Ocular Manifestations of Systemic Hypertension

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Vascular Disease

• Cerebrovascular Disease
• Hypertension
• Atherosclerosis
• Diabetes mellitus

Ocular Manifestations of Vascular Disease

• Hypertensive retinopathy
• Venous occlusive disease
• Arterial occlusive disease
• Diabetic retinopathy

Systemic Hypertension

Systemic Hypertension: Epidemiology

• 60 million Americans
• 1 billion people worldwide
• A normotensive (BP 120/80) American at age 55 has a 90% lifetime risk of developing hypertension.

Systemic Hypertension: Pathophysiology

• Essential hypertension
• Malignant hypertension (hypertensive crisis)
Systemic Hypertension: Target Organ Damage

- Left ventricular hypertrophy
- Angina
- Myocardial infarction
- Heart failure
- Stroke
- Peripheral vascular disease
- Chronic kidney disease

Systemic Hypertension: Ocular Manifestations

- Hypertensive Retinopathy:
  - vasoconstrictive phase
  - exudative phase
  - sclerotic phase
  - complications of sclerotic phase

Systemic Hypertension: Ocular Manifestations

- Hypertensive Choroidopathy:
  - Elschnig’s spots
  - Siegrist’s streaks
  - Large patches of chorioretinal atrophy

Systemic Hypertension: Ocular Manifestations

- Hypertensive Optic Disc Edema:
  - increased intracranial pressure
  - ischemia

Systemic Hypertension: OD Management

- Blood pressure management
- Referral to family physician or internist, depending on severity of hypertension
- Fundus monitoring at least every 12 months, referring to retinal specialist prn
- Patient counseling
- Interprofessional communication

Branch Retinal Vein Occlusion
Branch Retinal Vein Occlusion (BRVO)

- Thrombus formation at arteriovenous crossing
- Systemic hypertension commonly associated
- Age 60 – 70 most common

BRVO: Acute Findings

- Sectoral superficial hemorrhages
- Sectoral retinal edema
- Sectoral cotton-wool spots

BRVO: Chronic Findings

- Microvascular abnormalities
- Macular edema
- Intraretinal collaterals
- Sclerosis and sheathing of retinal vessels

BVOS Study

- Branch Retinal Vein Occlusion Study Group, Archives Ophthalmology 1986; 104:34-41

BRVO: Laser Treatment Techniques

- Macular Grid Laser Photocoagulation:
  - BRVO present for more than 3 months
  - absence of foveal hemorrhage
  - vision worse than 20/40
  - vision loss due to macular edema

Macular grid laser photocoagulation remains the criterion standard treatment of eyes with perfused macular edema secondary to BRVO.
BRVO: Laser Treatment Techniques

- Scatter Photocoagulation:
  - presence of neovascularization
  - presence of vitreous hemorrhage

BRVO: Other Treatment Techniques

- Laser-induced chorioretinal anastomosis
- Arteriovenous decompression (sheathotomy)
- Vitrectomy
- Intravitreal Kenalog (triamcinolone acetonide) – SCORE Study
- Ozurdex (0.7 mg dexamethasone intravitreal implant)
- Avastin, Lucentis, Eylea

Vascular Endothelial Growth Factor (VEGF)

- VEGF is a potent inductor of vascular permeability and intraocular neovascularization.
- Human aqueous levels of VEGF and interleukin 6 (IL-6) are correlated with the degree of retinal ischemia and the severity of macular edema in BRVO.
- Therefore, VEGF inhibition is a promising treatment modality for macular edema.

Clinical Evidence-Based Conclusions

- Timing of diagnosis and management of BRVO is important.
- Eyes with macular edema secondary to BRVO should be offered VEGF inhibition upon diagnosis to achieve the best possible visual outcome (BRAVO Study, HORIZON Trial, RETAIN Study).
- Eyes are eligible for laser after 3 months if hemorrhages have sufficiently cleared to allow safe laser treatment and if vision acuity remains worse than 20/40.
- Retinal nonperfusion is related to intravitreal VEGF levels and may result in loss of visual gains. The prevention of worsening retinal nonperfusion should be a treatment objective as important as the resolution of macular edema.
- Periodic fluorescein angiograms should be performed to monitor perfusion status.

Central Retinal Vein Occlusion (CRVO)

- Thrombus formation in retinal vein at lamina cribosa
- Etiology of thrombus formation unclear: arteriosclerosis, vasculitis
- Primary open angle glaucoma: 20% have POAG, 20% develop POAG
Central Retinal Vein Occlusion (CRVO)

- Systemic associations:
  - CVD - 74%
  - HTN - 57%
  - DM - 34%
- Risk factors include oral contraceptives and diuretics
- 90% of patients are over 50

Non-Ischemic CRVO

- 30+% convert to ischemic type (CVOS)
- < 10 dd of retinal non-perfusion (CVOS)

Ischemic CRVO

- Marked optic disc, retinal, and macular edema
- Marked venous dilatation and tortuosity
- Many retinal hemorrhages, cotton-wool spots
- VA worse than 20/200
- Afferent pupillary defect

CRVO: Incidence of Neovascularization

- Non-Ischemic:
  - Any NV in < 5%
  - NV glaucoma in < 2%
- Ischemic:
  - Any NV in > 60%
  - NV glaucoma in 33%

CVOS

- Central Retinal Vein Occlusion Study Group, Ophthalmology 1995; 102:1425-1444

CVOS Conclusions

- Grid photocoagulation for macular edema: effective in decreasing retinal thickening but ineffective in improving VA
- Pan retinal photocoagulation to prevent neovascular complications: indicated only in eyes with apparent iris NV, angle NV, or ischemic eyes that cannot be followed monthly
CRVO: Other Advocated Treatments

- Aspirin
- Anti-inflammatory agents
- Isovolemic hemodilution
- Plasmapheresis
- Systemic anticoagulation with warfarin, heparin, and alteplase
- Fibrinolytic agents
- Systemic corticosteroids
- Intravitreal treatments – the standard of care

CRVO: Intravitreal Treatments

- Local anticoagulation with intravitreal injection of alteplase (Activase)
- Intravitreal injection of triamcinolone (Kenalog)
- Ozurdex intravitreal implant
- Intravitreal injection of Lucentis
- Intravitreal injection of Avastin
- Intravitreal injection of Eylea

Intravitreal Injection of Triamcinolone

- SCORE Study - CRVO Trial demonstrated effectiveness in resolving perfused macular edema and improving vision
- 1-mg dose and retreatment prn may be considered up to 12 months (preferred over 4-mg dose due to fewer adverse effects)

SCORE Study: Conclusion

- No difference in long-term outcome between triamcinolone injections and grid photocoagulation with BRVO.
- Ozurdex biogradable implant (Allergan, June 2009) is considered superior to triamcinolone as a delivery method, with fewer injections.
- Triamcinolone remains a viable option for patients with financial troubles.

Anti-VEGF Trials For RVO

- After 6 months of Lucentis therapy, between 55% and 61% of BRVO patients and 47% of CRVO patients gained at least 3 lines of BCVA (BRAVO and CRUISE studies).
- 12 month data: vision gained at 6 months continued after 6 months of subsequent prn dosage.
- From a strictly evidenced-based perspective, slightly better visual outcomes and huge safety profile, relative to steroids.
- Lucentis approved for treatment of macular edema following RVO in June 2010.
- Eylea approved for macular edema following CRVO in September 2012 (COPERNICUS and GALILEO trials)
- Anti-VEGF therapy ranks as the preferred first-line therapy for RVO.

Head-to-Head Studies in RVO

- COMO and COMRADE B – comparing Lucentis with dexamethosone IVT in BRVO patients
- COMRADE C – in CRVO patients
- RABAMES – comparing Lucentis, argon laser monotherapy, and Lucentis plus adjunctive argon laser therapy in BRVO patients (completed)
- BRIGHTER (EUDRACT 2011) – European studies with similar treatment arms
BRVO/CRVO: OD Management

- Blood pressure measurement
- Referral to family physician or internist for management of any underlying cardiovascular disease, hypertension, diabetes
- Fundus monitoring (macular edema, neovascularization) every 4-6 weeks; timely referral to retinal specialist
- Patient counseling
- Interprofessional communication

The Comanagement Team

- Optometry
- Ophthalmology (vitreoretinal subspecialty)
- Family or Internal Medicine