

To Establish the Distinct Advantages of Various Imaging Modalities in Orbital Diseases over One Another

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Abstract: A study of the role of Radiological imaging in orbital masses was carried out by various imaging modalities like plain X-ray, Ultrasonography, CT & MRI. The eye contains a variety of structures which can give rise to swelling (exophthalmos) which may be a cause for a diagnostic dilemma. Such swellings may also be caused by extra orbital masses which invade the orbit secondarily. AIMS AND OBJECTIVES of the study were as follows, (1) To study the age and sex distribution of orbital diseases. (2) To study the incidence of orbital diseases. (3) To study the role of USG as a diagnostic modality of orbital pathologies. (4) To study the role of CT scan as a diagnostic modality of orbital pathologies, (5) To study the role of MRI as a diagnostic modality of orbital pathologies. (6) To compare the role of various imaging modalities in orbital pathologies. MATERIAL AND METHODS During the period of May 2005 to October 2007, a prospective study of 50 patients was carried out. Each patient was studied in detail with relevant clinical history, examination and laboratory investigations. Cases were selected from cases referred to CT SCAN and MRI CENTRE and they underwent USG scanning for comparison. Pseudotumour was found to be the commonest pathology in adults. The most common intra ocular tumour in childhood is retinoblastoma. In case of proptosis, USG is very helpful before other imaging modalities are undertaken and can provide information regarding solid / cystic tissue characterization. USG could well demonstrate orbital spread. However it had limitation in diagnosing extra orbital spread. CT and MRI have a definite edge over USG in such cases.

Keywords: Radiological imaging, Orbital diseases, X-ray, Ultrasonography, CT & MRI

1. Introduction

A study of the role of Radiological imaging in orbital masses was carried out by various imaging modalities like plain X-ray, Ultrasonography, CT & MRI. The eye contains a variety of structures which can give rise to swelling (exophthalmos) which may be a cause for a diagnostic dilemma. Such swellings may also be caused by extra orbital masses which invade the orbit secondarily. This study throws light into such areas and tries to differentiate between various causes of such swelling by their radiological features. With the advent of computed X-ray tomography (CT), the range of imaging procedures used in the investigation of intra- and periorbital disease became much narrower. The subsequent introduction of magnetic resonance imaging has had less of an impact than in other areas of neuro-radiological and head and neck imaging. Thus, techniques employing radionuclide, thermography, contrast orbitography and phlebography have virtually disappeared from clinical use and the role of plain radiography has become very restricted, I review the various imaging techniques currently in use, indications and, where relevant, contraindications. The purpose of my study was to establish the distinct advantages of various imaging modalities in ORBITAL diseases over one another.

Aims and Objectives

- 1) To study the age and sex distribution of orbital diseases.
- 2) To study the incidence of orbital diseases.
- 3) To study the role of USG as a diagnostic modality of orbital pathologies.

- 4) To study the role of CT scan as a diagnostic modality of orbital pathologies.
- 5) To study the role of MRI as a diagnostic modality of orbital pathologies.
- 6) To compare the role of various imaging modalities in orbital pathologies.

2. Material and Methods

During the period of May 2005 to October 2007, a prospective study of 50 patients was carried out. Each patient was studied in detail with relevant clinical history, examination and laboratory investigations. Cases were selected from cases referred to CT SCAN and MRI CENTRE and they underwent USG scanning for comparison.

Scanning Technique and Machine

USG was done on TOSHIBA NEMIO with 7.5 MHz linear and 3.5 MHz curvilinear probes. CT scan was done on SOMATOM scanner and SOMATOM SENSATION 64 scanner axial and reformatted coronal and saggital sections with plain and IV contrast. MRI was done on 0.5 Tesla Philips Scanner. Routinely axial and coronal T1W, T2W AND STIR Images were taken, As and when required T1W Gadolinium-DTPA enhanced, post contrast axial and coronal images were taken.

Inclusion Criteria

Any patient presented with orbital complains who came to CT SCAN or MRI centre for orbital CT or MRI.

Exclusion Criteria

Those cases where scanning was not possible due to poor general conditions. Traumatic conditions were excluded from study.

3. Observation, Analysis and Discussion

Table 1: Distribution of cases according to age

Age Group	No.of Cases	Percentage %
0-10	14	28
11-20	4	8
21-30	7	14
31-40	5	10
41-50	8	16
>51	12	24
Total	50	100

Total 50 cases of Orbital diseases were studied.

Table 1 shows Distribution of cases according to age. Maximum number of patients was in the age group of 0-10 years.

Table 2: Distribution of gender among all cases

Age Group	No.of Cases	Percentage %
Male	32	64
Female	18	36

In present study 64% of the patients were males.

Table 3: Side Involved

Side	No. of Cases
Right Eye	24
Left Eye	26

Thus no specific predilection of side involved noted in my study.

Table 4: Clinical Presentation

Symptoms & Signs	No. of Cases	Percentage
Swelling	50	100%
Pain	38	76%
vision loss	24	48%
Photophobia	6	12%
Constitutional symptoms	28	56%

Almost all the cases in the present study had come with proptosis. Among 50 patients, 38 of them complained of local pain and 28 had constitutional symptoms.

Table 5: Lesions Encountered With Proptosis

Lesions	No. of Cases	Percentage
Retinoblastoma	10	20
Pseudotumour	10	20
Dermoid	4	8
Hemangioma & other Vascular lesions	3	6
Rhabdomyosarcoma	2	4
Optic nerve meningioma	2	4
Abscess	4	8
Metastasis	2	4
Optic nerve glioma	2	4
Malignant melanoma	4	8
Extra orbital lesions with orbital extension	7	14

In a study by Mafee et al all of 145 cases, 20 cases were of Pseudotumour (15%), Dermoid and lymphoma occupied the second position with 12 cases each (9%).

Incidence of Pseudotumor

In the present study of 50 cases of orbital lesions, 10 cases each (20%) of pseudotumour and retinoblastoma was found. 4 cases each (8%) of Dermoid, hemangioma, abscess, malignant melanoma, extra-orbital lesion with orbital extension were diagnosed. Overall sensitivity of CT was higher than ultrasound in correct diagnosis. USG gives higher non specific diagnosis.

Taneja et al reported a detection rate of 100% for retinoblastoma by B scan USG. This is quite comparable with the present study.

Table 7: Overall Sensitivity Of Ct Scan And Mri In Diagnosis Of 10 Cases of Retinoblastoma

	Correct diagnosis	Sensitivity	Non Specific diagnosis
CT diagnosis	9	90	1
MRI diagnosis	7	70	3

CT scan is more sensitive to MRI for diagnosis of Retinoblastoma as a result of higher sensitivity for detection of calcification, which is similar to a study done by Brisse HJ et al for diagnosis of intraocular tumors by CT and MRI. Vashist reported that 78% of the retinoblastoma cases showed calcification. In the present study however only 9 out of 10 cases (90%) showed calcification.

Table 8: Overall Sensitivity Of Ct Scan And Mri In Diagnosis Of 10 Cases Of Orbital Pseudo Tumour

	Correct diagnosis	Sensitivity	Non Specific diagnosis	Normal
CT diagnosis	7	70	3	0
MRI diagnosis	7	70	3	0

Overall sensitivity of CECT and contrast enhanced MRI is equal in correct diagnosis 10 cases of Retinoblastomas were diagnosed in present study. Vashist and Berry reported an age group of 2-5 years of presentation of retinoblastoma. Of the 10 cases of retinoblastoma, 40% presented with metastasis. This shows that though US may be able to diagnose retinoblastoma, it is not enough. Further investigation in the form of CT scan is essential to rule out mets.

In the present study, there were 2 cases of Optic nerve tumour which was same on B scan as fusiform heterogenous mass replacing the normal optic nerve void. Optic nerve was not seen separately. This finding is consistent with those reported in the previous study by Vashist. Mafee et al in his study of 19 cases of malignant melanoma says that CT proved to be accurate in determining the location and size of melanoma

4. Summary and Conclusion

In this study, 50 cases of proptosis were evaluated by different radiological investigations. Pseudotumour was

found to be the commonest pathology in adults. The most common intra ocular tumour in childhood is retinoblastoma. In case of proptosis, USG is very helpful before other imaging modalities are undertaken and can provide information regarding solid / cystic tissue characterization. USG could well demonstrate orbital spread. However it had limitation in diagnosing extra orbital spread. CT and MRI have a definite edge over USG in such cases.

CT scan too can arrive at majority of diagnosis. It gives tissue density in Hounsfield units accurately and is extremely useful for bony involvement. Also it is very sensitive to calcification. It can detect metastasis accurately. In our experience, with advent of Multidetector CT multiplanar reformations are also possible adding to diagnostic advantage. The only disadvantage of CT over USG is the effect the ionizing radiation has over lens.

MRI is particularly useful in the evaluation of the orbit because of its higher contrast resolution. Thus no modality is complete in itself for the evaluation of orbital masses. However combination of USG and CT gives near accurate diagnosis. MRI is used more of a problem solving tool.

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