ORIGINAL ARTICLE

Evaluation of the Accuracy of CT Scan in Characterizing Orbital Masses

FAROOQ KHAN[1], MUHAMMAD NAUMAN SHAD[2], SHAHNAZ FATIMA[3], *AJAZ FATIMA[4]*

ABSTRACT

Background: Orbital mass lesions are a very common feature these days. CT(Computerized tomography) scan is helpful in etiopathological diagnosis of orbital mass lesions. By knowing precisely where a lesion is located, the proper surgical approach can be selected to minimize morbidity.
Aim: To determine sensitivity, specificity and accuracy of CT scan in characterizing orbital masses
Methods: 100 Patients referred to Radiology department with clinical diagnosis of orbital mass lesions were evaluated prospectively with CT scan. CT scan of the orbit was performed with 3mm thick axial slices. After giving intravenous contrast, axial slices were repeated and direct coronal 5mm slices were also taken. Based on CT appearances of masses, a provisional diagnosis was given.
Results: After completion of study, the CT provided overall sensitivity and specificity of 73.3% and 85.5% respectively. Overall accuracy was 85.3%.
Conclusion: Results conclude that CT is very much helpful in diagnosing and staging orbital masses. It is non – invasive and helps in planning for surgical approach and in reducing morbidity.
Keywords: CT Scan, orbital mass, axial slices

INTRODUCTION

Orbital imaging has dramatically changed with the advent of computed tomography (CT) and magnetic resonance imaging (MRI). Computerized tomography (CT) has revolutionized the study of orbital diseases.

CT is very fast and much less cumbersome than MRI. The patient does not need to be as cooperative as in MRI. It is the initial imaging modality of choice for most traumatic situations involving the orbit. Fractures are easier to detect with CT, and bone lesions are usually better visualized with CT. One of the most important attributes of CT is its ability to detect calcium and calcification[1,2].

Vivid radiographic demonstrations of orbital masses can be discerned for location, extent, configuration, and effect on adjacent structures; one may be able to deduce clues regarding possible tissue mass composition on the basis of its radiographic footprint[3].

The basic principle behind CT is that the internal structure of an object can be reconstructed from multiple projections of the object. The numerical data from multiple ray sums are then computer processed to reconstruct an image. By knowing precisely where a lesion is located, the proper surgical approach can be selected to minimize morbidity[4].

Optional visualization of the orbit requires imaging from at least two planes. Axial slices should be oriented parallel to the optic nerve and no thicker than 3 mm. Axial view, because of volume averaging, may miss lesions located along the floor or roof. Additional views, typically coronal, can be obtained by reformatting data obtained during axial imaging or by direct coronal scanning. Direct coronal views are usually preferable because of better resolution[5, 6].

[1]Assistant Prof of Radiology, Sahara Medical College, Narowal
[2]Associate Proff Pharmacology, Sahara Medical College, Narowal
[3]Assistant Proff Pharmacology, Sahara Medical College, Narowal
[4]Assoc Prof Pharmacology, Lahore Medical & Dental College, Correspondence to Dr. Farooq Khan Email:
mnauman2002saj@yahoo.com

Intravenous contrast material is usually given. Intravenous administration of iodinated contrast medium is most helpful in detecting intracranial extension of an orbital process or identifying a pathologic process involving the optic nerve/sheath, most notably optic nerve sheath meningioma[7].

For most orbital lesions including tumors likeretinoblastoma, melanoma, meningioma etc., CT is the imaging modality of choice for diagnosis of these lesions[8.9.10].

MATERIAL AND METHODS

This cross sectional was conducted in Radiology Department, Mayo Hospital Lahore. Sample population was 100 patients with clinical suspicion of orbital mass lesion referred to radiology department for CT scan examination.

Inclusion Criteria

1. Patients of all age groups were included.
2. Patients of either sex were included.
3. Patients admitted in hospital only were included.

Exclusion criteria

1. Patients who were already biopsied were not included.
2. Already operated cases coming for follow up scans were not included.

METHODOLOGY

100 patients were included in this study. All the patients were having clinical suspicion of orbital mass lesion. There were 57 female and 43 male patients. CT scans of all these patients were performed in the department of Radiology using CT scan machine, Toshiba spiral CT Xvision / Ex. In routine, axial thin (3mm) slices parallel to optic nerve were taken. After giving intravenous contrast axial slices were repeated and direct coronal (5mm) slices were taken in prone position. In patients where neck extension was not possible, reformatted coronal images were made. All the patients included in this study were operated in ophthalmology department Mayo hospital Lahore during a

period from August 2002 to MAY 2003. Biopsy reports of all these patients were collected. The results of biopsy reports were compared with CT diagnosis using biopsy results as gold standard.

Statistics: Sensitivity, Specificity and Accuracy were calculated as follows:

Sensitivity = True Positive / True Positive + Negative X100

= 54 / 54+7 X100=88.5%

Specificity = True Negative / True Negative + False Positive X100

Accuracy rate = True Positive + True Negative / True Positive + True Negative +False Positive +False Negative X100

RESULTS

Results of CT and histopathological diagnosis:

Disorders	Number of cases on CT	Number of cases on Histopathology
Neoplastic masses	65	61
Inflammatory masses	26	30
Dermoids	9	9

Results of Sensitivity, Specificity, and Accuracy rates of CT Scan

Disorders	Sensitivity rate	Specificity rate	Accuracy rate
Neoplastic masses	88.5%	71.8%	82%
Inflammatory Masses	56.7%	87%	78%
Dermoids	77.7%	97.8%	96%

Overall sensitivity rate = 73.3%., Overall specificity rate = 85.5%, Overall accuracy rate = 85. 3 %.

DISCUSSION

Eye is an important organ in human beings due to its crucial rule in connecting them with the outside world. This study was conducted in order to determine the usefulness of CT scans in evaluating the nature of orbital masses and compare the results with current literature.

100 cases were studied irrespective of age and sex using CT scan as a diagnostic tool. Most common cause of orbital mass lesion was retinoblastoma, followed by dermoids and inflammatory pseudotumors. The overall sensitivity rate was 73.3%, specificity rate was 85.5%, and accuracy rate was 85.3%. These results were comparable to international literature of similar studies available.

In a study carried out in the department of radiodiagnosis, All India institute of medical Sciences, Ansari Nagar, New Delhi, India, the overall accuracy rate was 83.6%. It was concluded from that study that CT is an excellent modality to determine nature of lesions[11].

In another study conducted at National scan center, KEM Hospital, Rasta Peth, Pune, India, they diagnosed on CT10 cases of mucocele projecting into orbit. On histopathology all the cases were proven as mucoceles[4,3].

In a study conducted in department of radiodiagnosis, All India institute of Medical Sciences, Ansari Nagar, New Delhi, India, they studied 5 patients suspected of having malignant melanoma on ophthalmoscopic examination. These patients were evaluated with CT. On CT they were all diagnosed as melanoma. Histopathology proved all of them[12].

CONCLUSION

It was concluded from the study that CT scan is an excellent modality of choice in characterizing orbital masses and in planning for surgical approach.

REFERENCES

1. Chapman S, Nakielny R. Face and neck. Aids to Radiological differential diagnosis. 3rd ed. London: WB Saunders; 1992. 359 – 78.
2. Wang Y, Osborne MT, Tung B, Li M and Li Y. Imaging Cardiovascular Calcification. *J Am Heart Assoc*; 2018. 28;7(13)
3. Khan SN and Ali RS. Orbital masses: CT and MRI of common vascular lesions, benign tumors, and malignancies. *Saudi J Opthalmol*; 2012. 26(4): 373–383
4. Naik MN, Tourani KL, Sekhar GC and Honavar SG. Interpretation of computed tomography imaging of the eye and orbit. A systematic approach. *Indian J Ophthalmol*; 2002. ;50(4):339-53
5. Sanders BM, Draper GJ, Kingston JE. Retinoblastoma in Great Britain 1969–80: Incidence, treatment and survival. *Br J Ophthalmol*; 1988. 72: 576 – 83.
6. Khelfaoui F, Validire P, Auperin A. Histopathologic risk factors in retinoblastoma. A retrospective study of 172 patients treated in a single institution. *Cancer;* 1996. 77: 1206 – 13.
7. Kyongtae TB. Intravenous Contrast Medium Administration and Scan Timing at CT: Considerations and Approaches. *Radiology*; 2010. Vol. 256, No. 1
8. Purohit BS, Vargas MI, Ailianou A, Merlini L, Poletti PA, Platon A, Delattre BM, Rager O, Burkhardt K and Becker M.Orbital tumours and tumour-like lesions: exploring the armamentarium of multiparametric imaging. *Insights Imaging*; 2016. 7(1): 43–68.
9. Shields J A. In: Shields JA. ed. Diagnosis and management of orbital tumors. Philadelphia: WB Saunders; 1989. 291-315.
10. Nugent RA, Rootman J, Robertson W D. Acute orbital pseudotumors: Classification and CT features. *Am J Neurorad*; 1981; 2: 431-6.
11. Sharma R, Vashisht S, Betharia S, Berry M. CT evaluation of Lacrimal gland lesions. Ind J RadiolImag 1991; 1:23-7.
12. Vashisht S, Kumar A, Berry M. Role of CT in the evaluation of Malignant melanoma. Ind J RadiolImag 1991; 1: 15-7.