

Original article

A Clinical Study of orbital lesions on the basis of Magnetic Resonance Imaging

¹Dr. Dipali Subhashrao Bonde, ²Dr. Archana Vare*

¹Junior Resident, Government Medical College, Aurangabad, Maharashtra, India

²Associate Professor, Dept. of Ophthalmology, Government Medical College, Aurangabad, Maharashtra, India

Corresponding author*

Abstract:

Background: A wide variety of processes can produce space occupying lesions in and around the orbit. Imaging can be used to precisely localize a lesion, to help establish a diagnosis or generate a differential diagnosis that guides management, to follow a known lesion for progression or some combination of these⁽²⁾

Aims & objectives: 1.To determine various orbital pathologies on the basis of MRI scan 2.To find out the commonest orbital pathology on the basis of MRI scan 3. To study the various orbital pathologies on the basis of MRI scan in Pediatric age group 4. To describe important MRI features in various types of orbital lesions.

Methodology: The study was conducted on patients who came to ophthalmology dept.from OPD, casualty and those who were referred from other specialties with suspected orbital lesions on clinical examination.

Results :A total of 50 patients were evaluated. Out of 50 patients we studied, 17 (34%)were of neoplastic etiology . 13(26%) patients had infective etiology. 10(20%) cases of inflammatory etiology.We also studied 5 cases of systemic diseases,3 cases of congenital & developmental anomaly and 2 other cases.

Conclusion: we conclude that overall most common pathology was neoplastic (34%) followed by infective (26%) & inflammatory (20%).In paediatric age group (0-18) most common pathology was infective 4(36.3%)followed by inflammatory 3(27.2%).

Key words-orbital lesions,MRI,

INTRODUCTION

The vision of man has enabled him to make enormous progress and emerge as supreme species. The basic anatomical unit of vision, ocular apparatus is housed in a four sided pyramid - The orbit⁽¹⁾A wide variety of processes can produce space occupying lesions in and around the orbit. These include benign neoplasms, malignant neoplasms, vascular lesion, inflammatory disease, congenital lesions and infection among other causes. Imaging can be used to precisely localize a lesion, to help establish a diagnosis or generate a differential diagnosis that guides management, to follow a known lesion for progression or some combination of these⁽²⁾ The eye and the orbit constitute a unique and complex region of the nervous system which poses a challenge to the ophthalmologist and neuroradiologist. While history and clinical examination are invaluable, CT and MR provide an insight into the retrobulbar area, the orbital apex and the brain.With the advent high –Tesla MR systems and small diameter dedicated surface coils,MRI is now the modality of choice⁽³⁾ MRI as an investigatory modality of orbital lesions plays an important role as mentioned below:^(4,5,6,7,8)

MR images obtained using head coil on a high field strength magnet (1.5T) enables adequate visualization at orbital apex and beyond. Short scan times with turbo/fast spin echo (SE) sequences, T1W, T2W without and with fat suppression (FS) techniques like short tau inversion recovery (STIR) images. Thin (3 mm or less) slice thickness with acquisition in at least two scan planes, small field of view (FOV), high resolution matrix (256 × 256) and T2W imaging of the brain for evaluation of the entire visual pathways are salient features of MRI imaging. Gadolinium (Gd) enhancement is seen as high intensity in post-contrast FS T1W images. Additional sequences with Gradient echo images (GRE) can be acquired depending on the indication.⁽⁴⁾

MATERIALS AND METHODS:

This Hospital Based Cross-sectional Study was carried out in the department of ophthalmology, with the permission of Institutional Ethical committee. Present study was conducted in Department of Ophthalmology in a tertiary care centre. The study was conducted on patients who came to us from OPD, casualty and those who were referred from other specialties with suspected orbital lesions on clinical examination. The study was conducted from October 2016 to October 2018

INCLUSION CRITERIA:

- 1) All patients with suspected Orbital Lesions on clinical examinations.

EXCLUSION CRITERIA:

1. Patients who refused to participate in the study
2. Patients with traumatic orbital lesions (majority of our patients came from rural area and in such patients, there is suspicion of foreign body and nature of foreign body is unknown)
3. Patients with metallic implants
 - a) Cardiac implants
 - b) Ocular prosthesis
 - c) Cochlear implants
 - d) Dental implants
 - e) Implantable Cardiac defibrillators
 - f) Implantable drug infusion pumps
4. Claustrophobic patients
5. Patients with suspected intraocular metallic foreign body

Equipment used:

- 1.5 T MRI machine with standard head coil was used for the examination.



OBSERVATION AND RESULTS:

Present study was conducted in a tertiary care centre, in Ophthalmology Department with suspected orbital lesions on clinical examination in the time period from October 2016 to October 2018. Total 50 patients with various orbital pathologies were included in the study.

Most common age group affected in our study was 19-36 years which was (15)30% of total. In our study most common age group affected among paediatric patients was 0-6 years and 13-18 years.

Out of total 50 patients in this study, 48% were males and 52% were females.

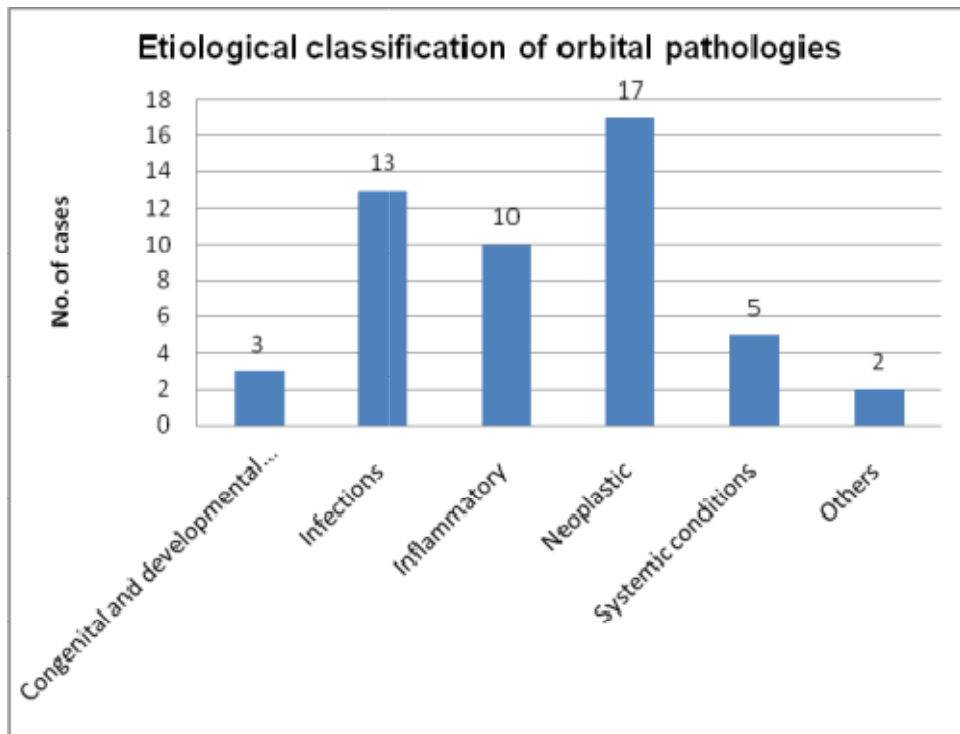
In this study right orbit involvement was 38% and left orbit involvement was 36%. Both orbits involvement was 26%.

Table No. 1 Clinical Symptoms and signs of patients:

Symptoms	Frequency	Percent
DOV	5	10.0 %
DOV, EE	1	2.0 %
DOV,NS	1	2.0 %
DOV,P	3	6.0 %
DOV,P,PROP	1	2.0 %
L	2	4.0 %
L,S	1	2.0 %
NS,W	1	2.0 %
NS,H	1	2.0 %
P, O	1	2.0 %
P,DOV	1	2.0 %
EE	2	4.0 %
PROP	29	58.0 %
PROP,P	1	2.0 %
Total	50	100.0 %

(DOV-diminution of vision, EE-eyelid edema, NS- nasal stuffiness, P- pain, PROP-proptosis, L-Leucocoria, S-Small eye, W-Watering, H-Headache, O-Ophthalmoplegia) . In our study, among all the symptoms most common presenting symptom was proptosis.

Figure No. 1



In our study, overall most common pathology was neoplastic (34%) which was followed by infective (26%) & inflammatory (20%).

In paediatric age group (0-18) most common pathology was infective 4(36.3%) which was followed by inflammatory 3(27.2%) and neoplastic pathology.

Table No -2 Orbital compartment involvement

	Preseptal	Ocular	Conal	Intraconal	Extraconal	Multicompartment	Total
Congenital & developmental	0	1	0	1	1	0	3
Infective	1	3	0	5	3	1	13
Inflammatory	0	0	4	6	0	0	10
Neoplastic	0	3	0	4	5	5	17
Systemic	0	0	5	0	0	0	5
Other	0	0	0	0	0	2	2
	1	7	9	16	9	8	50

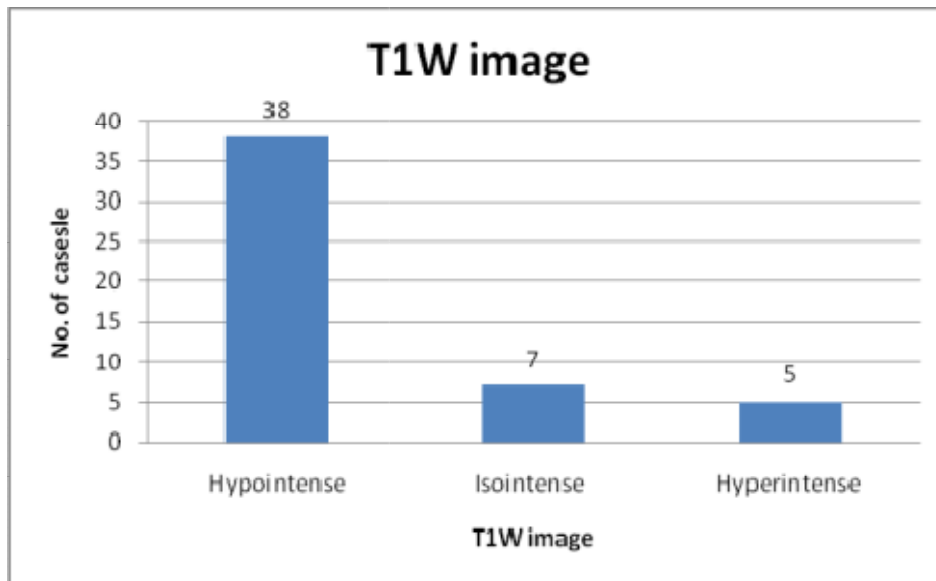
(pre-septal –portion of skin around the eye anterior to the orbital septum, ocular- intra-ocular portion involvement, conal- extra-ocular muscle involvement, intraconal –space inside the rectus muscle pyramid, extraconal- space outside the rectus muscle pyramid, multicompartment- more than 1 space involvement).

Most common compartment involved : intraconal space

Most common pathology in intraconal compartment: inflammatory

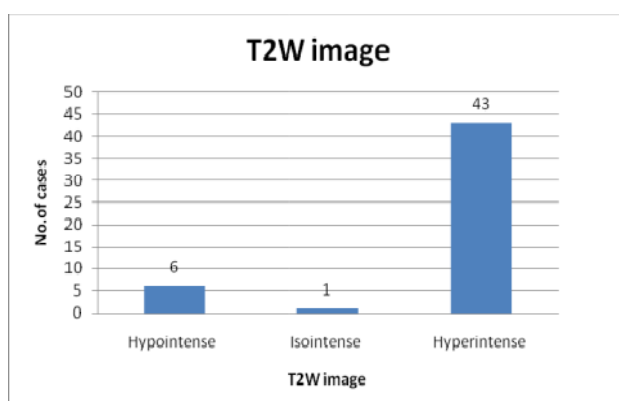
Most common pathology in extraconal compartment: neoplastic

Figure No.2 -T1W Imaging



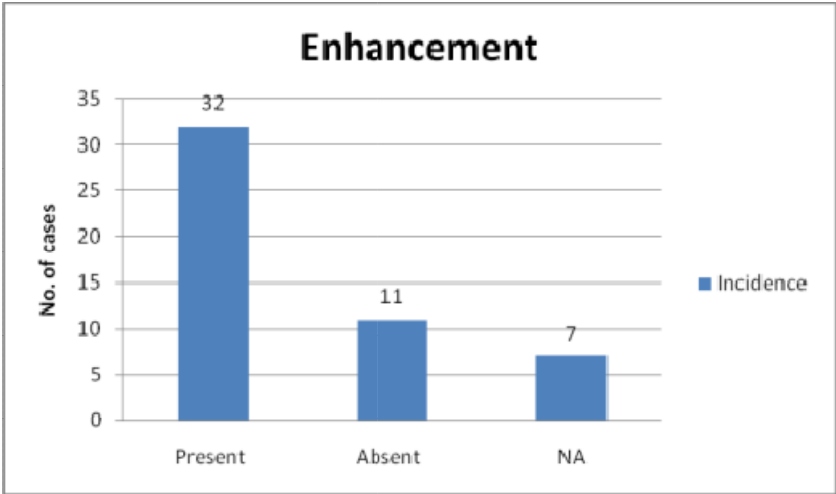
In our study, among 38 cases(76%) pathologies found were hypointense, in 7 cases (14%)pathologies were isointense and 5 cases (10%)were hyperintense on T1W imaging.

Figure No.3 T2W Imaging



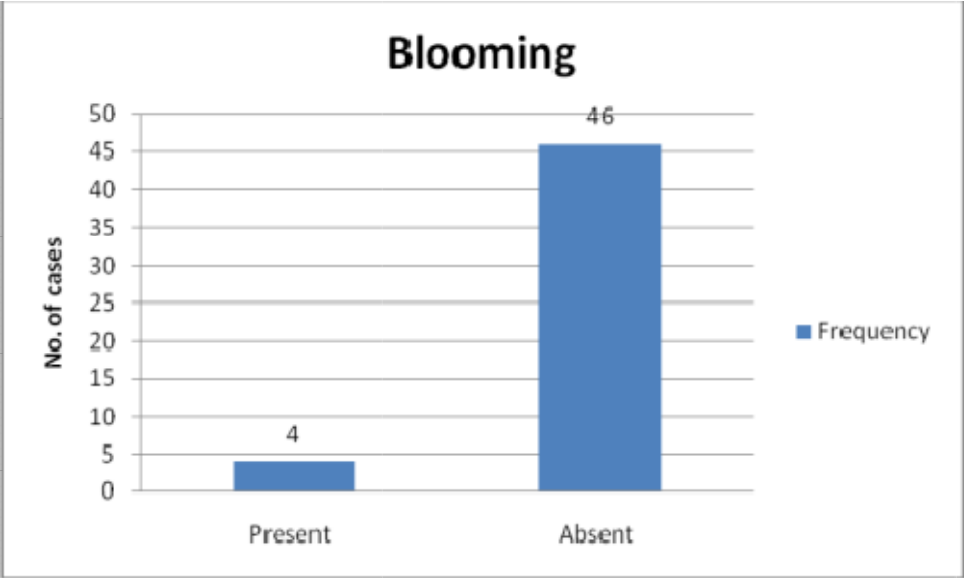
Total 43 cases(86%) were found hyperintense on T2W imaging . And in 6 cases(12%) pathologies were hypointense and isointense in 1 case(2%).

Figure No.4 Enhancement



In our study, 32(64%) cases showed enhancement and 11 cases showed no enhancement

Figure no.5 Blooming



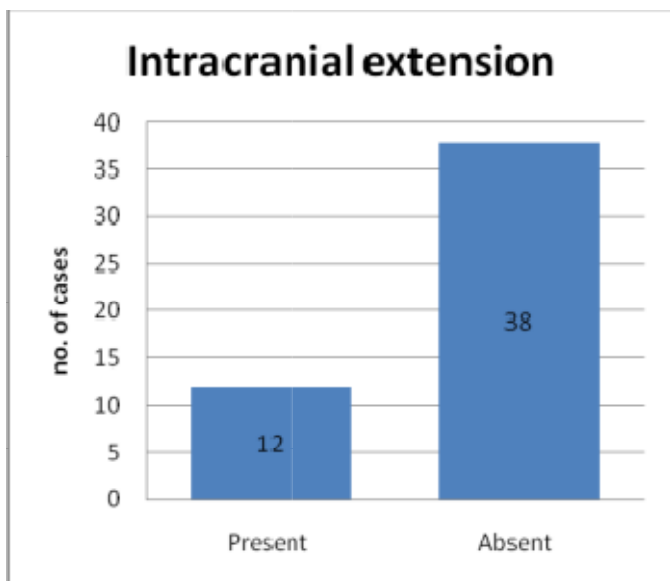
In our study Blooming on MRI findings seen in 4 cases(8%) and in absent in 46 cases(92%). Blooming seen in neoplastic and inflammatory cases.

Table no.3 Orbital bone involvement

	Frequency	Percentage
Present	7	14 %
Absent	43	86 %
Total	50	100 %

Bone involvement was found in 7(14%) of cases and absent in 43(86%) cases. Most of the lesions were neoplastic and infective etiology.

Figure no. 6 Intracranial extension



Intracranial extension was found in 12 cases(24%). It was seen in 7 patients of neoplasm , 4 patients of infective etiology and 1 case of carotico-cavernous fistula.

Table no.4 MRI Diagnosis:

	Frequency	Percentage
CAE	1	2.0
CAM	1	2.0
CCF	1	2.0
CMF	1	2.0
CPH	1	2.0
EDC	1	2.0
ENB	1	2.0
ESP	1	2.0
FSM	1	2.0
MET	1	2.0
METS	2	4.0

MSP	1	2.0
NHL	1	2.0
NPL	1	2.0
OA	3	6.0
OAS	1	2.0
OCC	1	2.0
ON	3	6.0
ONG	1	2.0
ONM	3	6.0
ORC	8	16.0
PHPV	1	2.0
PMA	1	2.0
PST	4	8.0
RET	2	4.0
SGC	1	2.0
THO	5	10.0
VV	1	2.0
TOTAL	50	100.0

In our study, we found the diagnosis of patients with various orbital lesions on the basis of Magnetic resonance imaging like neoplastic, infective, inflammatory, vascular and systemic pathology.

(CAE-Carcinoma of ethmoid sinus;MET-Metastasis , CPH-Capillary hemangioma ONM-Optic nerve meningioma ;Neoplastic lesion; CAM-Ca.Maxillary sinus;PST- pseudotumor ;CMF-Cavernous malformation; OCC-Orbital Cysticercosis; SGC-Sebaceous gland carcinoma; MSP-Maillary sinus polyp;VV-Venous varix; ESP-Ethmoid sinus polyp; PMA-Pituitary macroadenoma ;OAS-Orbital apex syndrome;RET-Retinoblastoma; THO-Thyroid ophthalmopathy;ON-Optic neuritis;ORC-Orbital cellulitis; CCF-Caroticocavernous fistula;ONG- Optic nerve glioma;EDC-Epidermoid cyst;FSM-Frontal sinus mucocele; PHPV;Persistent hyperplastic primary vitreous;OA-Optic atrophy)

Discussion:

A total of 50 patients were evaluated. Out of 50 patients we studied, 17 (34%)were of neoplastic etiology which consisted of optic nerve neoplasm(4), retinoblastoma(2), pituitary macroadenoma(1), metastasis to orbit(5),eyelid tumour(1), vascular tumour(1), esthesioneuroblastoma(1) & tumors of paranasal sinuses(2) extending to orbit.

13(26%) patients had infective etiology which included 9 cases of orbital cellulitis and rest were secondary to paranasal sinuses infection. 10(20%) cases of inflammatory etiology had pseudotumour in 4(8%)cases and optic neuropathy 6(12%)cases. We also studied 5 cases of systemic diseases (Grave's ophthalmopathy), 3 cases of congenital & developmental anomaly(1-cavernous malformation, 1- persistent hyperplastic primary vitreous(PHPV) &1- epidermoid cyst) and 2 other cases.

In our study, youngest patient was a 3 months old child and oldest patient was 80years old adult. Maximum number of patients were in the age group of 19-36 years (30%). Mean age of the patient included in our study was 41.5years with neoplastic etiology.

Our study coincides with the study done by Wright JE et al⁽¹¹⁾. Our study shows no sex predilection. Our study coincides with JA Akinmoladun et al⁽¹²⁾ study. In our study right orbit involvement was 38% and left orbit involvement was 36%. Both orbits were involved in 26% patients. Findings in our study coincides with the study done by Jerry Aet al⁽¹³⁾. The most common symptom in our study was proptosis (58%) which does not coincide with study done by Sherstha GB⁽¹⁴⁾, who found the most common symptom as swelling around periorbital area and mass of eyelid (85.1%) . In our study neoplastic orbital lesions(34%) were more common followed by infective orbital lesions(26%). The same results were found in study done by Kennedy⁽¹⁵⁾. In the present study, orbital lesions were found in intraconal space(16 cases), conal space(9 cases),in extraconal space(9cases) and in multiple compartments(8cases). The same results were found in Shrestha GB study⁽¹⁴⁾ and Sarah N khan study.⁽²⁾

CONCLUSION:

In our study, we concluded that most common pathology was of neoplastic etiology followed by infective etiology.

MRI is the tool of choice for diagnosing retinoblastoma due to signal intensity, enhancement and blooming.

- In orbital lesions MRI is vital in providing details of hemangioma, lacrimal gland, lacrimal apparatus, tumour location, tumour extension and tumour invasion in the retro-orbital space, intracranial regions and adjacent paranasal sinuses.
- Contrast enhanced MRI should be the imaging modality of choice in cases of orbital infections. One of the important MRI finding of mycotic infection was the hypointensity on T2W image. Hence, MRI should be the imaging modality of choice for suspected orbital lesions except where MRI is contraindicated.

REFERENCES:

- 1.Dubey R B, Tara N P, Sisodiya K N.Computerised tomographic evaluation of orbital lesions : Pictorial essay. Indian J Radiol Imaging.[serial online] 2003 [cited 2014 Jan1];13:261-70
- 2.Khan S N, Sepahdari A R.Orbital masses :CT and MRI of common vascular lesion, benign tumors, and malignancies. Saudi Journal of Ophthalmology.2012;26:373-383
- 3.Kalyanpur T, Cheriyan M.Role of MRI and CT in Ocular and Orbital Diseases.Kerala Journal of Ophthalmology.2009;21:430-441
- 4.Hande PC, Talwar I. Multimodality imaging of orbit. Indian J Radiol Imaging 2012;22:227-39.
- 5.Mafee MF.Orbit:Embryology, anatomy and pathology. In:Som PM,Curtin HD,editors.Head and Neck Imaging. 4th ed., vol. 2.St Louis:Mosby;2003. p.534-6.
- 6.Kirsch E, Hammer B, von Arx G.Graves'orbitopathy:Current imagingProcedures.Swiss Med Wkly 2009;139:618-23.
- 7.Atlas SW. Magnetic resonance imaging of the orbit:Current status.Magn Reson Q 1989;5:39-96

8. Weber AL, Mikulis DK. Inflammatory disorders of the paraorbital sinuses and their complications. *Radiol Clin North Am* 1987;25:615-30.
9. https://www.bcbst.com/mpmanual/Pediatric_Age_Range.htm
10. Knoppert D, Reed M. Paediatric Age Categories to be Used in Differentiating Between Listing on a Model Essential Medicines List for Children.
11. Wright, J E et al. "Primary optic nerve sheath meningioma" *British journal of ophthalmology* (1989); 73,(12): 960-966
12. Akinmoladun JA, Adeyinka AO, Uchendu O, Akinmoladun VI EVALUATION OF THE EFFECTIVENESS OF COMPUTED TOMOGRAPHY IN THE DIAGNOSIS OF ORBITAL TUMOURS IN IBADAN, SOUTHWEST NIGERIA. *Journal of the west African college of surgeons*. 2013;3(3):46-62
13. Jerry A. Shields, M.D., Carol L. Shields, M.D. Cancer Metastatic to the Orbit the 2000 Robert M. Curts Lecture; *Ophthalmic Plastic and Reconstructive Surgery* Vol. 17, No. 5, pp 346–354
14. Shrestha GB, Karmacharya PC, Shrestha JK and Shrestha GS. Profile of Pathology in Patients with Orbital Diseases. *J Ophthalmol & Vis Sci*. 2017; 2(1): 1014
15. Kennedy RE. An evaluation of 820 orbital cases. *The American Ophth. Soc* 1984;82:134-57.