1  HYPERTENSIVE RETINOPATHY
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2  COURSE DESCRIPTION
   ☑ This course focuses on the clinical features, diagnosis and management of hypertensive retinopathy. Additionally, some background and statistics on systemic hypertension is also presented.

3  COURSE OBJECTIVES
   ☑ Understand general background and current statistics of systemic hypertension
   ☑ Understand importance of checking blood pressure and knowing when to refer immediately
   ☑ Know the retinal signs of hypertension
   ☑ Know how to manage and co-manage these types of patients
   ☑ Understand early detection and proper referrals can save lives

4  PATIENT: 45 Y.O. CAUCASIAN MALE
   ☑ First exam: 6/12/2005
   ☑ CC: Blurry vision at near without Rx
     + POH: Unremarkable
     + PMH: Unremarkable
     + Meds: NONE
     + Occupation: Attorney
   ☑ BCVA: 20/20 OD, OS
   ☑ Pupils: ERLR, (-) APD
   ☑ EOMs: SAFE
   ☑ FDT VFs: Full OD, OS
   ☑ Anterior segment OU:
     + Unremarkable

5  PATIENT: 45 Y.O. CAUCASIAN MALE
   ☑ Posterior segment OU:
     + ONH: healthy, pink rims; distinct margins, small C/D
     + Posterior pole:
       ☑ Multiple, scattered cotton wool spots
       ☑ Few, scattered flame hemes
       ☑ Few, scattered, small patches of exudates
     + Vessels:
       ☑ Moderate tortuosity
       ☑ Moderate AV nicking
     + Macula:
       ☑ Flat, even pigment
   ☑ BP: 185/110

6  SAME PATIENT, RETURNS 5 YEARS LATER
   ☑ 50 y.o. Caucasian male
• Returns for routine exam: 6/12/2010
• CC: General Eye Exam
  + POH: HTN retinopathy
  + PMH: HTN
  + Meds: Lisinopril
  + Occupation: Retired
• BCVA: 20/20 OD, OS
• Pupils: ERLR, (-) APD
• EOMs: SAFE
• FDT VFs: Full OD, OS
• Anterior segment OU:
  + 1+ NSC

7  SAME PATIENT, RETURNS 5 YEARS LATER
• Posterior segment OU:
  + ONH: healthy, pink rims; distinct margins, small C/D
  + Posterior pole:
    × Homogenous
    × (-) hemes/CWS/exudates
  + Vessels:
    × Moderate tortuosity
    × Moderate AV nicking
  + Macula:
    × Flat, even pigment
• BP: 118/80

8  HYPERTENSION
THE SILENT KILLER

9  HYPERTENSION: THE SILENT KILLER
• No symptoms
• Many do not know they have hypertension
• Only way of knowing is having blood pressure measured

10 BLOOD PRESSURE READING
•
•
•
• Systolic BP: measures the pressure in the arteries during heart beats
• Diastolic BP: measures the pressure in the arteries between heart beats

11 DEFINING HYPERTENSION

12 DEFINING HYPERTENSION
Stage 3 or 4 hypertension is considered a *Hypertensive Crisis* 
+ Warrants emergency care!

### RISK FACTORS

- Family history
- Two fold risk factor for African Americans
  + African Americans > Whites > Mexican > Other
  + More than 40% of non-Hispanic blacks have hypertension
- Age > 55
- Sex:
  + Up to 45 y.o. – men > women
  + 45-64 y.o. – men = women
  + Over 65 y.o. – women > men
- Lack of exercise
- Poor diet (especially too much salt)
- Overweight and Obesity
- Excessive alcohol consumption

### OTHER CONTRIBUTING RISK FACTORS

- Smoking and second-hand smoking
- Stress
- Obstructive sleep apnea

### STATISTICS

- 1 in 3 US adults or ~80 million Americans have hypertension
  + Only 54% of people with hypertension have the condition under control
- Hypertension was a primary or contributing cause of death for more than 410,000 Americans in 2014

### ETIOLOGY

- Primary hypertension:
  + No known underlying cause
- Secondary hypertension:
  + Usually result of:
    - Preeclampsia/eclampsia
    - Pheochromocytoma
    - Kidney disease
    - Adrenal disease
    - Coarctation or abnormality of the aorta

### HYPERTENSIVE RETINOPATHY

### DEFINITION OF HYPERTENSIVE RETINOPATHY
Retinal Vascular changes secondary to chronic or acutely elevated systemic blood pressure

20 STATISTICS

- In hypertensive subjects, the prevalence of retinopathy has been estimated at well over 70%
- Hypertensive retinopathy:
  - Is a marker of subclinical cerebral disease
  - Is associated with risk of stroke
  - Is associated with a higher mortality

21 SYMPTOMS

- Asymptomatic
- Decreased vision (rare)
*Eye exam will often be the first clue of systemic hypertension

22 VESSEL TORTUOSITY

- By itself, not a sign of hypertensive retinopathy
- Segmental tortuosity IS a sign
  - Common in nasal retina
- ~80% of patients with hypertension do NOT have tortuous vessels
- Record tortuosity: severity and location

23 SIGNS

- Almost always BILATERAL and SYMMETRICAL
- Arteriolar attenuation
- Arteriolar light reflex
- Arteriovenous crossing changes
- Retinal hemorrhages
- Cotton wool spots
- Exudates
- Vessel sheathing
- Optic nerve swelling

24 ATTENUATION

25 ATTENUATION

- Young patients: autoregulation causes uniform narrowing of retinal arterioles
- Older patients: arteriosclerosis and autoregulation causes focal narrowing of retinal arterioles

26 GENERAL VS FOCAL ATTENUATION

27 ARTERIOLAR LIGHT REFLEX

- Arteriolar light reflex – light reflex from surface of blood column
  - Norm: 1/5 of width of vessel
Norm: 1/5 of width of vessel

Abnorm: widening & increased brightness
- “copper” or “silver” in color

28 ☐ ARTERIOVENUS CROSSING CHANGES
× Arteriovenus crossing changes – generalized nicking, tapering, compression, S-shaped bends, right angle deflections or banking of a venule

29 ☐ RETINAL HEMORRHAGES
× Retinal hemorrhages – flame shaped (most common) and dot-blots

30 ☐ COTTON WOOL SPOTS
× Cotton wool spots – acute inner retinal ischemia

31 ☐ EXUDATES
× Exudates – lipid within outer plexiform

32 ☐ VESSEL SHEATHING
× Vessel sheathing – anterior surface involved with glial proliferation secondary to vascular damage

33 ☐ OPTIC NERVE SWELLING
× Optic nerve swelling – associated with accelerated or malignant HTN

34 ☐ POSSIBLE COMPLICATIONS
× Retinal vein occlusion (CRVO, BRVO)
× Retinal artery occlusion (CRAO, BRAO)
× Retinal artery macroaneurysm
× Anterior ischemic optic neuropathy (NAION)
× Cranial nerve palsies
× Choroidal infarction
× Adversely affect diabetic retinopathy
× Glaucoma

35 ☐ KEITH-WAGENER-BARKER HTN RETINOPATHY CLASSIFICATIONS

36 ☐ GRADING HTN RETINOPATHY
× In general:
  + Grades 1 and 2 are typically chronic
  + Grades 3 and 4 are typically acute
    × Diastolic blood pressure ≥ 110 correlates with grade 3
    × Diastolic blood pressure ≥ 130 correlates with grade 4
Differential Diagnosis

1. Diabetic Retinopathy
   - Hemorrhages – dot-blot (usually)
   - Microaneurysms (common)
   - Vessel attenuation (less common)

2. CRVO or BRVO:
   - Unilateral
   - Hemorrhages (multiple)
   - Venous dilation & tortuosity
   - No arteriolar narrowing

3. Collagen-vascular disease
   - Cotton wool spots (multiple)

4. Anemia
   - Hemorrhages with no arterial changes

5. Radiation retinopathy
   - Hx of irradiation
   - Common within a few years

Hypertension vs Diabetes

1. Hypertension
   - Dry retina
   - Few hemorrhages
   - Rare edema
   - Rare exudates
   - Multiple CWS
   - Flame-shaped hemes
   - Visibly abnormal retinal arteries

2. Diabetes
   - Wet retina
   - Multiple hemorrhages
   - Extensive edema
   - Multiple exudates
   - Few CWS
   - Rare flame-shaped hemes
   - Visibly abnormal retinal veins and capillaries
WORK-UP

1. Take a good History
   - Ask about any systemic conditions, particularly:
     × History of hypertension
     × History of diabetes
     × History of adnexal radiation

2. Complete ocular examination: dilated fundus exam

WORK-UP

3. Check Blood Pressure
   - To ensure accurate measurement, it is important to use correct cuff size and correct cuff placement
   - Do not allow patients to smoke or consume caffeine before taking a blood pressure reading

4. (optional) Refer to ophthalmology for fluorescein angiogram to check for:
   + Retinal arteriole narrowing/straightening
   + Microaneurysms
   + Capillary nonperfusion
   + Macular edema

WORK-UP (CONTINUED)

5. REFER!
   - For medical consultation especially if:
     × Patient has an unremarkable systemic history
     × Patient is visually symptomatic
     ★ Blurred vision
     ★ Transient dimming of vision – TIA/amaurosis fugax
     × Patient has diastolic pressure > 110 to 120 mmHg
   + BP ≤ 179/109: non-urgent referral
   + BP 180/110 - 209/119: more urgent referral
   + BP > 210/>120: medical crisis, immediate referral

TREATMENT/MANAGEMENT

× Comanage with primary care physician to control/treat underlying hypertension
   - Life style changes:
     × weight reduction, exercise, decrease salt and cholesterol intake, relaxation, stress management and smoking cessation
   + HTN meds:
     × Diuretics, beta-blockers, ACE inhibitors, Angiotensin-receptor blockers, Calcium-channel blockers, vasodilators

× If hypertension is controlled well, then prognosis is usually good!
FOLLOW-UP
- More severe: follow up every 2-3 months at first and then every 6-12 months
- Mild to moderate: 3-6 months, then 6-12 months

HYPERTENSIVE RETINOPATHY: MORE STATISTICS

HYPERTENSIVE RETINOPATHY SIGNS AS RISK INDICATORS OF CARDIOVASCULAR MORBIDITY AND MORTALITY
- Survival rate:
  + Grade 1 HTN retinopathy had a 70% survival rate in the next 3 years
  + Grade 4 HTN retinopathy had a 6% survival rate in the next 3 years
- Fundus findings of retinal hemorrhages, microaneurysms, and cotton wool spots were:
  + 2-4 times more likely to develop an incident clinical stroke within 3 years, even with control of BP, smoking, lipids, etc.
  + 2 times more likely to develop congestive heart failure
  + 3 fold increased risk of heart failure events
  + **If combined with findings of AV nicking, these patients were more likely to develop renal dysfunction

HYPERTENSIVE RETINOPATHY SIGNS AS RISK INDICATORS OF CARDIOVASCULAR MORBIDITY AND MORTALITY
- Within normal blood pressure patients presenting with fundus findings of arteriolar narrowing:
  + 60% more likely to be diagnosed with hypertension within 3 years
  + Predicts incidence of type 2 diabetes
- Retinal microaneurysms and retinal hemorrhages are 2 times more likely to die from cardiovascular events
- Treatment of microcirculation in hypertensive patients may further reduce cardiovascular morbidity and mortality

IN SUMMARY: HYPERTENSIVE RETINOPATHY
- Patients are asymptomatic
- Be diligent to check for blood pressure
  + Know when to refer immediately
- Know the retinal signs of hypertension
  + Most common for chronic systemic hypertension:
    - Arteriolar attenuation
    - AV crossing changes
    - Increased ALR
- Co-manage with primary care physician
REFERENCES


QUESTION 1

Which of the following blood pressure measurement(s) is(are) considered a hypertensive crisis?

A. Blood pressure: 125/86

B. Blood pressure: 166/105
C. Blood pressure: 188/117
D. Blood pressure: 212/125
E. C & D

**QUESTION 2**

Which of the following are risk factors for hypertension?

A. Family history
B. Lack of exercise
C. Poor diet
D. Excessive alcohol consumption
E. All of the above

**QUESTION 3**

Which of the following is a symptom of hypertensive retinopathy?

A. Asymptomatic
B. Photopsia
C. Pain
D. Diplopia
E. Increased floaters

**QUESTION 4**

Which of the following signs, when presented alone, may NOT represent a manifestation of hypertensive retinopathy?

A. Vessel tortuosity
B. Vessel attenuation
C. Increased arteriolar light reflex
D. Arteriovenous crossing changes

**QUESTION 5**

Which of the following is most commonly associated with hypertensive retinopathy?

A. Flame heme
B. Dot heme
C. Blot heme
D. Microaneurysm
E. Macroaneurysm

**QUESTION 6**

Which of the following is a possible retinal complication of hypertension?

A. Retinal vein occlusion
B. Retinal artery occlusion
C. Cranial nerve palsy
D. Anterior ischemic optic neuropathy
E. All of the above
QUESTION 7
Which of the following grade(s) of hypertensive retinopathy is associated with chronic systemic hypertension?
A. Grade 1 hypertensive retinopathy
B. Grade 2 hypertensive retinopathy
C. Grade 3 hypertensive retinopathy
D. Grade 4 hypertensive retinopathy
E. A & B
F. C & D

QUESTION 8
Which of the following statements regarding hypertensive retinopathy is TRUE?
A. Flame shaped hemes are rare with hypertensive retinopathy
B. Compared to diabetic retinopathy, hypertensive retinopathy is more “dry”
C. Cotton wool spots are rare with hypertensive retinopathy
D. Extensive hemes and edema is common with hypertensive retinopathy

QUESTION 9
Which of the following life style changes help control/treat systemic hypertension?
A. Weight reduction
B. Decrease salt intake
C. Relaxation
D. Smoking cessation
E. All of the above

QUESTION 10
According to the statistics presented in the 2005 paper, Hypertensive retinopathy signs as risk indicators of cardiovascular morbidity and mortality, which of the following is statements is true?
A. Mild retinopathy has a strong association with stroke, congestive heart failure, renal dysfunction and cardiovascular mortality
B. Moderate retinopathy weak association with stroke, coronary heart disease and cardiovascular mortality
C. Accelerated retinopathy is associated with mortality and renal failure
D. All of the above statements are true