Ain Shams university
Faculty of Medicine
Diagnostic Radiology department

COMPUTED TOMOGRAPHY AND MAGNETIC RESONANCE IMAGING OF PEDIATRIC ORBITAL LESIONS

An Essay
Submitted for Fulfillment of the Master Degree in Diagnostic Radiology

Presented by

Ahmed Mohammed Salah El Din Mohammed
M.B.B.Ch.

Under Supervision

of

Prof. Dr. Mohammed Zaky El Hedik
Prof. of Diagnostic Radiology
Faculty of Medicine
Ain Shams University

Dr. Sherine Ebrahim Sharara
Lecturer of Diagnostic Radiology
Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain Shams University
2015

سورة البقرة الآية: ٣٢

Acknowledgement

First of all, all gratitude is due to **God** *almighty for blessing this work, until it has reached its end, as a part of his generous help, throughout my life.*

Really I can hardly find the words to express my gratitude to **Prof. Dr. Mohammed Zaky El Hedik** *Professor of Diagnostic Radiology, faculty of medicine, Ain Shams University, for his supervision, continuous help, encouragement throughout this work and tremendous effort he has done in the meticulous revision of the whole work. It is a great honor to work under his guidance and supervision.*

I would like also to express my sincere appreciation and gratitude to **Dr. Sherine Ebrahim Sharara** *Lecturer of Diagnostic Radiology, faculty of medicine, Ain Shams University, for his continuous directions and support throughout the whole work.*

Last but not least, I dedicate this work to my family & my friends whom without their sincere support, pushing me forward this work would not have ever been completed.

Ahmed Mohammed Salah El Din
Cairo 2015

Contents

List of Abbreviations I

List of Tables III

List of Figures IV

Introduction and aim of work……1

Chapter 1: Anatomy of the orbit and its contents …….5

Chapter 2: Pathology of the pediatric orbital lesions ……..31

Chapter 3: Technical consideration…….73

Chapter 4: CT and MRI findings……89

Summary & Conclusion……...……..…161

References…….……..……...……..165

Arabic Summary……179

Tableof Abbreviations

Abbreviations	
ADC	Apparent diffusion coefficient AML= Acute myelogenous
CT	Computed tomography
FLAIR	Fluid-attenuated inversion recovery
FS	Fat suppression
FSE	Fast spin echo
Gd – DTPA	Gadolinium diethylenetriamine penta-acetic acid
IR	Inversion recovery
MRA	Magnetic resonance arteriography
MRI	Magnetic resonance imaging

PD	Proton density
PNETs	Primitive neuroectodermal tumors
RB	Retinoblastoma
SE	Spin echo
STIR	Short-time inversion-recovery
TE	Echo time
TR	Time repetition
2D	Two dimensional
3D	Three dimensional

List of tables

No.	*Tables*	page
Tab.1	Abnormalities arising from the extraconal, conal and intraconal spaces	**32**
Tab.2	CT Technique for Orbital/Globe Imaging	**80**
Tab.3	Scout for coronal, axial and sagittal cuts	**86**
Tab.4	Overview of signal intensities of specific orbital tissue and brain parenchyma	**86**

Table of Figures

No.	*Fig.*	Page
Fig. 1	3D surface shaded CT and Schematic representation of orbital bones	**6**
Fig. 2	Image at the level of the mid-orbit	**8**
Fig. 3	Axial CT of skull base	**9**
Fig. 4	CT of the orbit in bone window	**9**
Fig. 5	Zygomatico- facial canal	**9**
Fig. 6	Diagrams of the four compartments of the orbital space	**15**
Fig. 7	Diagram of extraocular muscles	**17**
Fig. 8	Coronal image in the mid-orbit	**17**
Fig. 9	Optic chiasm and tracts	**19**
Fig. 10	Optic chiasm and tracts	**20**
Fig. 11	Diagram of the visual pathway	**20**
Fig 12	Optic chiasm and tracts	**21**

Fig. 13	Axial T1-WI of the optic nerve	**21**
Fig. 14	Lacrimal gland	**22**
Fig. 15	Diagram of lacrimal apparatus	**23**
Fig. 16	Axial MR of the orbit	**24**
Fig. 17	Eye lid in horizontal sections	**27**
Fig. 18	The arterial supply and venouos drainage of the orbit	**29**
Fig. 19	Macroscopic examination of coloboma	**39**
Fig. 20	Inferonasal chorioretinal coloboma	**39**
Fig. 21	Anterior PHPV	**41**
Fig. 22	Posterior PHPV	**42**
Fig. 23	Microscopic section in specimen of late coat's disease	**44**
Fig. 24	Large masses of cholesterol and blood beneath the retina	**44**
Fig. 25	Trauma caused by a wooden stick	**47**
Fig. 26	Retinal and optic nerve hemorrhages	**49**

Fig. 27	Fungal infection	**50**
Fig. 28	Intraorbital abscess	**51**
Fig. 29	lacrimal gland dacryocytitis	**53**
Fig. 30	Pseudotumour of the orbit	**55**
Fig. 31	Idiopathic orbital inflammatory	**56**
Fig. 32	Inflammatory disease idiopathic orbital inflammatory disease	**56**
Fig. 33	Epidermoid inclusion cyst	**59**
Fig. 34	Capillary hemangioma	**60**
Fig. 35	Venous malformation	**61**
Fig. 36	Cavernous haemangioma	**61**
Fig. 37	Lymphangioma	**62**
Fig. 38	Optic nerve glioma	**64**
Fig. 39	Immunohistochemistry of optic nerve glioma	**64**
Fig. 40-42	Retinoblastoma	**68**

Fig. 43	Enucleation specimen of retinoblastoma	**69**
Fig. 44	Retinoblastoma	**69**
Fig. 45 & 46	Medulloepithelioma	**71**
Fig. 47-48	Marked embryonic cellular pattern	**72**
Fig. 49	Beam hardening artifact	**76**
Fig. 50 & 51	Scout view of an axial imaging protocol	**79**
Fig. 52 & 53	Coronal and sagittal reconstructions of the orbit	**79**
Fig. 54	Scout for coronal, axial and sagittal cuts	**83**
Fig. 55	Loss of signal at the left orbit	**87**
Fig. 56 & 57	Axial FLAIR images with and without motion artifact	**88**
Fig. 58	Unilateral anophthalmia	**90**
Fig. 59	Left macrophthalmia	**91**
Fig. 60	Coloboma	**93**

Fig. 61-63	PHPV	**95-96**
Fig. 64-66	Coats disease	**97**
Fig. 67	Orbital floor fracture	**100**
Fig. 68	Zygomaticomaxillary complex fracture	**102**
Fig. 69	Orbital roof fracture	**103**
Fig. 70	Posterior complete subluxation of the lens	**105**
Fig. 71	Corneal laceration	**105**
Fig. 72 & 73	Ruptured globe	**107**
Fig. 74	Retinal hemorrhage	**109**
Fig. 75	Traumatic retinal detachment	**110**
Fig. 76	Orbital metallic foreign body	**111**
Fig. 77 & 78	Carotid cavernous fistula	**112-113**
Fig. 79	Optic nerve injury	**114**

Fig. 80	Orbital and peiorbital cellulites	**116**
Fig. 81	Orbital cellulites and superiosteal abcess	**118**
Fig. 82	Dacryocystitis	**119**
Fig. 83 & 84	Optic neuritis	**120-121**
Fig. 85 & 86	Orbital pseudotumour	**123-124**
Fig. 87	Dermoid inclusion cyst	**127**
Fig. 88	Epidermoid cyst	**128**
Fig. 89	Capillary hemangioma	**130**
Fig. 90 & 91	Cavernous malformation	**132-133**
Fig. 92 & 93	Venous lymphatic malformation	**136**
Fig. 94	Optic nerve glioma	**140**
Fig. 95	Bilateral optic nerve gliomas	**140**
Fig. 96	Left optic nerve glioma	**140**
Fig. 97	Calcification within Retinoblastoma	**142**

Fig. 98	Retinoblastoma with intracranial extension	**143**
Fig. 99	Endophytic retinoblastoma	**144**
Fig. 100	Macroscopic vitreous seeding	**145**
Fig.101	Retinal detachment and hemorrhage	**146**
Fig. 102	Vitreous hemorrhage	**147**
Fig. 103	Iris neovascularization	**148**
Fig. 104	Choroidal invasion	**149**
Fig. 105	Transscleral spread of retinoblastoma	**151**
Fig. 106	Optic nerve involvement of retinoblastoma	**152**
Fig. 107	Extraocular tumor spread	**153**
Fig. 108	Trilateral retinoblastoma	**154**
Fig. 109	Leptomeningeal enhancement of retinoblastoma	**155**
Fig. 110	Medulloepithelioma of the retina	**157**
Fig. 111	Embryonal rhabdomyosarcoma	**160**

INTRODUCTION AND AIM OF WORK

The evaluation of the orbital lesions in pediatric patient, especially the extremely young, can be challenging and unreliable, and therefore requires a heightened index of suspicion and a broad differential diagnosis. Management of these disease processes requires an understanding of the growing face and sensitivity to the long-term impact of intervention. Therefore, the pediatric orbit can be highly resilient, making the care of these patients especially rewarding **(Gonzalez M.O & Durairaj V.D, 2012).**

Orbit and ocular adnexa are important sites for primary and secondary orbital diseases. All tissue types including bone, vascular, neural, muscular, and glandular tissues may be involved with specific pathologies **(Dutton et al., 2012).**

Different kinds of tumors, vascular, traumatic and inflammatory diseases which involve the orbit continue to be a great challenge to the diagnostic radiologist. The complex anatomy of the orbit on the one hand and the multitude of