



HYPERTENSION PATHOPHYSIOLOGY & HYPERTENSIVE EYE DISEASE

جامعة ساوة

كلية التقنيات الصحية والطبية

قسم تقنيات البصريات

المرحلة

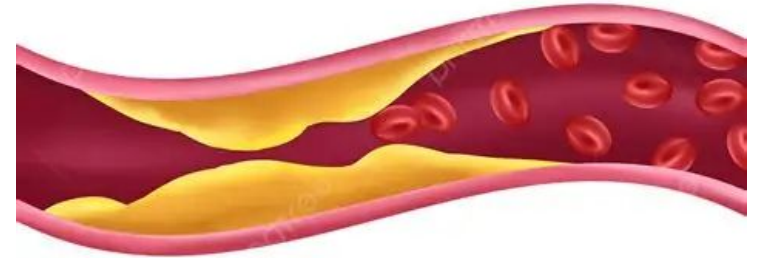
Definition of Hypertension

- Hypertension: persistent elevation of arterial blood pressure above normal range.
- Normal: $<120/80$ mmHg
- Hypertension: $\geq 140/90$ mmHg



Pathophysiology of Hypertension

- ↑ Peripheral vascular resistance (vasoconstriction)
- ↑ Cardiac output (sympathetic overactivity)
- Arteriolar remodeling → thickening of vessel wall
- Endothelial dysfunction → ↓ nitric oxide, ↑ oxidative stress
- Leads to: Target organ damage (heart, kidney, brain, eyes)



Hypertensive Target Organ Damage

- Heart → Left ventricular hypertrophy
- Kidney → Nephrosclerosis
- Brain → Stroke
- **Eye → Hypertensive Retinopathy**

Hypertensive Eye Disease (Definition)

- Spectrum of retinal & optic nerve changes caused by elevated systemic BP.
- Reflects the severity and duration of hypertension.
- Can indicate systemic vascular damage.

Pathophysiology in the Eye

1. Vasoconstriction of retinal arterioles (early & reversible).
2. Sclerosis (thickening) of vessel walls with chronic HTN.
3. Breakdown of blood-retinal barrier → hemorrhage & exudate.
4. Optic disc edema in severe malignant hypertension.

Retinal Changes – Stages (Keith–Wagener–Barker Classification)

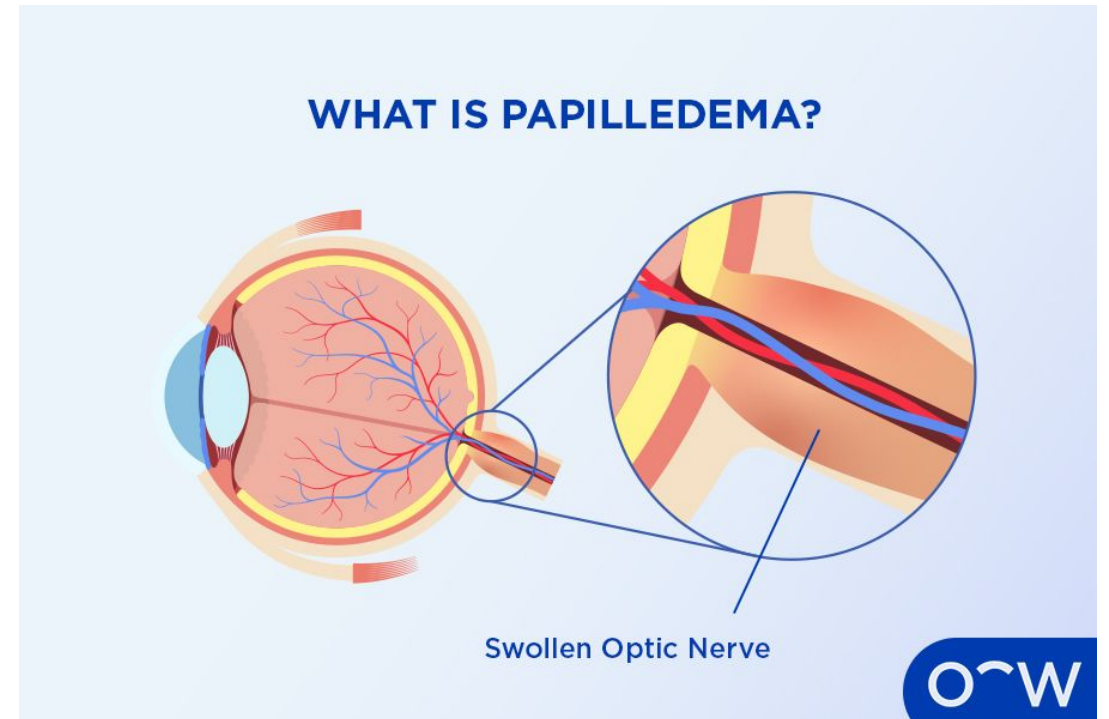
<u>Grade</u>	<u>Findings</u>	<u>Description</u>
I	Mild arteriolar narrowing	Copper wiring” appearance
II	AV nicking	Arteriovenous crossing changes
III	Hemorrhages, cotton-wool spots, hard exudates	Retinal ischemia
IV	Papilledema	Malignant hypertension, emergency

Clinical Features

- Often asymptomatic initially
- Later: blurred vision, visual field defects.

- **Fundus exam shows:**

- 1) Arteriolar narrowing
- 2) Hemorrhages
- 3) Cotton-wool spots
- 4) Macular star
- 5) Papilledema (severe)



Fundus Findings Summary

Early:

- Generalized/focal arteriolar narrowing
- AV nicking

Moderate:

- Retinal hemorrhages
- Cotton-wool spots
- Hard exudates

Severe:

- Papilledema
- Macular star formation



Differential Diagnosis:

- Diabetic retinopathy
- Retinal vein occlusion
- Anemia or blood dyscrasias
- Radiation retinopathy

Management

- Control systemic blood pressure
- Lifestyle: diet, exercise, reduce salt
- Medications: ACE inhibitors, ARBs, β -blockers, diuretics
- Ophthalmic follow-up
 - Fundus examination every 6–12 months
 - Treat complications: macular edema, optic neuropathy

Key Points for Optometry Students

- Always measure BP in patients with retinal changes
- Fundus findings reflect systemic vascular health
- Sudden vision changes → suspect malignant HTN
- Eye is a “window to systemic circulation”

Summary

- **Hypertension = $\uparrow$ vascular resistance**
 - **Causes structural & functional changes in retinal vessels**
- **Classification (I–IV) helps estimate systemic risk**
- **Early detection by optometrists can prevent vision & life-threatening complications**

References

- Vaughan & Asbury's General Ophthalmology
- Kanski's Clinical Ophthalmology
- Guyton & Hall Textbook of Medical Physiology
- American Heart Association (AHA) Guideline

**Thank
you!**

