

**Orbits, Vision and Visual Loss
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|-----------------|---------------------|---|---|------------------|
| 1. Graves JS, Galetta SL. Acute visual loss and other neuro-ophthalmologic emergencies: management. <i>Neurol Clin.</i> 2012;30(1):75-99, viii. | Review/Other-Dx | N/A | To review the approach to acute visual loss, the abnormal optic disc, double vision, and the neuro-ophthalmologic signs of neurologic emergencies, including hydrocephalus, herniation syndromes, vascular lesions, and trauma. | No results stated in the abstract. | 4 |
| 2. Lee AG, Brazis PW, Garrity JA, White M. Imaging for neuro-ophthalmic and orbital disease. <i>Am J Ophthalmol.</i> 2004;138(5):852-862. | Review/Other-Dx | N/A | To provide an update on imaging of the brain and orbit for ophthalmologists. | Computed tomography and magnetic resonance (MR) scanning are the mainstays for the evaluation of most disorders involving the brain and orbit. Computed tomography angiography and magnetic resonance angiography are relatively newer applications that are useful for the evaluation of arterial and venous disorders. Special sequences such as fat suppression and fluid attenuation inversion recovery are useful techniques for specific ophthalmic indications. Diffusion weighted imaging and perfusion-weighted imaging are improving the evaluation of acute stroke. Functional MRI, positron emission tomography scanning and single photon emission computed tomography may provide useful information regarding brain or tumor metabolism. Magnetic resonance spectroscopy has expanded our knowledge of brain function. Newer imaging studies have improved our diagnostic abilities on many fronts, including new sequences, new applications of imaging studies, and functional imaging of brain. | 4 |
| 3. Salmela MB, Mortazavi S, Jagadeesan BD, et al. ACR Appropriateness Criteria(R) Cerebrovascular Disease. <i>J Am Coll Radiol.</i> 2017;14(5S):S34-S61. | Review/Other-Dx | N/A | To provide clinical guidelines on cerebrovascular disease. | No results stated in abstract. | 4 |
| 4. American College of Radiology. ACR Appropriateness Criteria®: Headache. Available at: https://acsearch.acr.org/docs/69482/Narrative/ . | Review/Other-Dx | N/A | Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for a specific clinical condition. | N/A | 4 |

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| 5. Goh PS, Gi MT, Charlton A, Tan C, Gangadhara Sundar JK, Amrith S. Review of orbital imaging. <i>Eur J Radiol.</i> 2008; 66(3):387-395. | Review/Other-Dx | 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 |
| 6. Conneely MF, Haccin-Bey L, Jay WM. Magnetic resonance imaging of the orbit. <i>Semin Ophthalmol.</i> 2008; 23(3):179-189. | Review/Other-Dx | 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 |
| 7. Wu AY, Jebodhsingh K, Le T, et al. Indications for orbital imaging by the oculoplastic surgeon. <i>Ophthalm Plast Reconstr Surg.</i> 2011; 27(4):260-262. | Observational-Dx | 735 patients | To determine the indications for ordering orbital imaging and the indications for ordering CT versus MRI by oculoplastic surgeons and to assess the correlation between surgeon's clinical indications for imaging and the radiologist's diagnosis. | Of 735 patients, 632 CT and 223 MRI scans were ordered, 135 of which were follow-up scans. The most common indication for CT scan was thyroid disease, followed by orbital tumors and then inflammatory disease, while the most common indication for MRI scan was orbital tumors, followed by inflammatory disease and then thyroid disease. CT scans were more commonly ordered than MRI, largely for trauma and to rule out orbital foreign body. | 4 |
| 8. Bord SP, Linden J. Trauma to the globe and orbit. <i>Emerg Med Clin North Am.</i> 2008;26(1):97-123, vi-vii. | Review/Other-Dx | N/A | To describe the aspects of the eye examination that merit special attention in the case of trauma. It then discusses the eye injuries most likely to be seen in the emergency department and their appropriate treatment | No results stated in the abstract | 4 |
| 9. Stotland MA, Do NK. Pediatric orbital fractures. <i>J Craniofac Surg.</i> 2011;22(4):1230-1235. | Review/Other-Dx | N/A | To review the epidemiology, anatomy, growth implications, pathomechanics, particular clinical features, assessment, and surgical management of pediatric orbital fractures. | No results stated in the abstract. | 4 |

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| 10. Caranci F, Cicala D, Cappabianca S, Briganti F, Brunese L, Fonio P. Orbital fractures: role of imaging. [Review]. Semin Ultrasound CT MR. 33(5):385-91, 2012 Oct. | Review/Other-Dx | N/A | To determine the role of imaging. | Computed tomography is considered the imaging modality of choice in this circumstance, as it is deemed to be the most accurate method in detecting fractures. The protocol is based on obtaining thin-section axial scans and multiplanar reformatted images, both are useful tools to guide treatment. Orbital fractures are not considered an ophthalmologic emergency unless there is visual impairment or globe injury. Surgical repair is indicated for patients who have persistent diplopia or cosmetic concerns (enophthalmos) and generally is not performed until swelling subsides 7-10 days after injury | 4 |
| 11. Hink EM, Wei LA, Durairaj VD. Clinical features and treatment of pediatric orbit fractures. Ophthal Plast Reconstr Surg. 2014;30(2):124-131. | Review/Other-Dx | 312 | To describe a series of orbital fractures and associated ophthalmic and craniofacial injuries in the pediatric population. | Five hundred ninety-one fractures in 312 patients were evaluated. There were 192 boys (62%) and 120 girls (38%) with an average age of 7.3 years (range 4 months to 16 years). Orbit fractures associated with other craniofacial fractures were more common (62%) than isolated orbit fractures (internal fractures and fractures involving the orbital rim but without extension beyond the orbit) (38%). Roof and medial wall fractures were most common (30% and 28%, respectively), followed by orbital floor (24%) and lateral wall (18%) fractures. Orbital roof fractures are the most common fracture in patients <8 years old, whereas orbital floor fractures are the most common fracture in patients older than 8 years. Eighty-seven patients (28%) underwent surgical repair. There is an increasing incidence of surgery in older patients (p = 0.02). Associated neurologic injuries were more common (23%) than associated ophthalmic injuries (20%). | 4 |

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| 12. Ong HS, Qatarnah D, Ford RL, Lingam RK, Lee V. Classification of orbital fractures using the AO/ASIF system in a population surveillance cohort of traumatic optic neuropathy. Orbit. 2014;33(4):256-262. | Observational-Dx | 25 patients. | To identify the association of craniofacial-orbital fractures with the severity of visual loss. | Twelve of the 25 patients (48%) with imaging available had adequate high resolution craniofacial CT imaging for review and classification using the Arbeitsgemeinschaft für Osteosynthesefragen/Association for the Study of Internal Fixation (AO/ASIF) system (i.e. 48 classifiable units). Three of 48 (6%) units were undisplaced (grade A), 18 of 48 (29%) units were minimally displaced (grade B), and 4 of 48 (8%) units had largely displaced (grade C) fractures. Twenty-three units (47.9%) had no fractures; 5 patients had radiological evidence of optic canal fractures. Poor visual acuities positively correlated with severity of fractures graded using the AO/ASIF classification (Spearman's rho=?0.95, p=?0.05) and number of fractured units (Spearman's rho=?1.0, p?<?0.0001). | 3 |
| 13. Schouman T, Courvoisier DS, Van Issum C, Terzic A, Scolozzi P. Can systematic computed tomographic scan assessment predict treatment decision in pure orbital floor blowout fractures? J Oral Maxillofac Surg. 2012;70(7):1627-1632. | Observational-Dx | 48 patients | To describe and evaluate the reliability and the accuracy of a specific computed tomography-based assessment in predicting treatment decisions for pure orbital floor blowout fractures (BOFs). | Forty-eight patients (24 male) were included. The patients' mean age was 49.5 years. The ratio of the fractured orbital floor, the maximal height of periorbital tissue herniation, and the muscular subscore were significant predictors in univariate analysis (P = .02, P = .006, P = .001, respectively), whereas, in a multivariate analysis, only muscular subscore remained a significant predictor (P = .003) and reached a similar predictive ability as the 3 parameters together. | 3 |

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| 14. Lakits A, Prokesh R, Scholda C, Nowotny R, Kaider A, Bankier A. Helical and conventional CT in the imaging of metallic foreign bodies in the orbit. <i>Acta Ophthalmol Scand.</i> 2000; 78(1):79-83. | Observational-Dx | 24 standardized metallic foreign bodies placed into orbit of 3 cadaver heads | 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 imaging scored statistically significantly better with regard to overall accuracy of foreign body localization and presence of beam-hardening streak artifacts from dental fillings. Conventional CT scored significantly better with regard to stair-step artifacts. The radiation dose delivered to the lens was 35.4 mGy for helical CT imaging and 73.9 mGy for conventional CT workup (axial and coronal scanning). Total scanning time was 18 seconds for helical CT axial scanning and 104 seconds for conventional CT axial and coronal scanning. 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. Lethaus B, Weigl S, Kloss-Brandstatter A, et al. Looking for landmarks in medial orbital trauma surgery. <i>Int J Oral Maxillofac Surg.</i> 2013;42(2):209-213. | Observational-Dx | 100 patients. | To identify these anatomical structures in 100 consecutive computed tomography (CT) scans and measure the distance between them. The authors investigated whether a predictable symmetry existed between the left and right side. | An anatomical variation was found in nearly every fourth patient. The authors think that these data call into question the use of the posterior ethmoid canal (PEC) and anterior ethmoid canal (AEC) as reliable surgical landmarks in medial orbital surgery. | 3 |
| 16. Shetty VS, Reis MN, Aulino JM, et al. ACR Appropriateness Criteria Head Trauma. <i>J Am Coll Radiol.</i> 2016;13(6):668-679. | Review/Other-Dx | N/A | Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for head trauma. | No results stated in abstract. | 4 |

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|---|------------------|-------------------------------------|---|--|------------------|
| 17. Bodanapally UK, Shanmuganathan K, Shin RK, et al. Hyperintense Optic Nerve due to Diffusion Restriction: Diffusion-Weighted Imaging in Traumatic Optic Neuropathy. AJNR Am J Neuroradiol. 2015;36(8):1536-1541. | Observational-Dx | 29 patients | To evaluate optic nerve hyperintensity on diffusion-weighted imaging, we compared the group differences of apparent diffusion coefficient (ADC) values between the injured and uninjured contralateral nerve and identified the relation between measured ADC values and admission visual acuity. | Hyperintensity of the optic nerve was demonstrated in 8 of the 29 patients, with a sensitivity of 27.6% (95% CI, 12.8-47.2) and a specificity of 100% (95% CI, 87.9-100). ADC values were obtained in 25 patients. The mean ADC in the posterior segment of the injured nerve was significantly lower than that in the contralateral uninjured nerve (Welch ANOVA, F = 9.7, P = .003). There was a moderate-to-strong correlation between low ADC values and poor visual acuity in 10 patients in whom visual acuity could be obtained at admission (R = 0.7, P = .02). Patients with optic nerve hyperintensity presented with worse visual acuity. | 2 |
| 18. Bolanos Gil de Montes F, Perez Resinas FM, Rodriguez Garcia M, Gonzalez Ortiz M. Exophthalmometry in Mexican adults. Rev Invest Clin. 1999;51(6):341-343. | Review/Other-Dx | 301 patients | To measure the Ocular protrusion values using Hertel's exophthalmometer in 301 randomly selected normal adult subjects (185 females and 116 males), mean age 36 +/- 8.6 years, without known history of ocular trauma, surgery, endocrine disease or any ocular pathologic process. | The mean protrusion value was 15.18 +/- 2.16 mm for males and 14.82 +/- 1.98 mm for females. (p = NS). The distance between the lateral orbital rims was 97.78 +/- 3.97 mm for males and 94.33 +/- 1.98 mm for females (p < 0.001). We found a statistically significant difference between the values found in Mexican adults and those of American white and black subjects with enough data to make statistical calculations | 4 |
| 19. de Juan E, Jr., Hurley DP, Sapira JD. Racial differences in normal values of proptosis. Arch Intern Med. 1980;140(9):1230-1231. | Review/Other-Dx | 727 adults(402 black and 325 white) | Measurement of proptosis was made with a Luedde exophthalmometer by one experimenter in 402 black and 325 white adults without endocrine disease or obvious orbital pathologic conditions. | Black subjects had significantly higher values of proptosis than white subjects. It is suggested that the following "upper limits of normal" be used when clinically estimating proptosis: 19 and 21 mm for white female and male patients, respectively; and 23 and 24 mm for black female and male patients, respectively. | 4 |

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| 20. Chen CC, Chang PC, Shy CG, Chen WS, Hung HC. CT angiography and MR angiography in the evaluation of carotid cavernous sinus fistula prior to embolization: a comparison of techniques. <i>AJNR Am J Neuroradiol.</i> 2005;26(9):2349-2356. | Observational-Dx | 53 patients | To compared CT angiography (CTA), MR angiography (MRA), and digital subtraction angiography (DSA) in elucidating the size and location of carotid cavernous sinus fistulas (CCFs) before embolization treatment. | CTA did not differ significantly from DSA (P = .155), and both CTA (P = .001) and DSA (P = .007) performed significantly better than MRA in the population as a whole. Differences in performance among the methods, however, depended upon the segmental location of the fistula along the internal carotid artery (ICA). CTA and MRA were similar in detection of CCFs in patients with a fistula at segment 3. CTA significantly outperformed MRA in patients with a fistula at segment 4, who accounted for approximately half of the population. | 3 |
| 21. Bilaniuk LT, Farber M. Imaging of developmental anomalies of the eye and the orbit. <i>AJNR Am J Neuroradiol.</i> 1992; 13(2):793-803. | Review/Other-Dx | N/A | Review imaging of the orbit and eye developmental anomalies. | CT and MRI can demonstrate abnormalities. | 4 |
| 22. Burns NS, Iyer RS, Robinson AJ, Chapman T. Diagnostic imaging of fetal and pediatric orbital abnormalities. <i>AJR Am J Roentgenol.</i> 2013;201(6):W797-808. | Review/Other-Dx | N/A | To discuss the orbital anatomy and a simple compartmental approach to evaluating the orbit on diagnostic imaging. The characteristic findings of key fetal structural diseases and a wide spectrum of pediatric orbital disorders, including inflammatory disorders and developmental lesions, and the differential diagnosis of benign versus malignant masses will be discussed. | No results stated in the abstract. | 4 |
| 23. Holmes S. Reoperative orbital trauma: management of posttraumatic enophthalmos and aberrant eye position. <i>Oral Maxillofac Surg Clin North Am.</i> 2011;23(1):17-29, v. | Review/Other-Dx | N/A | To discuss the management of posttraumatic enophthalmos and aberrant eye position. | No results stated in abstract. | 4 |
| 24. Martinez-Capoccioni G, Varela-Martinez E, Martin-Martin C. Silent sinus syndrome an acquired condition and the essential role of otorhinolaryngologist consultation: a retrospective study. <i>Eur Arch Otorhinolaryngol.</i> 2016;273(10):3183-3188. | Observational-Dx | 20 patients | The aim of this study was to present an SSS diagnostic feature and evaluate the relationship between nasal septum deviation and maxillary sinus volume. | There was no statistical difference between gender and the presence of SSS. Maxillary sinus sizes were significantly smaller on the same side as the deviation (p < 0.01). 14 patients were treated with functional endoscopic sinus surgery (FESS) with maxillary antrostomy. We concluded that patients with SSS usually present with facial asymmetry, and the best approach to document and show all facial asymmetries for these patients are the frontal and crano-caudal photographs. | 4 |

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| 25. Balmer A, Munier F. Differential diagnosis of leukocoria and strabismus, first presenting signs of retinoblastoma. Clin Ophthalmol. 2007;1(4):431-439. | Review/Other-Dx | N/A | To review the differential diagnosis of leukocoria and strabismus, first presenting signs of retinoblastoma. | No results stated in abstract. | 4 |
| 26. Howard GM, Ellsworth RM. Differential diagnosis of retinoblastoma. A statistical survey of 500 children. I. Relative frequency of the lesions which simulate retinoblastoma. Am J Ophthalmol. 1965;60(4):610-618. | Review/Other-Dx | 500 children | No abstract available | No results stated. | 4 |
| 27. Jakobiec FA, Tso MO, Zimmerman LE, Danis P. Retinoblastoma and intracranial malignancy. Cancer. 1977;39(5):2048-2058. | Review/Other-Tx | 2 cases | To review and describe the occurrence of independent brain tumors in two patients with retinoblastoma. | Patients who develop symptoms of a brain tumor after a prolonged interval since the treatment of their ocular tumors should be suspected of harboring a second intracranial primary. | 4 |
| 28. Kaufman LM, Mafee MF, Song CD. Retinoblastoma and simulating lesions. Role of CT, MR imaging and use of Gd-DTPA contrast enhancement. Radiol Clin North Am. 1998;36(6):1101-1117. | Review/Other-Dx | N/A | To determine the role of CT, MR imaging and use of Gd-DTPA contrast enhancement. | No results stated in the abstract. | 4 |
| 29. Muller-Forell W, Pitz S. Orbital pathology. Eur J Radiol. 2004; 49(2):105-142. | Review/Other-Dx | 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 |
| 30. Rauschecker AM, Patel CV, Yeom KW, et al. High-resolution MR imaging of the orbit in patients with retinoblastoma. Radiographics. 2012;32(5):1307-1326. | Review/Other-Dx | N/A | To review a high resolution MR imaging of the orbit in patients with retinoblastoma | Diagnosis and treatment of retinoblastoma involve a multidisciplinary approach, for which imaging is a vital component. Increasing awareness and concerns about the effects of radiation in patients with retinoblastoma have led to a shift away from external-beam radiation therapy and toward chemotherapy and locoregional treatment, as well as the establishment of magnetic resonance imaging as the most important imaging modality for diagnosis, staging, and treatment monitoring | 4 |

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| 31. Hiwatashi A, Yoshiura T, Togao O, et al. Diffusivity of intraorbital lymphoma vs. IgG4-related DISEASE: 3D turbo field echo with diffusion-sensitised driven-equilibrium preparation technique. Eur Radiol. 2014;24(3):581-586. | Observational-Dx | 15 adults | To differentiate intraorbital lymphoma from immunoglobulin G4-related disease (IgG4-RD) using the apparent diffusion coefficient (ADC) derived from DSDE-TFE. | Intraorbital lesions were clearly visualised on DSDE-TFE without obvious geometrical distortion. The ADC of lymphoma ($1.25 \pm 0.50 \times 10^{-3}$ mm ² /s; mean \pm standard deviation) was significantly lower than that of IgG4-RD ($1.67 \pm 0.84 \times 10^{-3}$ mm ² /s; $P < 0.05$). Conventional sequences could not separate lymphoma from IgG4-RD (0.93 ± 0.18 vs. 0.94 ± 0.21 on T1-weighted images, 0.92 ± 0.17 vs. 0.95 ± 0.14 on T2-weighted images and 2.03 ± 0.35 vs. 2.30 ± 0.58 on postcontrast T1-weighted images, for lymphoma and IgG4-RD, respectively; $P > 0.05$). ROC analysis showed the best diagnostic performance with ADC | 4 |
| 32. Le Moli R, Pluchino A, Muscia V, et al. Graves' orbitopathy: extraocular muscle/total orbit area ratio is positively related to the Clinical Activity Score. Eur J Ophthalmol. 2012;22(3):301-308. | Observational-Dx | 55 adults (23 control subjects and 32 with Graves orbits) | To investigate longitudinally the extraocular muscle (EOM) in patients with Graves' orbitopathy (GO) and their relationship with clinical activity. | Orbital EOM coronal area (CA)/ total orbit coronal area (TOA) ratio (OM/TOA ratio) after 18 months decreased in most patients with Graves' ophthalmopathy (GO), indicating that EOM area decrement contributed significantly to orbit EMO (OM)/ total orbit coronal area (TOA) ratio reduction. Clinical Activity Score decrease was significantly correlated to the OM/TOA ratio decrease. | 3 |

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| 33. Weis E, Heran MK, Jhamb A, et al. Quantitative computed tomographic predictors of compressive optic neuropathy in patients with thyroid orbitopathy: a volumetric analysis. <i>Ophthalmology</i> . 2012;119(10):2174-2178. | Observational-Dx | 198 orbits from 99 patients. | To evaluate the relationship between orbital bony geometry and the volume of the intraorbital structures in predicting compressive dysthyroid optic neuropathy (DON). | Significant volumetric univariate predictors of compressive optic neuropathy included medial rectus volume (P = 0.005), lateral rectus volume (P = 0.011), superior muscle group volume (P = 0.04), and total rectus muscle volume (P = 0.015). Inferior rectus muscle volume, orbital volume, bony orbital apex angle, globe diameter, and bony medial wall contour were not associated with optic neuropathy. Multivariate modeling found medial rectus volume the only independently significant predictor. Univariate modeling of simple rectus diameter measurements found medial rectus axial diameter (P = 0.003) and total recti diameter (P = 0.016) predictive of optic neuropathy. Lateral rectus, superior rectus, and inferior rectus diameters were not predictive. Multivariate modeling found only medial rectus diameter to be a significant independent predictor of optic neuropathy. The area under the receiver operating characteristic curve was not different between the volumetric and rectus diameter curves. | 3 |
| 34. Wu W, Selva D, Bian Y, et al. Endoscopic medial orbital fat decompression for proptosis in type 1 graves orbitopathy. <i>Am J Ophthalmol</i> . 2015;159(2):277-284. | Review/Other-Dx | 108 patients (206 orbits) | To describe the surgical technique for endoscopic medial orbital fat decompression in type 1 (lipogenic) Graves orbitopathy and report outcomes | The mean surgical time was 97.7 ± 16.7 minutes (67-136 minutes). The mean follow-up was 16.0 ± 4.2 months (12-24 months). Preoperative and postoperative proptosis values at final review were 21.1 ± 2.3 mm (17-26 mm) and 13.0 ± 0.9 mm (12-15 mm), respectively (P < .001). Median reduction in proptosis was 8.0 mm with mean of 8.2 ± 1.8 mm (4-11 mm). Symmetry to within 2 mm was achieved in 106 of 108 patients (98.1%). Twenty-five of 108 patients (23.1%) had diplopia within 30-degree visual field of the gaze, and 23 of these had complete resolution within 3 months, while the remaining 2 patients required squint surgery. | 4 |

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| 35. 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. | Review/Other-Dx | 5 patients(4 adults and 1 child) | Retrospective study to evaluate the clinical utility of Time-Resolved Imaging of Contrast KineticS (TRICKS) MRA in the evaluation of vascular orbital tumors. | 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 |
| 36. Poon CS, Sze G, Johnson MH. Orbital lesions: differentiating vascular and nonvascular etiologic factors. AJR. 2008; 190(4):956-965. | Review/Other-Dx | 6 cases | To illustrate how attention to vascular anatomic features and blood flow patterns can facilitate the diagnosis of an orbital lesion. | Accuracy of radiologic diagnosis can be improved by an understanding of orbital vascular anatomy and blood flow patterns and with optimal use of imaging techniques. | 4 |
| 37. Tan AC, Farooqui S, Li X, et al. Ocular manifestations and the clinical course of carotid cavernous sinus fistulas in Asian patients. Orbit. 2014;33(1):45-51 | Observational-Dx | 45 patients | To study the clinical course with regard to both the angiographic and visual outcomes of carotid cavernous fistulas (CCFs). | 45 patients who had confirmed CCF on conventional cerebral angiography were included. Anterior draining CCFs presented with orbital congestion while posterior draining CCFs presented with pain, diplopia and cranial nerve palsies. Mild residual symptoms were still present in 85% of treated direct CCFs despite complete angiographic closure however 52% of treated dural CCFs had complete resolution of symptoms despite only half of those achieving angiographic closure. Treated and untreated dural CCFs had similar outcomes (87% versus 76% recovered or improved (p>?>0.05)). Poor outcomes can result from residual diplopia or vision loss from complications of the CCF itself (e.g. compressive optic neuropathy, glaucoma, retinopathy) or complications from CCF embolization treatment (e.g. central retinal artery occlusion). | 3 |
| 38. Chandler JR, Langenbrunner DJ, Stevens ER. The pathogenesis of orbital complications in acute sinusitis. Laryngoscope. 1970;80(9):1414-1428. | Review/Other-Dx | N/A | To review the pathogenesis of orbital complications in acute sinusitis. | No results stated in abstract. | 4 |

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| 39. Andrew N, Kearney D, Selva D. IgG4-related orbital disease: a meta-analysis and review. <i>Acta Ophthalmol.</i> 2013;91(8):694-700. | Meta-analysis | N/A | To conduct the meta-analysis study of published cases and to reveal the several differences between Immunoglobulin G4-related diseases (IgG4-RD) affecting the orbit and that affecting the pancreas. | IgG4-related orbital disease (IgG4-ROD) affects a slightly younger group of patients, affects men and women approximately equally, is commonly associated with salivary gland lesions, is associated with a relatively higher serum IgG4 and may confer an increased risk of non-Hodgkin Lymphoma. Its pathogenesis may involve an immune response to antigen exposure in the upper aerodigestive tract. | M |
| 40. Deschamps R, Deschamps L, Depaz R, et al. High prevalence of IgG4-related lymphoplasmacytic infiltrative disorder in 25 patients with orbital inflammation: a retrospective case series. <i>Br J Ophthalmol.</i> 2013;97(8):999-1004. | Review/Other-Dx | 25 patients | To evaluate retrospectively the prevalence of positive Immunoglobulin G4-immunostaining (IgG4) in orbital tissue of patients with idiopathic orbital inflammation and to compare the clinical, radiographic and pathologic features among patients with and without IgG4-positive cells. | Immunohistochemical staining showed 10 cases (40%) were IgG4 positive. The symptoms and signs included eyelid or periocular swelling/mass in all, pain (3/10), extraocular muscle restriction (3/10), proptosis (5/10) and/or decreased vision (4/10). Demographic and clinical findings of these patients did not differ from those with IgG4-negative cells. The presence of positive IgG4-immunostaining in orbital tissue was significantly associated with characteristic pathological features (more background fibrosis, lymphoid hyperplasia, plasma cells and phlebitis). | 4 |
| 41. Plaza JA, Garrity JA, Dogan A, Ananthamurthy A, Witzig TE, Salomao DR. Orbital inflammation with IgG4-positive plasma cells: manifestation of IgG4 systemic disease. <i>Arch Ophthalmol.</i> 2011;129(4):421-428. | Review/Other-Tx | 21 patients | To describe clinical, radiographic, and morphologic findings in patients with Immunoglobulin G4 (IgG4)-positive cells present on orbital biopsy specimens. | Of 21 patients, 11 had increased IgG4-positive cells (defined as >10 cells on biopsy). Symptoms included eyelid or periocular swelling (8 patients) or proptosis (3 patients), with bilateral involvement in 6 patients. Computed tomographic imaging displayed lacrimal gland mass in 10 patients; 6 patients had lesions in other organs. Two patients had increased serum IgG4 levels. In 10 patients without IgG4-positive cells (<=10 cells on biopsy), 6 had proptosis, 1 had eyelid swelling, 2 had eyelid mass, and 1 had diplopia, all unilateral. None had systemic symptoms. Patients with IgG4-positive cells had longer symptom duration, and their biopsy specimens showed more background fibrosis, lymphoid hyperplasia, plasma cells, and eosinophils. | 4 |

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|---|-----------------|--|---|---|------------------|
| 42. De Wyngaert R, Casteels I, Demaerel P. Orbital and anterior visual pathway infection and inflammation. <i>Neuroradiology</i> . 2009;51(6):385-396. | Review/Other-Dx | N/A | To review the Orbital and anterior visual pathway | The diagnosis and differential diagnosis of inflammation is more challenging. Differentiating inflammation from lymphoproliferative diseases and tumours can be difficult. | 4 |
| 43. Lee AG, Johnson MC, Policeni BA, Smoker WR. Imaging for neuro-ophthalmic and orbital disease - a review. <i>Clin Exp Ophthalmol</i> . 2009;37(1):30-53. | Review/Other-Tx | N/A | To review (i) the basic mechanics, indications and contraindications for cranial and orbital computed tomography and magnetic resonance (MR) imaging; (ii) the utility and indications for intravenous contrast, (iii) the use of specific MR sequences; (iv) the techniques and ophthalmic indications for computed tomography/MR angiography and venography; and (v) the techniques and indications for functional MR imaging, positron emission tomography scanning and single photon emission computed tomography | No results stated in abstract. | 4 |
| 44. Ketenci I, Unlu Y, Vural A, Dogan H, Sahin MI, Tuncer E. Approaches to subperiosteal orbital abscesses. <i>Eur Arch Otorhinolaryngol</i> . 2013;270(4):1317-1327. | Review/Other-Dx | 36 females (13 females aged from 3 to 76) | To evaluate the epidemiology, clinical features, management and complications of subperiosteal orbital abscesses (SPOA)-a serious complication of rhinosinusitis. | Patients were analyzed in terms of age, gender, clinical features, CT findings, surgical procedures, microbiology, and complications. Twenty-three males and 13 females aged from 3 to 76 were evaluated. Nine patients-seven of which were under the age of 10-with small medial SPOA were treated only with medical management. Of the 13 with medial SPOA, transnasal endoscopic approach was performed for 10 and external approach for 3 to drain the abscess. As for the 12 patients with superior SPOA, 8 were treated via combined approach and 4 via external approach. The most common microorganisms were streptococci in children and anaerobes in adults. Total loss of vision developed in two adults with diabetes mellitus (DM). One patient with superior SPOA died due to frontal lobe abscess. | 4 |

**Orbits, Vision and Visual Loss
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|---------------------|--|---|------------------|
| 45. Le TD, Liu ES, Adatia FA, Buncic JR, Blaser S. The effect of adding orbital computed tomography findings to the Chandler criteria for classifying pediatric orbital cellulitis in predicting which patients will require surgical intervention. J AAPOS. 2014;18(3):271-277. | Observational-Dx | 75 males | To assess the effect of adding orbital computerized tomography (CT) findings to the Chandler criteria for classifying pediatric orbital cellulitis in predicting which patients will require surgical intervention. | Of 101 cases of orbital cellulitis, 71 (mean age, 7.1 ± 4.0) were successfully managed with systemic antibiotics alone; 30 patients (mean age, 7.2 ± 4.3) required surgical intervention. Bony destruction on CT was significantly associated with surgical intervention (P = 0.02), and the size of the subperiosteal abscess (SPA) was significantly correlated with management outcome. Patients who were managed with systemic antibiotics alone had a mean SPA volume of 2.1 ± 2.4 mL; those who had undergone surgical intervention had a mean SPA volume of 14.3 mL ± 16.8 mL (P < 0.0001). If SPA volume is <3.8 mL, then the probability of surgery is 12%; if SPA is >3.8 mL, the probability of surgery is 71% (P < 0.0001). | 3 |
| 46. Piromchai P, Thanaviratnanich S. Invasive fungal rhinosinusitis versus bacterial rhinosinusitis with orbital complications: a case-control study. ScientificWorldJournal. 2013;2013:453297. | Review/Other-Dx | 100 adult males | To determine the risk factors, presentations, clinical, and imaging findings that could help increase the awareness of symptoms derived from invasive fungal rhinosinusitis with orbital complications that require urgent intervention. | Sixty-five patients were diagnosed with Invasive fungal rhinosinusitis with orbital complications (IFSwoC), while the other thirty-five patients composed the control group. The most important risk factor for IFSwoC was diabetes mellitus. Visual loss and diplopia were the significant symptom predictors. The significant clinical predictors were nasal crust, oculomotor nerve, and optic nerve involvement. The computed tomography (CT) findings of IFSwoC were sinus wall erosion and hyperdensity lesions. The mortality rate was 25.71 percent in the IFSwoC group and 3.17 percent in the control group. | 4 |

**Orbits, Vision and Visual Loss
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|-------------------------|---|--|------------------|
| 47. Chandrasekharan R, Thomas M, Rupa V. Comparative study of orbital involvement in invasive and non-invasive fungal sinusitis. J Laryngol Otol. 2012;126(2):152-158. | Observational-Dx | 100 cases | To investigate differences in orbital involvement in patients with invasive versus non-invasive fungal sinusitis. | Clinical orbital involvement was more common in invasive (73.5 per cent) than non-invasive (12.1 per cent) fungal sinusitis (p = 0.000). Computed tomography scanning showed similar orbital involvement in both groups, except for erosion of the floor of the orbit, which was more common in patients with invasive fungal sinusitis (p = 0.01). Extra-ocular muscle enlargement (44.4 vs 4 per cent, p = 0.01) and optic atrophy (44.4 vs 0 per cent, p = 0.003) were more common in chronic than acute invasive fungal sinusitis. Four patients (16 per cent) with acute invasive fungal sinusitis had no evidence of orbital involvement on scanning, despite clinical evidence of optic atrophy. | 3 |
| 48. Ding ZX, Lip G, Chong V. Idiopathic orbital pseudotumour. Clin Radiol. 2011;66(9):886-892. | Review/Other-Tx | N/A | To investigate orbital disease using computed tomography (CT) and magnetic resonance imaging (MRI) | No results stated in the abstract | 4 |
| 49. Aalokken TM, Hagtvedt T, Dalen I, Kolbenstvedt A. Conventional sinus radiography compared with CT in the diagnosis of acute sinusitis. Dentomaxillofac Radiol. 2003;32(1):60-62. | Observational-Dx | 47 consecutive patients | Prospective study to evaluate the accuracy of radiography in patients with clinical suspicion of acute sinusitis, using standard CT as a gold standard. | Specificity of radiographic examination was high, but sensitivity was low except for the maxillary sinus (sensitivity 80%). The sensitivity of radiography for detecting sinus opacifications was unacceptably low for the ethmoid, frontal and sphenoid sinuses. | 2 |
| 50. Optic Neuritis Study Group. Multiple sclerosis risk after optic neuritis: final optic neuritis treatment trial follow-up. Arch Neurol. 2008;65(6):727-732. | Observational-Dx | 389 adults | To assess the risk of developing multiple sclerosis (MS) after optic neuritis and the factors predictive of high and low risk | The cumulative probability of developing MS by 15 years after onset of optic neuritis was 50% (95% confidence interval, 44%-56%) and strongly related to presence of lesions on a baseline non-contrast-enhanced magnetic resonance imaging (MRI) of the brain. Twenty-five percent of patients with no lesions on baseline brain MRI developed MS during follow-up compared with 72% of patients with 1 or more lesions. After 10 years, the risk of developing MS was very low for patients without baseline lesions but remained substantial for those with lesions. Among patients without lesions on MRI, baseline factors associated with a substantially lower risk for MS included male sex, optic disc swelling, and certain atypical features of optic neuritis. | 1 |

Orbits, Vision and Visual Loss
EVIDENCE TABLE

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|------------------------|---|---|------------------|
| 51. Polman CH, Reingold SC, Banwell B, et al. Diagnostic criteria for multiple sclerosis: 2010 revisions to the McDonald criteria. <i>Ann Neurol.</i> 2011;69(2):292-302. | Review/Other-Tx | N/A | To discuss the diagnostic criteria for multiple sclerosis: 2010 revisions to the McDonald criteria. | No results stated in abstract. | 4 |
| 52. 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. <i>Invest Ophthalmol Vis Sci.</i> 2005; 46(4):1264-1268. | Observational-Dx | 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%). In only two (9.1%) eyes of the same patient was no abnormality found. 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. In patients affected by clinically definite multiple sclerosis without history of optic neuritis and no visual symptoms, there is a large prevalence of visual pathway involvement that can be diagnosed only by performing multiple tests. The comparison of the tests is also useful to detect the presence of multiple lesions in the same patient. | 3 |
| 53. Filippi M, Rocca MA, Ciccarelli O, et al. MRI criteria for the diagnosis of multiple sclerosis: MAGNIMS consensus guidelines. <i>Lancet Neurol.</i> 2016;15(3):292-303. | Review/Other-Dx | N/A | To provide consensus guidelines for the magnetic resonance imaging (MRI) criteria in the diagnosis of multiple sclerosis. | No results stated in abstract. | 4 |
| 54. Pittock SJ, Lennon VA, Krecke K, Wingerchuk DM, Lucchinetti CF, Weinshenker BG. Brain abnormalities in neuromyelitis optica. <i>Arch Neurol.</i> 2006;63(3):390-396. | Observational-Dx | 60 patients | To describe the magnetic resonance image (MRI) brain findings in neuromyelitis optica (NMO). | Sixty patients (53 women [88%]) fulfilled these inclusion criteria. The mean +/- SD age at onset was 37.2 +/- 18.4 years and the mean +/- SD duration of follow-up was 6.0 +/- 5.6 years. Neuromyelitis optica-IgG was detected in 41 patients (68%). Brain MRI lesions were detected in 36 patients (60%). Most were nonspecific, but 6 patients (10%) had multiple sclerosis-like lesions, usually asymptomatic. Another 5 patients (8%), mostly children, had diencephalic, brainstem or cerebral lesions, atypical for multiple sclerosis. When present, symptoms of brain involvement were subtle, except in 1 patient who was comatose and had large cerebral lesions. | 3 |

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EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|---------------------|---|---|------------------|
| 55. Takahashi T, Fujihara K, Nakashima I, et al. Anti-aquaporin-4 antibody is involved in the pathogenesis of NMO: a study on antibody titre. Brain. 2007;130(Pt 5):1235-1243. | Observational-Dx | 148 patients | To analyse the relation of anti aquaporin-4 (AQP4) antibody titres and clinical and laboratory parameters | The sensitivity of anti-AQP4 antibody assay was 91% (95% CI 79-100) for Neuromyelitis optica (NMO) and 85% (65-100) for high-risk syndrome, and the specificity was 100% (91-100) for NMO and high-risk syndrome, that is, none with the other disorders was positive. Among 21 anti-AQP4 antibody-positive cases whose NMO- immunoglobulin (IgG) were tested, 15 were NMO-IgG-positive and 6 were NMO-IgG-negative. Higher anti-AQP4 antibody titres were associated with complete blindness and extensive or large cerebral lesions on MRI. The lengths of spinal cord lesions on MRI were positively correlated with the titres of anti-AQP4 antibody at the nadir of exacerbations. A few patients who had short (approx. one to two vertebral segments) spinal cord lesions on MRI were also seropositive with low anti-AQP4 antibody titres, but did have other clinical and MRI features of NMO. Anti-AQP4 antibody titres became lower after high-dose methylprednisolone, and a follow-up showed anti-AQP4 antibody titres remained low in relapse-free periods under immunosuppression. Cerebrospinal fluid (CSF)-anti-AQP4 antibody was detected when the serum-antibody titres exceeded 512x, at the ratio of 1 (CSF) to 500 (serum). Using a sensitive assay, the results of the present study suggest that NMO and high-risk syndrome may be essentially anti-AQP4 antibody-associated disorders, and that the anti-AQP4 antibody titres have significant clinical and immunological implications in NMO. | 3 |

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EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|-----------------|---------------------|--|--|------------------|
| 56. Fiedorowicz M, Dyda W, Rejdak R, Grieb P. Magnetic resonance in studies of glaucoma. Med Sci Monit. 2011; 17(10):RA227-232. | Review/Other-Dx | N/A | Review data on the MR evaluation of the visual pathway and the use of MR techniques in the study of glaucoma, both in humans and in animal models. | These studies demonstrated decreases in optic nerve diameter, localized white matter loss and decrease in visual cortex density. Studies on rats employing manganese-enhanced MRI showed that axonal transport in the optic nerve is affected. Diffusion tensor MRI revealed signs of degeneration of the optic pathway. Functional MRI showed decreased response of the visual cortex after stimulation of the glaucomatous eye. Magnetic resonance spectroscopy demonstrated changes in metabolite levels in the visual cortex in a rat model of glaucoma, although not in glaucoma patients. Further applications of MR techniques in studies of glaucomatous brains are indicated. | 4 |

**Orbits, Vision and Visual Loss
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|-----------------|---------------------|--|---|------------------|
| 57. Mahendraraj K, Lau CS, Lee I, Chamberlain RS. Trends in incidence, survival, and management of uveal melanoma: a population-based study of 7,516 patients from the Surveillance, Epidemiology, and End Results database (1973-2012). Clin Ophthalmol. 2016;10:2113-2119. | Review/Other-Dx | 7,516 adults | To analyze the impact of demographics, histology, clinical presentation, and treatments on the clinical outcomes of Uveal melanoma (UM) in a large modern nationwide patient cohort. | A total of 7,516 cases of UM represented 3.2% of all recorded cases of melanoma. The mean age-adjusted incidence was 5.1 per million (95% CI 4.2-6.1) and was higher in males (5.9, CI =4.4-7.6) compared to females (4.5, CI =3.3-5.8), P<0.001. UM occurred most commonly in the sixth decade of life (61.4±15) and among Caucasians (94.7%). A total of 52.3% of cases were reported in the Western US (35.7% in California). The initial diagnoses in 65.2% of cases were by histopathology, followed by clinical diagnosis (18.8%) and radiographic imaging (16.0%). The percentage of UM cases managed by surgery alone decreased by 69.4% between the 1973-1977 and 2006-2012 time periods, concomitant with a 62% increase in primary radiotherapy, P<0.001. The UM mean overall and cancer-specific 5-year relative survival rates were 79.8%±5.8% and 76%±5.3%, respectively. The mean 5-year cancer-specific survival rate (76%) remained stable during the study period between 1973 and 2012. The mean survival for patients treated with primary radiotherapy was significantly improved compared to those treated with surgery alone (15.4±0.4 vs 13.6±0.3, P<0.001). Multivariate analysis identified male sex (odds ratio [OR] 1.1, CI =1.0-1.3), age >50 years (OR 4.0, CI =3.4-4.6), distant metastases (OR 8.6, CI =4.7-15), and primary surgical treatment (OR 2.6, CI =2.0-3.3) as independently associated with increased mortality, P<0.005. Conversely, patients identified as Hispanic (OR 0.6, CI =0.5-0.8) and patients receiving radiation treatment (OR 0.5, CI =0.4-0.7) were independently associated with reduced mortality, P<0.005 | 4 |

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EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|-----------------|---------------------|--|--|---------------|
| 58. Damento GM, Koeller KK, Salomao DR, Pulido JS. T2 Fluid-Attenuated Inversion Recovery Imaging of Uveal Melanomas and Other Ocular Pathology. Ocul Oncol Pathol. 2016;2(4):251-261. | Review/Other-Dx | 24 patients | To describe patterns of intraocular lesions on T2 fluid-attenuated inversion recovery (FLAIR) imaging, exploring a prospective role of FLAIR imaging sequence in diagnosis and treatment | Twenty-four patients with intraocular pathology were evaluated. All lesions, regardless of pigmentation, revealed previously described melanotic patterns on T1- and T2-weighted images; 80% of 10 melanomas localized were hyperintense on T2 FLAIR, which better delineated lesion margins. All of the four inflammatory pathologies on T2 FLAIR were hyperintense, as were 80% of the amelanotic neoplasms. Pathology of two large uveal melanomas paralleled the findings seen on T2 FLAIR | 4 |
| 59. Buchfelder M, Schlaffer S. Imaging of pituitary pathology. Handb Clin Neurol. 2014;124:151-166. | Review/Other-Dx | N/A | To review the role imaging techniques in the diagnosis, surveillance, and treatment of pituitary pathology. | For monitoring treatment effects after surgical procedures, drug applications, or irradiation, follow-up studies with identical parameters should be employed, preferably at the same investigation site. Some space is devoted to intraoperative imaging, which not only allows assessment of how radical tumor resection needs to be during pituitary tumor surgery, but also provides extremely accurate structural data for neuronavigation. Less frequent lesions, such as craniopharyngiomas, meningiomas, germ cell tumors, gliomas, skull base tumors, hypothalamic hamartomas, vascular malformations, inflammatory and developmental lesions and other, even less frequent pathologies should be considered in the differential diagnosis. The particular strength of computed tomography (CT) is the direct depiction of calcification, a weakness of MRI, and the high resolution of bone structures at the skull base. This chapter presents the characteristics of both frequent and less commonly encountered tumoral lesions, with an emphasis on computed tomography and magnetic resonance imaging | 4 |

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EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|-----------------|---------------------|--|--|------------------|
| 60. Gumus K, Koc G, Doganay S, et al. Susceptibility-Based Differentiation of Intracranial Calcification and Hemorrhage in Pediatric Patients. J Child Neurol. 2015;30(8):1029-1036. | Review/Other-Dx | 14 children | To extend the application to pediatric patients and demonstrate feasibility and merits of using phase maps produced by susceptibility-weighted imaging acquisition to differentiate calcification and hemorrhage in this population. | The pathologies identified were tuberous sclerosis, Sturge-Weber syndrome, craniopharyngioma, congenital cytomegalovirus, subependymal hemorrhages, and hemorrhagic microembolic infarction. Calcifications appeared hypointense whereas hemorrhages were hyperintense on phase maps (left-handed magnetic resonance system). Statistical comparison of phase shift values yielded significant difference between hemorrhage versus calcification ($P < .01$). Phase maps were found to offer valuable data to differentiate 2 pathologies when used complementary to conventional magnetic resonance images. Considering the relatively higher risks of radiation exposure in children, susceptibility-weighted imaging with phase maps may help to waive radiation exposure from CT. | 4 |

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EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|---|------------------|---------------------------------------|---|---|------------------|
| 61. Kwacharoen R, Blitz AM, Tavares F, Caturegli P, Gallia GL, Salvatori R. Clinical features of sellar and suprasellar meningiomas. Pituitary. 17(4):342-8, 2014 Aug. | Review/Other-Dx | 1,516 meningiomas operated | To gain insights that would enhance our ability to establish a pre-surgical diagnosis of meningioma. | We identified 57 meningiomas. F:M ratio was 6:1. The mean age was 52 years (median 50, range 30-78). The most common symptoms were visual disturbance (58%), headache (16%) and incidental finding (12%). The mean duration of symptoms was 13 months. Hyperprolactinemia was found in 36%, with mean value of 51.6 ng/ml (median 41.8, range 22.5-132). Mean maximal diameter was 2.9 cm (median 2.7, range 0.9-6.8), and most tumors enhanced homogeneously on MRI after gadolinium. A "dural tail" sign was reported in a third. The radiologist reported "likely meningioma" in 65%, "possible meningioma" in 8.7%, and pituitary adenoma in 11%. After surgery, visual disturbances improved in most patients (80%) but headache only in 7%. Post-operative complications at 1 and 3 months occurred 38.6 and 33.3% respectively. There was no mortality. Sellar/suprasellar meningiomas represent 4% of all meningiomas, and have a particularly high female predominance. The diagnosis is suggested by the radiologist in approximately 2/3 of the cases. An improved method to differentiate preoperatively these tumors from adenomas would be desirable. | 4 |
| 62. Peng J, Qi S, Pan J, Zhang X, Huang G, Li D. Preliminary Study on Composition and Microstructure of Calcification in Craniopharyngiomas. J Craniofac Surg. 2016;27(4):e409-413. | Observational-Dx | 50 patients (29 males and 21 females) | To analyze the element composition and microstructure of calcification in craniopharyngiomas and to explore the differences among differing degrees of calcification, 50 consecutive patients with craniopharyngioma were selected. X-ray diffraction analysis and energy-dispersive X-ray spectroscopy analysis were performed on the calcified plaques isolated from the tumor specimens. | There were significant differences among groups of differing degrees of calcification in the percentage composition of calcium, phosphorus, and carbon ($P < 0.05$), in which the element content of calcium and phosphorus had a positive correlation with the extent of calcification ($r_p = 0.745$ and 0.778 , respectively, $P < 0.01$), while the element content of carbon had a negative correlation with the extent of calcification ($r_p = -0.526$, $P < 0.01$). The calcium, phosphorus, and carbon content are different in calcified plaques with different extents of calcification. The element content of calcium, phosphorus, and carbon influences the degree of calcification. | 3 |

* See Last Page for Key

**Orbits, Vision and Visual Loss
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|-------------------------|--|---|------------------|
| 63. Boffano P, Rocchia F, Gallesio C, Karagozoglu KH, Forouzanfar T. Diplopia and orbital wall fractures. <i>J Craniofac Surg.</i> 2014;25(2):e183-185. | Observational-Dx | 447 patients | To present the incidence and patterns of diplopia after orbital wall blow-out fractures in 2 European centers | On the whole, 447 patients (334 males, 113 females) with pure blow-out orbital wall fractures were included. The most frequently involved orbital site was the floor (359 fractures), followed by medial wall (41 fractures) and lateral wall (5 fractures). At presentation, 227 patients (50.7%) had evidence of diplopia. In particular, in most patients, a diplopia in all directions was referred (78 patients). Statistically significant associations were found between diplopia on eye elevation and orbital floor fractures ($P < 0.05$) and between horizontal diplopia and medial wall fractures ($P < 0.000005$). In patients under evaluation for orbital trauma, the observation of diplopia on eye elevation and horizontal diplopia at presentation could be useful clinical indicators orbital floor and medial wall fractures | 3 |
| 64. Friedman DI, Liu GT, Digre KB. Revised diagnostic criteria for the pseudotumor cerebri syndrome in adults and children. <i>Neurology.</i> 81(13):1159-65, 2013 Sep 24. | Review/Other-Dx | N/A | To provide diagnostic criteria for pseudotumor cerebri syndrome in adults and children. | No results stated in abstract. | 4 |
| 65. Aryasit O, Preechawai P, Aui-Aree N. Clinical presentation, aetiology and prognosis of orbital apex syndrome. <i>Orbit.</i> 2013;32(2):91-94. | Review/Other-Dx | 50 patients; 58 eyes | To present the clinical features, determine the causes and evaluate the prognosis of orbital apex syndrome in patients of Songklanagarind Hospital | In our series, the major cause of orbital apex syndrome was carotid-cavernous sinus fistula, for which 30 patients were diagnosed. After excluding those patients whose condition was caused by carotid-cavernous sinus fistula, 50 patients (58 eyes) were analyzed. The mean age of the patients was 47.60 ± 18.88 years (27 male patients and 23 female patients). The most common presenting symptom was blurred vision (86%). The median duration of the presenting symptom was 37.5 d. Of the 50 patients the most frequent aetiology of orbital apex syndrome was neoplasia (48%), of which lymphoma was the most common in this group. After treatment, the vision of 19.4% of the patients improved and proptosis improved by 68.4%. | 4 |

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EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|---------------------|--|--|------------------|
| 66. Keane JR. Internuclear ophthalmoplegia: unusual causes in 114 of 410 patients. Arch Neurol. 2005;62(5):714-717. | Review/Other-Dx | 410 | To demonstrate that unusual causes of Internuclear ophthalmoplegia (INO) are more common than the 11% reported in previous series | In this series, the cause of INO was infarction in 157 patients (38%), multiple sclerosis in 139 (34%), and unusual causes in 114 (28%). Unusual causes included trauma (20 cases), tentorial herniation (20 cases), infection (17 cases), tumor (17 cases), iatrogenic injury (12 cases), hemorrhage (13 cases), vasculitis (7 cases), and miscellaneous (8 cases). Internuclear ophthalmoplegia was unilateral in 136 of the infarct cases (87%), 38 of those with multiple sclerosis (27%), and 48 of the unusual cases (42%). Because unusual causes compose more than one quarter of the cases, the differential diagnosis of INO should be tripartite: multiple sclerosis, stroke, and other causes. | 4 |
| 67. Suh SY, Clark RA, Le A, Demer JL. Extraocular Muscle Compartments in Superior Oblique Palsy. Invest Ophthalmol Vis Sci. 2016;57(13):5535-5540. | Observational-Dx | 38 patients | To investigate changes in volumes of extraocular muscle (EOM) compartments in unilateral superior oblique (SO) palsy using magnetic resonance imaging (MRI). | The medial and lateral compartments of the ipsilesional SO muscles were equally atrophic in isotropic SO palsy, whereas the lateral compartment was significantly smaller than the medial in anisotropic SO palsy (P = 0.01). In contrast to the SO, there were no differential compartmental volume changes in rectus EOMs; however, there was significant total muscle hypertrophy in the ipsilesional inferior rectus (IR) and lateral rectus (LR) muscles and contralesional superior rectus (SR) muscles. Medial rectus (MR) volume was normal both ipsi- and contralesionally. | 3 |

**Orbits, Vision and Visual Loss
EVIDENCE TABLE**

| Reference | Study Type | Patients/ Events | Study Objective (Purpose of Study) | Study Results | Study Quality |
|--|------------------|---------------------|--|---|------------------|
| 68. Hao R, Suh SY, Le A, Demer JL. Rectus Extraocular Muscle Size and Pulley Location in Concomitant and Pattern Exotropia. <i>Ophthalmology</i> . 2016;123(9):2004-2012. | Observational-Dx | 36 patients | To determine whether rectus extraocular muscle (EOM) sizes and pulley locations contribute to exotropia, we used magnetic resonance imaging (MRI) to measure these factors in normal control participants and in patients with concomitant and pattern exotropia | Rectus pulleys were located differently in patients with A-pattern, versus V- and Y-pattern, exotropia. The lateral rectus (LR) pulleys were displaced significantly superiorly, the medial rectus (MR) pulleys were displaced inferiorly, and the inferior rectus pulleys were displaced laterally in A-pattern exotropia. However, the array of all rectus pulleys was excyclorotated in V- and Y-pattern exotropia. The PPV of the medial rectus muscle was statistically subnormal by approximately 29% in concomitant, but not pattern, exotropia ($P < 0.05$). The ratio of the PPV of the LR relative to the MR muscles in concomitant exotropia was significantly greater than in control participants and those with pattern exotropia ($P < 0.05$). | 3 |
| 69. Lee AG, Hayman LA, Brazis PW. The evaluation of isolated third nerve palsy revisited: an update on the evolving role of magnetic resonance, computed tomography, and catheter angiography. <i>Surv Ophthalmol</i> . 2002;47(2):137-157. | Review/Other-Dx | N/A | To review the pertinent recent literature on the use of these new imaging techniques, such as computed tomography angiography and magnetic resonance angiography in evaluating the patient with a third nerve palsy. | No results stated in abstract | 4 |
| 70. American College of Radiology. ACR Appropriateness Criteria® Radiation Dose Assessment Introduction. Available at: http://www.acr.org/~media/ACR/Documents/AppCriteria/RadiationDoseAssessmentIntro.pdf . | Review/Other-Dx | N/A | Guidance document on exposure of patients to ionizing radiation. | N/A | 4 |

Evidence Table Key

Study Quality Category Definitions

- *Category 1*: The study is well-designed and accounts for common biases.
 - *Category 2*: The study is moderately well-designed and accounts for most common biases.
 - *Category 3*: There are important study design limitations.
 - *Category 4*: The study is not useful as primary evidence. The article may not be a clinical study or the study design is invalid, or conclusions are based on expert consensus. For example:
 - a) the study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);
 - b) the study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;
 - c) the study is an expert opinion or consensus document.
 - M = Meta-analysis
-

Dx = Diagnostic

Tx = Treatment