HYPERTENSIVE RETINOPATHY
Early Detection and Treatment

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INTRODUCTION

- Hypertensive retinopathy is a manifestation in ophthalmic involvement in hypertension, which can **really visualization** of vascular sclerotic among other target organ damage.
- It is may happen gradually long life disease but **no sign and symptom in visual function**, although in late state of the disease without occlusive vascular complication in the retina.
INTRODUCTION

On the other hand ophthalmologist have are important role in the detection, monitoring, and share management of patient, because early reaction of vascular narrowing can give important information for potential occlusive complication in target organ damage.
## Classification of Blood Pressure for Adults Aged 18 Years or Older (JNC 7, 2003)

<table>
<thead>
<tr>
<th>Blood pressure classification</th>
<th>Systolic</th>
<th>Diastolic, mmHg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120</td>
<td>And &lt;80</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120-139</td>
<td>Or 80-89</td>
</tr>
<tr>
<td>Stage 1 hypertension</td>
<td>140-159</td>
<td>Or 90-99</td>
</tr>
<tr>
<td>Stage 2 hypertension</td>
<td>≥160</td>
<td>Or ≥100</td>
</tr>
</tbody>
</table>
TARGET ORGAN DAMAGES IN HYPERTENSION:

- Stroke (brain)
- MI (Myocard Infarct)
- Heart failure
- Peripheral vascular disease
- Kidney disease
- Retinal vascular complication
Hypertensive Retinopathy
Retinal Vein Occlusion
Retinal Arterial Occlusion
Glaucoma
Ischemic optic neuropathy
RETINAL METABOLISM

- High Rate Glycolysis
- Oxygen Consumption
- Electrical Activity
Primary response to systemic hypertension is narrowing of capillary, pure form only in young adult.

The rigidity of capillary in older patient also make the narrowing in the same degree because of involutional sclerosis.
### SYSTEMIC CIRCULATION
- IOP
- Scleral Rigidity
- Central Neural Mechanism
- Circulating hormone
- Local vascular mediator
- Lamina Cribrosa

### OCULAR BLOOD FLOW

### INTERNAL AUTOREGULATOR
- Capillary endothelium
- Retinal pigment epithelium
- Oxygen pressure (P O2)

### RETINAL PERFUSION
EXTERNAL AUTO REGULATOR

Physiology

SYSTEMIC ARTERIAL PRESSURE

Lamina Cribrosa

Scleral Rigidity

IOP
Increase 41% systemic BP (above baseline)
or
Increase 27-30% mmHg IOP (above baseline)
To decrease Retinal Perfusion Pressure 50%
Pre Arterioles Level

- “POISEUILLE – HAGEN” LAW

Decreasing capillary diameter 10-25%

Decreasing capillary blood flow ± 30-70%
RETINAL VASCULAR:

- Pre-capillary (without sphincter, replacement by smooth muscle)
- Capillary
- Post-capillary
Mechanical Stimuli To Capillary Wall
- Shear forces
- Pulsatility

Endothelial Cell Mediator release
- Coagulation factor
- Platelets
- White blood cells

Smooth Muscle Tonus ↑

Vaso spasm (Temporary Narrowing)
CHRONIC HYPERTENSION

Retinal Capillary Response in Hypertension

Chronic Response

- Endothelial cell dysfunction
- Capillary wall deformity and functional disturbance
- Vascular rigidity

- Medial hypertrophy
- Hyalinization
THE BASIC THEORY OF HYPERTENSIVE RETINOPATHY

- Long standing of the high blood pressure
- Impaired of retinal capillary
- Disturbance of retinal auto regulation system
FUNDUSCOPIC MANIFESTATION IN SYSTEMIC HYPERTENSION
MULTI FACTORS INFLUENCES:

- Onset of hypertension
- How old when the first onset
- How high systolic pressure persistence
- How long of hypertension
- Metabolic status
- Lipid profile
- Medical treatment
THE IMPORTANT THINGS OF FUNDUSCOPIC EXAMINATION IN HYPERTENSION

- Representative, the real condition of capillary in target organ damage
- Early diagnose, early treatment
TARGET OF EXAMINATION

- Vascular system (vasculopathy)
- Retinal condition (retinopathy)
- Optic disc (optic neuropathy)
- Exudative retinal detachment (choroidopathy)
No theory could explained the relation of chronological, clinical and prognostic aspect

Modified Scheie Classification of Hypertensive Retinopathy: (1999)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No changes</td>
</tr>
<tr>
<td>1</td>
<td>Barely detectable arterial narrowing</td>
</tr>
<tr>
<td>2</td>
<td>Obvious arterial narrowing with focal irregularities</td>
</tr>
<tr>
<td>3</td>
<td>Grade 2 plus retinal hemorrhages and/or exudate</td>
</tr>
<tr>
<td>4</td>
<td>Grade 3 plus disc swelling</td>
</tr>
</tbody>
</table>
## Classification of Hypertensive Retinopathy with Systemic Associations (JNC 7, 2004)

<table>
<thead>
<tr>
<th>Grade of Retinopathy</th>
<th>Retinal Signs</th>
<th>Systemic Associations</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>No detectable signs</td>
<td>None</td>
</tr>
<tr>
<td>Mild</td>
<td>Generalized and/or focal arteriolar narrowing, arteriovenous nicking, opacity (&quot;copper wiring&quot;) of arteriolar wall, or a combination of the signs</td>
<td>Modest association with risk of stroke, coronary artery disease, and death</td>
</tr>
<tr>
<td>Moderate</td>
<td>Hemorrhage (blot, dot, or flame-shaped), microaneurysm, cotton-wool spot, hard exudates, or a combination of these signs</td>
<td>Strong association with stroke, cognitive decline, and death from cardiovascular causes</td>
</tr>
<tr>
<td>Malignant</td>
<td>Signs of moderate retinopathy plus swelling of the optic disc</td>
<td>Strong association with death</td>
</tr>
</tbody>
</table>
Practically is difficult

- Ophthalmoscopic screening for **Major risk factor** (cigaretts smoker, obesity, physical inactivity, dislipidemia, diabetes melitus >55yr for men/>65yr for female, family history)
- Identification of arteriosclerotic grading
RETINAL VASCULAR RESPONSE IN HYPERTENSION

- Acute stage → angiospasme (reversible)
- Chronic stage: (irreversible)
  - Grade 1:
    - Broadening arteriolar light reflect, mild arteriolar attenuation, vein concealment
  - Grade 2:
    - Obvious broadening arteriolar light reflect, A.V. crossing (salus sign)
  - Grade 3:
    - Copper wiring of arterioles, A.V. crossing (banking-bonnet sign / Gunn sign)
  - Grade 4: silver wiring arterioles

KANSKI 2007
RETINAL COMPLICATION IN HYPERTENSION

- Acute $\rightarrow$ generalized oedema
- Chronic:
  - Macular star
  - Cotton-wool spots
  - Flame-shaped hemorrhages
  - Reversible
Disc-swelling:

- Acute / chronic response
- Neuropathy - Severity sign
HYPERTENSIVE CHOROIDOPATHY

- Choroidal capillary decompensated
- Impairement of choroidal capillary autoregulator
- Acute hypertensive crisis in young adult (accelerated)
HYPERTENSIVE CHOROIDOPATHY

- Elschnig spot
  - Small black spot, surrounded by yellow halos (choroidal infarcts)
- Siegrist streaks
  - Flecks linearly along choroidal vessels (fibrinoid necrosis)
- Exudative retinal detachment
  - Bilaterally, bullous, inferior quadrant
Influence Factors:

- Vascular system
- Hematology
- Blood rheology
- Perivascular status
Early detection of sclerotic vasculopathy (grade 1-2), as soon as possible must be consulted for treatment.
If there is vascular occlusive in retina (with visual disturbances)

- Examination must be performed
  - Fluorescine angiography
  - Optical Coherent tomography

- Treatment for primary cause (Hypertension)
  - Laser Photocoagulation
  - Anti-VEGF
HOW TO PREVENT HYPERTENSIVE RETINOPATHY?

- To normalized systemic blood pressure and METS control as soon as possible:
  - To pursue progressivity of hypertensive retinopathy
  - To reduce possibility target organ damage
  - Carefully monitored periodically
  - Lifestyle Modification
THANK YOU
REFERENCE

- American Academy of Ophthalmology; Retinal Vascular Disease; Basic and Clinical Science Course, Retina and Vitreous, Section 12, Chapter 5, p. 97-99, 2007-2008
- American Academy of Ophthalmology; Hypertension; Basic and Clinical Science Course, Update on General Medicine, Section 1, Chapter 2, p. 81-89, 2007-2008
REFERENCE

- Tjokroprawiro. A.; The METS; One of The Major Threat to human Health; Sumetsu-1., p.1-7, 2005