



## Melanoma/Retinoblastoma Intra-Orbital Lesions (Imaging Results Correlation with Ultrasound and Magnetic Resonance Imaging)

Syed Naseer Ahmed<sup>1</sup><sup>1</sup>Department of Radiology, Sheikh Khalifa Bin Zayed Hospital, Pakistan.

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**Correspondence to:** Syed Naseer Ahmed, Department of Radiology, Sheikh Khalifa Bin Zayed Hospital, Pakistan.

**Email:** [drsnahmed@gmail.com](mailto:drsnahmed@gmail.com)

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### ABSTRACT

**Objective:** This study aims to correlate radiological data on ultrasonography and MRI in order to identify intra-orbital lesions. **Methods:** In this prospective study, 58 patients were included, representing both sexes. Patients' ages ranged from two to fifty years. All patients referred from the ophthalmology department who were clinically suspected of having orbital or eye abnormalities had CT scans. Radiological data associated with MRI and ultrasound were used to evaluate outcomes among all patients. Full data analysis was carried out using SPSS 24.0. **Results:** Out of the total number of instances, 49 (84.5%) were determined to be non-traumatic, whereas 9 (15.5%) proved to be traumatic. The most prevalent disease among the 49 cases of non-traumatic lesions was neoplasm, followed by infective and inflammatory lesion cases. Non-traumatic lesions were most commonly retinoblastoma (17 instances, or 34.7% of the total), followed by endocrine orbitopathy and orbital cellulitis. Nine traumatic lesion cases included six fractures (66.7% of the total), two cases of presapital soft tissue edema (22.2%), and one case of a retained foreign body (orbital or lid) (11.1%). **Conclusion:** Ct scans help in lesion diagnosis, surgical planning, and monitoring of eye and orbital diseases. MDCT is the gold standard for evaluating bone, detecting calcification, and determining the location, size, and shape of lesions. Orbital and ocular lesions can be evaluated with MDCT.

### INTRODUCTION

The ability to identify and characterize pathology is significantly improved by ultrasonography (USG), which provides a thorough cross-sectional anatomy of the entire globe, superior topographic visualization, and a real-time display of the moving organ [1]. This makes it possible to pinpoint and describe pathology more accurately. Most recently, it has been established that the utilization of eye scanners that are not specialized can achieve a sensitivity of 93% and a specificity of 99%. In addition to being an effective noninvasive procedure, it is also a great method for detecting intraocular cancers and efficiently treating them. This provides a vivid illustration of the shape, size, location, and relationship to nearby components that are present in an intraocular tumor [2,3]. B-mode real-time ultrasonography is a non-invasive, painless, and invaluable technique for the evaluation of orbital-ocular lesions [3,8]. This examination is particularly useful in situations where opaque media is present and an intraocular mass is suspected.

Despite the fact that it is relatively small, the orbit contains a vast variety of vital organs. Because of the high incidence of tumors and tumor-like lesions in the orbit, radiographic assessment of the orbit is frequently required in both children and adults. This is because the orbit is particularly susceptible to cancers. When it comes

to the identification and treatment of malignant tumors, the utilization of cross-sectional imaging is of the utmost importance. In the process of selecting an imaging modality, it is beneficial to take into consideration the age of the patient as well as their clinical presentation. Children are more likely to be diagnosed with retinoblastoma (RB) and rhabdomyosarcoma (RMS), but adults are more likely to be diagnosed with lymphoma, malignant uveal melanoma, and inflammatory orbital pseudotumor (IOP). Diplopia, exophthalmos, visual impairments, extraocular muscle palsies, and eye discomfort are all examples of clinical symptoms that can be utilized as a diagnostic method. In contrast, a biopsy might be required in order to make a diagnosis based on tissue [1-4].

Treatment is available for retinoblastoma, which is a disorder that can be cured. It is almost always possible for the kid to make a full recovery, assuming that the cancer is diagnosed at an early stage and there are no associated risk factors for metastatic disease [5]. Optical preservation, the original volume of the tumor, the anatomical connections between the tumors and the macula and optic disc, and the adverse consequences of treatment, such as cataracts and vitreous hemorrhage, are all factors that should be taken into consideration when

attempting to preserve one's vision. In patients who have risk factors for metastatic cancer, adjuvant therapy is required in order to prevent a recurrence that could potentially be fatal. [6,7]

The diagnosis of retinoblastoma typically involves the utilization of fundoscopy, which is carried out when the patient is anesthetized with general anesthesia, as well as ultrasonography. Eye specialists are normally the ones who carry out both examinations. The prevalence of common intratumoral calcifications can be reliably detected by ultrasound (US) in virtually every instance. These techniques allow for the examination of a wide range of tumor characteristics, including the size, amount, position, and laterality of the tumor, as well as the location of the tumor in relation to the vitreous, the subretinal area, or the anterior segment. The subgrouping of retinoblastoma is an important piece of knowledge that pertains to the several treatment options. Additional imaging examinations may be of assistance to patients who have 13q deletion syndrome in determining the extent of the tumor and identifying any concurrent brain abnormalities, such as brain malformations, midline intracranial primitive neuroectodermal tumor (PNET), or intracranial tumor expansion [8]. It has been found that PNETs are related with a subset of pediatric retinoblastoma known as trilateral retinoblastoma, which accounts for between 5 and 15 percent of all cases [9]. It is possible to find tumors in the temporal lobes as well as in other suprasellar or parasellar regions, in addition to the pineal gland where they originated. Trilateral retinoblastoma is typically deadly; however, there is a possibility that some people may be able to survive the disease if they receive quick diagnosis and undergo intensive chemotherapy.[10]

While earlier research has shown that magnetic resonance imaging (MRI) can accurately detect intraocular tumor extent and metastasis, our study thoroughly assesses the diagnostic accuracy of 3 T ocular MRI, the diagnostic role of diffusion weighted imaging (DWIs), the sensitivity and specificity of various tumor diameter cutoff values for postlaminar optic nerve invasion (PLONI) and ocular coat invasion, and the relationship between abnormal anterior eye segment enhancement in MRI and patient outcomes. The objective of this study is to identify intra-orbital lesions by the utilization of both magnetic resonance imaging (MRI) and ultrasonic imaging data.

**MATERIAL AND METHODS**

This prospective study was conducted at Department of Radiology, Sheikh Khalifa Bin Zayyed Hospital, Pakistan comprised of 58 patients had intra orbital lesions. After obtaining written agreement, a thorough record-keeping of the patient's demographic details was executed. Participants were not included for this study if they were either under the age of two or did not provide written consent.

Based on the volume of patients undergoing orbital CT scans to assess possible eye and orbital abnormalities in the preceding year, a consensus was reached that seventy-five individuals would be enrolled in the study. No one who has ever received radiation, chemotherapy, or surgery

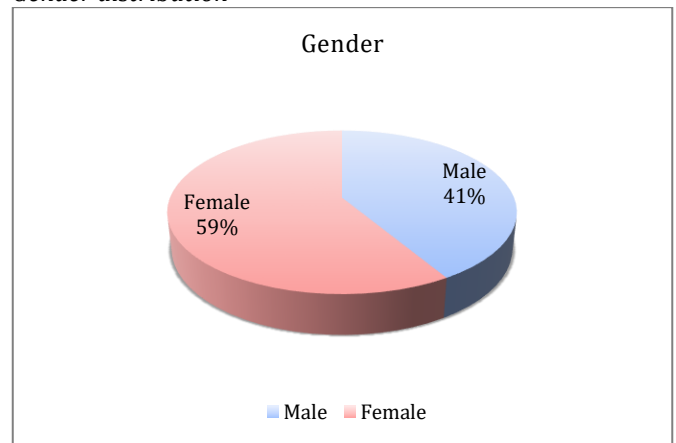
before could participate in this trial. It is worth noting that this investigation did not include participants who were sent to the ophthalmology department because of a clinical suspicion of orbital or ocular abnormalities. Participants were included in this study regardless of their gender or age. The Hitachi Eclon 16 slice multidetector CT scanner was used to conduct the scans in line with the standard protocol. Axial pictures of the orbit were acquired while the patient lay supine. These images encompassed the full orbit, beginning at the infra-orbital and ending at the supra-orbital regions. An infra-orbitomeatal line, which was perpendicular to the orbital plane, was employed throughout the image acquisition process.

Additional scanning time could be achieved by factoring in the pathology. To generate the volumetric sectional images, tube currents between 150 and 175 mA and 120 to 140 kVp were employed. Data processing and the creation of multiplanar and three-dimensional reconstructions reduced the interslice gap between scans to 2.5 millimeters. Intravenous administration of a non-ionic contrast agent was performed when it was determined to be essential. Factors that contributed to the final diagnosis were the histological analysis of the surgical material, the FNAC, the patient's reaction to treatment during follow-up, and, based on the pathology, the results of other radiological examinations (USG and MRI). Using SPSS 24.0, a thorough analysis was performed on the obtained data sets.

**RESULTS**

We found majority of the cases 34 (58.6%) were females and 24 (41.4%) were males among all cases.(figure 1)

**Figure 1**  
Gender distribution



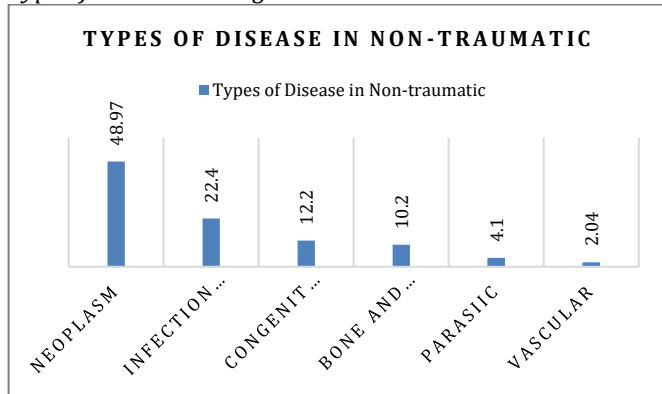
Out of the total number of instances, 49 (84.5%) were determined to be non-traumatic, whereas 9 (15.5%) proved to be traumatic.(table 1)

**Table 1**  
Frequency of traumatic and non-traumatic lesions

Variables	Frequency (58)	Percentage
<b>Traumatic Cases</b>		
Yes	9	15.5
No	49	84.5

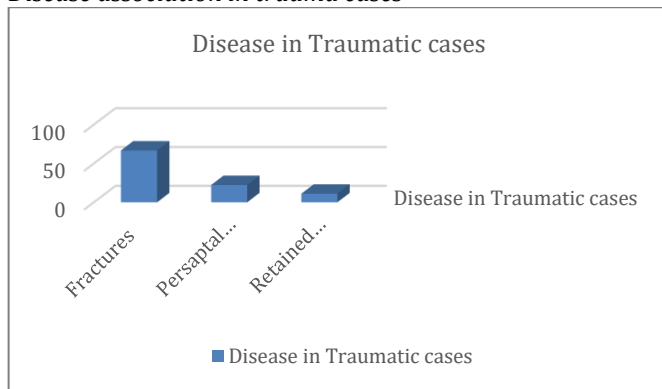
The most prevalent disease among the 49 cases of non-traumatic lesions was neoplasm, followed by infective and inflammatory lesion cases.(figure 2)

**Figure 2**  
Type of diseases among non traumatic lesions



Among nine traumatic lesion cases included six fractures (66.7% of the total), two cases of presapital soft tissue edema (22.2%), and one case of a retained foreign body (orbital or lid) (11.1%).(figure 3)

**Figure 3**  
Disease association in trauma cases



The most common non-traumatic lesion we observed was retinoblastoma. Melanoma was the second most prevalent, followed by endocrine orbitopathy, orbital cellulitis, preseptal cellulitis, solitary dermoid cyst, endophthalmitis, myocysticercosis, orbital pseudotumo, PHPV, and staphyloma.(table 2)

**Table 2**  
In non-traumatic ocular orbital lesions, radiology matched MRI and ultrasound.

Variables	Radiological	Ultrasound	MRI
<b>Non-traumatic lesions</b>			
retinoblastoma	18	-	14
melanoma	9	-	8
endocrine orbitopathy	7	-	6
orbital cellulitis	4	-	2
preseptal cellulitis	4	-	2
isolated dermoid cyst	2	-	5
endophthalmitis	1	-	3
myocysticercosis	2	4	3
orbital pseudotumo	3	-	1
PHPV	2	5	1
staphyloma	1	-	1
staphyloma	2	3	2

**DISCUSSION**

Imaging has the capability of identifying any new orbital abnormalities that may be developing, and the involvement of the radiologist in the process of directing patient care is critical to the achievement of favorable

outcomes throughout the course of treatment. It is vital to have a full understanding of the imaging properties of the various orbital disorders in order to avoid irreversible vision loss and other possibly catastrophic repercussions. This is required in order to avoid the possibility of catastrophic outcomes. Imaging has the ability to differentiate between pathogenic entities and physiologic calcifications, post-therapeutic alterations, and orbital implants, which is essential in order to get the best possible outcomes after treatment. Computerized tomography (CT) and magnetic resonance imaging (MRI) are two examples of imaging techniques that have had a substantial impact on the area of ophthalmology. Because of the prevalence of imaging abnormalities associated with eye and orbital diseases, it is advantageous for ophthalmologists to be aware of these results. This makes it possible for them to make more precise assessments of the progression of the disease and to keep track of the outcomes of the treatment that has been delivered. [11]Even if computed tomography (CT) is the major imaging modality for assessing the orbit, magnetic resonance imaging (MR) may be an additional diagnostic help in the event of an emergency situation. This is due to the fact that MR has a greater tissue contrast resolution than CT. A paradigm change has occurred in the field of medicine as a result of the introduction of computed tomography (CT), which makes it feasible to identify and treat disorders of the eye and orbital region. It is much simpler to plan and carry out surgical procedures when the precise site of a lesion is known. Additionally, there is a decreased risk of complications happening during the actual surgical procedures. [12,13]

The vast majority of the people who took part in our research were female. Twenty-five percent of the incidents were considered to be traumatic, while eighty-four and a half percent of the incidents were not considered to be traumatic. The findings of the study that was presented came to the same conclusions as those of the studies that had been conducted earlier.[14,15] A total of 49 cases of non-traumatic lesions were found, and the condition that was found to be the most prevalent was neoplasm. There were two types of lesions that came in second and third, respectively: infectious and inflammatory. According to the findings of a study that Mahsud [16] carried out, he found that 28 instances of proptosis were brought on by neoplastic disorders, 12 instances were brought on by inflammation, seven instances were brought on by congenital conditions, and three instances were brought on by traumatic events.

During the course of our investigation, we came to the realization that the ocular and orbital lesions were quite comparable to one another in a number of ways. Chinda et al. [17] were able to analyze 49 patients who were suffering from ocular and orbital malignancies. They made the discovery that the most prevalent form of tumor in this group was retinoblastoma, which was found in 18 of the instances, which is equivalent to 46.15 percent of the total. Thirty percent of the cases that were evaluated by Vashisht et al. [18] were found to have retinoblastoma. These cases were those that had orbital mass. The retinoblastoma was the most prevalent type of lesion, as it was discovered in

12 out of the 50 cases. In the research carried out by Arrigg and colleagues [19], it was demonstrated that calcification was present in eighty-three percent of the tumors that were diagnosed as retinoblastoma. In contrast, Asih et al. [20] discovered that calcification was present in ninety-two percent of the RB tumors that they examined. All of the findings from our analysis were the same as those found in the studies that were mentioned before. During the course of our investigation, we came to the realization that retinoblastoma was the non-traumatic lesion that was the most common. This was followed by melanoma, endocrine orbitopathy, orbital cellulitis, preseptal cellulitis, solitary dermoid cyst, endophthalmitis, myocysticercosis, orbital pseudotumor, PHPV, and staphyloma.

The frequency of fractures was determined to be 66.7% among the nine cases of traumatic lesions, presapital soft tissue edema was observed in 22.2% of the cases, and retained foreign bodies (orbital and lid) were detected in 11.1 percentage of the cases. [21] During the course of their investigation into ocular injuries, LeBedis and colleagues [26] proposed that computed tomography (CT) be the initial imaging modality that should be utilized. In a sample of one hundred individuals who were suspected of having orbital mass, it was found that CT

scans showed an accuracy of 86-91 percent when it came to recognizing and measuring the size of intra-orbital mass lesions as well as forecasting their nature. This revelation was made possible by the fact that CT scans exhibited a high degree of accuracy. [22] According to the findings of a study that Mahsud [23] conducted on fifty patients who had been diagnosed with proptosis, the accuracy of the diagnosis that was derived from a CT scan was eighty percent. The sensitivity, specificity, and accuracy of MDCT ranged from 50% to 100% for non-traumatic lesions, 96.95-100% for traumatic lesions, and 96% to 100% for non-traumatic lesions, respectively. The most accurate results were obtained for non-traumatic lesions. In the course of our investigation, we found that MDCT was able to accurately diagnose a limited number of patients who were suffering from a wide range of clinical illnesses.

## CONCLUSION

Ct scans help in lesion diagnosis, surgical planning, and monitoring of eye and orbital diseases. MDCT is the gold standard for evaluating bone, detecting calcification, and determining the location, size, and shape of lesions. Orbital and ocular lesions can be evaluated with MDCT.

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