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Ocular manifestation of metastatic disease – a clinical radiological pictorial review

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Introduction

Ocular metastases, although a rare manifestation, represent a clinically significant complication of cancer. Our objectives included a review of the current literature on the clinical features of ocular metastases and to present the clinical radiological manifestation of ocular metastases, illustrated through clinical cases from a tertiary referral centre in the UK.

Discussion

Metastatic disease to the orbit accounts for 1-13% of orbital masses and has a 2% prevalence in cancer patients.[3] Among metastatic disease to the orbit, breast carcinoma followed by lung carcinoma are the most prevalent primary sources.[1, 4.] The pathophysiology involves haematogenous spread predominantly involving the choroid.[2] Infiltration of orbital structures such as the extraocular muscles and cranial nerves have also been described. Clinically, patients may present with diplopia, proptosis, pain, or visual impairment.[3] Symptoms can be subtle and there is a growing population of cancer patients with incidental ocular metastases detected while under surveillance.[4] Not all patients diagnosed with ocular metastases have a history of a previous primary cancer, lung carcinoma can metastasise early to the eye and therefore ophthalmic symptoms can be the first presentation of the disease.[1] Treatment options are usually radiotherapy as well as systemic treatment depending on the primary and disease extent. The radiological features of ocular metastases in selected oncology patients are demonstrated in case studies 1, 2 & 3.

Ocular adnexal lymphoma (OAL) is the most common primary orbital malignancy in adults. In comparison to other sites of extra nodal lymphoma, it is rare (accounting for less than one in ten cases). In the orbit, OAL can involve the lacrimal glands (as demonstrated in case 4), extraocular muscles or intraconal and extraconal spaces. It can also involve the conjunctiva. OAL is considered primary if it involves the ocular adnexa alone and secondary if it is accompanied by lymphoma of an identical type at another site. In contrast to ocular metastasis, OAL generally does not result in decreased vision or diplopia, instead presenting as a painless and slow growing mass causing proptosis.[5]

The approach to the orbit and its compartments (Figure A), attention to symmetry, systematic review of globe/fat/muscles/optic nerve (Figure B) and superior ophthalmic vein are important factors when formulating a radiological diagnosis along with clinical details. Inflammatory disorders should be kept in mind for the differential e.g. cellulitis particularly in immunocompromised patients.

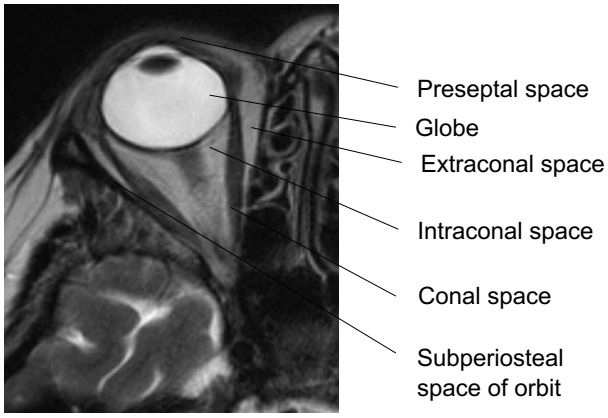

Figure A. Orbital spaces, axial cross section.

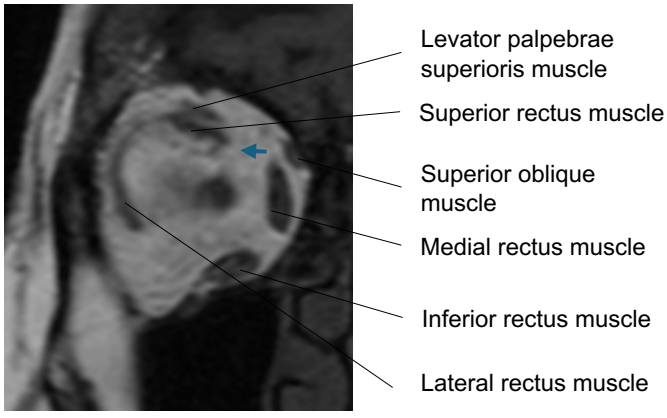

Figure B. Extraocular muscles, sagittal cross section through the mid orbit. The inferior oblique muscle not shown due to the anterior location. Superior ophthalmic vein (➡).

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Case 1: 58F with metastatic lobular breast cancer, ER/ PgR +ve, HER2 –ve

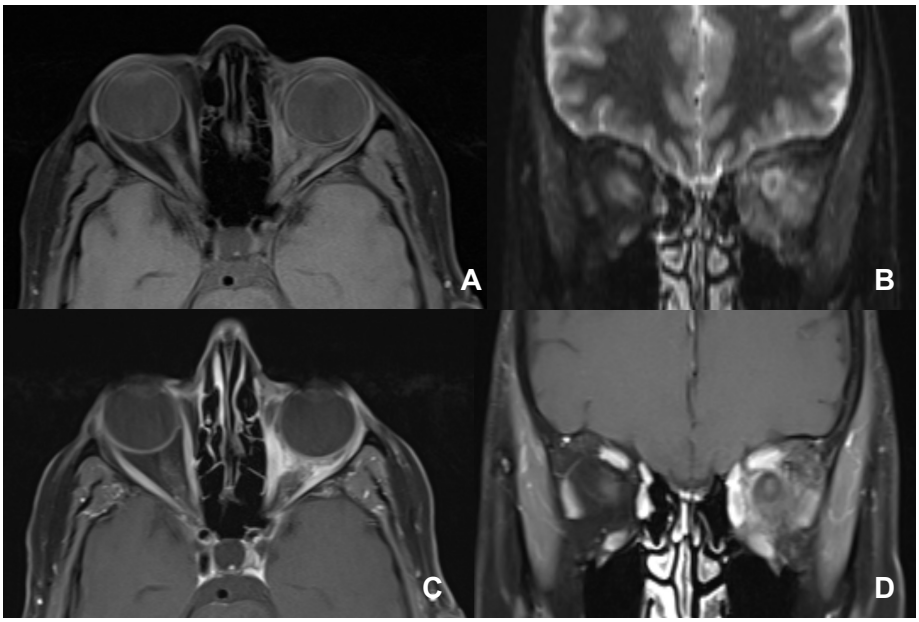

Figure 1. Malignant infiltration of the retrocrural fat in the left orbit, encasing the optic nerve. There is mild enophthalmos. Axial T1 TSE Dixon demonstrating normal homogeneous suppression of the intraconal fat in the right orbit compared to the left incomplete heterogenous suppression due to presence of tumour (A). Axial and sagittal T1 TSE Dixon post contrast with tumoural enhancement (C, D). Sagittal T2 STIR high signal showing oedema of the left intraconal fat (B).

Case 2: 65F BRCA-2 carrier with metastatic ER +ve, HER2 –ve breast cancer

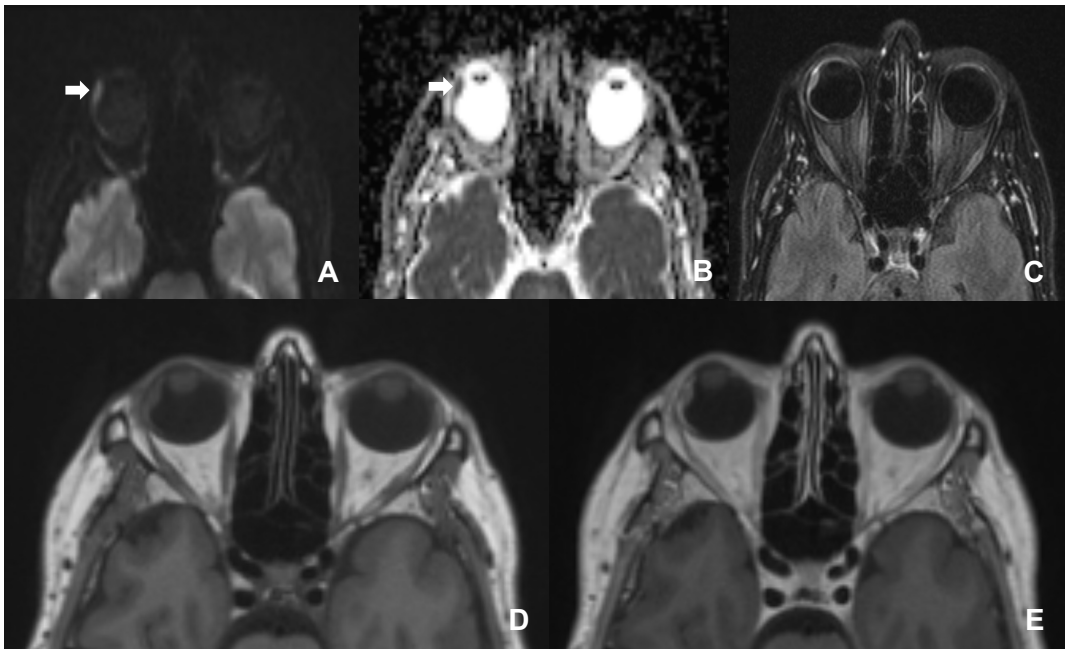

Figure 2. Choroidal right globe metastasis. Nodular curvilinear soft tissue in the inner table of the lateral aspect of the right globe (➡ showing restricted diffusion (A, B). Axial T1 SPACE with isointense soft tissue with post gadolinium enhancement (D, E). Axial T2 FLAIR TSE post gadolinium sequence highlights choroidal metastasis in good detail (C).

Case 3: 48M with metastatic melanoma

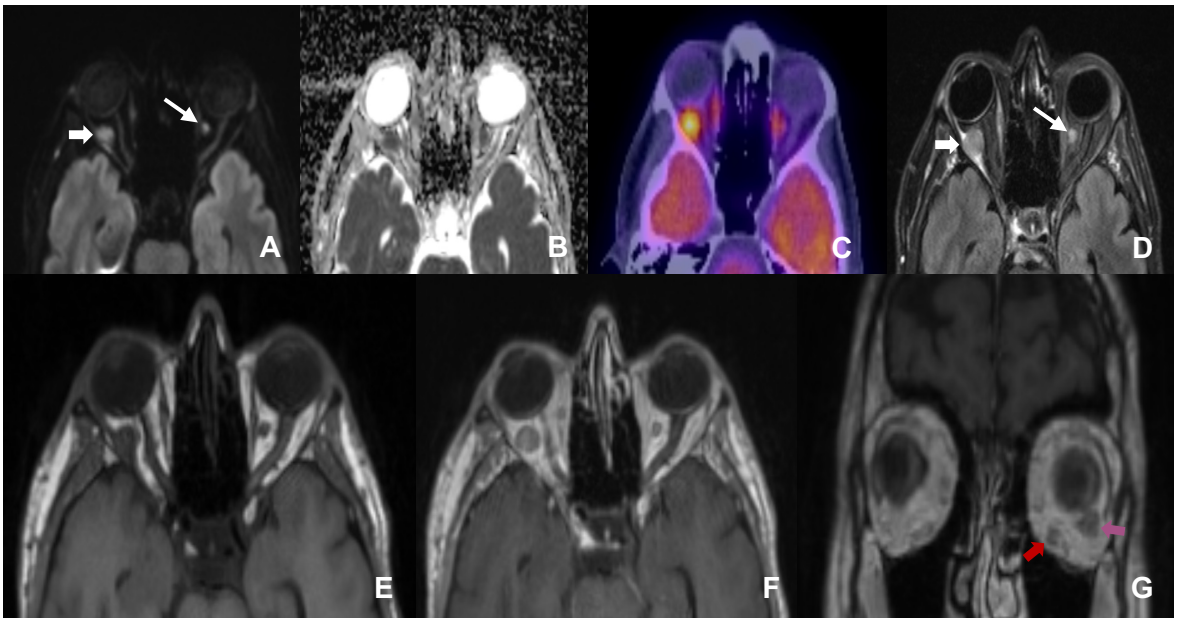

Figure 3. Multiple bilateral orbital metastatic deposits involving the ocular muscles showing restriction in the DWI sequences and post gadolinium enhancement. Right lateral rectus muscle lesion with displacement of the intraconal fat and buckling of the optic nerve (➡). Small lesion involving the right medial rectus muscle. Lesions showed restricted signal nodularity in DWI sequences (A, B). Axial T1 SPACE with deposits isointense to skeletal muscle (E), enhancement in the T2 FLAIR TSE and axial T1 SPACE (D, F) post gadolinium. Metastatic deposits in the left medial rectus (⟶), inferior oblique (➡) muscle close to the attachment to the globe and inferior rectus (➡) muscle (G). FDG PET CT with corresponding metabolically active intraorbital disease (C).

Case 4: 52F with marginal zone lymphoma involving the lacrimal gland

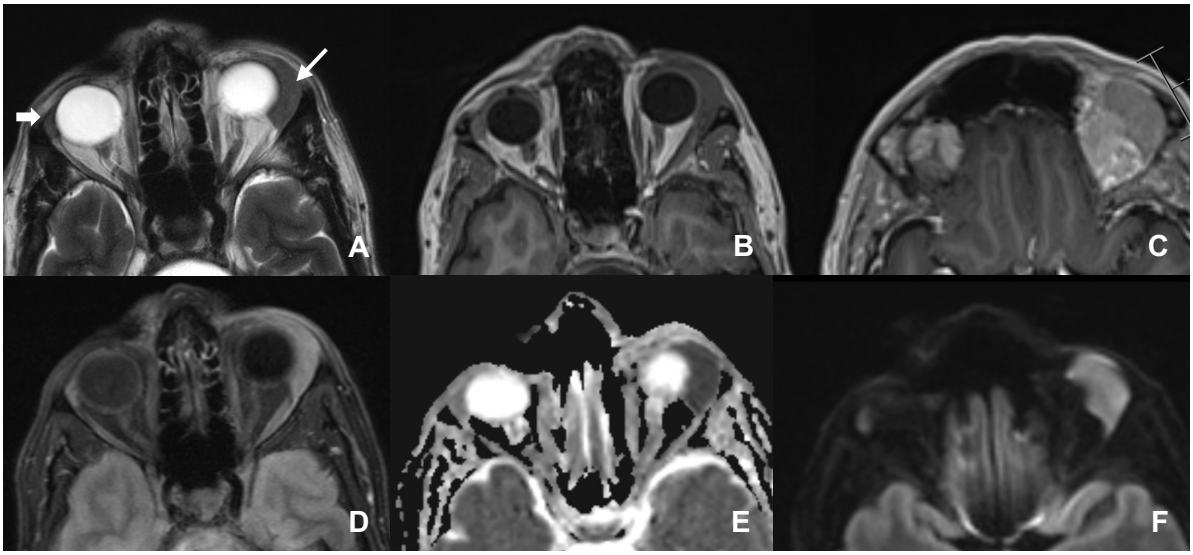

Figure 4. Axial T2w image (A) showing asymmetrical enlargement of the left lacrimal gland (⟶) versus the normal right side (➡) by homogenous intermediate T2w signal, low T1w signal soft tissue (B) which enhances uniformly post-contrast administration (C). The lesion is hyperintense on the fluid sensitive/fat saturated T2w series (D). High b-value imaging shows hyperintense signal (F) with profound hypointensity on the ADC map (E) suggesting hypercellularity.

Case 5: 30M with locally advanced nasopharyngeal cancer

Figure 5. Locally advanced right nasopharyngeal tumour filling the pterygopalatine fossa with right orbital and skull base invasion. There are soft tissue disease filling the right orbital apex with encasement of the optic nerve and proptosis.

Conclusion

Magnetic resonance imaging (MRI) provides superior soft tissue detail to delineate intraconal and extraconal structures including the ocular globe, orbital nerve and extraocular muscles. Computed tomography (CT) is readily available and provides rapid assessment of the orbit, particularly useful in assessing for bone destruction or involvement of the orbital fissures and foramina as well as assessment of the orbital and intracranial vessels (Figure 5).

These imaging modalities play a critical role in the assessment and surveillance of ocular metastatic disease. Early recognition of ophthalmic involvement can significantly improve quality of life and mitigate morbidity in Stage IV carcinomatosis.

References

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