ORIGINAL ARTRICLE

Evaluation of Common Causes of Proptosis on Computerized Tomography in Pakistani Population

ANISA KALSOOM[1], JUNAID KHAN[2], MUHAMMAD KHALID[3]

ABSTRACT

Objectives: To determine the frequency of various lesions causing proptosis and to examine their radiological appearances in adults using CT as imaging modality.
Study design: "Descriptive study (case series)"
Setting: Radiology Department, MH Rawalpindi
Duration of study: 1 year from date of approval of synopsis (9th April 2006)
Results: Patients of both genders were included in study with age bracket of 18 years and above. Majority of patients belonged to age group 60 –70 yrs with male preponderance. Orbital and extra orbital tumors were commonest pathology resulting in proptosis in adults; however inflammatory pseudotumor was commonest orbital mass followed by Graves disease.
Conclusion: Orbital and exrtaorbital pathology resulting in proptosis increases with age with male preponderance. Tumors of orbital and extra orbital origin are commonest pathology leading to proptosis in adults; however commonest orbital pathology is inflammatory pseudotumor followed by graves disease.
Key words: Computerized tomography, proptosis, Graves disease, pseudotumor, Thyroid ophthalmopathy

INTRODUCTION

Proptosis is defined as an abnormal protrusion of the ocular globe. Globe protrusion >21 mm anterior to interzygomatic line on axial scans at the level of lens will be considered as proptosis[1].

There are various lesions of the orbit causing proptosis which may be unilateral or bilateral. These include Idiopathic Inflammatory pseudotumor, orbital tumors (benign or malignant), orbital myositis, graves ophthalmopathy. The most common cause of orbital mass in adults is Idiopathic inflammatory pseudotumor[2].

The second most common cause in adults is orbital tumor. They are usually benign but malignant, metastasis and lymphomas are also encountered rarely. The most common benign orbital tumor in adults is cavernous hemangioma. The most common primary cancers that metastasize to the orbit are breast, prostate gland and lung cancer[3].

The most frequent cause of bilateral proptosis is Graves ophthalmopathy. Contrast Enhanced Computerized Tomography with axial and coronal views may be considered as a single, non-invasive diagnostic tool, which not only localizes and characterizes the lesion but also, will show calcification, cystic changes and extent of disease process[4].

Conditions like chronic infections of sinuses including fungal infections, tumors arising from para nasal sinuses and sinonasal polyposis can involve orbit secondarily and are best evaluated on computerized tomography [5]. In this study, we would examine morphology and frequency of various causes of proptosis in adults on Computerized Tomography.

SUBJECTS AND METHODS

It was a descriptive study carried out at Military Hospital Rawalpindi during one year (April 2006- July 2007). A total of 31 patients were included in the study in which proptosis was diagnosed clinically or on Computerized Tomography. Both genders were included with age bracket of 18 years and above. Informed written consent regarding permission for computerized tomography with contrast enhancement was taken from all patients. Clinical data available was considered in the results of the study. Computed Tomography was performed with contiguous thin section (2-3 mm) axial and thicker section (4-5 mm) coronal images, displayed in soft tissues and bone windows [6]. The patient was examined according to the attached proforma. SPSS version 10 was used for computation and analysis of data.

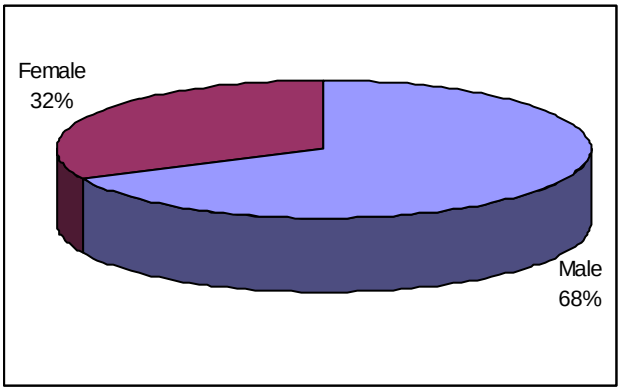
---

1. Classified Radiologist, Fauji Foundation Hospital Rawalpindi
2. Classified Neurosurgeon, Combined Military Hospital, Peshawar. E-mail: junaidneuro@hotmail.com
3. Public Health Expert, German International Cooperation (GIZ) E-mail: dr_khalid_m@hotmail.com

RESULTS

Inflammatory pseudo tumor in 6 (19.4%) patients, graves disease in 5(16.1%), lymphoma in 3(9.7%), intraconal cellulitis in 1 (3.2%), orbital abscess in 1(3.2%), orbital dermoid in 1(3.2%), sinonasal polyposis in 2(6.5%), increased retro orbital fat due to thyrotoxicosis in 1(3.2%), adenoid cystic carcinoma of lacrimal gland in 1(3.2%), fungal infection in 1(3.2%), lipodystrophy in 1(3.2%), chronic infective maxillary sinusitis in one (3.2%), optic nerve meningioma in two (6.5%),aggressive sphenoid wing meningioma in one (3.2%), maxillary squamous cell carcinoma with intra orbital extension in 2(6.5%) and advanced basal cell carcinoma with intraorbital extension in one (3.2%), choroidal melanoma in one (3.2%). Descriptive statistics of various causes of proptosis are shown in table 1.

Regarding compartment of orbit involved in 20 out of 31(64.5%) patients all the three compartements were involved namely conal, intraconal and extraconal, in 4 out of 31(12.9%)patients conal region was involved, in 4 out of 31(12.9%) patients intraconal compartment was involved, in 3 out of 31(9.7%) patients extraconal compartment was involved. Percentages of involvement of various compartments are given in Fig.



Regarding extension into surrounding structures; no extension was found in 13 out of 31(48.4%) patients. 5 out of 31(16.1%) patients had involvement of eye ball and in 13 out of 31 (48.4%) patients extension into surrounding structures like soft tissues, sinuses and intra cranial extension was noted. Thickening or enlargement of extra ocular muscles was seen in 18 out of 31 (58%) patients. The most common muscle to get enlarged in our study was inferior rectus which was enlarged in 9 out of 31(29%) patients followed by medial rectus which was enlarged in 8 out of 31 (25%) patients. Proptosis was measured on axial slices of CT orbit anterior to inter zygomatic line at the level of lens. Minimum measurement of proptosis was 23mm while maximum displacement of globe anteriorly was 34mm with mean of 28.2mm and with a standard deviation of 2.8. Bone erosion was seen in 11 out of 31 (35.5%) patients. Calcification was noted in only one out of 31 (3.2%) patient.

Figure 1: Percentages of involvement of various compartments of orbit

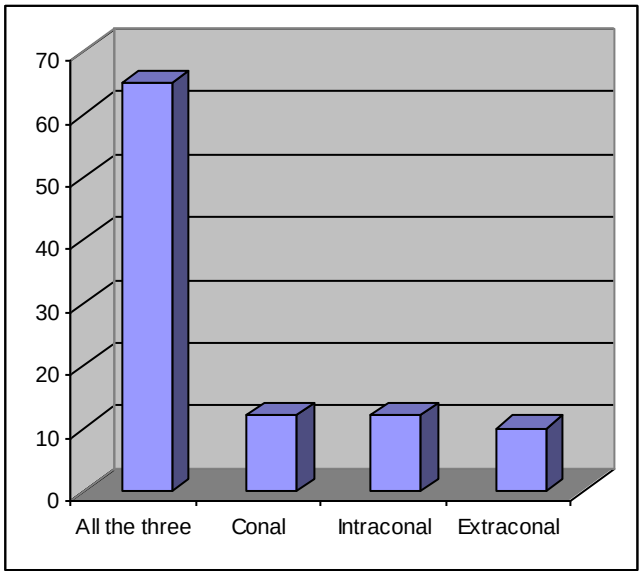


Table 1: Diagnosis on computerized tomography

	Freq.	%age
Intraconal cellulites	1	3.2
Orbital abscess	1	3.2
Enlarged recti --- Graves disease	5	16.1
Dermoid	1	3.2
Sinonasal polyposis	2	6.5
Increased retro orbital fat density	1	3.2
Inflammatory pseudotumor	6	19.4
Lymphoma	3	9.7
Adenoid cystic carcinoma lacrimal gland	1	3.2
Fungal infection	1	3.2
Liopodystrophy	1	3.2
Chronic infective maxillary sinusitis	1	3.2
Optic nerve meningioma	2	6.5
Aggressive sphenoid wing meningioma	1	3.2
Maxillary squamous cell carcinoma with orbital extension	2	6.5
Advanced basal cell carcinoma with orbital extension	1	3.2
Choroidal melanoma	1	3.2

DISCUSSION

The most common tumor groups in adult population include carcinomas (paranasal sinus, secondary & metastatic), inflammatory masses (pseudotumor),

lacrimal gland tumors, cysts, lymphomas, meningiomas, and vascular tumors (cavernous hemangiomas). Secondary tumors commonly invade the orbit and include mucoceles, squamous cell carcinoma, meningioma, vascular malformations and basal cell carcinoma. An encapsulated venous malformation, commonly referred to as the cavernous hemangioma, is a relatively common vascular lesion in the orbit. It is the most common vascular lesion of adults and is the most common primary intraconal orbital lesion in adults[7].

The commonest cause of proptosis in our study was found to be tumors; both of primary orbital origin and of surrounding regions. In our study 14 out of 31(45%) patients had orbital and extra orbtial tumors with orbital extension. Furthermore 8 out of 31(25%) patients had benign tumors; while 6 out of 31(19.3%) patients had malignant tumors. This is in accordance with a study done by Kodsi et al. In this international study overall frequencies of malignancy was 18.2%[8,9].

Idiopathic orbital inflammation, also known as orbital pseudotumour, is a term describing a spectrum of idiopathic, non-neoplastic, non-infectious, space-occupying orbital lesion without identifiable local or systemic cause[10]. Percentage of orbital pseudotumor in our study was 6 out of 31(19.4%). This was in accordance with an international study done by Kenji Ohtsuka in which the percentage was 24% 102. In their report of 9 cases Enzmann et al noted the difficulty in distinguishing this condition from endocrine ophthalmopathy. This difficulty was encountered in our study as well where the attenuation of pseudotumor ranged from isodense to hyperdense lesions and the appearance varied from isolated discrete mass to just rectus muscle thickening simulating an endocrine disorder, or generalized increased density without a definite mass obscuring details of muscle cone and optic nerve[11].

Adenoid cystic carcinoma of lacrimal gland was found in 1 out of 31(3.2%) patients. The lesion was isodense showing contrast enhancement with periorbital component making percentage of each of these characteristic to be 100%. All these findings were comparable to study done by Glenn S et al. In this international study in 7 out of 9 patients lesion was isodense, 5 out of 8 patients showed contrast enhancement and all 9 out of 9 patients had peri orbital involvement. In our study 11 out of 31(35.5%) patients had bone erosion which is comparable to study done by Glenn S et al in which 22% of patients had bone erosions.

Contrast enhancement of lesions on CT orbit was seen in 29 out of 31(93%) patients which is comparable to study done by Glenn S et al. In this international study 48 out of 73(66%) patients had tumor enhancement on post contrast study.

Basal cell carcinoma was seen in 1 out of 31(3.2%) patients. Peri orbital compartment was involved and bone erosion was present as well as contrast enhancement on post contrast study making percentage of each of this characteristic to be 100%[12].

In our study 3 out of 31 (9.6%) had meningioma. 2 out of these 3(66%) patients primary intra orbital meningioma of optic nerve was seen while in one out of 3 (33%) patients intra orbital extension of sphenoid wing meningioma was seen. This was in accordance with study done by Glenn S et al. In this international study 39% of patients had intra orbital extension of sphenoid wing meningioma. This was also comparable to another international study done by Pfeiffer[12,13].

CONCLUSION

The present study evaluates different causes of proptosis in adults of 18 yrs of age and above; the commonest cause was found to be tumors of both orbital and extra orbital origin i.e from surrounding structures like PNS, base of skull and soft tissues of face with intra orbital extension. However the commonest orbital pathology causing proptosis in our study was inflammatory pseudotumor followed by graves disease. Male prevalence was also noted in our study. Our study also indicates that an important cause of proptosis includes pathologies related to maxillary antra like chronic infective maxillary sinsusitis, suamous cell carcinoma of maxillary antra and sinonasal polyposis. The mass lesions (including tumors) comprised lacrimal gland tumors, inflammatory pseudotumor, optic nerve lesions, lymphomas, basal cell carcinoma, choriocarcinoma, maxillary squamous cell carcinoma and sinonasal polyposis along with graves disease and increased retro orbital fat in thyrotoxicosis. Characteristic findings were seen in each of these groups of lesions. Role of CT in evaluation of these tumors is primarily to know posterior extension into orbital soft tissues and presence or absence of bone deformity, remodeling, erosion or destruction.

REFERENCES

1. Dahnert W. Orbit in: Radiology Review Manual 5th Ed. Lippincott Williams & Wilkins, Philadelphia. 2003; 331.
2. Weber AL, Romo LV, Sabates NR. Pseudotumour of the orbit. Clinical, Pathological & radiologic evaluation. Radiol Clin North Am, 1999; 37: 151-68.
3. Shields JA, Shields CL.Brotman HK, carvalho C, Perez N, Eagle RC Jr. Cancer metastasis to the orbit: the

2000 Robert M.Curts Lecture. Ophthal Plast Reconstr Surg, 2001; 17:346-54.
4. Maya MM, Heir LA. Orbital CT, Current use in MR era. Neuroimaging Clin N Am, 1998; 8:651-83.
5. Mumtaz S, Naeem K, Abbas N.Unilateral proptosis due to Sino-nasal Pathology. Management of thirty cases Ann KE Med Coll, 2000; 6: 81-3.
6. Sutton D, Whitehouse R, Rothman M, Zoarski G. The Orbit In: Textbook of Radiology and Imaging, 7th Ed. New York, Churchill Living stone.2003; 1573-95.
7. Bilaniuk LT. Orbital vascular lesions: Role of imaging. Radiologic Clinics of North America Jan 1999; 37(1): 169-182.
8. Sven Johansen, Steffen Heegaard, Lars Bogeskov, Jan Ulrik Prause. Orbital space occupying lesions in Denmark 1974-1997: Acta Ophthalmol. Scand.2000; 78 : 547-552.
9. Kodsi SR, Shetlar DJ, Campbell RJ, Garrity JA, Bartley GB. A review of 340 orbital tumors in children during a 60 year period. Am J Ophthalmol 1994; 117:177-182.
10. Kenneth SC Yuen MRCS, Connie HY Lai, Wai-Man Chan, Dennis SC Lam. Bilateral exudative retinal detachments as the presenting features of idiopathic orbital inflammation. Clinical & Experimental Ophthalmology 2005; 33 (6): 671–674.
11. Kenji Ohtsuka, Masato Hashimoto, Yasuo Suzuki. A Review of 244 Orbital Tumors in Japanese Patients during a 21-Year Period: Origins and Locations. Japanese journal of ophthalmology, Springer Japan January 2005; 49 (1): 49-55.
12. Glenn S, Forbes, Patrick F, Sheedy ll, Robert R, Waller. Orbital tumors evaluated by computerized tomography. Radiology July 1980; 136:101-111.
13. Pfeiffer RL. Roentgenography of exophthalmos with notes on the roentgen ray in ophthalmology. Am J Ophthalmo Jul 1943; l26:724-741. Aug 1943; 816-833. Sep1943; 928-942.