

EFFECTIVENESS OF CT IN DIAGNOSIS OF PROPTOSISVikas Agrawal¹, Manish Madan², Santosh Jajodia³, Gayatri Kanungo⁴¹Associate Professor, Department of Radiodiagnosis, Hi-Tech Medical College and Hospital, Pandara, Bhubaneswar, Odisha, India.²Associate Professor, Department of Radiodiagnosis, Institute of Medical Sciences, ANS Sum Hospital, Siksha "O" Anusandhan University, K8 Kalinganagar, Bhubaneswar, Odisha, India.³Assistant Professor, Department of Ophthalmology, Hi-Tech Medical College and Hospital, Pandara, Bhubaneswar, Odisha.⁴Consultant, Department of Medical Retina, JPM Rotary Eye Hospital, Cuttack, Odisha, India.**ABSTRACT****BACKGROUND**

Orbit is a pyramidal shaped anatomical space bound by orbital bones whose apex is continued posteriorly as the optic canal and rectangular base opens into the face. Though a series of canal, fissures and foramina communicate with extra orbital compartment, it is a closed compartment with broad opening anteriorly. Orbit contains the eye ball, extra ocular muscles, vascular elements, nerves, lacrimal gland and connective tissue. Proptosis is defined as an abnormal protrusion of the eyeball.

MATERIALS AND METHODS

Total 32 patients referred from various departments mainly from ophthalmology and medicine with history and clinical features suggestive of proptosis were evaluated in our department and after proper history taking and clinical examination, Computed Tomography (CT) scan and histopathological diagnosis was done.

RESULTS

The age of the patients ranged from 1-55 years. Mass lesions (46.87%) were the most common cause of proptosis followed by inflammatory lesions (37.5%). Trauma, vascular lesions and congenital conditions were infrequent causes of proptosis. Unilateral proptosis was more frequent (84.37%) than bilateral proptosis (15.62%) and thyroid ophthalmopathy accounted for 60% of bilateral proptosis cases.

CONCLUSION

Mass lesions were the most common cause of proptosis followed by inflammatory lesions. CT scanning should be the chief investigation in evaluation of lesions causing proptosis. It is the most useful in detecting, characterising and determining the extent of disease process. The overall accuracy of CT scan in diagnosis of proptosis was 96.87%.

KEYWORDS

Proptosis, Computed Tomography, Burla.

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BACKGROUND

Orbit is a pyramidal shaped anatomical space bound by orbital bones whose apex is continued posteriorly as the optic canal and rectangular base opens into the face. Though a series of canal, fissures and foramina communicate with extra orbital compartment, it is a closed compartment with broad opening anteriorly. Orbit contains the eye ball, extra ocular muscles, vascular elements, nerves, lacrimal gland and connective tissue.¹ Proptosis is defined as an abnormal protrusion of the eyeball. Owing to the rigid bony structure of the orbit with only anterior

opening for expansion, any increase in orbital contents taking place from the side or from behind will displace the eyeball forward. Proptosis can be the result of a myriad of disease processes including infections, inflammations, tumours, trauma, metastases, endocrine lesions, vascular diseases & extra orbital lesions.²

The etiological basis of proptosis can include inflammatory, vascular, infectious, cystic, neoplastic and traumatic factors. Some representative examples include infectious causations such as orbital cellulitis and subperiosteal abscesses. Traumatic causations could be orbital emphysema, retro-orbital haemorrhage and carotid-cavernous fistula. Vascular causations not traumatically related would be orbital arteriovenous malformation (AVM) varices and aneurysms. Neoplastic causations include adenocarcinoma of the lacrimal gland, pleomorphic adenoma of the lacrimal gland, meningioma, lymphoma, and metastatic disease.

Computed tomography (CT) Scan has superior contrast resolution and delineates bony as well as the soft tissues

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structures with better resolution with intra orbital fat acting as natural contrast. C T Scan has become the main investigation in evaluation of orbital lesions.

MATERIALS AND METHODS

The present study was carried out on patients referred from various departments with history and clinical features suggestive of proptosis were included in the present study. Study was conducted in the Department of JHL Radio diagnosis, V.S.S. Medical College and Hospital, Burla, Sambalpur, Orissa between the period December 2003 to December 2005. Patients referred from various departments mainly from ophthalmology and medicine with history and clinical features suggestive of proptosis were evaluated in our department and after proper history taking and clinical examination C T scan was done.

Altogether 32 patients of different age groups of either sex were studied in detail. In all these 32 patients, CT scan was done and the results were analysed and compared later. CT examination was done with Hitachi third generation whole body CT scanner in all the patients and all the cases subjected to non-enhanced and contrast-enhanced CT in axial and coronal planes. Non-enhanced images of the orbit initially were obtained by using 3 mm collimation in axial and coronal planes. The axial scans were taken with gantry angulation of 10 to 15 degrees to the orbital meatal line. Then 2 to 3 mm sections were taken after giving intravenous (IV) contrast medium.

Contrast given non-ionic iodine containing dye at a dose of 1 ml/Kg body weight in adults and 2 ml/kg body weight in children. The contrast was given IV bolus in the superficial vein of the arm. Use of non-ionic 3 contrast was limited to patients in whom use of ionic contrast was considered dangerous. The paediatric patient was given sedatives before the scan (syrup pedichloryl and injection diazepam). Data was entered in excel sheet and results were expressed in terms of number and percentage.

RESULTS

In the present study, 32 study subjects with history and clinical feature suggestive of proptosis were included. There are two peak age group of proptosis observed in the study.

Age	Male	Female	Total
1-10	5	5	10
11-20	2	2	4
21-30	2	3	5
31-40	3	4	7
41-50	2	1	3
>50 Yrs.	1	2	3
Total	15	17	32

Table 1. Distribution of Study Subjects Based on their Age and Sex

Tumor Type	Unilateral or Bilateral	Bone Erosion	Retrobulbar fat Obliteration	Intra Cranial Spread	Contrast Enhancement
Graves diseases	Bilateral (3) Unilateral (1)	Absent	Absent	Absent	Mild
Pseudo tumor	Unilateral (3) Bilateral (1)	Absent	Absent Present	Absent	Moderate

The incidence of proptosis is found to be equally distributed among males (47%) and females (53%) in this study group. Associated chief complains in case of proptosis were in decreasing order of Pain/headache, restricted eye movement, diminished vision and diplopia.

Aetiological Lesions	Number of Cases	Percentage
Inflammatory	12	37.5
Mass Lesions	15	46.87
Trauma	03	9.37
Vascular Lesions	02	6.25
Congenital	00	00

Table 2. Frequency of Aetiological Lesions Causing Proptosis

Mass lesions accounted most of the cases of proptosis in this study about 47% followed by inflammatory lesions 37.5%. Trauma and vascular lesions accounted for the rest.

In the study retinoblastoma was the most common cause of proptosis in children accounting for about 36%. Of all the cases, followed by orbital cellulitis which accounted for about 29 % of proptosis in this study.

Inflammatory lesions accounted for 7 cases of proptosis (38.88%). Mass lesions also accounted for the same number of cases that is 7 (38.88%). Trauma and Vascular lesions accounts for the rest of the cases.

	Number of Cases	Percentage
Unilateral	27	84.37
Bilateral	05	15.62

Table 3. Unilateral V/S Bilateral Proptosis

Majority of the proptosis cases in the study were Unilateral.

Causes	Number of Cases	Percentage
Thyroid ophthalmopathy	3	60%
Pseudotumour	1	20%
Retinoblastoma	1	20%

Table 4. Causes of Bilateral Proptosis

Thyroid ophthalmopathy accounted for most of the cases of bilateral proptosis 60% followed by pseudotumor and retinoblastoma.

Orbital cellulitis	Unilateral	Absent	Absent	Absent	Mild
Lacrimal adenitis	Unilateral	Absent	Absent	Absent	Mild

Table 5. Inflammatory Conditions

Total Number of Histopathological, follow-up & Diagnosed Cases	Accurate result in CT	Accuracy
32	31	96.37

Table 6. Accuracy of CT In Evaluating the Cause of Proptosis

In this study, there were 4 cases of thyroid ophthalmopathy, CT scan showed bilateral orbital involvement in 3 cases with inferior and medial rectus involvement. There was no evidence of any bony erosion, retro bulbar fat obliteration, or optic nerve involvement. Four patients in the studied group had pseudotumour with bilateral involvement in one case and unilateral affection in the rest. There was thickening of various rectus muscles during the contrast study which showed moderate enhancement along with contrast enhancement of uveoscleral thickening.

Three patients in the paediatric age group in our study had orbital cellulitis and all had pre-septal swelling. The extents of infection in two cases were intraconic and extraconic in one case. All cases showed opacification of adjacent para nasal sinuses due to sinus infection.

One patient in the study had para nasal sinus mucocele of which frontal sinus was involved and another patient had fibrous dysplasia of the frontal bone. CT picture of mucocele was well defined hypo dense mass without any contrast enhancement.

In the present study three were 2 cases of lacrimal gland lesions which were evaluated by CT scan. The lesions were exteronal and located in superolateral quadrant and were of soft tissue density (isodense). The margins were well defined. Post-contrast studies showed mild enhancement in both the cases. One was acute inflammation– lacrimal adenitis, other was a mass lesion in adolescent female, which came out to be pleomorphic adenoma.

One case of optic nerve glioma in a 2-year-old girl and one case of optic nerve meningioma in a 42 years old female patient were detected in this study. The case of optic nerve glioma had a well-defined isodense intraconal mass involving optic nerve. Optic nerve meningioma presented as a well-defined isodense mass with a speck of calcification. Five cases of retinoblastoma were detected and the characteristic CT findings were ill-defined soft tissue mass involving the globe with presence of calcifications. One case of bilateral retinoblastoma was seen.

Three cases of orbital trauma were evaluated, they showed pre-septal swelling and fracture of orbital walls. One case of rhabdomyosarcoma was seen in a 3-year- old female child who presented with rapidly progressive exophthalmos mimicking orbital cellulitis. On CT rhabdomyosarcoma appears as an enhancing iso-hyperdense mass, which may infiltrate retro bulbar fat and often involves posterior aspect of globe.

One case of lymphangioma was seen in a 1-year-old girl, the mass was extraconal, lobulated and mildly contrast enhanced. One case of haemangioma was seen in a 36-year-

old female, who presented as unilateral painless proptosis. CT scan studies demonstrate cavernous haemangioma as a homogenous mass usually within muscle cone with smooth margins with uniform contrast enhancement. One case of sphenoid wing meningioma was seen in an old lady. The mass was large with contrast enhancement and direct extension into the orbit.

One case of lymphoma was seen in the study, with retrobulbar involvement: With lymphomatous infiltration of orbital fat, which was a well circumscribed mass. Two cases of metastasis were seen. One was a 55-year-old man who had lung cancer. On CT, it was wrongly diagnosed as lymphoma. Another case of metastasis was in a 53-year-old lady, who had breast carcinoma and metastasis to the orbit.

DISCUSSION

In adults there is normal ocular protrusion of the eye ball which as measured (with a Hertel Exophthalmometer) from the lateral orbital rim to the corneal apex is 14 to 21 mm. The severity of proptosis can be measured with a plastic rule resting on the lateral orbital margin or a Hertel Exophthalmometer. Readings greater than 21 mm are indicative of proptosis and a difference of 2 mm between the two eyes is suspicious regardless of the absolute value.

Thirty-two cases of proptosis were investigated by CT scan between the period December 2003 to December 2005 in department of radio diagnosis, V.S.S. Medical College and Hospital, Burla. There were 15 males and 17 females in the study group. Age of the patients ranged from 1 year to 55 years.

The age distribution of 32 cases of proptosis subjected to CT scan. Two peak age incidence were observed one below 10 years and another between 31-40 years. Table number 2, shows the sex distribution of 32 cases of proptosis subjected to CT scan. The incidence of proptosis was found to be almost equally distributed among males and females. Kaimbo DK.³ and associates in their study of proptosis in 129 cases in Zaire and observed that 79 (61%) cases were males and 50 (39%) were females and majority of the cases were between 30-50 years. The discrepancy with the present study could be due to this geographic factor and small sample size in this study.

Regarding the frequency of different lesions causing proptosis, the mass lesions accounted for 46.87 % cases of proptosis followed by inflammatory lesions (37.5%), trauma (9.37%), and vascular lesions (6.25%). No cases of congenital disorders were seen in the study. This correlates with the study of Kaimbo and associates in which mass lesions accounted for 40% of cases and inflammatory

disorders for 36% and study of Al Salem associates, in which inflammatory disorders accounted for 43% of cases.^{4,5}

Regarding the incidence of unilateral and bilateral proptosis in relation to aetiology, in our study unilateral affection was seen in 84.37% of cases and bilateral involvement in 15.62% of cases. Kaimbo and associates in their study of proptosis noted that 76% of cases were unilateral and 24% of cases were bilateral.⁴ Richard Dallow and associates in their study noted that inflammatory lesions accounted for most bilateral lesions in adults, the chief causes were thyroid disorder and pseudotumour.⁵

In this study, there were 4 cases of thyroid ophthalmopathy, CT scan showed bilateral orbital involvement in 3 cases with inferior and medial rectus involvement. There was no evidence of any bony erosion, retro bulbar fat obliteration, or optic nerve involvement. These findings correlate well with the study of Enzamann et al.⁶

CONCLUSION

Mass lesions were the most common cause of proptosis followed by inflammatory lesions. Unilateral proptosis was more frequent than bilateral proptosis. CT scanning should be the chief investigation in evaluation of lesions causing proptosis. It is the most useful in detecting characterizing

and determining the extent of disease process. The overall accuracy of CT scan in diagnosis of proptosis is 96.87 %.

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