it begins to invade the frontal bone, so that by the year it has assumed the pear like shape.

At the age of 15 years the frontal sinus is fully developed and all the other sinuses are usually and fully developed by puberty. The ethmoid sinuses are the most developed sinuses at birth and are allready fully pneumatized. They form cavity systems which cover over two-thirds of the lateral wall of the nasal cavity.

1- The Frontal Sinuses

These are Pneumatic cavities, rarely Symmetrical as one of the cavities is frequently enlarged at the expense of the other. Each cavity is triangular in shape, apex being at the nasion, and it extends upwards above the

medial end of the eye brow into the medial part of the roof of the orbit, backwards into the roof of the orbit. The sinuses itself may sometimes divided into a number of intercomunicating recesses by in complete bony partitions. (Davis, 1967).

2- The Maxillary Sinuses

They are the Largest Sinuses of all the paranasal sinuses. Each sinus is contained within the maxilla. The maxilla bone consists of a body with four processes and four surface. The four processes are zygomatic process which forms the apex, alveolar process from which arise the teeth, palatine process which articulates with its follow in midline and the frontal process which forms the medial wall of the orbit. The surface of the maxilla are the surface which forms the roof of the antrum and the floor of the orbit. The facial surface which is concave and carries the infra orbital foramen and is continous with the alveolar process. The nasal surface rarely in the midline except at the base. The posterior surface of the maxilla is separated from the facial surface by the zygomatic process. The outer wall of the infra temporal fossa is formed by this surace but the inner most part becomes the anterior wall of the petrygo-palatine fossa. The most important content of the fossa is the maxillary nerve.

The maxillary antrum is pyramidal in shape, the base is formed by the lateral wall of the nasal cavity apex extends to the zygomatic process of the maxilla, roof (orbital floor) is ridged by the inferior orbital canal, floor is formed by the alveolar margin. (Davis, 1967).

3- The Sphenoid Sinuses

They are two cavities filled with air present in the body of the sphenoid bone behind the upper part of the nasal cavity, separated from each other by an osseous septum, which is rarely midline in position. (Dean, 1975).

4- The Ethmoid Air Cells

The cells are paired series of spaces of variable number forming the paired ethmoid labyrinth which are located in the lateral ethmoid masses between the upper part of the nasal cavities and the orbits, they are separated from the orbit by the thin plate of the ethmoid bone. They are separated from each other by thin osseous septums which are covered by mucous membrane.

They usually form three groups : the anterior group, the posterior group and the middle group. They are rarely limited to the lateral ethmoid mass, they often extend into the turbinates, cristagalli and the neighbouring frontal, maxillary and sphenoid bones. (Davis, 1967).

The anterior ethmoid air cells occupy the anterior part of the lateral ethmoid mass. The middle ethmoid air cells project as a cavity into the lateral wall of the nose under cover of the conchae. They form the bulla of the ethmoid. The posterior ethmoid air cells form an irregular cavity in the back of the lateral ethmoid mass, the bony wall is completed posteriorly by fusion of the orbital process of the palatine bone and the sphenoid bone, the roof is formed by the small orbital plate of the frontal bone. (Last, 1973).

The Sinuses Open in the Nasal Cavities as

Each frontal sinus drain via a fronto-nasal duct which runs vertically and slightly posteriorly to open into the anterior end of the hiatus semilunaris in the middle meatus.

The maxillary sinuses, each one open into the nasal cavity via an ostium (half-way up its medial wall) in the meatus semilunaris in the middle meatus.

The sphenoid sinuses drain anteriorly into the superior recess of the nasal cavities.

The ethmoid air cells, these cells extend into the middle and superior conchae and drain indevidually into the middle or superior meatus.

RADIOLOGICAL ANATOMY OF THE PARANASAL SINUSES

The normal paranasal sinuses appear radiological translucent. This transperancy is due to the air present inside them. The degree of blackening of these sinuses depends on the amount of air, so when there is mucosal thickening or fluid replacing the air the sinus involved appears less black on x-ray film or even completely opacified.

The more the shallow the sinus-the less translucent on x-ray film even without pathological changes.

Normally the healthy mucosa of the paranasal sinuses is not visualised on x-ray film. The bony outlines of the sinus are sharply defined in normal case. Variations in the thickness of these bony walls may be found normally in one sinus compared to its fellow, so giving false impression of pathological changes (Caffey, 1956).

The radiograph of the infantile sinuses appears of less contrast compared with the adult one due to thin bones of the infantile skull and less air contained inside them, (Simon, 1975).

In the P.A. view of the paranasal sinuses, the maxillary sinus forms a pyramidal translucent area, with

its apex directed down wards below the orbits and laterally to the lower part of the nasal cavity,inferiorly it extends to the alveolar margins of the maxilla. So the floor of the maxillary sinus is formed from the clear shadow of the maxillary alveolar bone and teeth. The lateral wall of the sinus is demarkated from the surrounding bone by a thin whiteline of dense bone. The medial wall is poorly demarkated due to the overlying shadows. The roof of the maxillary sinus lies adjacent to the inferior margin of the orbit, a smaller circular or oval translucent area in the bone is seen, which is the infra-orbital foramen.

The air in the maxillary sinus is separated from the bony wall by a thin layer of mucosa which is normally invisible. Foramen rotundum is seen as a small ring shadow just lateral to the nasal wall of the maxillary sinus, (Hamilton, 1971). (Fig.11).

In the submento-vertical view of the sinuses the maxillary sinuses are pyramidal in shape, but their apex are directed backwards.

In the lateral view of the skull the maxillary sinuses are quadri-lateral with rounded corners, they are seen lying below the orbits extending downwards to the root of the teeth. Recognition of the posterior wall of

Fig.1 : Normal appearance of the paranasal sinuses occipitomental position (sitting position).

Fig.2 : Normal appearance of the ethmoid air cells oblique views.

the antrum in the plain radiography is difficult due to the overlying shadows.

Frontal Sinus

Radiologically they appear over the root of the nose and the inner portions of the orbits. The frontal sinuses are often asymetrical and vary in shape and size, partial septa extending from the roof and anterior wall deviding the cavity of each sinus into several compartement and recesses. Each sinus extends from the medial orbital wall or from the nasofrontal process at the base of the nose to the supra-orbital notch, (Laurance, 1961). In infancy the frontal sinuses are not developed untill the age of about four years, when seen before this age it may be either, highly placed ethmoidal air cells or premitive frontal sinuses.(Fig.1).

Ethmoid Air Cells

They are paired groups of air cells located in the lateral ethmoid masses, between the upper part of the nasal cavities and the orbits (separated from the orbits by the lamina papyracea of the ethmoid bone). They are bounded superiorly by the floor of the anterior fossa. The ostea are not seen in the radiogram. They are rarely limited to the lateral ethmoid masses, but often extent

Fig.3 : Submento-vertical view, supine.
Sphenoid sinuses.

to turbinates, crista galia, frontal, maxillary and sphenoid bones, forming ager nasi cells or ethmoid bullae, (Simon , 1975).(Fig.2).

The Sphenoid Sinuses

They are seen radiologically as paired cavities in the body of the sphenoid bone and are separated from each other by an osseous partitions. They vary in size and shape and the bony septum is infrequently shifted to one side. Ridges or septa may be present in each cavity deviding it into several compartments, (Simon, 1975). (Fig.3).