RADIOLOGICAL STUDY OF THE TEMPORAL BONE

THESIS

Submitted for the Partial Fulfilment for the Requirement of the Master Degree of Radiodiagnosis

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1985

ACKNOWLEDGEMENT

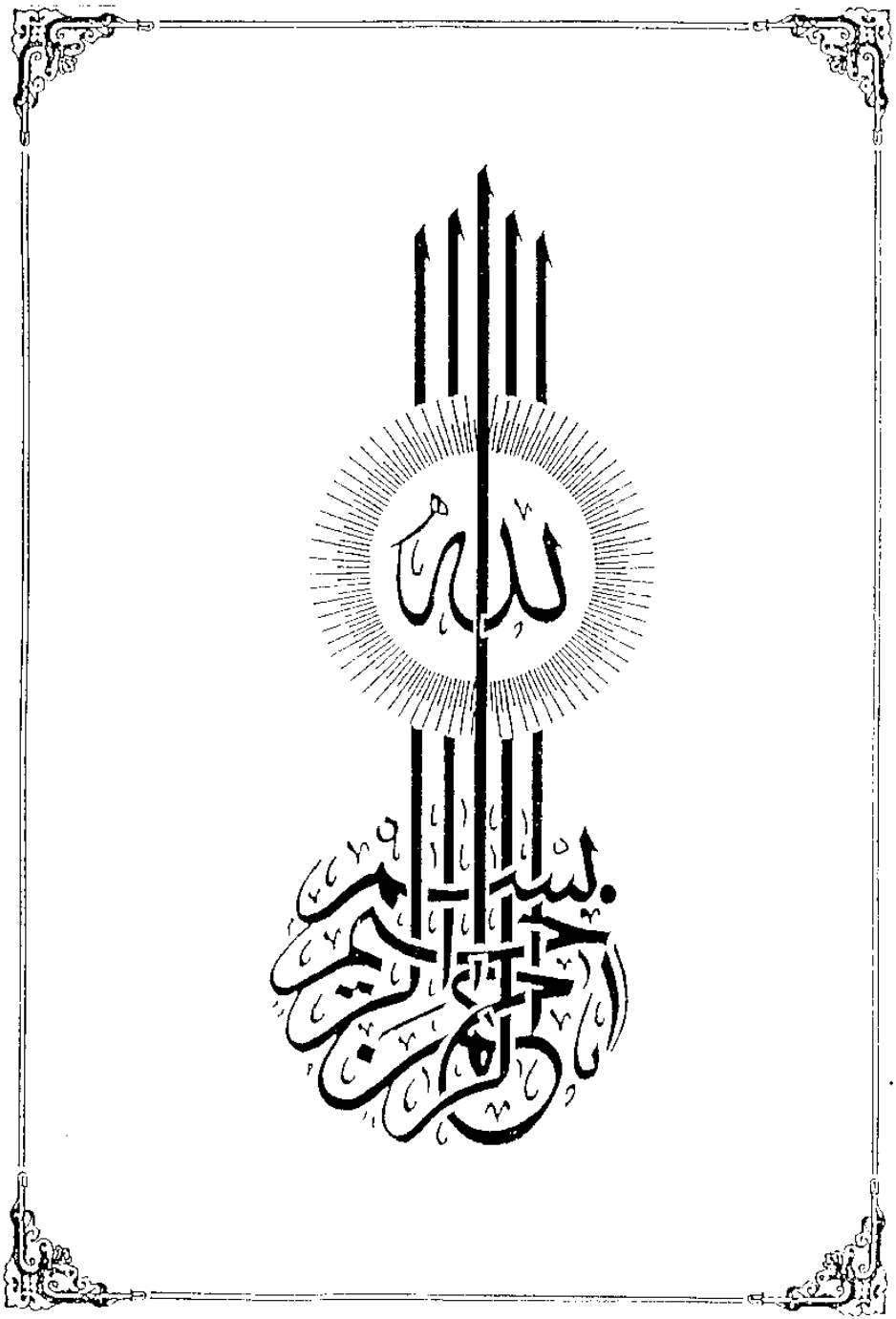
I would like to express my deep thanks to all those who participated in giving their golden knowledge, to those who honoured me and gave glints of lights on my way to knowledge.

I would like to express my faithful gratitude to Prof. Dr. Zeinab Abd - Allah, for her help, encouragement and constructive criticism.

I am greatly thankful to Lecturer, Dr. Heba El-Deeb for her support, guidance and honourable advise.

The Candidate

1985



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INTRODUCTION AND AIM OF WORK

(I) Introduction and aim of work

The anatomy of the temporal bone is complex and in many circumstances confusing. The temporal bone form part of the lateral aspects and floor of cranium. The temporal bone has a special importance because it contains the organ of hearing and equilibrium.

The aim of this work is to examine the normal radiological anatomy of the temporal bone, using various radiologic techniques and position.

The knowledge of the normal radiographic anatomy in the various projections is indispensable for the recognition and evalution of the Pathological conditions.

The conventional radiological examination of the temporal bone often provide useful information to assess the significance of pneumatization, but confusing any changes in the ossicles or the labyrinth and it is important to say that the disadvantage of these methods is [illegible]t small

structures are lost by the superimposition of larger structures and dense or more calcified structures will obscure those of lesser density.

Tomography of the temporal bone is often the only way of assessing the anatomical detail of the temporal bone. It is the method of examining tissue structures by blurring out objects above and below the desired plane. Tomographic studies are valuable for the diagnosis of the ear diseases which can not be visualized with conventional radiographs.

Since the introduction of high-resolution computed Tomography (with which details significantly smaller than 1 mm can be resolved), CT has been applied more and more to examination of the petrous bone.

Small structures is now seen much better than with tomography. Even tiny soft tissue such as the muscles of the middle ear are visualized, distinctly. This method used to show the finest detail of the temporal bone.

BASIC ANATOMY AND DEVELOPMENTAL REVIEW

(II) Basic anatomy of the temporal bone and organs of hearing (with developmental review)

Development of temporal bone

Temporal bone develops in four separate pieces, two in membrane (Squamous and tympanic bones) and two in cartilage (Styliod process and petromastiod bone). (last 1977).

Temporal bone is formed primarily from the capsule of the inner ear which is part of the primitive chondrocranium. (Pette, 1953).

The squamous temporal bone arises from a center about the eighth week of the faetal life. It then extends into the zygomatic arch.

The periotic capsule (later petrous bone) ossifies in cartilage from four centers, beginning about the fifth month of faetal life. It consists of porous bone by sixth month.

The styloid process which is derivative of the second or hyoid arch, ossifies in certilage, (Anson & Davies 1980).

The tympanic portion is developed together with the external auditory meatus. (Samuel, E. 1969).

The mastoid process is absent at birth,so that the facial nerve emerging from the stylomastoid canal is superficial. (Figure.1) (Anson & Davies 1980).

The mastoid process is a postnatal structure and begins to develop during the second year of life as a result of downward extension of cells arising from the squamous portion and partially by extensions of cells from the petrous portions. With further maturation of the mastoid, the thin, incomplete infantile ring that constitutes the tympanic portion of bone grows laterally and inferiorly to form the osseous extension of cartilaginous auditory canal. (Figure.2) (Bergeron,T.R, 1984).

(Figure :1) Temporal bone at birth, lateral view .
1- Petro-squamous suture. 2- mandibular fossa.
3- Petrous apex. 4- Tempanic bone
5- Stylomastoid foramen. 6- Cribriform area over antrum. 7- Petrosa.
(Quoted from Anson & Bast 1980).

(Figure.2) Temporal bone of adult.
(1) Tympanosquamous suture. (2) mandibular fossa.
(3) articular tubercle. (4) vaginal process.
(5) Styloid process. (6) Stylomastoid foramen.
(7) Mastoid process. (8) mastoid suture.
(9) Mastoid foramen. (10) Cribriform area.
(11) Suprameatal spine. (12) Temporal line.
(Quoted from Anson & Bast 1980).

Development of Pneumatic cells of the temporal bone:-

The air cells of the temporal bone develops as out pouchings from the tympanum, epitympanum, antrum and Eustachian tube. Epithelium-lined evaginations begin to appear from the antrum as early as 34 weeks in the faetus. However, it is not until air enters the middle ear at birth, permitting the loose embryonic connective tissue to condense and thin, that pneumatization accelerates, continuing throughout infancy and early childhood. In petrous apex, pneumatization may continue into early adult life.

Pneumatization of the mastoid process occurs by epithelium lined projection into soft tissue between spicules of new bone. From the antrum grow air cells of the mastoid process and squama.

From the antrum and the epitympanum cells grow into the root of the zygoma and into the base of the petrous

Pyramid around the semicircular canals. From the floor of the tympanum, cells extend below the Eustachian tube. From the anterior aspect of the tympanum, cells extend in front of, behind and above the carotid artery and often in front of and above the cochlea, medially into the petrous apex. (Anson & Bast 1980).

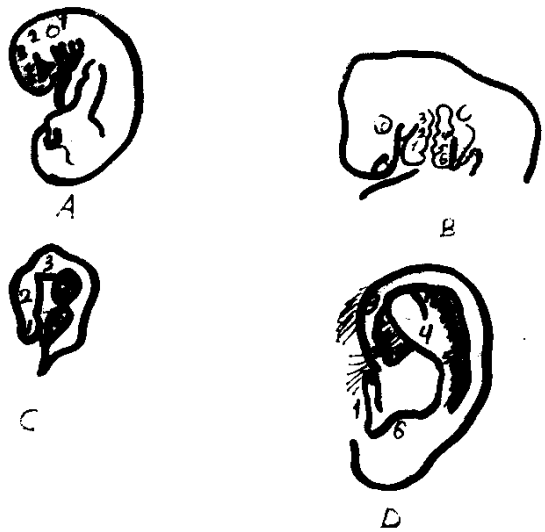
Development of the Ear

The developmental history of the ear is remarkable. The inner ear is the only organ that reaches full adult size and complete differentiation by midterm, even before the tiny faetus has become a viable premature infant. The labyrinthine capsule and ossicles are the only parts of the osseous skeleton that retain primitive endochondral bone throughout the life span of the individual. (Anson & Bast 1980).

Development of the external ear:-

The auricle develops around the first branchial groove from six knoblike outgrowths from the first and second branchial arches, which appear in the Sixth week of embryonic life and then gradually fuse by the third month to form the auricle. (Figure 3) (Anson & Bast 1980).

The external acoustic meatus is developed from the dorsal end of the hyomandibular or first branchial groove.



(Figure.3) Development of the auricle.

(A) The primordial elevations of the first and second arches.

(1) Otocyst. (2) Mid brain.
(3) Fore brain. (4) Optic vesicle.
(5) Mandible.

(B) Which fuse. (C) To form the adult auricle.

(D) Marked with numerals to indicate the derived parts. (1 to 6, six knoblike outgrowths from first & second branchial arches).

(Quoted from Anson & Bast 1980).