Orbits, Vision and Visual Loss
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Strength of Evidence
1. Goh PS, Gi MT, Charlton A, Tan C, Gangadhara Sundar JK, Amrith S. Review of orbital imaging. *Eur J Radiol* 2008; 66(3):387-395.	12	N/A	Review imaging of patients with suspected orbital disease. Article presents a diagnostic strategy based on a compartment model.	In the diagnosis of patients with orbital disease, a systematic evaluation using an anatomical compartment strategy, evaluation of imaging features, and correlation with clinical presentation and patient age are recommended.	4
2. Aviv RI, Miszkiel K. Orbital imaging: Part 2. Intraorbital pathology. *Clin Radiol* 2005; 60(3):288-307.	12	N/A	Pictorial review of common intraorbital lesions using a compartmental approach.	Knowledge of the contents of each compartment provides a cue for the differential diagnosis in each compartment.	4
3. Muller-Forell W, Pitz S. Orbital pathology. *Eur J Radiol* 2004; 49(2):105-142.	12	N/A	Review orbital pathology with emphasis on different kinds of tumors, inflammatory, vascular, and traumatic diseases. Discuss specific presentation of lesions on CT and MRI.	CT is method of choice for orbital trauma. CT enables both accurate visibility of bony and soft-tissue lesions and exact localization of (mostly ferromagnetic) foreign bodies without risk of dislocation.	4
4. Bilaniuk LT, Farber M. Imaging of developmental anomalies of the eye and the orbit. *AJNR Am J Neuroradiol* 1992; 13(2):793-803.	12	N/A	Review imaging of the orbit and eye developmental anomalies.	CT and MRI can demonstrate abnormalities.	4
5. Vaphiades MS. Imaging the neurovisual system. *Ophthalmol Clin North Am* 2004; 17(3):465-480, viii.	12	N/A	Review the neuroimaging modalities (MRI, MRA, CT, CTA, and DSA) commonly used in neuro-ophthalmology.	The difference between each technique is emphasized.	4
6. Wang S, Xiao J, Liu L, et al. Orbital floor reconstruction: a retrospective study of 21 cases. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2008; 106(3):324-330.	9	21 cases	Retrospective study to examine the diagnostic methods, therapeutic principles, surgical approach, and materials used for orbital floor reconstruction.	CT scans were 100% accurate in diagnosing the fractures. CT is the first choice of investigation for an orbital floor fractures.	3
7. Karaki M, Kobayashi R, Kobayashi E, et al. Computed tomographic evaluation of anatomic relationship between the paranasal structures and orbital contents for endoscopic endonasal transethmoidal approach to the orbit. *Neurosurgery* 2008; 63(1 Suppl 1):ONS15-19; discussion ONS19-20.	15	100 axial and CT scans	Two objectives: • To examine the anatomic relationship between the paranasal and orbital structures with the use of CT imaging and to find useful landmarks for a transethmoidal approach to the orbital retrobulbar space. • To determine a procedure to minimize the possibility of bleeding via the endonasal transethmoidal approach.	Third lamella was located posteriorly to the posterior end of the eyeball on all axial CT scans. Third lamella and ethmoid-maxillary plate are the most important anatomic landmarks for an endoscopic endonasal transethmoidal approach to the orbital retrobulbar space.	2

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8. Kahn DM, Shaw RB, Jr. Aging of the bony orbit: a three-dimensional computed tomographic study. *Aesthet Surg J* 2008; 28(3):258-264.	15	60	3-D CT study to show how specific bony aspects of the orbit change with age in both male and female subjects and what impact this may have on the techniques used in facial cosmetic surgery.	The orbital aperture width and area in both male and female subjects showed a significant increase with increasing age. Significant increase in height of the superior orbital rim medially in both genders, suggesting that the superior orbital rim receded with age in this region. The inferior orbital rim receded significantly laterally in female population, while male subjects had a recession of the entire inferior orbital rim. Results suggest bony elements of the orbit change dramatically with age, and this, coupled with soft tissue changes, can lead to the appearance of the aged eye and orbit.	2
9. Kovacs AF, Sauer SN, Stefenelli U, Klein C. Growth of the orbit after frontoorbital advancement using nonrigid suture vs rigid plate fixation technique. *J Pediatr Surg* 2008; 43(11):2075-2081.	1	16 consecutive children	Prospective randomized study to examine the difference between the rigid and nonrigid surgical fixation regarding the influence on the long-term outcome of the orbit in patients with craniosynostoses.	Long-term improvement of the orbit was achieved with absolute distances staying below norm values in all patients. Sutures providing nonrigid fixation of bone flaps seem to be feasible in reaching the aims of surgery in craniosynostotic children.	2
10. Song WK, Lew H, Yoon JS, Oh MJ, Lee SY. Role of medial orbital wall morphologic properties in orbital blow-out fractures. *Invest Ophthalmol Vis Sci* 2009; 50(2):495-499.	15	118 patients without orbital wall fracture 70 patients with medial wall fractures and 37 with inferior wall fractures	CT scans of patients with periocular trauma were reviewed to compare medial orbital wall supporting structures in patients with isolated inferior and medial wall fractures.	Patients with fewer ethmoid air cell septa and a larger lamina papyracea area per septum are more likely to develop medial wall fractures than inferior wall fractures.	2
11. Turhan-Haktanir N, Aycicek A, Haktanir A, Demir Y. Variations of supraorbital foramina in living subjects evaluated with multidetector computed tomography. *Head Neck* 2008; 30(9):1211-1215.	13	399 patients	Evaluate computer records of patients referred for CT to examine the anatomic variations of supraorbital foramina/notches in living subjects using MDCT related to age, sex, and side.	Most common presentation was single notch. Presence of double foramen/notch was higher in the right. Bilateral foramina and left notches were located more lateral in men. Notches were closer to nasion than foramina. Positive correlations were found between right and left sides for the diameters and distances to nasion. Widths of foramina showed negative correlation with the distances to nasion. MDCT may be used in preoperative evaluation.	2

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12. Conneely MF, Hacein-Bey L, Jay WM. Magnetic resonance imaging of the orbit. *Semin Ophthalmol* 2008; 23(3):179-189.	12	N/A	Review MRI of the orbit	MRI offers variety of pulse sequences, each of which exploits differences in the magnetic properties of protons in living tissue to produce contrast resolution. When optimal protocols are used, MRI contrast resolution in the orbital soft tissues is superior to other imaging modalities. MRI has the ability to select the plane of imaging, and improve safety due to the lack of ionizing radiation.	4
13. Filatova IA, Tishkova AP, Beraia MZ, Poliakova L, Tkhelidze NR. [Computed tomography in diagnosing and determining treatment policy in patients with posttraumatic pathology of the eye and orbit]. *Vestn Oftalmol* 2005; 121(6):9-14.	10	323	Retrospective study to examine the value of CT in diagnosing and determining treatment policy in patients with posttraumatic pathology of the eye and orbit.	Analysis of CT scans identified the basic groups of patients in whom this study was essential. The studies could extend indications in patients with posttraumatic lesion of the eye and orbital area for CT.	2
14. Lakits A, Prokesch R, Scholda C, Nowotny R, Kaider A, Bankier A. Helical and conventional CT in the imaging of metallic foreign bodies in the orbit. *Acta Ophthalmol Scand* 2000; 78(1):79-83.	9	24 standardized metallic foreign bodies	To compare helical CT to conventional CT imaging in the assessment of orbital metallic foreign bodies with regard to image quality, scanning time, and radiation exposure.	Helical CT is superior to conventional CT imaging, because it can provide adequate information about orbital metallic foreign bodies with a single acquisition, thus reducing both the number of examinations and the radiation exposure for the patient.	2
15. Georgouli T, Chang B, Nelson M, et al. Use of high-resolution microscopy coil MRI for depicting orbital anatomy. *Orbit* 2008; 27(2):107-114.	9	10	To examine use of high-resolution microscopy coil MRI for depicting orbital anatomy. High-resolution MRI was compared with conventional head coil MRI.	High-resolution microscopy coil MRI improves the image resolution and enables a detailed tissue depiction of the orbital and globe structures.	3
16. Balcer LJ, Liu GT, Heller G, et al. Visual loss in children with neurofibromatosis type 1 and optic pathway gliomas: relation to tumor location by magnetic resonance imaging. *Am J Ophthalmol* 2001; 131(4):442-445.	13	43 consecutive pediatric patients	Review neuro-ophthalmologic records and brain/orbital MRI scans to examine the potential for visual acuity loss, and its relation to extent and location of optic pathway gliomas in a cohort of children with neurofibromatosis type 1.	Visual loss noted in 20/43 patients (47%). Visual loss is dependent on the extent and location of the tumor by MRI and is particularly associated with involvement of postchiasmal structures.	2

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17. Kashiwagi K, Okubo T, Tsukahara S. Association of magnetic resonance imaging of anterior optic pathway with glaucomatous visual field damage and optic disc cupping. *J Glaucoma* 2004; 13(3):189-195.	13	31 glaucoma patients 23 controls	To examine the association of MRI of anterior optic pathway with glaucomatous visual field damage and optic disc cupping.	The optic nerve diameter was significantly smaller in glaucoma patients (2.25 +/- 0.33 mm) than in controls (2.47 +/- 0.24 mm) and the height of the optic chiasm was significantly shorter in glaucoma patients (2.12 +/- 0.37 mm) than in controls (2.77 +/- 0.36 mm). Glaucoma affects the anterior visual pathway anterogradely at least up to the optic chiasm, and these morphologic changes in the anterior visual pathway are correlated with glaucomatous optic nerve damage. MRI may be useful for evaluating glaucomatous damage objectively.	2
18. Sisto D, Trojano M, Vetrugno M, Trabucco T, Iliceto G, Sborgia C. Subclinical visual involvement in multiple sclerosis: a study by MRI, VEPs, frequency-doubling perimetry, standard perimetry, and contrast sensitivity. *Invest Ophthalmol Vis Sci* 2005; 46(4):1264-1268.	9	22 eyes of 11 patients	To evaluate the effectiveness of visual evoked potentials (VEPs), frequency-doubling perimetry (FDP), standard achromatic perimetry (SAP), contrast sensitivity (CS) test, and MRI, isolated or in combination, in detecting subclinical impairment of visual function in multiple sclerosis.	VEPs showed abnormal results in 12 eyes (54.4%), FDP in 11 (50%), SAP in 14 (63.6%), CS in 17 (77.1%), and MRI in 16 (72.7%). No single test detected all the abnormal eyes. Four (18.2%) eyes had pure optic nerve involvement and the remaining 16 (72.7%) had both pre- and postchiasmal involvement.	3
19. Kahana A, Lucarelli MJ, Grayev AM, Van Buren JJ, Burkat CN, Gentry LR. Noninvasive dynamic magnetic resonance angiography with Time-Resolved Imaging of Contrast KineticS (TRICKS) in the evaluation of orbital vascular lesions. *Arch Ophthalmol* 2007; 125(12):1635-1642.	14	5	Retrospective study to evaluate the clinical utility of Time-Resolved Imaging of Contrast KineticS (TRICKS) MRA in the evaluation of vascular orbital tumors.	Diagnosis was changed as a result of TRICKS MRA in 2 patients. Dynamic MRA in the form of TRICKS is a newly available imaging modality with great potential for improving the evaluation and management of patients with complex orbital tumors.	4
20. White JH, Fox AJ, Symons SP. Diagnosis and anatomic mapping of an orbital varix by computed tomographic angiography. *Am J Ophthalmol* 2005; 140(5):945-947.	14	1	Observational case report to examine the role of CTA in diagnosing an orbital varix.	CTA showed a homogeneously enhancing orbital apex lesion and provided exceptional anatomic detail of inflow and outflow veins, confirming orbital varix diagnosis.	4
21. American College of Radiology. *Manual on Contrast Media*. Available at: http://www.acr.org/SecondaryMainMenuCategories/ quality_safety/contrast_manual.aspx	15	N/A	Guidance document on contrast media to assist radiologists in recognizing and managing risks associated with the use of contrast media.	N/A	3

Evidence Table Key

Study Type Key

Numbers 1-7 are for studies of therapies while numbers 8-15 are used to describe studies of diagnostics.

1. Randomized Controlled Trial — Treatment
2. Controlled Trial
3. Observation Study
    a. Cohort
    b. Cross-sectional
    c. Case-control
4. Clinical Series
5. Case reviews
6. Anecdotes
7. Reviews

8. Randomized Controlled Trial — Diagnostic
9. Comparative Assessment
10. Clinical Assessment
11. Quantitative Review
12. Qualitative Review
13. Descriptive Study
14. Case Report
15. Other (Described in text)

Strength of Evidence Key

- Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.
- Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.
- Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.
- Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.