



Publisher homepage: www.universepg.com, ISSN: 2663-7529 (Online) & 2663-7510 (Print)

<https://doi.org/10.34104/ejmhs.022.02010205>

European Journal of Medical and Health Sciences

Journal homepage: www.universepg.com/journal/ejmhs

European Journal of
**Medical and
Health Sciences**



Investigation of the Efficacy of Computed Tomography in the Evaluation of Intraorbital Tumors

Abir Zahangir Hassan¹, Shahrin Sultana², Tanzila Parvin^{3*}, Md. Abul Fayed¹, and S.M. Muraduzzaman³

¹Dept. of Radiology & Imaging Technology, Bangladesh University of Health Sciences, Bangladesh; ²Phase-B Resident (Internal Medicine), BIRDEM Academy, Bangladesh; and ³Dept. of Biomedical Engineering, Bangladesh University of Health Sciences, Bangladesh.

*Correspondence: tanzilla@buhs.ac.bd (Tanzila Parvin, Assistant Professor, Department of Biomedical Engineering, Bangladesh University of Health Sciences, Bangladesh).

ABSTRACT

The objective of the study was to evaluate the effectiveness of diagnosis of the intraorbital tumours with the help of CT scan. This cross sectional study took place in the Department of Radiology and Imaging, Dhaka Medical College Hospital and Department of Radiology and Imaging, National Institute of Ophthalmology during the period of January 2017 to December 2018. The sampling technique was purposive and sample size was 67. Patients attending outdoor and indoor patient facilities of Department of Ophthalmology of aforementioned Institute and Hospital and referred to their respective Radiology and Imaging Departments with suspicion of intraorbital tumours were included in the study. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of CT scan in the diagnosis of the intraorbital tumours were determined. Out of 67 cases, 31 (46.3%), 14 (20.9%) and 22 (32.8%) patients were diagnosed respectively with malignant tumour, benign tumour and nontumorous lesions on histopathology. On the other hand, out of 67 cases 37 (55.22%), 16 (23.88%) and 14 (20.9%) patients were diagnosed with malignant tumour, benign tumour and nontumorous lesions respectively with the help of CT scanning procedures. The accuracy of CT scan was 85.07% with sensitivity of 93.54%, specificity of 77.77%, and predictive value of 78.38% (positive) and 93.33% (negative) for findings of the malignant intraorbital tumours. In case of radiological findings for benign intraorbital tumours, the accuracy of CT scan was 97.01% with sensitivity of 100%, specificity of 96.23%, where predictive value was 87.50% positive and 100% negative. From the result of this study, it may be concluded that CT scan is a useful modality to correctly identify the patients with a disease and without a disease of intraorbital tumours. In case of benign tumours the validity tests showed relatively more accuracy.

Keywords: Computed Tomography, Investigation, Efficacy, Evaluation, and Intraorbital Tumors.

INTRODUCTION:

A variety of space occupying lesions or mass lesions may involve the orbit. Pathology of these lesions range from benign to malignant. Tumours form an important portion of them. Patients with intraorbital tumours often present with debilitating clinical features. Early diagnosis and prompt treatment can reduce their complications. Hassan *et al.* (2016) mentions that the overall age adjusted incidence rate

of malignant orbital tumours in USA was 3.39 (95% CI: 3.27-3.52) per million person-years. From his study it was observed that orbital tumours are mainly diagnosed at the age of above 50 years whereas most of the soft tissue sarcomas occurred in the young age. It is further mentioned that lymphomas were the dominant subtype in the adult population. It was also noticed that the incidence rates were higher in males than females mainly caused by the increase in car-

cinoma subtypes. Koopman *et al.* (2011) stated that in Netherlands the average age-adjusted incidence of malignant orbital tumours was 10.9. Lymphoma had a relative frequency of 67%, rhabdomyosarcoma 12%, adenocarcinoma 6%, and adenoid cystic carcinoma 5%. Nowadays in Netherlands primary malignant orbital tumours had been diagnosed more. In Bangladesh no definite statistical information is available regarding prevalence or incidence of intraorbital benign and malignant tumours in general population (Hasibuzzaman *et al.*, 2022).

Computed tomography scan is an important preoperative diagnostic imaging modality to detect and characterize tumours yielding information on their size, shape, location, extension and perilesional features. Accurate information regarding extent of the tumour and its surroundings is essential for preoperative planning. It is also a necessity to differentiate between malignant and benign tumours and nontumorous lesions. Increasing wide availability of CT scan machines and their capability to produce high resolution images along with multiplanar reformation facilitates diagnosis of the intraorbital tumours. Furthermore its faster image acquisition minimizes motion related artifacts. Although CT scan is useful to evaluate the intraorbital tumours, it has some limitations (Ushalatha *et al.*, 2016).

CT scan provides detailed visualization of regional bony anatomy and landmarks, but some soft tissue details such as delineation of necrotic or cystic components and inflammatory conditions are often not possible. Intralesional calcification and hemorrhage are well visualized with CT scan, but soft tissue interfaces and outline of inflammatory conditions are better identified with MRI (Ushalatha *et al.*, 2016). Some studies have been conducted worldwide on evaluation of the diagnosis of the intraorbital tumours in paediatric and adult subjects by Computed Tomography (CT). But no such study has been conducted in general population of Bangladesh. With this view the present study was undertaken and designed to assess the usefulness of CT scan image

to diagnose the intraorbital tumours and its histopathological correlation.

Objectives of the study

The study was designed to assess the diagnosis of the intraorbital tumours with the help of Computed Tomography (CT). Specific objectives were to evaluate CT scan findings in cases with clinical suspicion of intraorbital mass lesions and thus diagnose the lesions, to compare the CT scan and histopathological diagnoses of intraorbital mass lesions. Moreover it was found out the sensitivity and specificity of CT scan and also predictive value of CT scan was analyzed to evaluate the accuracy of CT scanning for diagnosis of intraorbital mass lesions.

MATERIALS AND METHODS:

This cross sectional study took place in the Department of Radiology and Imaging, Dhaka Medical College Hospital and Department of Radiology and Imaging, National Institute of Ophthalmology during the period of January 2017 to December 2018.

The sampling technique was purposive and sample size was 67. Patients attending outdoor and indoor patient facilities of the ophthalmology department of afore-mentioned Institute and Hospital and referred to their respective Radiology and Imaging Departments with suspicion of intraorbital tumours were included in the study. After selection of the patients, informed written consent was obtained from the patients or their legal guardians upon describing the purpose, method, benefit and hazards of the study. Data were collected from preformed data collection sheet and analyzed by SPSS computer program.

RESULTS:

Mean age of the included patients was 26.69 years with standard deviation of 16.84 years. Largest numbers of patients jointly belong to 10-20 years and 31-40 years age group. Most common presentation of the included patients was proptosis (49.25%), followed jointly by headache (32.83%) and visual impairment (32.83%).

Table 1: Relation between age group and diagnosis.

| Age groups | CT scan diagnosis (Histopathological diagnosis) | | | Frequency (%) |
|------------|---|---------------|--------------------|---------------|
| | Malignant tumour | Benign tumour | Nontumorous lesion | |
| <10 | 12 (10) | 0 (0) | 0 (2) | 12 (17.9) |
| 10-20 | 2 (2) | 8 (8) | 4 (4) | 14 (20.9) |

| | | | | |
|--------------|----------------|----------------|----------------|-----------|
| 21-30 | 3 (3) | 6 (6) | 4 (4) | 13 (19.4) |
| 31-40 | 6 (4) | 2 (0) | 6 (10) | 14 (20.9) |
| 41-50 | 8 (6) | 0 (0) | 0 (2) | 8 (11.9) |
| >50 | 6(6) | 0 (0) | 0 (0) | 6 (9) |
| Total | 37 (31) | 16 (14) | 14 (22) | 67 |

Table 2: Relation between gender and diagnosis.

| Gender | CT scan diagnosis (Histopathological diagnosis) | | | Frequency (%) |
|--------------|---|----------------|--------------------|---------------|
| | Malignant tumour | Benign tumour | Nontumorous lesion | |
| Male | 18 (14) | 14 (14) | 6 (10) | 38 (57) |
| Female | 19 (17) | 2 (0) | 8 (12) | 29 (43) |
| Total | 37 (31) | 16 (14) | 14 (22) | 67 |

Table 3: Correlation between CT scan diagnosis and histopathological diagnosis.

| | | Histopathological diagnosis | | | Total |
|-------------------|--------------------|-----------------------------|---------------|--------------------|-----------|
| | | Malignant tumour | Benign tumour | Nontumorous lesion | |
| CT scan diagnosis | Malignant tumour | 29 | 0 | 8 | 37 |
| | Benign tumour | 0 | 14 | 2 | 16 |
| | Nontumorous lesion | 2 | 0 | 12 | 14 |
| Total | | 31 | 14 | 22 | 67 |

For malignant tumours CT scan had an accuracy of 85.07% with sensitivity 93.54%, specificity 77.77%, positive predictive value (PPV) 78.38% and negative

predictive value (NPV) 93.33%. For benign tumours CT scan had an accuracy of 97.01% with sensitivity 100%, specificity 96.23%, PPV 87.50%, NPV 100%.



Fig 1: Post-contrast axial CT scan appearance of orbital lymphoma.

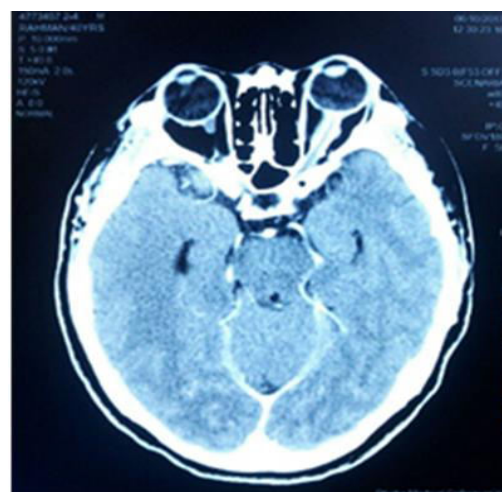


Fig. 2: Post-contrast axial CT scan appearance of optic nerve meningioma.

DISCUSSION:

The study was carried out to determine the diagnostic performance of CT scan in the diagnosis of the malignant and benign intraorbital tumours compared with histopathological diagnosis. This cross-sectional study was carried out with an aim to establish the role of CT scan in preoperative diagnosis of the intraorbital tumours and their correlation with histopathology of resected tissue by calculating sensitivity, specificity, PPV, NPV and accuracy. The

age range of the participants of this study was from 1 year to 62 years. The mean age was 26.69 years with a standard deviation of 16.84 years. In this study, largest numbers of patients with clinical suspicion of the intraorbital space occupying lesion belong to 10-20 years age group (20.9%) and 31-40 years age group (20.9%). The study showed a male dominance (57%) for clinical suspicion of intraorbital mass lesion with a male-female ratio of 1.3:1. In age groups upto 30 years male predominance is noted. It is also

observed that age groups above 30 years have female predominance. In this study largest number of patients presented with proptosis (49.25%). Other presentations include headache (32.84%), visual impairment (32.84%), dry eye (19.4%) and leukocoria (17.91%). This study showed that malignant tumour is relatively more common in patients with age less than 10 years and above 40 years both on CT scan and histopathology. It is also showed that benign tumour is relatively more common in patients with age ranging from 10 years to 30 years both on CT scan and histopathology. 37 cases were diagnosed with malignant tumour on CT scan. Of them 18 were male and 19 were female. Benign tumour was diagnosed in 16 cases. Of them 14 were male and 2 were female. 31 cases were diagnosed histopathologically with malignant tumour. Of them 14 were male, 17 were female. 14 cases were diagnosed with benign tumour. All of them were male. On histopathology, benign tumour was not found in case of female patients. Out of 37 patients diagnosed with malignant tumour on CT scan, most of them had complained of proptosis (17), visual impairment (12), leukocoria (12). The clinical history of headache and dry eye was less common. On the other hand when 31 cases were investigated on histopathology, proptosis, visual impairment, leukocoria were also most common complaint with frequency 13, 12, 10 nos. respectively. Patients diagnosed with benign tumour on CT scan, 8, 6, 4, 4 patients among 16 cases presented with visual impairment, proptosis, dry eye and headache respectively while it was 8, 4, 4 and 4 patients out of 14 cases presented with visual impairment, headache, proptosis and dry eye respectively diagnosed histopathologically with benign tumour. Out of 67 cases 37 (55.22%), 16 (23.88%) and 14 (20.9%) patients were diagnosed by computed tomography with malignant tumour, benign tumour and nontumorous lesion respectively. Moreover, 12 (17.91%), 12 (17.91%), 10 (14.93%), 8 (11.94%), 7 (10.45%), 6 (8.96%), 4 (5.97%), 4 (5.97%), 2 (2.99%) and 2 (2.99%) patients were diagnosed respectively with retinoblastoma, pseudotumour, metastasis, melanoma, cavernous haemangioma, pleomorphic adenoma, meningioma, lacrimal gland abscess and capillary haemangioma on CT scan.

When 67 cases were investigated on histopathology, 31 (46.3%), 14 (20.9%), and 22 (32.8%) patients were diagnosed with malignant tumour, benign tumour and nontumorous lesion respectively. To be

more specific after histopathological test it was found that 17 (25.37%), 10 (14.93%), 10 (14.93%), 8 (11.94%), 5 (7.46%), 5 (7.46%), 4 (5.97%), 4 (5.97%), 2 (2.99%), 1 (1.49%) and 1 (1.49%) patients had pseudotumour, retinoblastoma, metastasis, melanoma, lymphoma, cavernous haemangioma, pleomorphic adenoma, meningioma, PHPV, capillary haemangioma and lacrimal gland abscess respectively. Malignant tumour and nontumorous lesion were found in 29 and 8 cases respectively after histopathological test of 37 patients; no cases were diagnosed histopathologically with benign tumour. 16 patients were diagnosed with benign tumour on CT scan. Of them 14 and 2 cases were diagnosed with benign tumour and nontumorous lesion respectively on histopathology; no cases were diagnosed with malignant tumour. On CT scan 14 patients were diagnosed with nontumorous lesion. Of them 2 and 12 cases were diagnosed with malignant tumour and nontumorous lesion respectively on histopathology.

No cases were diagnosed histopathologically with benign tumour. In case of investigation of the malignant intraorbital tumours, accuracy of CT scan was 85.07% with sensitivity 93.54%, specificity 77.77%, positive predictive value (PPV) 78.38% and negative predictive value (NPV) 93.33%, while for benign intraorbital tumours investigation, accuracy of CT scan was 97.01% with sensitivity 100%, specificity 96.23%, positive predictive value 87.50% and negative predictive value 100%.

CONCLUSION:

CT scan showed good sensitivity, specificity, predictive value and accuracy in the diagnosis of the intraorbital tumours. For the benign tumours the validity tests showed relatively more accuracy. Therefore it can be concluded that CT scan is a useful modality in the diagnosis of the intraorbital tumours.

ACKNOWLEDGEMENT:

I would like to acknowledge and give my warmest thanks to my supervisor who made this work possible. His guidance and advice carried me through all the stages of writing my article. I would also like to give special thanks to my family as a whole for their continuous support and understanding when undertaking my research and writing my article. Their prayer for me was what sustained me this far. Finally, I would like to thank Allah, for letting me through all the difficulties.

CONFLICTS OF INTEREST:

The authors declare that there is no conflict of interest.

REFERENCES:

- 1) Hasibuzzaman MA, Hossain MA, Kumari K, Dey M, Hossen MM, and Zhu B. (2022). During COMA, body pathology of CT/MRI changes: a case report with literature review. *Eur. J. Med. Health Sci.*, 4(2), 51-54. <https://doi.org/10.34104/ejmhs.022.051054>
- 2) Hassan WM, Bakry M, Hassan MH, Alfaar AS. (2016). Incidence of orbital, conjunctival and lacrimal gland malignant tumors in USA from Surveillance, Epidemiology and End Results, 1973-2009. *Inter J. of Ophthalmology*, 9(12), 1808-1813. <https://doi.org/10.18240/ijo.2016.12.18>
- 3) Koopman JH, Loo MH, Dijk MR and Bijlsma WR. (2011). Incidence of primary malignant orbital tumours in the Netherlands. *The Scientific J. of the Royal College of Ophthalmologists*, 25(4), 461-465. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3171243/>
- 4) Rana S, Hossen M, Islam A, Shah S, Parvin T, Muraduzzaman SM, and Jalali MA. (2021). Interpretation of the common MRI findings in patients with painful knee joint, *Eur. J. Med. Health Sci.*, 3(1), 19-26. <https://doi.org/10.34104/ejmhs.021.019026>
- 5) Ushalatha, B. and Sambasivarao, K. (2016). Role of CT in the Evaluation of Orbital Tumors. *IOSR Journal of Dental and Medical Sciences*, 15(4), 16-19. <https://doi.org/10.9790/0853-1504141619>

Citation: Hassan AZ, Sultana S, Parvin T, Fayeze MA, and Muraduzzaman SM. (2022). Investigation of the efficacy of computed tomography in the evaluation of intraorbital tumors, *Eur. J. Med. Health Sci.*, 4(6), 201-205. <https://doi.org/10.34104/ejmhs.022.02010205>

