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Computed tomography in the evaluation of orbital lesions

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Abstract
Objectives: To analyze the role of computed tomography (CT) in the evaluation of Orbital Tumors.
Material and Methods: Fifty patients presenting with orbital masses were evaluated by CT scan orbits. Role of CT was evaluated in localizing and extention of the orbital masses causing proptosis. Final diagnosis was arrived after correlation between histopathology operative findings and response to treatment.
Results: Pseudotumor orbit was the most common orbital tumour (26%) followed by lymphoma (18%). Among paediatric population optic nerve glioma (10%), haemangioma (8%) followed by dermoid (6%). Accuracy of CAT scan in diagnosing orbital lesions was (86%) with sensitivity for benign lesions higher (90.3%) than malignant lesions (78.9%).
Conclusion: Computed tomography is a cost effective method of evaluating orbital tumours (86%).

Keywords: Computed tomography, tumours, pseudo tumours, glioma, lymphoma

Introduction
A variety of space-occupying lesions may involve the orbit. The pathology of these lesions ranges from benign to malignant. The evaluation of orbital masses include a detailed clinical history, ocular examination, laboratory investigations & imaging studies. As far as the radiological investigations are concerned findings on plain radiographs &ultrasonography are not pathognomonic of most of the orbital disease process though some help can be obtained in characterization of lesion in certain cases. Advent of CT& MRI has revolutionized the diagnostic imaging of orbit & its contents. MRI with its superb soft tissue contrast & multiplanar ability provides excellent rendering of orbital anatomy but is limited by lack of wider availability & high cost. On the other hand easy availability and operability, good maintenance and speed makes CT scan an affordable diagnostic tool in orbital diseases under existing circumstances and present set up. However, information about the accuracy of the radiological findings, correlated with the pathological or histological findings as a reference, is useful for the management of orbital lesions.

Material and Methods
This retrospective study reviewed 50 patients of various age groups & both sexes with Ophthalmology, Government General Hospital, Guntur for Computed Tomography of Orbits between September2017-December2018. Before commencing for CT examination, all the preceding history, clinical, laboratory data were recorded. A CT scanner was used for the study. The technique was to obtain a lateral scannogram with the patient supine and contiguous axial sections with slice thickness of 3 mm and interslice gap of 3 mm were obtained. Coronal 3-5 mm sections were obtained as and when required with the patient in prone position. The scans were obtained both prior to and after administration of non ionic intravenous contrast. The radiological findings were reviewed and the radiological diagnosis for each patient was defined by the conclusive diagnosis given on the radiological report after CT. Benign lesions have well defined margins, homogenous, with no bone destruction. Malignant tumors have ill defined, heterogenous with bone destruction and multi compartmental involvement. CT findings were correlated with final diagnosis based on clinical, laboratory findings, operative findings, histopathological study or response to treatment.

Results

Fifty patients with age groups between 2 to 70 years were reviewed. 28 patients were men and 22 patients were female. 22 children between the age of 2-12 years were also included in the present study. The lesions were categorized based on their location (Table-1) as ocular, intra Conal, conal, extraconal, and multi compartmental. The lesions were characterized based on their density (attenuation), enhancement calcification necrosis. adjacent fat stranding and bone involvement primarily as benign and malignant tumours. benign cases were 62% (31 cases) and malignant 38%(19 cases).

Table 1: Location of Lesion

S. No.	Diagnosis	Frequency	Percentage
1	ocular	1	2%
2	intraconal	7	14%
3	conal	8	16%
4	extraconal	12	24%
5	multicompartmental	22	44

Multi compartmental tumors involving more than one compartment were most predominant in our study accounting for 44% of the tumors. Of the 22multi compartmental lesions 18 were malignant and 4 were benign. Lymphomas, Rhabdomyosarcoma, Lacrimal gland tumors, Metastases are multicompartmental.

Extraconal lesions are the most common single compartment lesions with 12 cases (24%). Hemangioma, Dermoid cyst are the most common extraconal lesions. Opti nerve gliomas and optic nerve sheath meningiomas are the most common intraconal lesions

Table 2: Orbital Tumours

S. No.	Diagnosis	Frequency	Percentage	Children	Adults
1	Orbital lymphomas	9	18	6	3
2	Optic nerve gliomas	5	10		5
3	rhabdomyosarcoma	4	10	1	3
4	meningiomas	3	6	3	
5	metastasis	2	4	2	
6	hemangiomas	4	8		4
7	dermoid	3	6		3
8	Lacrimal gland tumour	3	6	3	
9	retinoblastoma	1	2		1
10	Orbital pseudotumours	13	26	10	3
11	Fibrous dysplasias	1	2	1	
12	osteoma	2	4	2	
	total	50			

Orbital pseudotumors are the most common orbital mass lesions in 13 patients of which 4 patients show multicompartmental involvement, followed by lymphomatous involvement of the orbit in 9 cases and all the cases presented with proptosis as their chief presenting complaint and all cases have multicompartmental involvement. Pseudotumor case s have shown response to steroids, and showed a decrease in size. Optic nerve gliomas are the most common pediatric orbital masses in 5 children followed by hemangiomas in 4 cases. Retinoblastoma was seen in one female child of two years. Rhabdomyosarcomas were the most common pediatric malignant tumor in 3 cases. (13.6%). Most of the pediatric tumors are benign in nature (86.4%). Osseous lesions were seen in 3 cases, and were symptomatically managed due to their smaller size.

Table 3: Benign Orbital Lesions

S. No.	Diagnosis	Frequency	Percentage
1	Orbital pseudotumor	13	26%
2	Optic nerve glioma	5	10%
3	hemangioma	4	8%
4	Dermoid cyst	3	6%
5	meningioma	3	6%
6	osteoma	2	4%
7	Fibrous dysplasia	1	2%

Table 4: Malignant Orbital Tumours

S. No.	Diagnosis	Frequency	Percentage
1	Orbital lymphoma	9	18%
2	rhabdomyosarcoma	4	8%
3	Lacrimal gland tumours	3	6%
4	metastasis	2	4%
5	retinoblastoma	1	2%

Orbital pseudotumors are the most common benign orbital mass lesions in 26% of patients, unilateral involvement is seen in 11 cases and both eyes are involved in 2 cases. 4 cases are conal, 3 are intraconal 2 are extraconal and 4 are multicompartmental lesions and show good response to steroids. Optic nerve Glioma was the most common pediatric orbital tumour (10%) causing proptosis. The lesion was diagnosed with a characteristic fusiform enlargement involving optic nerve with mild to moderate contrast enhancement. Meningiomas were found in3 cases. On CT they appeared as well defined hyper dense homogenously enhancing intraconal mass with central lucency (Optic nerve) with calcification and Minimal sclerosis of adjacent bones. Hemangioma appeared as Well defined capsulated hyperdense mass with moderate enhancement in four patients.

Lymphoma is the most common malignant orbital tumour in adults (18%). Lymphoma appeared as homogenously enhancing soft tissue masses in extraconal space with involvement of intraconal space in four patients. Extraocular muscles were involved in all patients and Optic nerve involvement was seen in one patient. Four patients of Rhabdomyosarcoma (8%) presented as homogenously enhancing extraconal masses with involvement of extraocular muscles in all four patients. Epidural extension was seen in one patient. Three out of four cases of Rhabdomyosarcoma were seen in children. Two patients in our study presenting with pro ptosis were proved to be metastases in the orbit. One of the patients presenting with extraconal masses in superolateral quadrants in left orbit was proved to be a case of Ewings sarcoma. One patient was a follow up case of Carcinoma breast and was shown to have metastatic extraconal mass in the left orbit. In our study Retinoblastoma was unilateral in the left orbit of a 2 years old female child. On CT Retinoblastoma revealed homogenously enhancing masses involving whole of the eyeball with Calcification and thickening of the Optic nerve.

Of the fifty patients evaluated by CT in our study, the most common orbital tumor was a pseudotumor in 26%, followed by lymphoma 18%, and are the common tumors in adults. Optic nerve gliomas are the most common pediatric tumors in 10% cases, followed by Rhabdomyosarcomas in 8% of the cases, hemangioma (8%), optic nerve sheath

meningioma, Dermoid Cyst (6%). CT has been accurate in delineating benign and malignant lesions with a sensitivity of 96%. Accurate diagnosis has been made based on contrast enhanced CT of benign lesions with a sensitivity of 90.3%, and less accurate in diagnosing malignant tumors with a sensitivity of 78.9%.Overall the diagnostic accuracy of CT in diagnosing orbital tumors was86%.

The diagnosis of an orbital lesion may be made according to the imaging appearance. The location of alesion within the orbit may serve as a clue to the diagnosis. Certain lesions have a predilection for either the intraconal or extraconal space. Optic nerve gliomas, optic nerve sheath meningiomas are intraconal hemangiomas dermoid cysts, benign lacrimal gland tumours are extraconal. Whether an orbital lesion is unilateral or bilateral is also important. Pseudotumor tend to involve the orbit bilaterally. Multicentricity of lesions would suggest lymphoma, malignant process or a pseudotumor.

Specific lesion characteristics such as the appearance of the margin may be helpful. Lesions with well-defined margins are often benign, whereas vague, poorly defined margins suggest an infiltrative process such as lymphoma or pseudotumor. The shape of the lesion also aid the diagnosis, especially vascular lesions that possess components of a characteristic tubular shape. Cystic lesions are recognized by a capsule that is of higher density than the central contents. Calcification may be found in mixed tumors of the lacrimal glands, cavernous hemangiomas, retinoblastomas, dermoids, optic nerve sheath meningiomas, and optic gliomas. Bone destruction is an important clue to the diagnosis of orbital lesions. Frank bone destruction generally signifies an aggressive malignant process, whereas smooth erosions ormolu ding indicates a long-standing benign lesion. Hyperostosis noted in fibrous dysplasias, meningiomas, and lacrimal gland tumors.

CT is a good choice for viewing almost every lesion in the craniofacial area except for the intracanalicular optic nerve. CT scan is highly useful in describing the precise location and extent of the lesion and is fairly accurate in lesion characterization. Although MRI is considered to be a superior technique for evaluating soft tissues, in the orbit, most pathologic processes are adequately demonstrated by CT. Only those patients for whom CT yielded insufficient information for making the diagnosis or insufficient anatomical detail for future surgical management underwent MRI.

Radiological diagnosis was most accurate for diagnosing nonmalignant lesions, cystic and vascular lesions and was less accurate for lacrimal, lesions. This finding may be due to the fact that cystic and vascular lesions have characteristic features that are easily recognizable radiologically On the other hand, malignant lesions such as lymphoma are particularly difficult to differentiate from benign inflammatory conditions of the orbit. Radiological investigations were found to be accurate for ruling out malignant conditions, with a high specificity. An accurate preoperative diagnosis by CT Is essential for managing patients with orbital masses. collaboration and discussion between ophthalmologists and radiologists is essential for making an accurate radiological diagnosis.

Conclusion

CT is useful to characterize the precise location, extent and features of the lesion (density, calcification, enhancement.). These findings are helpful to generate a differential diagnosis. CT is also useful to demonstrate the precise extension to adjacent paranasal sinuses & nasal cavity, The evidence of bone erosion and intracranial extension which helps in pre treatment evaluation & post treatment follow up. To conclude CT scan can be considered as a cost effective, non invasive, reliable diagnostic tool for evaluation of orbital tumors. Early CT scan evaluation is required for prompt adequate management and for early intervention.

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