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شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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التوثيق الالكتروني والميكروفيلم

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le of Magnetic Resonance Imaging in Diagnosis of Orbital Masses

Thesis submitted in partial fullfillment for M.D. degree in Radio-diagnosis

By

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2003

Dedication

To my father, the first teacher in my life .
To my mother ,the nearest person to my heart.
To the patients, for whom this work has been done.

Hala Maher

2003

ACKNOWLEDGMENTS

Above all and first of all, thanks to **ALLAH,** whose care has supplied me with much strength to complete this work.

My sincere appreciation to **Prof.,Dr.Fathy Tantawy** " Prof. of Radio-diagnosis ' Faculty of Medicine, Zagazig University, due to his effort and cooperation throughout this work.

I am greatly grateful to **Prof.,Dr. Saleh El-Essawy** " Prof. of Radio-diagnosis " Faculty of Medicine, Mansoura University, who gave me the privilege of working under his supervision and followed up this work and helped me to bring it out to light.

NO words can express my gratitude and thanks to **Prof.,Dr.Tamer Kamal** "Prof. of Radio-diagnosis" Benha, Faculty of Medicine, Zagazig University ,for his continuous and valuable supervision .Without his efforts ,this work would not have appeared in such form.

I am deeply grateful to **Dr.Ahmed Farid** "Assistant Prof. of Radio-diagnosis "Benha Faculty of Medicine, Zagazig University for his supervision, kind guidance, valuable advice and continuous encouragement.

Special thanks to **Prof.,Dr.Tarek El-Diasty,**" Head of Radio-diagnosis department ", Mansoura urology and Nephrology centre, whose permission allowed me to conduct a great part of this thesis in that highly qualified centre.

My utmost gratitude to **Prof.,Dr.NaderRoshdy**"Prof.,of phthalmology, Mansoura University". for regularly supplying cases,explaining surgical maneuvers and for his constructive criticism and marvelous support that made this work possible.

Thanks to **Dr. Eman El-Hifny** "Lecturer of ophthalmology, Mansoura University" for she kindly dedicated me much of her time and experience during this work.

I highly estimate the efforts exerted by the pathology department staff, especially **Prof., Dr. Abd El-Fatah El-Bedaewy** who wisely and patiently reviewed many of the histopathologic examinations and diagnosed them soundly.

I feel truly thankful to***all members of the family of radiology department*** ,who patiently assisted me during this study and always guided me to the right direction.

Grateful thanks to all my professors ,senior staff, colleagues ,and nursing group in clinical departments for their generous help .

Contents

Abbreviation List

AVM	Arteriovenous malformation
CCFs	Cartico-cavernous fistula
CSF	Cerebrospinal fluid
CT	Computed tomography
EC	Extraconal space
EOM	Extra ocular muscles
EPM	En plaque meningioma
GRE	Gradient echo
IO	Intraocular
OP	Idiopathic Orbital Pseudotumor
IOF	Inferior Orbital fissure
IC	Intraconal space
IV	Intravenous
IR	Inferior rectus
LPS	Levator papebrae superioris
LR	Lateral rectus
MR	Medial rectus
MRA	Magnetic Resonance Angiography
μMRI	Extremely high resolution MRI
MRS	MR spectroscopy
MRI-DCM	MR Dynamic Color Mapping
MRI	Magnetic resonance imaging
NEX	Number of excitation
OP	Optic nerve
PNS	Paranasal sinus
ROI	Region of interest
SOF	Superior Orbital Fissure
SI	Signal intensity
SR	Superior rectus
STIR	Short inversion time inversion recovery
TE	Echo time
TON	Traumatic Optic Neuropathy
TR	Repetition time
WFB	Wooden foreign body

Review of Literature

Anatomy and MRI

Appearance of Normal Orbit

A-Osteology of The Orbit(The Bony orbit): -

The bony orbit is pyramidal in shape having four walls ,an apex directed posteriorly and a base directed anteriorly. The orbit is essentially a socket for the eyeball, containing the muscles, nerves, and vessels proper to it. Moreover, it transmits certain vessels and nerves to supply areas around the orbital aperture. *(Fig.1,2)*.

Seven bones form the orbit: the maxillary, palatine, frontal, sphenoid, zygomatic, ethmoid and lacrimal bones. **(Bron et al., 1997)**

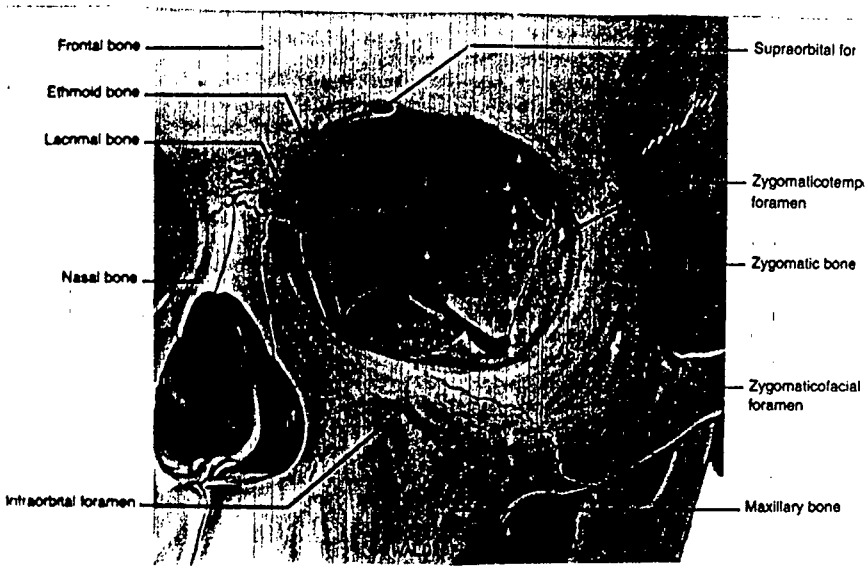

Fig.(1)Orbital bones ,frontal view

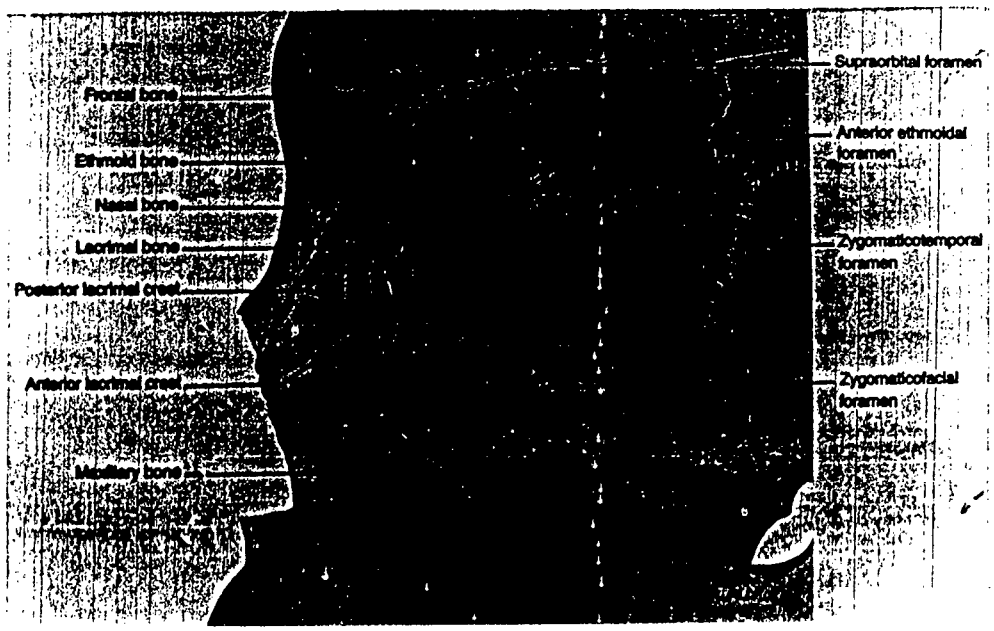

Fig.(2) Orbital bones ,Lateral view *(Fig.1&2 Quoted from Dutton 1994)*

Orbital walls:

The superior orbital wall = roof of the orbit is triangular and formed largely by the orbital plate of frontal bone and behind it the lesser wing of sphenoid separates the orbit from the anterior cranial fossa.

The inferior orbital wall =floor like the roof is triangular and formed by three bones; the orbital plate of maxilla, the orbital surface of zygomatic bone and the orbital surface of palatine bone.

It is related to maxillary sinus and traversed by the infraorbital sulcus, which ,then becomes roofed as infra-orbital canal,the anterior opening of canal is infra-orbital foramen.

The medial wall of the orbit is the **thinnest component** of the orbital walls. It serves to separate the orbital content from ethmoid and sphenoid air cells. It consists of four bones united by vertical sutures ,from the front backwards ; the frontal process of maxilla, the lacrimal bone, the orbital plate of ethmoid bone (lamina papyracea) and a small part of the body of sphenoid. The lamina papyracea form the major part. (Kiss-Klin 1919)

The lateral wall is the **thickest and strongest** of the orbital walls.It is triangular with its base anteriorly,. It is formed by the zygoma anterior and the greater wing of sphenoid posteriorly.Two major fissures are present in lateral orbital wall :superior orbital fissure (S.O.F.) lies between lateral orbital wall & the roof of the orbit .Inferior orbital fissure (I.O.F.) :lies between lateral orbital wall and floor of the orbit (**Fig.3**)(Whintall 1911)

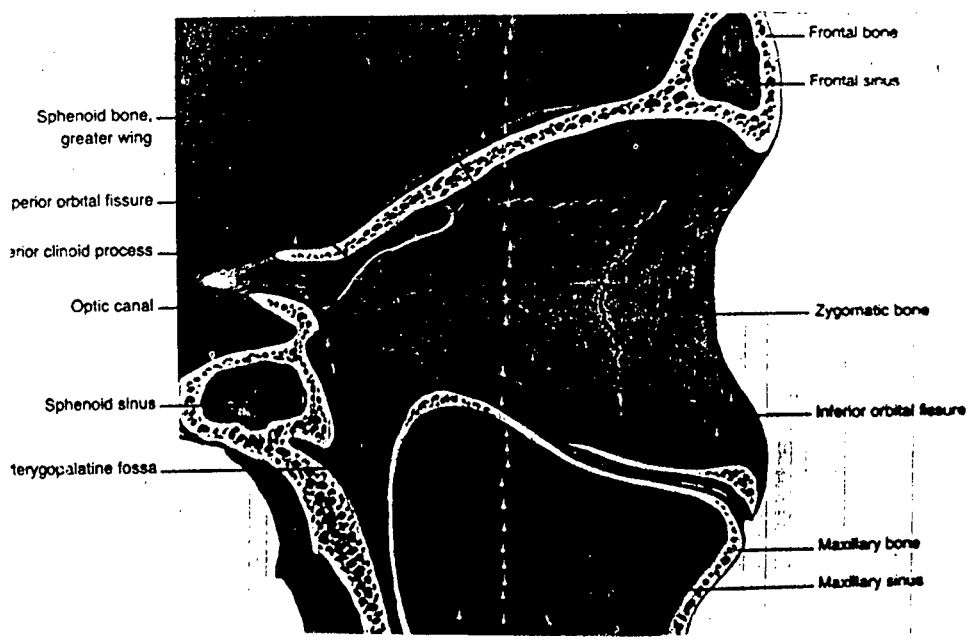

Fig.3 Orbital bones ,Lateral wall internal view

Orbital Apex:

It is the site of meeting of the four orbital walls.At the orbital apex ,the optic canal is medial to to anterior clinoid process and superior orbital fissure is lateral to anterior clinoid process.(**Fig.4**) (El-Gabaly et al, 1983)

The bony land marks is best visualized on CT with the aid of the bone extended scale and bone window technique (**Fig.5**). The optic canal can be seen on both axial and coronal scans. The lateral and medial bony orbital margins, the superior and inferior orbital fissures, the lacrimal fossa, lacrimal sac, nasolacrimal canal, infraorbital canal and paranasal sinuses are also equally well seen in axial or coronal scans. Coronal scans are best for assessing the floor and roof of the orbit. The lamina papyracea is a paper thin plate of bone that forms most of the medial orbital wall, separating it from adjacent ethmoid air cells. This late often appears to be dehiscent on CT, and therefore care should be taken not to make an erroneous diagnosis of bone destruction or fracture. **(Harms 1990, Biraffman et al., 19978)**

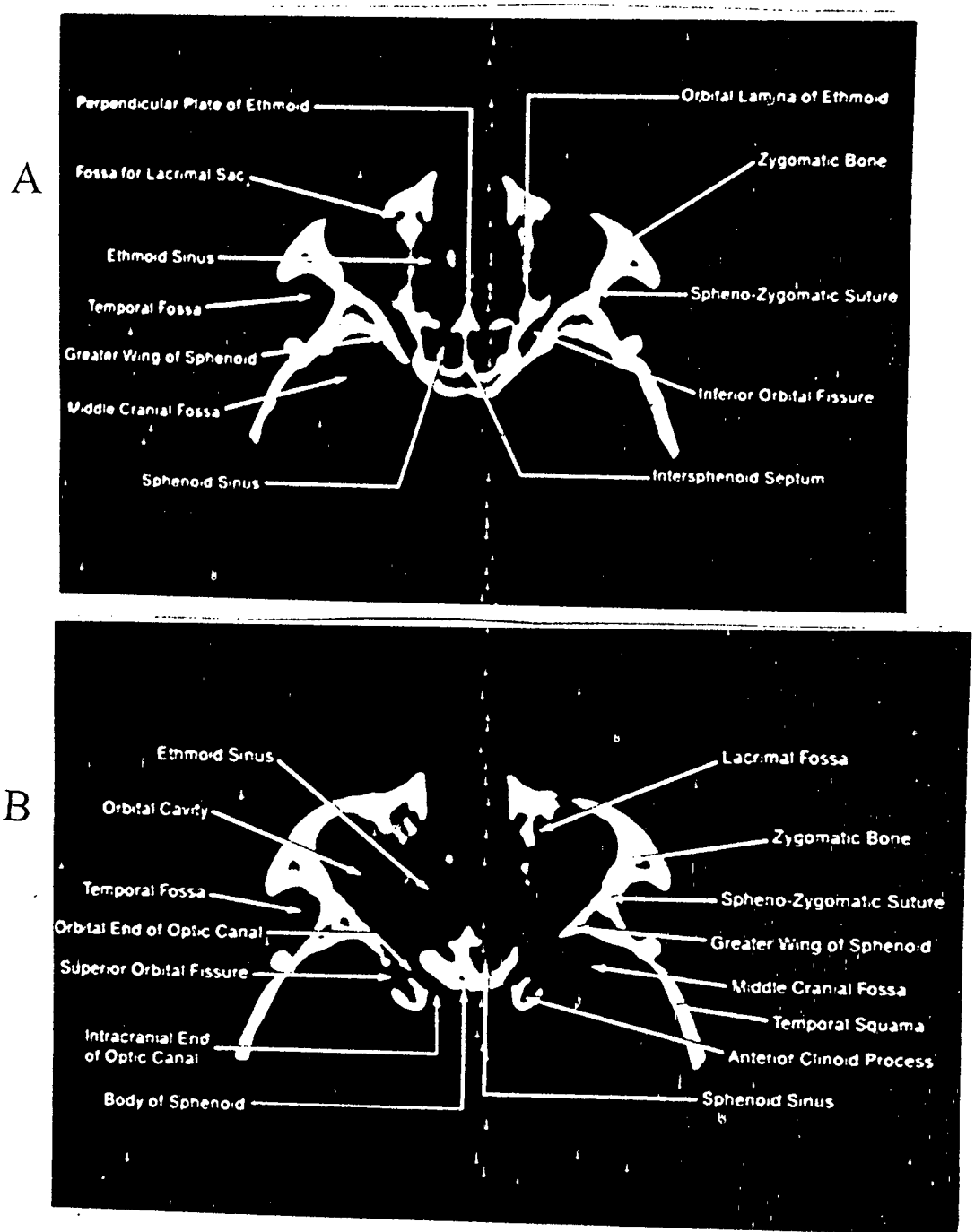

Fig.5 . Bone setting:CT appearance of orbital bony details. Axial cuts .
(A)CT through inferior Orbit.
(B) CT through Optic Canal
(Fig.5 Quoted from Hammerschlag et al., 1983)

B-Orbital soft tissue:

The anterior orbit (Pre-septal space): The anterior soft tissues of the orbit are separated from the ***orbit proper*** by a thin connective tissue membrane ,called the ***orbital septum*** .It is continuous with the periosteum of the anterior orbital margin and attached to the tarsal plates of the eye lids .It divides the orbit into preseptal &post septal compartments .(Wolff 1968)

The septum acts as a major barrier to the spread of inflammatory processes of pre-septal space to the rest of the orbit.**On MRI :**the septum is seen as moderate to low signal structure on T1WI.(Hoffmann et al 1998)

1-The globe:

The globe occupies approximately 20 % of the total volume of the orbit. Each eye ball is located in the anterior orbit, nearer to the roof and lateral wall than to the other walls.Fine anatomic details of the globe can be identified by high field MRI using surface coil (Atlas&Galetta 1996).The globe is divided into two compartment ,the anterior segment filled with aqueous humor and the posterior segment filled with vitreous humor,the iris projects into the anterior segment circumfrentially,dividing it into anterior and posterior chambers .These compartments are separated by the lens apparatus(**Fig.6a).**

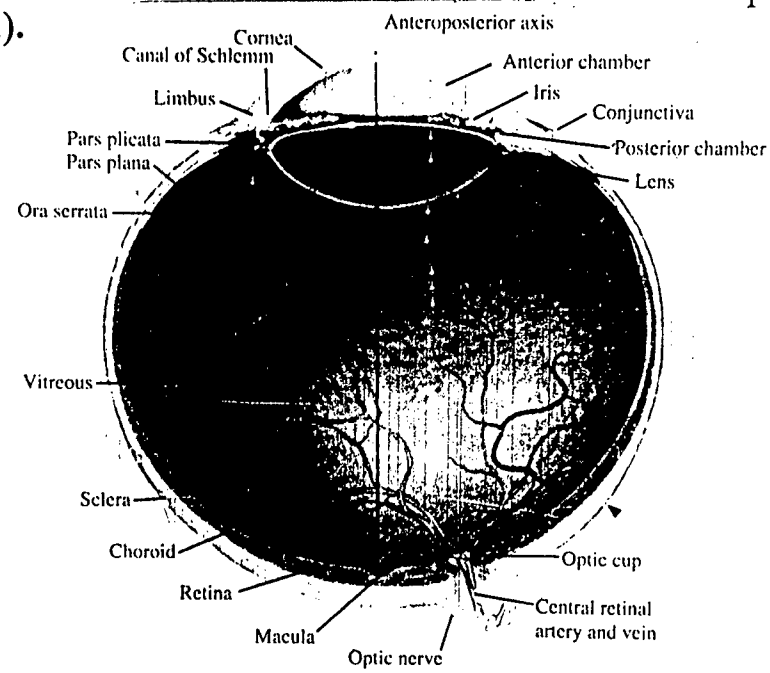

Fig.6.A Anatomy of the globe *(Quoted from Mafee et al., 1996)*

On MRI (**Fig.6B**):The vitreous and aqueous humor have signal intensity similar to that of cerebrospinal fluid (CSF) owing to high fluid content .The signal is low on T1WI ,moderately low on proton density density and relatively high on T2WI compared with the brain (Harms 1990).Also,the globe is multilayred structure composed of **three layers**:-

1)The outer most layer is a fibrous protective coat that constitutes the **sclera** posteriorly and the transparent **cornea** anteriorly.The sclera is covered by the conjunctiva.A thin fibrous membrane called tenon,s capsule (the fascia bulbi) Theepiscleral space is apotential space between capsule and the sclera.The recti muscles penetrate the tenon,s capsule to insert on the sclera.(Hesselink ,1990) .