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## OPHTHALMOLOGY | CASE REPORT

# Clinical, radiological and histological correlation in diagnosis of orbital tumours

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**Abstract:** This is a 10-year retrospective review to correlate clinical features, imaging and pathologic findings in lesions of the orbit in order for a more accurate diagnosis. Eighty-three patients undergoing biopsy or orbitotomy between September 2000 and August 2010 for orbital lesions were evaluated clinically, radiologically (CT) and histopathologically to determine the correlation between the three modalities. There was complete correlation for all cases under congenital orbital tumours and lacrimal gland and sac tumours that were studied. Negative correlation between clinical diagnosis and final histopathology was seen most significantly in lymphoproliferative disorders and orbital inflammation. The most commonly misdiagnosed type of orbital lesion is lymphoproliferative disorder and orbital inflammation, whereas the least commonly misdiagnosed type of orbital lesion is congenital and lacrimal gland and sac tumours. There was significant disparity between clinical diagnosis and radiology report, however, relatively less disparity between histopathology report and clinical diagnosis.

**Subjects:** Medicine, Dentistry, Nursing & Allied Health; Medicine; Ophthalmology; Pathology; Radiology



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### ABOUT THE AUTHOR

The research activities of the authors are focused on ophthalmology. Orbital neoplasms in adults comprise a broad spectrum of benign and malignant entities and this paper delves into the disciplines of not only ophthalmology but also radiology and histology. Even as a subspecialty, this paper aims to emphasise the importance of clinical skills, as well as corroborative evidence from the various sources in radiological modalities and histopathological specimens. R.S., a first-year medical graduate, is grateful for the guidance of her mentors, contributing in her participation in research conferences and publication. S.M.Y has published various papers on oculoplastics in peer-reviewed journals, as well as two book chapters. R. A. has published many articles on ocular inflammation in peer-reviewed journals and has presented free papers and delivered lectures on ocular trauma and uveitis both nationally and internationally. G.S, a regional and international faculty at various orbital and craniomaxillofacial conferences, symposia, has contributed chapters to several textbooks in his field.

### PUBLIC INTEREST STATEMENT

*Orbital tumours* constitute an array of diverse lesions and their relative incidence in the population is low. Hence, with the paucity of evidence-based studies and cases to learn from, management of such orbital tumours, primary or secondary, may be challenging when encountered in the clinical setting. When faced with such a clinical dilemma, we are confronted with how to balance between the use of clinical judgement and acumen or imaging to reach our differential diagnoses. Hence, in our work, we have picked a few choice cases of orbital tumours with each case proving salient points on their own. The importance of clinical evaluation cannot be overemphasized and all radiological scans should be correlated clinically. When faced with symptoms that suggest an orbital mass, clinicians should rely on our clinical evaluation first rather than resorting to advanced imaging tools, which can accrue to less healthcare costs when not used judiciously.

**Keywords:** orbit; orbital tumours; orbital neoplasms; correlation; clinical; radiological; histopathological

### 1. Introduction

Orbital tumours can be present in a myriad of ways, resulting in a great challenge in terms of diagnosis (Tailor, Gupta, Dalley, Keene, & Anzai, 2013). They comprise a broad spectrum of benign and malignant entities and the wide range of structures present within this small anatomical space means it is often the site of origin of various tumours and tumour-like conditions, both in adults and children (Bastola, Koirala, Pokhrel, Ghimire, & Adhikari, 2013; Demirci et al., 2002; Shields, Shields, & Scartozzi, 2004; Tailor et al., 2013).

Imaging plays a valuable role in characterization of these lesions as the accurate assessment of the site of involvement, involved structures, and extent of dissemination provides an important guide to differential diagnostic considerations and facilitation of proper treatment planning (Purohit, Vargas, Ailianou, & Merlini, 2016; Tailor et al., 2013). Although imaging studies graphically illustrate tissue definition, pathological conditions can be assessed definitely only by histopathological diagnosis. A combined diagnostic approach with the help of pathologists and radiologists is usually necessary in arriving at the appropriate clinical diagnosis. At times, histopathological, radiological and clinical findings may point towards the same diagnosis, but at times there may be a discrepancy.

There have been several studies on clinical, histopathological and radiological features of orbital lesions (Bastola et al., 2013; Demirci et al., 2002; Goldberg & William, 1997; Shields et al., 2004; Sunderraj, 1991; Tailor et al., 2013; Thakur, Sah, Lakhey, & Badhu, 2003; Tikur Anbessa, 2001; Ud-Din, Mushtaq, Mamoon, Khan, & Malik, 2001). However, to our knowledge, there has been no study done evaluating the clinical, radiological and histopathological correlation in the diagnosis of orbital tumours. It is important to know what the correlation of clinical, radiological and histopathological diagnoses is, before we can counsel patients on the likelihood of a diagnosis based on clinical or/and radiological judgement alone before any biopsy is done. It is also important to know what are the conditions that most likely have correlation clinically, radiologically and histopathologically, as it may affect our decision of whether to proceed with a definitive biopsy.

Hence, we performed a 10-year retrospective review to determine the correlation or discordance between clinical diagnosis and radiologic report of orbital tumours, as well as the final histopathological report.

### 2. Methods

We performed a retrospective observational case series at a single tertiary referral eye care centre over a duration of 10 years (September 2000–August 2010). Patients who had undergone biopsy or orbitotomy for their orbital lesions were included in the study. A review of clinical notes, histopathological reports and radiologic reports was done. We then assessed the correlation of their various diagnoses, based on clinical impression, radiological description and final histopathological diagnosis. Exclusion criteria included patients with orbital lesions who did not undergo surgery, patients without preoperative radiologic imaging, patients with thyroid orbitopathy or orbital infections.

### 3. Results

Eighty-five orbits of 83 patients (2 patients had bilateral orbital biopsy) with space occupying lesions were studied. The mean age of the patients was 45.5 years, with an age range of 3–92 years. Of all the patients, 52.43% were male.

Figure 1 shows the number and percentage of patients with each type of space-occupying lesion, the most common being lymphoproliferative disorders ( $n = 14$ , 16.87%), and the least common being mesenchymal tumours ( $n = 3$ , 3.61%).

**Figure 1. Number and percentages of orbital tumours in patients.**

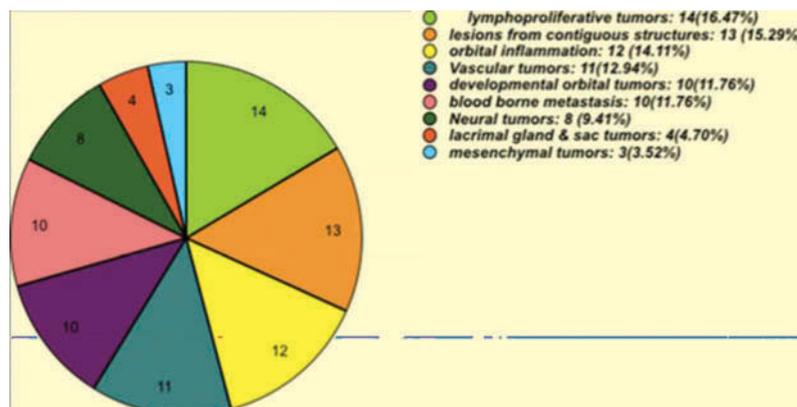


Table 1 shows various concordance rates between clinical, radiological and pathological findings, as well as the final diagnoses of the cases. Fifty-two patients (62.7%) had concordance in clinical, radiological and histopathological diagnoses. The remaining 37.3% had discordance between the various diagnoses, with complete discordance found in 6.0% of patients. The latter comprised the following cases: nodular fasciitis ( $n = 1$ ), sarcoidosis ( $n = 1$ ), rhabdomyosarcoma ( $n = 1$ ), orbital inflammation ( $n = 1$ ), lymphoma ( $n = 1$ ).

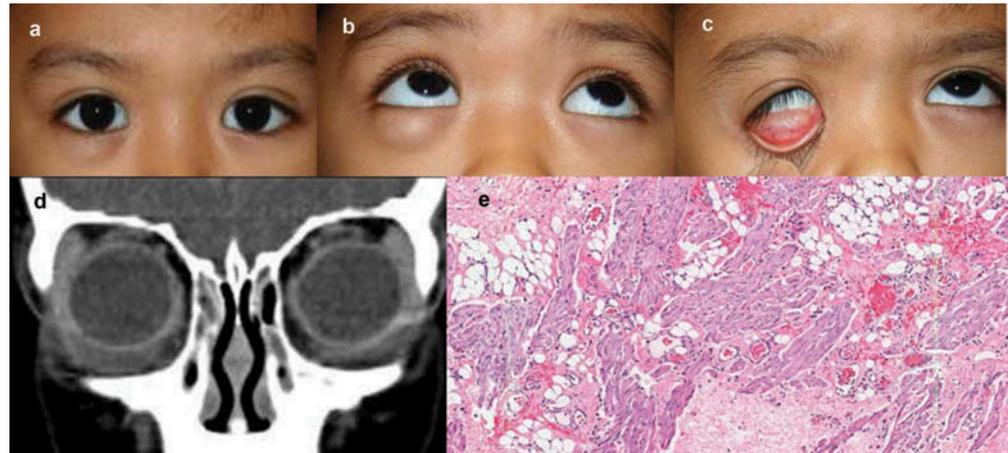
The illustrative cases below show the discordance that can occur between clinical, radiological and histopathological findings. They bring to light the importance of not relying too much on either clinical or radiological findings alone but to corroborate with each other, as well as with the final histopathological diagnosis where incision or excision biopsy is undertaken.

Illustrative case 1 (Figure 2) is a 7-year-old girl who presented with fullness of the right lower lid on primary gaze which became more prominent on looking up. On examination of the right inferior forniceal conjunctiva, there was a light pink coloured mass which appeared compressible. Clinical

**Table 1. Concordance between clinical, radiological and pathological findings**

Clinical and radiological concordance	Clinical and pathological concordance	Radiological and pathological concordance	No concordance	Clinical, radiological and pathological concordance
<b>3 (3.6%)</b>	<b>18 (21.7%)</b>	<b>5 (6.0%)</b>	<b>5 (6.0%)</b>	<b>52 (62.7%)</b>
Aspergillosis ( $n = 1$ ) Non-specific benign cyst ( $n = 1$ ) Non-specific orbital inflammation ( $n = 1$ )	Orbital mets ( $n = 3$ ) Lymphoproliferative disorder/lymphoma ( $n = 3$ ) Orbital inflammation ( $n = 2$ ) Capillary haemangioma ( $n = 1$ ) Lipogranuloma ( $n = 1$ ) Hematic cyst ( $n = 1$ ) Myeloma ( $n = 1$ ) Olfactory neuroblastoma ( $n = 1$ ) Rhabdomyosarcoma ( $n = 1$ ) NPC extension ( $n = 1$ )	Paranasal sinus tumour ( $n = 3$ ) Non-specific orbital inflammation ( $n = 1$ ) Optic nerve meningioma ( $n = 1$ )	Nodular fasciitis ( $n = 1$ ) Sarcoidosis ( $n = 1$ ) Rhabdomyosarcoma ( $n = 1$ ) Orbital inflammation ( $n = 1$ ) Lymphoma ( $n = 1$ )	

**Figure 2. Illustrative case 1: capillary haemangioma appearing as lymphangioma clinically with negative radiological evaluation.**



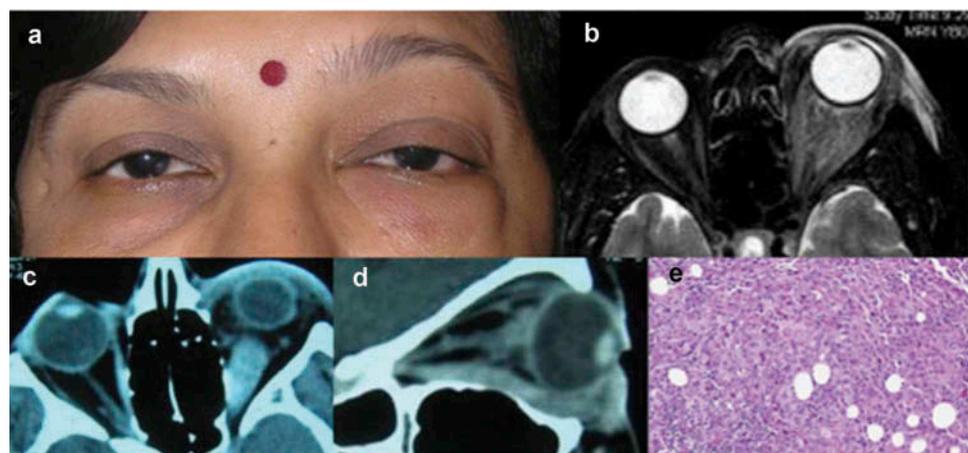
impression was that of lymphangioma. However, the radiologist reported that no intraorbital or periorbital mass lesion was detected. Excision biopsy revealed a capillary haemangioma on histopathological examination.

Illustrative case 2 (Figure 3) is a 55-year-old female with a history of breast cancer who presented with gradually progressive left eye proptosis. The clinical differential diagnoses were orbital metastasis or orbital lymphoma. Imaging revealed an inflammatory mass lesion along the inferior rectus and no evidence of malignancy or neoplasm was reported. Histopathology showed fibroadipose tissue with metastatic carcinoma similar to a previous biopsy from the breast cancer.

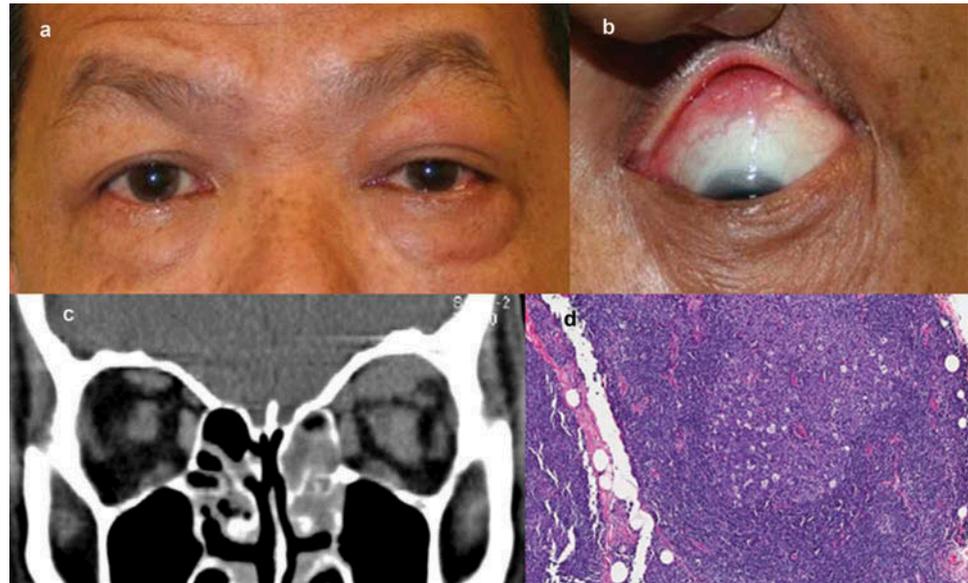
Illustrative case 3 (Figure 4) is a 57-year-old male who presented with progressively increasing left-sided fullness, with resistance to retropulsion and a superior bulbar salmon patch on the conjunctiva. Clinically, a diagnosis of lymphoproliferative disorder was made. Radiologically, the lesion was reported to be idiopathic orbital inflammation. Histopathological diagnosis revealed lymphoid hyperplasia, suspicious of biclonal rearrangement.

Illustrative case 4 (Figure 5) shows a 50-year-old male with left-sided facial pain for 1-month duration. The patient was treated for facial abscess initially but imaging later showed a maxillary carcinoma invading and eroding bone. Histopathology showed moderate-to-poorly differentiated squamous cell carcinoma.

**Figure 3. Illustrative case 2: metastatic orbital tumour presenting clinically as neoplastic lesion but appearing as inflammatory lesion radiologically.**



**Figure 4. Illustrative case 3: lymphoid hyperplasia appearing as lymphoproliferative disorder clinically and radiologically appearing as inflammation.**

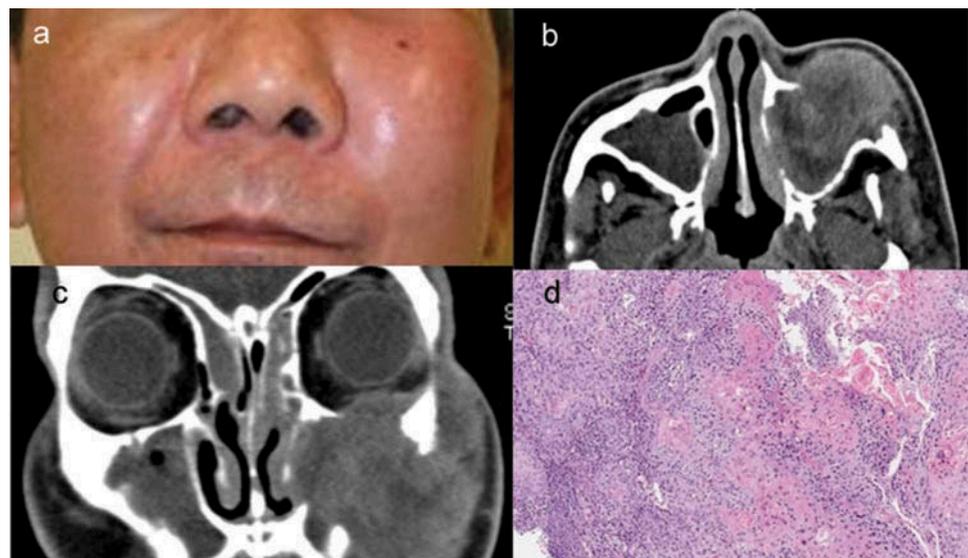


There were two patients whose histopathological diagnosis was malignant, while clinical and radiological diagnosis did not suspect so. One case was a suspected ethmoidal mucocele, which turned out to be an ethmoidal sinus cancer, while another was suspected to be a cavernous haemangioma, which turned out to be an optic nerve meningioma. There were six patients who were diagnosed to be benign while clinically and radiologically suspected to be malignant. Four were suspected lymphoma, which turned out to be reactive lymphoid hyperplasia, while two were suspected orbital metastasis which turned out to be orbital non-specific inflammation.

#### 4. Discussion

In this report, the correlation between clinical diagnoses and histopathological findings has shown that we are far from 100%. There have not been studies attempting to determine a clinicopathological correlation for a variety of space-occupying lesions. Improvement in clinicopathological correlation is particularly important in enucleation, since it is disastrous to remove the eye in benign conditions which could have been managed conservatively. Indications for

**Figure 5.**



enucleation have decreased over the last decade, most probably due to improved treatment options. Similarly, if we manage cases conservatively and not as aggressively as we should, we would not treat the disease appropriately, leading to severe consequences.

Orbital lesions are not easily accessible and a firm clinical diagnosis requires a detailed history, meticulous clinical examination and ancillary investigations. For optimization of diagnosis and management of orbital disorders, there needs to be input from three professionals—the clinician (oculoplastics specialist), radiologist and the pathologist.

Our illustrative cases demonstrate several important lessons. Cases 1 and 2 emphasize the importance of communication with the radiologist the clinical suspicion. The fundamental purpose of diagnostic radiology is to help guide clinical care and predict patient outcomes through the acquisition, interpretation and communication of medical imaging information (Larson, Froehle, Johnson, & Towbin, 2014). Based on the patient history and order information, they receive from referring clinicians, the radiologist then extracts information from the patients in the form of images, which are interpreted within the corresponding clinical context (Larson et al., 2014).

Case 2 also reminds us to keep orbital metastases on our list of differentials in patients with a history of carcinoma, especially breast carcinoma. In most cases of metastases to the orbit, there is a previous history of breast cancer that has been previously treated or the patient presents with an orbital mass in the setting of active malignancy affecting multiple organ systems. To date, the basis for breast carcinoma as the most common primary metastatic process to the orbit is unclear. Given the lack of lymphatics in the orbit, haematogenous spread is required for the development of metastasis (Giordano, Buzdar, & Hortobagyi, 2002). Orbital breast metastases tend to preferentially localize within orbital fat or extraocular muscles (Ahmad & Esmaeli, 2007; Goldberg, Rootman, & Cline, 1990). Scirrhous infiltration of the orbit can also occur, resulting in enophthalmos.

The third illustrative case highlights the difficulty in distinguishing between not just reactive and neoplastic lymphoid disorders but also between lymphoproliferative disorders and non-specific orbital inflammation (Good & Gascoyne, 2009; Young & Chan et al., 2017). The clinical implications for both the patient and the treating clinician are profound. In our study, negative correlation between clinical diagnosis and final histopathology was seen most significantly in lymphoproliferative disorders and orbital inflammation. There is also value in the use of diffuse-weighted imaging in differentiating between lymphoproliferative disorders and orbital inflammation (Haradome et al., 2014). Hence we believe that while clinical and radiological findings are important for lymphoproliferative disease and orbital inflammatory disorders, an orbital biopsy is important and useful for definitive histopathologic typing for optimal management of these conditions (Young & Chan et al., 2017).

Illustrative case 4 highlights the lesson that tumours can masquerade as infection. Around the orbit, cancers arising from the paranasal sinuses should be a differential for orbitofacial lesions. Carcinoma of the maxillary sinus is one of the neoplasms that is difficult to treat and carries a poor prognosis (Carrillo, Guemes, Ramirez-Ortega, & Onate-Ocana, 2005). The clinical presentation of carcinoma of the maxillary sinus can be highly variable, including facial asymmetry, oral cavity swelling, epistaxis, nasal obstruction or discharge, diplopia and proptosis of the eye (Waldron, O'Sullivan, Gullane, Witterick, & Liu et al., 2000). In the absence of these physical signs, the clinician may overlook the possibility of a malignant disease (Hone, O'Leary, Maguire, Burns, & Timon, 1995).

There was complete correlation for all cases under congenital orbital tumours and lacrimal gland and sac tumours that were studied, indicating that clinical and radiological findings were the most reliable for these two types of lesions. Congenital orbital tumours usually are diagnosed at a very

early age. Cavernous haemangioma, although congenital, is not usually diagnosed until the fourth or fifth decades. Hence, it may be easier to differentiate congenital tumours from other lesions.

There was significant disparity between clinical diagnosis and radiology report, however, relatively less disparity between histopathology report and clinical diagnosis. The most commonly misdiagnosed type of orbital lesion was lymphoproliferative disorders and orbital inflammation, whereas the least commonly misdiagnosed type of orbital lesion was congenital and lacrimal gland and sac tumours.

This study highlights the value of comprehensive history taking, comprehensive clinical examination and correlation with appropriate imaging study to tailor treatment planning and final management for optimal outcome, which involves coordinated investigations with radiologists and pathologists. Clinical examination and imaging studies can narrow the differential diagnosis. Diagnosis of an orbital tumour ultimately requires confirmatory histology. However, we must still keep in mind not to rely excessively on sophisticated imaging techniques such as high definition ultrasonography, computerized tomography and magnetic resonance imaging as they are of high expense to the patient. Ophthalmologists, orbital surgeons and radiologists need to be well versed with the varied radiological and histopathological features of the orbital space occupying lesions in order to embark the appropriate treatment.

The evaluation of clinicoradiopathological correlation of orbital tumours has not been well looked into and this report hopes that with these cases, it helps to shed light onto the approach to orbital tumours. In summary, there is need for detailed ophthalmic and systemic history taking, documentation of differential diagnosis and plan, communication in ordering and reviewing reports, having a high index of suspicion in atypical cases and looking at radiological images with an ophthalmic perspective. The final diagnosis should take into account the clinical, radiological and histopathological findings.

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