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CT & MRI Evaluation of Orbital Masses

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Abstract

A variety of space-occupying lesions may involve the orbit(1) and can present with a wide variety of symptoms. If they are not diagnosed early and treated immediately they can lead to loss of vision and disability.

Therefore accurate diagnosis is necessary which will help in directing the therapy. CT and MRI are the commonly used modalities. Nowadays MRI is the most commonly used modality for orbital tumor diagnosis unless there is a contraindication.

Objectives

1. *To study the demographic profile of patients with orbital tumors.*
2. *To assess the distribution, features, localization and extent of orbital tumors by MRI.*
3. *To access the nature (benign / malignant) of tumor.*
4. *To correlate the tissue characterization by MRI with that of histopathological examination.*

Materials and Methods

1. *A prospective study was conducted in the departments of Radiodiagnosis, Ophthalmology, Neurosurgery, and Pathology at SCBMCH, Cuttack from March 2017 to September 2018.*
2. *51 patients diagnosed as having orbital tumors by clinical examination and MRI were followed till post surgery discharge or HP result.*

Results: *Out of 51 patients with orbital tumors, 23 patients (45.1%) were males and females made up around 54.9% (28 patients). Around 17.6% of the patients were in the pediatric age group and the rest were adults. Our study showed that extraconal tumors 29/51(56.9%) were the commonest, followed by intraconal tumors 14/51(27.5%) and ocular tumors 8/51(15.7%). Proptosis was the commonest symptom followed by swelling in the orbit.*

Overall, hemangiomas and lymphomas were the commonest orbital tumors accounting for 11.8% of the tumors each. Other tumors in decreasing order of frequency were meningiomas 5/52(9.8%), pseudotumor 5/51(9.8%), metastasis 5/51(9.8%), glioma 4/51(7.8%), adenoid cystic carcinoma 4/51 (7.8%), pleomorphic adenoma 3/51 (5.9%), two (3.9%) each of schwannoma, dermoid cyst, rhabdomyosarcoma, retinoblastoma, choroid melanoma, and one (1.9%) each of extranodalRosaiDorfmann disease, fibrous dysplasia, venous malformation.

Lymphoma was the commonest extraconal tumor accounting for 20.7% of the extraconal tumors. Hemangioma was the commonest intraconal tumor accounting for 42.8% of them. Metastases were the commonest ocular tumor accounting for 62.5% of them.

Out of 51 cases, MRI diagnosed 40 cases correctly. Out of the 11 wrongly diagnosed cases, 9 were extraconal, 2 were intraconal in location. Overall, MRI was able to correctly diagnose 78.43% of the orbital tumors. MRI was able to correctly diagnose 69% of the extraconal tumors, 85.7% of the intraconal tumors, and 100% of the ocular tumors. Ability of MRI to detect malignancy was as follows: sensitivity 85.7% specificity 80%, PPV 75%, NPV 88.89% with an accuracy of 82.35%.

Conclusion

1. *MRI is an important imaging modality which can accurately assess the distribution, features, localization, and extent of orbital tumors.*
2. *MRI can accurately characterize the tumor tissue in 78.43% of the orbital tumors, 69% of the extraconal tumors, 85.7% of the intraconal tumors, and 100% of the ocular tumors. Advanced MRI techniques may help in better tissue characterization.*
3. *MRI had an accuracy of 82.35% in detecting malignancy.*

Mesh Terms: *Orbital tumors, extraconal tumors, intraconal tumors, magnetic resonance imaging.*

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Introduction

A variety of space-occupying lesions may involve the orbit[(1)] and can present with a wide variety of symptoms. If they are not diagnosed early and treated immediately they can lead to loss of vision and disability.

Many benign tumors, such as capillary hemangioma, lymphangioma, optic nerve sheath meningioma, and asymptomatic orbital cavernous hemangiomano longer require surgery[(2)]. Therefore accurate diagnosis is necessary which will help in directing the therapy.

Orbital tumors are classified based on their location into extraconal, intraconal and ocular tumors. This categorization helps in localization and finally the differential diagnosis of the orbital tumors.

Extraconal tumors arise outside the extraconal muscles, mainly from the eyelids. They consist of a number of primary orbital tumors, the commonest being lymphomas. These lesions usually cause proptosis or swelling of the orbit.

Intraconal tumors are within the extraocular muscles and involve the retroorbital space. Hemangioma are the common primary tumors in this location. Other tumors are meningioma and optic nerve glioma. These tumors usually produce proptosis or loss of vision. They are predominantly benign tumors.

Intraocular tumors are present within the blobe itself. Almost all are malignant tumors in the globe. These tumors result I loss of vision. Most of the intraocular tumors are metastases. Other tumors are choroid melanoma and retinoblastoma.

Various modalities are available for detection of orbital tumors and tissue characterization. CT and MRI are the commonly used modalities. Nowadays, MRI is the most commonly used modality for diagnosis of orbital tumors unless there is a contraindication.

Radiological diagnosis is based on

- ❖ Topography of the lesion.
- ❖ Characterization into benign / malignant.
- ❖ Morphology analysis.
- ❖ Presence of secondary changes adjacent to the lesion.

Observation & Results

This study comprised of 51 patients diagnosed as having orbital tumors by clinical examination and MRI examination of the orbit.

Demographic profile

Table 1: Age and Sex Distribution

Age in Years	Male		Female		Total	
	Number	%	Number	%	Number	%
< 15	7	13.7	2	3.9	9	17.6
15 – 30	1	1.96	3	5.9	4	7.8
31 – 40	2	3.9	3	5.9	5	9.8
41 – 50	4	7.8	10	19.6	14	27.4
51 – 60	3	5.9	7	13.7	10	19.6
>60	6	11.8	3	5.9	9	17.6
Total	23	45.1	28	54.9	51	100

Among 51 cases 23 (45.1%) were males and 28 (54.9%) were females. Adult population were 42 (82.4%) and 9 (17.6%) were in pediatric age group. In adult population 16 (38.1%) were males.

And 26 (61.9%) were females. In pediatric population 7 (77.8%) were males and 2 (22.2%) were females.

Table 2: Age & Sex Distribution of Each Tumor

Tumors In Numbers	%	Sex		Age						
		M	F	0 – 10	11 – 20	21 – 30	31 – 40	41 – 50	51 – 60	> 60
Hemangioma (6)	11.8	2	4	-	2	1	3	-	-	-
Meningioma (5)	9.8	0	5	-	-	-	1	2	2	-
Pseudotumor (5)	9.8	3	2	-	-	-	-	1	2	2
Glioma (4)	7.8	2	2	2	1	-	-	1	-	-
Schwannoma (2)	3.9	1	1	-	-	-	-	1	1	-
Lacrimal Adenoma (3)	5.9	2	1	-	-	-	-	-	1	2
Dermoid Cyst (2)	3.9	2	0	2	-	-	-	-	-	-
Fibrous Dysplasia (1)	1.96	0	1	-	-	-	-	1	-	-
Avm (1)	1.96	0	1	-	-	-	-	1	-	-
Rosai Dorfman (1)	1.96	0	1	-	1	-	-	-	-	-
Lymphoma (6)	11.8	1	5	-	-	-	-	1	2	3
Metastasis (5)	9.8	2	3	-	-	-	-	1	3	1
Adenoid C CA (4)	7.8	3	1	-	-	-	-	3	-	1
Rhabdomyosarcoma (2)	3.9	2	0	1	1	-	-	-	-	-
Retinoblastoma (20	3.9	1	1	2	-	-	-	-	-	-
Choroid Melanoma (2)	3.9	2	0	-	-	-	1	1	-	-

Most common benign orbital tumors were hemangiomas 6 (11.8%), meningiomas 5 (9.8%), inflammatory pseudotumors 5 (9.8%). Most common malignant orbital tumors were lymphomas 6 (11.8%), metastasis 5 (9.8%). Most common benign pediatric orbital tumors were optic nerve gliomas, most common malignant pediatric tumors were rhabdomyosarcoma, retinoblastoma. Hemangiomas, meningiomas, lymphomas, metastases showed a female predominance. Lacrimal adenomas, adenoid cystic ca were common in males.

Table 3: Compartmental Distribution of Tumors

Extraconal	No	Intraconal	No	Ocular	No
Lymphoma	6	Meningioma	4	Metastasis	4
Pseudotumor	5	Hemangioma	5	Choroid Melanoma	2
Lacrimal Adenoma	3	Glioma	4	Retinoblastoma	2
Hemangioma	1	AVM	1		
Schwannoma	2				
Anenoidcysticcarcinoma	4				
Metastasis	1				
Meningioma	1				
Dermoid Cyst	2				
Fibrous Dysplasia	1				
Rosai Dorfman	1				
Rhabdomyosarcoma	2				
Total	29		14		8

Out of 51 cases extraconal compartment tumors were more common. Extraconal tumors were 29 (56.9%), intraconal tumors were 14 (27.5%), and ocular tumors were 8 (15.7%).

Table 4: Compartmental Distribution in Adults & Pediatric Population

	Extraconal		Intraconal		Ocular	
	No	%	No	%	No	%
Adults	25	59.5	11	26.2	6	14.3
Pediatrics	4	44.4	3	33.3	2	22.2

Out of 42 adults tumors extraconal tumors were 25 (59.5%). Intraconal were 11 (26.2%) and ocular were 6 (14.3%). Among pediatric tumors extraconal tumors were 4 (44.4%), intraconal were 3 (33.3%), and ocular were 2 (22.2%).

Table 5: Distribution of Extraconal Tumors in Adults

Extraconal Tumors	No	% In Adult Extraconal Tomors (25)	% In Adult Orbital Tumors (42)
Lymphoma	6	24	14.3
Pseudotumor	5	20	11.9
Lacrimal Adenoma	3	12	7.1
Hemangioma	1	4	2.4
Schwannoma	2	8	4.8
Anenoidcysticcarcinoma	4	16	9.5
Metastasis	1	4	2.4
Meningioma	1	4	2.4
Fibrous Dysplasia	1	4	2.4
Rosai Dorfman	1	4	2.4

In adluts, most common extraconal tumors were lymphomas 6 (24%), pseudotumors 5 (20%). In pediatric population, rhabdomyosarcomas 2, dermoid cysts 2 were the extraconal tumors.

Table 6: Distribution of Intraconal Tumors in Adults

Intraconal Tumors	No	% Of Intraconal Tumors In Adults (11)	% Of Adult Orbital Tumors (42)
Meningioma	4	36.4	9.5
Hemangioma	5	45.5	11.9
Glioma	1	9.1	2.4
AVM	1	9.1	2.4

In adult population, hemangiomas were the most common intraconal tumors 5 (45.5%) in pediatric population, gliomas 3 cases were the only intraconal tumors.

Table 7: Distribution of Ocular Tumors in Adults

Ocular Tumors	No	% of Ocular Tumors In Adults (6)	% of Adult Orbital Tumors (42)
METASTASIS	4	66.7	9.5
Choroid Melanoma	2	33.3	4.8

In adults, metastases 4 (66.7) were the most common ocular tumors. In pediatric population, retinoblastomas 2 cases were the only ocular tumors.

Table 8: Distribution of Symptoms

SYMPTOMS	ORBITAL TUMORS (51)	HEMANGIOMA	LYMPHOMA	MENINGIOMA	PSEUDOTUMOR	GLIOMA	METASTASIS	ADENOID CA	LAC ADENOMA	RHABDOMYO	RETINOBLASTOMA	CHOROID MELANOMA	DERMOID CYST	FIBROUS DYSPLASIA	ROSAI DORFMAN	AVM	SCHWANNOMA
PROPTOSIS	24	6	2	1	4	4	1	-	-	2	-	-	-	-	1	1	2
SWELLING	15	-	4	-	1	-	-	4	3	-	-	-	2	1	-	-	-
LOSS OF VISION	9	-	-	4	-	-	1	-	-	-	2	2	-	-	-	-	-
BLURRING	3	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-

Proptosis was the most common symptom. All haemangioma, glioma cases had proptosis as the main symptom. Lymphomas, adenoid cystic ca, lacrimal adenoma cases had swelling of orbit as

the main complaint. Meningioma showed loss of vision as the main complaint. Blurring of vision was seen in most cases of metastasis.

Table 9: Side Predominance of Orbital Tumors

SIDE	NUMBER	%
LEFT	29	56.9
RIGHT	19	37.3
BILATERAL	3	5.9

Left side predominance was seen in orbital tumors (56.9%). 5.9% of cases showed bilaterality.

Table 10: Imaging Characteristics of Extraconal Tumors

EXTRACONAL TUMORS	MARGIN		MOLDING	PRESEPTAL	BONE DESTRUCTIO	T2 HOMOGENO	T2 INTENSITY			GRE HOMOGENO
	WELL	ILL					HYPO	ISO	HYPER	
LYMPHOMA (6)	-	6	4	4	-	6	2	4	-	6
PSEUDOTUMOR (5)	-	5	3	3	-	5	3	2	-	5
LACRIMAL ADENOMA (3)	3	-	-	-	-	-	-	-	3	-
ADENOID C CA (4)	2	2	-	3	3	-	-	4	-	3
SCHWANNOMA (2)	2	-	-	-	-	-	-	-	2	-
DERMOID (2)	2	-	-	-	-	-	2	-	-	-
METASTASIS (1)	-	1	-	-	1	-	-	-	1	-
FIBROUS DYSPLASIA (1)	1	-	-	-	-	-	1	-	-	-
ROSAI DORFMAN (1)	-	1	-	1	-	1	-	1	-	1
RHABDOMYO (2)	-	-	-	2	2	-	-	-	2	-

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