Vascular Retinal occlusions: Initial Workup

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Internal Medicine
Auto-immunity / Ophthalmology interface

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Clinical Story 1
69-yr-old man

- Presented with sudden, painless visual loss in his left eye 9 hours ago

- Medical history
  1. hypertension
  2. diabetes mellitus
  3. no ophthalmic problem

- On examination, vision was light-perception in left and 20/20 in right eye
Fundus examination

white edematous retina and typical "cherry-red spot"
Central retinal artery occlusion (CRAO) and Branch retinal artery occlusion (BRAO)
Introduction

- Retinal artery occlusion is a form of acute, painless loss of monocular vision.
- These disorders are considered a form of stroke
- with a similar clinical approach and management
• CRAO is a rare event
• Incidence: 1 to 10 in 100,000
• Symptomatic BRAO is even less common.

• Demographic characteristics: consistent with those seen for other vascular disorders.
  1. The mean age of patients is between 60 and 65 years (> 90% > 40 years)
  2. Men more commonly affected than women.
  3. Hypertension, smoking, and diabetes more prevalent compared with controls
### Prevalence of systemic conditions in non-arteritic CRAO*

<table>
<thead>
<tr>
<th>Systemic condition</th>
<th>Non-arteritic CRAO n=234 patients</th>
<th>White Age-Period matched population</th>
<th>Non-arteritic CRAO vs. matched population p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes mellitus</td>
<td>47 (20%) (95% CI: 15%, 26%)</td>
<td>7.7%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Renal disease</td>
<td>17 (7%) (95% CI: 4%, 11%)</td>
<td>2.3%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Arterial hypertension</td>
<td>121 (52%) (95% CI: 45%, 58%)</td>
<td>30.1%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>60 (26%) (95% CI: 20%, 31%)</td>
<td>10.7%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>TIA/CVA</td>
<td>45 (19%) (95% CI: 14%, 25%)</td>
<td>4.3%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Cholesterol ≥240 mg/dL In males</td>
<td>(n=81, 49 missing)  25 (31%) (95% CI: 21%, 42%)</td>
<td>27.6%</td>
<td>0.580</td>
</tr>
<tr>
<td>Cholesterol ≥240 mg/dL In females</td>
<td>(n=56, 48 missing)  29 (52%) (95% CI: 38%, 65%)</td>
<td>41.5%</td>
<td>0.157</td>
</tr>
<tr>
<td>Current smoker In males</td>
<td>(n=109, 21 missing)  41 (38%) (95% CI: 29%, 47%)</td>
<td>23.6%</td>
<td>0.001</td>
</tr>
<tr>
<td>Current smoker In females</td>
<td>(n=79, 25 missing)  21 (27%) (95% CI: 17%, 38%)</td>
<td>17.7%</td>
<td>0.063</td>
</tr>
</tbody>
</table>

Cl = Confidence limit  
CRAO = Central retinal artery occlusion  
CVA = Cerebrovascular accident  
TIA = Transient ischemic attack

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Etiologies

- The distribution is influenced by the patient's age.

1. Carotid artery atherosclerosis is the most common etiology
2. < 40 years: cardiogenic embolism is the most likely etiology
3. > 70 years: giant cell arteritis is more likely than in younger patients.
Carotid artery atherosclerosis

- Atherosclerotic disease of the ipsilateral carotid artery is the most common cause.

- The diagnosis of high-grade carotid disease is important because of the risk for future stroke and other vascular events.

- However, arterial occlusions in the eye are due to microembolism in the vast majority of cases, and the major source of microemboli is plaque - which may be present with or without any significant carotid artery stenosis.

  Thus, the absence of significant stenosis or of plaque in the carotid artery does not necessarily rule out the carotid artery as the source of microembolism.
Cardiogenic embolism

- more likely in younger patients (<40 years) as an etiology

- Likelihood increases if there is a suggestive medical history: atrial fibrillation, infectious endocarditis, cardiac valvular disease, myocardial infarction, intravenous drug use

- Visualization of retinal emboli on funduscopic examination is not more frequent among patients with a cardiogenic embolism compared with those with an alternative or unknown etiology
Small artery disease

- local atheroma is often the presumptive etiology in older patients with diabetes and/or hypertension and no other demonstrated cause for retinal artery occlusion
Other vascular disease

- Carotid artery dissection
- Fibromuscular dysplasia
- Radiation injury of the carotid or retinal arteries
- Fabry disease
- vasospasm and migraine: diagnoses of exclusion
Hematologic disease

- Sickle cell disease
- Leukemia and lymphoma

Retinal arteriolar occlusions during a sickle cell crisis.
Inflammatory disease

Giant cell arteritis

- 2% of elderly patients with CRAO have underlying giant cell arteritis (GCA).
- 10% of patients who lose vision from GCA do so on the basis of CRAO.
- Important to diagnose because of implications for prognosis and treatment.
- Should be strongly considered as a potential cause of CRAO.
  1. In any patient over the age of 50 years
  2. Who does not have visible retinal emboli.
Inflammatory other than GCA

- Susac syndrome — rare vasculitic disorder
  1. vision loss (BRAO)
  2. + sensorineural hearing loss
  3. + subacute encephalopathy.

- Systemic lupus erythematosus, polyarteritis nodosa, and Wegener's granulomatosis.

In such patients, retinal artery occlusion typically occurs in the setting of an established diagnosis of the underlying autoimmune disease.
Rare causes

- Infection can cause a secondary vasculitis of the ophthalmic and/or retinal artery.
  1. fungi, particularly mucormycosis,
  2. viruses (cat scratch disease, varicella).

- Complication of ocular surgery, ocular or retrobulbar injections of steroids

- Cerebral angiography and carotid endarterectomy can lead to thromboembolism and retinal artery occlusion
Clinical Course

- acute and profound loss of vision in one eye
- usually painless.
- Occasionally, CRAO is preceded by transient monocular blindness or there is a stuttering or fluctuating course.
- Rarely, the initial event is heralded by flashing lights.
- CRAO almost never occurs in both eyes simultaneously,
- may occur sequentially.
Clinical Course

- The vision loss is severe, usually leaving no more than a small temporal island of vision.
- Most affected patients can see only hand motions and rarely can count fingers.
The prognosis varies with the site of retinal artery occlusion.

Most patients (80 percent) with BRAO recover normal vision.

Visual acuity at presentation usually predicts final visual acuity in patients with CRAO.

Most severely affected patients are left only with a temporal island of vision that allows for hand motions or counting fingers.
Diagnosis of etiology

- A suggestive medical history may tailor the diagnostic work-up to the most likely etiology

1. **Carotid artery imaging** — the first test ordered
2. **Exclusion of giant cell arteritis** — emergently, in all patients >50 years and no visible retinal embolus.
3. **Cardiogenic embolism** should be ruled out in patients in whom carotid disease has been excluded. Testing may include Holter monitoring and echocardiography
<table>
<thead>
<tr>
<th>Transthoracic cardiac echography</th>
<th>All patients</th>
</tr>
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<tbody>
<tr>
<td>Transoesophageal cardiac echography</td>
<td>Young patients</td>
</tr>
<tr>
<td>Carotid imagery</td>
<td>All patients</td>
</tr>
<tr>
<td>ESR or CRP</td>
<td>Elderly patients</td>
</tr>
</tbody>
</table>
| Detailed hemostasis / hyperviscosity | Young patients
  No identified cause |
Clinical Story 2
55-year-old male patient

- sudden loss of vision in the right eye
- following Sirsasana with wall support (2 minutes) without supervision.

Indian J Ophthalmol. 2009 Jan-Feb;57(1):69-70. Central retinal vein occlusion following
The patient had suffered from pulmonary thromboembolism 5 years back and was receiving warfarin prophylaxis.

On examination, best-corrected visual acuity (BCVA) was finger counting 1 m in the right and 20/20 in the left eye.

Fundus examination showed disc edema, scattered superficial hemorrhages, and superficial whitening in macular area in the right eye.

All systemic investigations (hemoglobin, erythrocyte sedimentation rate, lipid profile, blood sugar, serum homocysteine levels) were normal, and international normalization ratio (INR) was 2.0.

Over 6 months follow-up, the patient developed neovascularization of the iris and received pan-retinal laser
Retinal Vein Occlusion
RVO
What is this?

- may affect the central vein (CRVO) or a branch

- Circulatory venous stasis of variable importance in the central retinal artery or a branch

- RVO increases with age and prevalence has been reported to be 0.3% to 1.6% in adults aged 40 years and older, and 4.6% in people 80 years and older.
presentation

- Painless unilateral vision loss
- variable degree
- Asymptomatic in 20%
- Significant residual visual loss is frequent: it is one of the five main causes of unilateral blindness.
- The diagnosis is usually easy at fundus examination, which shows multiple hemorrhages, retinal and papillary edema, and venous dilations in the territory of the occluded vein.
Risk factors and associations

- clearly associated with arterial hypertension and glaucoma
- but not with thrombophilia.
- It is neither associated with cancer risk, nor with classical venous thromboembolism.
- The risk of ischemic neurovascular event might be doubled in patients aged less than 70 years with RVO.
Retinal vein occlusion (RVO) occurs in healthy patients or in patients having an arterial risk profile rather than a venous one.
RVO and antiphospholipids?

- The role of antiphospholipid syndrome (APS) in the pathogenesis of retinal vein occlusion has been discussed for several years.
- Conflicting results of the published studies are caused by small numbers of investigated patients and lack of control groups.
- Results of a recent meta-analysis show a significantly higher prevalence of APS in patients with retinal vein occlusion compared with controls.
- For patients with retinal vein occlusion with APS, no data are currently available regarding the recurrence of thrombosis.
- To give a clear recommendation, a prospective randomized study is required to investigate the benefit of anticoagulation.
Complications

- The course of the disease lasts several months
- The most frequent complication is macular edema
- The most feared complication is the occurrence of iris or retinal neovascularization (15-20% of CRVO cases)
# General Workup


<table>
<thead>
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<th>NFS</th>
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<tbody>
<tr>
<td>Plasma proteins electrophoresis</td>
</tr>
<tr>
<td>Classical cardio-vascular risk factors investigation / management</td>
</tr>
<tr>
<td>No evidence that risk factors control affect RVO evolution</td>
</tr>
<tr>
<td>Hypertension control may reduce macular edema</td>
</tr>
<tr>
<td>No evidence for thrombophila screening</td>
</tr>
<tr>
<td>No need for radiologic investigation (doppler….)</td>
</tr>
</tbody>
</table>
Anterior ischemic optic neuropathy (AION)
Introduction

- the most frequent optic neuropathy in patients older than 50 years.
- Non-arteritic form (NA-AION) : 2.3 to 10.2/ 100 000 annual incidence for patients older than 50 years (Hattenhauer 1997).
- The condition is caused by infarction of the optic nerve head supplied by the short posterior ciliary arteries (J Clin Neurosci. 2009).
- One or more vascular risk factors are usually found, especially diabetes, hypertension, dyslipidemia and nocturnal hypotension (IONDT 1997).
Nocturnal hypotension

- Nocturnal hypotension is known to be associated with myocardial infarction, stroke and AION (Am J Hypertens. 1999, Buono 2002).
- This could explain that many AION are discovered upon awakening (hayreh Am J Ophthalmol. 1997, arnold 2001).
Risk factors of non arteritic anterior ischemic optic neuropathy in elderly: a control-case study

Service de médecine Interne
CHNO des Quinze-Vingts
PARIS
A retrospective case-control study in patients older than 70 years with or without NA-AION in whom a 24-hour blood pressure profile was realized between 2001 and 2008 in the ophthalmology center Centre Hospitalier National d’Ophtalmologie des Quinze-Vingt-Paris. 49 NA-AION patients (29 women and 20 men) and 27 control patients (18 women and 9 men) were recruited.
One or more falls in diastolic arterial pressure ≤ 50 mmHg during the night observed in 41% of AION patients vs 15% in the control group (p=0.02). No difference in systolic arterial pressure and mean arterial pressure.
very short episodes of severe hypotension could precipitate NA-AION if overwhelming autoregulatory capacity in optic nerve head without affecting the mean arterial pressure.

arterial pressure variations are frequent in elderly (for example when going to the toilet at night) and is dependent on the sleep deepness.
78-years old woman with treated arterial hypertension

Therapeutic implications: how to control hypertension in elderly without inducing nocturnal hypotension
Merci