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Disclosures

No financial relationships or conflicts of interest to disclose

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Learning Objectives

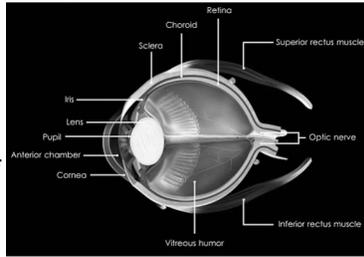
- Identify key retinal and macular injuries associated with ocular trauma, including traumatic retinal detachment and macular pathology.
- Apply appropriate diagnostic strategies, including targeted fundus examination and multimodal imaging.
- Formulate initial management decisions for vision-threatening traumatic retinal conditions to optimize visual outcomes and prevent secondary complications.

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Review of Anatomy

The retina is a multilayered neurosensory tissue tethered at points of vulnerability.



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Mechanisms of Ocular Trauma

Blunt	Rapid globe compression and equatorial expansion = shearing forces
Penetrating	Full-thickness laceration with no exit wound
Perforating	Entrance and exit wounds with extensive posterior damage
Intraocular Foreign Body	Mechanical disruption, infection risk, metallotoxicity (siderosis, chalcosis)

Mechanism predicts injury pattern and guides urgency of intervention

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Imaging in Ocular Trauma

Imaging Modality	Clinical Application	Limitations/Contraindications
B-Scan	Evaluation of posterior segment when direct visualization is not possible due to obscured media	Contraindicated in cases of open-globe injury
OCT	Assess architecture of the retina to evaluate layer integrity	Requires clear media; hazy media may compromise image quality
Fundus Autofluorescence	Noninvasive evaluation of metabolic activity and health of the RPE	Hemorrhage, edema, inflammation may obscure signal
CT Scan	Initial choice for suspected intraocular foreign bodies	Organic materials (wood/plastic) may be difficult to detect; dense IOFBs may introduce artifacts
MRI/MRI Orbits	Secondary assessment of orbital soft tissue, intracranial abnormalities, and organic foreign bodies (wood, vegetable matter) when CT is inconclusive or in non-acute settings	Strictly contraindicated if there is suspicion of retained metallic foreign bodies due to risk of further damage

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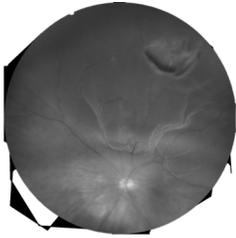
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Spectrum of Retinal Trauma

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Rhegmatogenous Retinal Detachment

Clinical Evaluation	Retina pulled from normal position by blunt trauma; ~10-20% of all detachments.	
Imaging	Widefield fundus photography. B-scan if media opaque (confirm closed globe first).	
Diagnosis	Flashes/floaters, scleral depressed exam, close follow-up.	

Management Protocol

Lincoff's Rules Most tears (70%) located superiorly between 10 and 2 o'clock.	Treatment options Laser barricade, pneumatic retinopexy, vitrectomy, scleral buckle.
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Retinal Dialysis

Clinical Evaluation	Separation of retina from ora serrata. Common in young males and blunt trauma.	
Imaging	Widefield photography (focus on periphery). B-scan if vitreous hemorrhage.	
Diagnosis	Disinsertion at the vitreous base. Most common location – inferotemporal.	

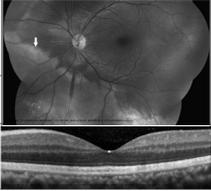
Management Protocol

Action Early surgical repair to prevent macula-off RD.	Optimization The "missed" diagnosis. Requires meticulous scleral depressed exam in all blunt trauma cases once globe is confirmed closed.
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Comotio Retinae (Berlin's Edema)

Clinical Evaluation	Transient retinal whitening post-blunt trauma. Vision loss proportional to macular involvement.	
Imaging	OCT (shows IS/OS junction disruption).	
Diagnosis	Cellular edema of Müller cells and photoreceptor disruption. Not true edema.	

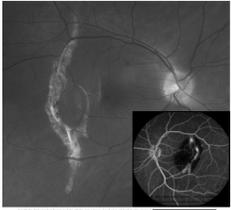
Management Protocol

Action Observation. Retinal changes resolve in 4-7 days. Anti-inflammatories generally not indicated.	Optimization Prognosis correlates with photoreceptor integrity on OCT. Counsel on potential permanent scotomas.
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Choroidal Rupture

Clinical Evaluation	Traumatic mechanical event at site of contusion – force buckles the globe.	
Imaging	FA (filling defect followed by staining); OCT (loss of continuity of RPE layer).	
Diagnosis	Crescent lesions concentric to disc or parallel to ora. Acute heme often obscures the rupture.	

Management Protocol

Action Observation in acute phase.	Optimization Surveillance is critical. 5-10% develop choroidal neovascularization (CNV). Treat CNV promptly with Anti-VEGF.
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Intraocular Foreign Body (IOFB)

Clinical Evaluation	History of metal-on-metal (hammering). Wound may be self-sealing.	
Imaging	CT orbit (thin cuts) is gold standard. MRI is CONTRAINDICATED.	
Diagnosis	Radiopaque object within globe. Distinguish from orbital foreign body.	

Management Protocol

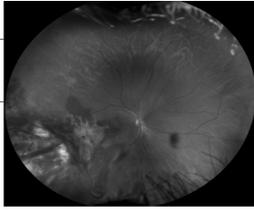
Action Identification of IOFB; consider siderosis vs. chalcosis	Optimization Removal < 24 hours to reduce endophthalmitis risk.
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Sclopetaria

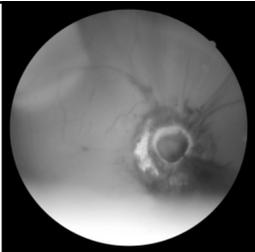
Clinical Evaluation	High-velocity projectile passes adjacent to globe (no penetration); increased risk of RD.
Imaging	Fundus photo (extensive chorioretinal rupture). OCT (full-thickness tissue loss).
Diagnosis	DFE can show white areas of bare sclera with adjacent rupture of retina and choroid.
Management Protocol	
Action	Conservative management. Spontaneous scarring creates self-healing adhesion.
Optimization	Distinguish from frank scleral rupture. No effective restorative surgery exists for missing tissue.



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Optic Nerve Avulsion

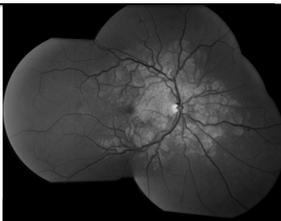
Clinical Evaluation	Rapid torsional force to the globe. Immediate NLP vision. Profound RAPD.
Imaging	Fundus (retraction of nerve into sheath). OCT (deep excavation).
Diagnosis	Peripapillary hemorrhage or excavation of the nerve.
Management Protocol	
Action	No effective treatment. Steroids are unproven.
Optimization	Counseling is key. Establish realistic expectations (permanent vision loss). Monocular precautions to protect the contralateral eye (polycarbonate lenses).



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Purtscher's Retinopathy

Clinical Evaluation	Sudden vision loss after severe systemic trauma (head trauma or compressive injury to trunk).
Imaging	OCT (inner retinal ischemia). FA (late leakage from injury to retinal vessels).
Diagnosis	Retinal whitening, cotton-wool spots with clearing, papillitis.
Management Protocol	
Action	Supportive care. Treat underlying systemic condition.
Optimization	Vision recovery is variable. Spontaneous improvement can occur over months.

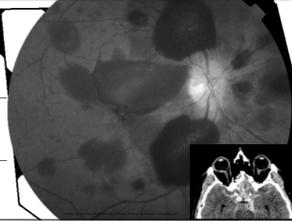
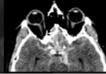


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Terson Syndrome

Clinical Evaluation	Vitreous hemorrhage in setting of subarachnoid hemorrhage. Intracranial pressure transmits through optic nerve sheath.
Imaging	CT head (confirms intracranial bleed). B-scan (confirms vitreous hemorrhage).
Diagnosis	Dome-shaped hemorrhages; loss of red reflex.
Management Protocol	
Action	Observation (spontaneous clearing possible). Vitrectomy if non-clearing (1-3 months).
Optimization	Coordinate with neurosurgery. Early vitrectomy aids rehabilitation in cognitively impaired patients.

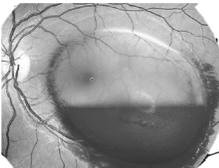
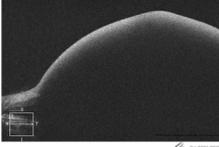



16 CASEY EYE

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Valsalva Retinopathy

Clinical Evaluation	Acute, <i>painless</i> vision loss after lifting/coughing/vomiting.
Imaging	OCT localizes blood to sub-ILM or sub-hyaloid space.
Diagnosis	Rupture of perifoveal capillaries due to venous pressure spike; usually unilateral.
Management Protocol	
Action	Observation → spontaneous resolution in weeks to months; YAG laser.
Optimization	YAG allows rapid drainage into vitreous. Reserved for massive hemorrhage masking fovea.

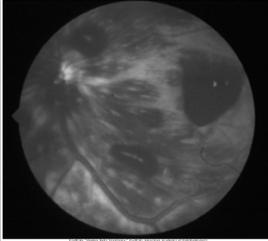



17 CASEY EYE

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Non-Accidental Trauma

Clinical Evaluation	Inconsistent history, bilateral findings, pediatric patients.
Imaging	Fundus photos, B-scan if indicated.
Diagnosis	Retinal hemorrhages that are multilayered (preretinal, intraretinal, and subretinal).
Management Protocol	
Action	Immediate escalation.
Documentation	Clear fundus photos or retinal drawings for medicolegal purposes.
Optimization	Prognosis is generally poor. Cortical blindness occurs in up to 15% of cases.



18 CASEY EYE

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