Diagnostic Imaging Pathways - Orbital Pathology (Suspected)

Population Covered By The Guidance

This pathway provides guidance on imaging patients with traumatic and non-traumatic orbital pathology.

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Quick User Guide

Move the mouse cursor over the PINK text boxes inside the flow chart to bring up a pop up box with salient points.
Clicking on the PINK text box will bring up the full text.
The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

Pathway Diagram

Date reviewed: July 2014

Please note that this pathway is subject to review and revision.

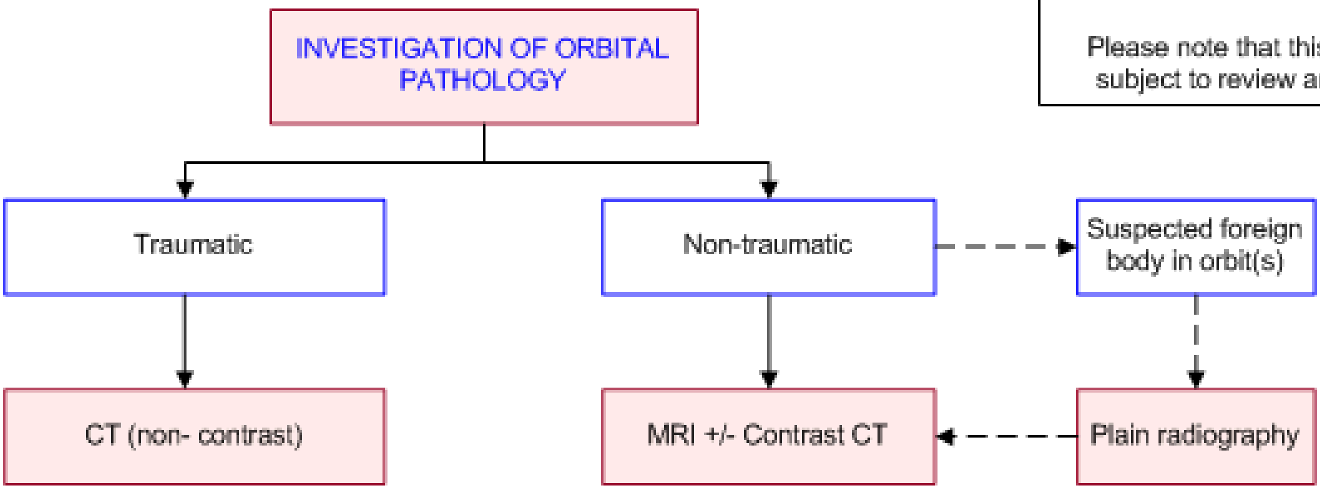
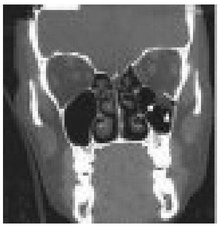


Image Gallery

Note: These images open in a new page

1



Inferior Orbital Margin Fracture with Trapping of Inferior Rectus Muscle
Image 1 - Computed Tomography
Coronal image demonstrating a traumatic fracture of the inferior orbital margin with soft tissue (arrowhead) and inferior rectus muscle (arrow) extending into fracture.

2a

Uveal Melanoma
Image 2a and 2b - Magnetic Resonance Imaging
T1 and T2-weighted images showing melanoma of the left uvea (arrow).

2b

3a

Uveal Melanoma
Image 3a - Gross pathology
Orbital enucleation showing a uveal malignant melanoma (blue arrow) arising posteriorly and causing retinal

detachment (white arrow).

3b

3c

Image 3b (H&E, x2.5) and 3c (H&E, x20) - Histopathology
Uveal malignant melanoma infiltrating beneath the retinal layer (blue arrow) and showing marked nuclear atypia with cytoplasmic and extracellular melanin pigment production.

Teaching Points

- **Plain films have a limited role in the assessment of orbital trauma**
- **If an orbital pathology is suspected clinically, CT is the imaging modality of choice. It enables superior visualisation of the bone structures of the midface and orbits**
- **MRI is a useful adjunt to CT, particularly in identifying soft tissue injury. Before a patient undergoes MRI, foreign metal in the orbit should first be excluded (on plain films or CT)**
- **In the assessment of traumatic orbital pathology CT is the modality of choice. For non-traumatic orbital pathology, MRI is the preferred imaging modality provided it is available and there are no contraindications**

Computed Tomography (CT)

- **Imaging modality of choice for investigation of orbital trauma, some inflammatory diseases, Graves' ophthalmopathy, orbital infections and suspected retinoblastoma 1,2**
- **Gives the best illustration of fine bony structures of the midface and orbits 1,2**
- **Allows detection of the orbital fractures and assessment of the extent of injury in the evaluation of patients with orbital trauma 3**
- **Has high sensitivity and specificity for the detection and localisation of intraocular and orbital metal, glass and stone foreign body 4,5**
- **Limitations**
    - **Less accurate for detection of wooden foreign bodies 6**
- **Information for consumers on CT InsideRadiology**

Magnetic Resonance Imaging (MRI)

- **Due to its superior soft tissue resolution, it is the imaging modality of choice**

for evaluating 2
  - **Ocular lesions, the optic nerve complex, cranial nerve palsies, and retrobulbar disease with potential intracranial extension 7-9**
  - **Intraocular tumours such as uveal melanoma (because of superior delineation of the extent of the disease and unique paramagnetic signal characteristics of melanin) 10,11**
- **Compared to CT, MRI allows for more accurate depiction of optic nerve or sheath tumours extending into the optic chiasm, optic tracts and lateral geniculate bodies of thalami 7,12**
- **As a predictor of multiple sclerosis, it can help to prognosticate the development of MS after optic neuritis 13**
- **MRI is valuable in the examination of the optic nerve and globe for injury and hence is a useful adjunct in the assessment of orbital injury. However, metallic fragments in the orbit should first be excluded on plain film or CT 1**
- **Advantages 1**
  - **Superior soft tissue resolution**
  - **Can distinguish the three layers of the globe (sclera, choroid and retina)**
  - **Allows for visualisation of globe components not seen on CT**
- **Limitations 1,6**
  - **A metal foreign body within the orbit is an absolute contraindication because the risk of blindness (since the fluctuating magnetic fields of a MRI machine can potentially move the ferromagnetic foreign body around the orbit damaging important structures)**
  - **Poor visualisation of the bone**
- **Information for consumers on Magnetic Resonance Imaging InsideRadiology**

Plain Radiography

- **Plays a limited role in the detailed evaluation and management of orbital disease and trauma 3,14,15**
- **May be useful in screening for intraocular foreign bodies and in detection of orbital fractures directly or through indirect findings (such as asymmetrical opacification by haemorrhage of a paranasal sinus adjacent to a particular orbital surface, and orbital emphysema) 15,16**
- **Limitations**
  - **50% rate of false negatives and non-diagnostic in 30% in the evaluation of orbital blowout fractures 3**
  - **Poor visualisation of medial orbital wall and orbital floor fractures**
- **Information for consumers on plain radiographs InsideRadiology**

References

Date of literature search: June 2014

The search methodology is available on request. Email

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. Download the document

1. **Go JL, Vu VN, Lee KJ, et al. Orbital trauma. Neuroimaging Clin N Am. 2002;12(2):311-24. (Review article).** View the reference
2. **Belden CJ, Zinreich SJ. Orbital imaging techniques. Semin Ultrasound CT MRI. 1997;18(6):413-22. (Review article).** View the reference
3. **Brady SM, McMann MA, Mazzoli RA, et al. The diagnosis and management of orbital blowout fractures: update 2001. Am J Emerg Med. 2001;19:147-54. (Level IV evidence).** View the reference
4. **Lakits A, Prokesch R, Scholda C, et al. Orbital helical computed tomography in the diagnosis and management of eye trauma. Ophthalmology. 1999;106:2330-5. (Level II/III evidence).** View the reference
5. **Gor DM, Kirsch CF, Leen J, et al. Radiologic differentiation of intraocular glass: evaluation of imaging techniques, glass types, size, and effect of intraocular haemorrhage. AJR Am J Roentgenol. 2001;177:1199-203. (Level II/III evidence).** View the reference
6. **Maya MM, Heier LA. Orbital CT: current use in the MR era. Neuroimaging Clin N Am. 1998;8(3):651-93. (Review article).** View the reference
7. **Ettl A, Kramer J, Daxer A, et al. High resolution magnetic resonance imaging of neurovascular orbital anatomy. Ophthalmology. 1997;104:869-77. (Level III evidence).** View the reference
8. **Tonami H, Tamamura H, Kimizu K, et al. Intraocular lesions in patients with systemic disease: findings on MR imaging. AJR Am J Roentgenol. 1990;154(2):385-9. (Level III evidence).** View the reference
9. **Breslau J, Dalley RW, Tsuruda JS, et al. Phased-array surface coil MR of the orbits and optic nerves. AJNR Am J Neuroradiol. 1995;16:1247-51. (Level III evidence).** View the reference
10. **Peyster RG, Augsburger JJ, Shields JA, et al. Intraocular tumors: evaluation with MR imaging. Radiology. 1988;168(3):773-9. (Level IV evidence).** View the reference
11. **Gomori JM, Grossman RI, Shields JA, et al. Choroidal melanomas: correlation of NMR spectroscopy and MR imaging. Radiology. 1986;158:443-5. (Level III evidence).** View the reference
12. **Gass A, Barker GJ, MacManus D, et al. High resolution magnetic resonance imaging of the anterior visual pathway in patients with optic neuropathies using fast spin echo and phased array local coils. J Neurol Neurosurg Psychiatry. 1995;58:562-9. (Level III evidence).** View the reference
13. **Dunker S, Wiegand W. Prognostic value of magnetic resonance imaging in monosymptomatic optic neuritis. Ophthalmology. 1996;103:1768-73. (Level III**

evidence). View the reference

14. **Mosley IF. The plain radiograph in ophthalmology: a wasteful and potentially dangerous anachronism. J Royal Soc Med. 1991;84:76-80. (Level II evidence).** View the reference
15. **Bhattacharya J, Mosley IF, Fells P. The role of plain radiography in the management of suspected orbital blow-out fractures. Br J Radiol. 1997;70:29-33. (Level III evidence).** View the reference
16. **Otto PM, Otto RA, Virapongse C, et al. Screening test for detection of metallic foreign objects in the orbit before magnetic resonance imaging. Invest Radiol. 1992;27:308-11. (Level III evidence).** View the reference

Further Reading

1. **Duvoisin B, Zanella FE, Sievers KW. Imaging of the normal and pathological orbit. Eur Radiol. 1998;8:175-188.** View the reference

Information for Consumers

Information from this website	Information from the Royal Australian and New Zealand College of Radiologists' website
Consent to Procedure or Treatment Radiation Risks of X-rays and Scans Computed Tomography (CT) Magnetic Resonance Imaging (MRI) Plain Radiography (X-ray)	Computed Tomography (CT) Contrast Medium (Gadolinium versus Iodine) Gadolinium Contrast Medium Iodine-Containing Contrast Medium Magnetic Resonance Imaging (MRI) Plain Radiography/X-rays Radiation Risk of Medical Imaging During Pregnancy

	Radiation Risk of Medical Imaging for Adults and Children

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