CEREBROVASCULAR DISORDERS — Part I.

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SCHEME OF THE LECTURE

CEREBROVASCULAR DISORDERS = STROKE

- DEFINITION
- EPIDEMIOLOGY
- CLASSIFICATION
- CLINICAL SIGNS
- DIAGNOSTIC PROCEDURES
WHO:

Stroke is a "neurological deficit of cerebrovascular cause that persists beyond 24 hours or is interrupted by death within 24 hours".

Hippocrates (460-370 BC) first described the sudden paralysis that is often associated with stroke.
STROKE: Epidemiology

- **WHO:** 15 million people suffer STROKE worldwide each year
  - 5 million die and another 5 million are permanently disabled
  - USA: stroke is a leading cause of disability

- **Stroke** was the second most frequent cause of death worldwide (in 2011), accounting for 6.2 million deaths (~11% of the total) - appr. 17 million people had a stroke (in 2010)
  - Europe: 650,000 stroke deaths each year
  - USA: 140,000 stroke deaths/year

- **Age:** Stroke can occur at ANY age
  - two-thirds of strokes occurred in people over 65 years old
  - the risk of having a stroke more than doubles each decade after the age of 55

- The incidence of stroke increases exponentially from 30 years of age, and etiology varies by age

- **Risk factors** for stroke:
  - in current smokers is about double risk that of non-smokers
  - atrial fibrillation is an independent risk factor for stroke, increasing risk about 5-fold
  - high blood pressure is the most important risk factor for stroke
STROKE: Classification

• Ischemic (Cerebral infarct) (80%)
  ◦ Thrombosis (obstruction of a blood vessel by a blood clot forming locally)
  ◦ Embolism (obstruction due to an embolus from elsewhere in the body)
  ◦ Systemic hypoperfusion (general decrease in blood supply)
  ◦ Cerebral venous sinus thrombosis
  ◦ "Cryptogenic" (of unknown origin)

• Hemorrhagic (20%)
  ◦ Intraparenchymal hemorrhage (bleeding within the brain tissue)
**Hemorrhagic Stroke**

- Weakened/diseased blood vessels rupture.

  - Blood leaks into brain tissue

**Ischemic Stroke**

- Blood clots stop the flow of blood to an area of the brain

© Heart and Stroke Foundation of Canada
STROKE: Ischemic or hemorrhagic
ISCHEMIC STROKE/BRAIN INFARCT: Classification

- **Anterior** circulation infarct
  - in the region of **internal carotid** artery

- **Posterior** circulation infarct
  - in the region of **vertebro-basilar** artery system

- **Lacunar** infarcts (< 1 cm Ø)
  - small vessels of the brain

- **Transient ischemic attack (TIA)**
  - stroke-related symptoms resolve **completely** within 24 hours
Cerebral circulation
STROKE: Diagnostics: Medical history & neurological state

- Previous medical history
  - Vascular risk factors
  - Regular drug treatment

- Physical examination: Neurological state

- NIH Stroke Scale

<table>
<thead>
<tr>
<th>Score</th>
<th>Stroke severity</th>
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<tbody>
<tr>
<td>0</td>
<td>No stroke symptoms</td>
</tr>
<tr>
<td>1-4</td>
<td>Minor stroke</td>
</tr>
<tr>
<td>5-15</td>
<td>Moderate stroke</td>
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<tr>
<td>16-20</td>
<td>Moderate to severe stroke</td>
</tr>
<tr>
<td>21-42</td>
<td>Severe stroke</td>
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</tbody>
</table>
## STROKE: Vascular risk factors
(modifiable or non-modifiable)

<table>
<thead>
<tr>
<th>Modifiable Risk Factors</th>
<th>Non-Modifiable Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Smoking</td>
</tr>
<tr>
<td>Gender</td>
<td>Alcoholism</td>
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<tr>
<td>Hypertension</td>
<td>Stress</td>
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<tr>
<td>Diabetes mellitus</td>
<td>Hormonal contraception</td>
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<tr>
<td>Dyslipidaemia</td>
<td>Psychostimulants (e.g., cocaine)</td>
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<tr>
<td>Obesity (BMI)</td>
<td>Previous TIA/Stroke</td>
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<tr>
<td>Physical inactivity</td>
<td>Migraine with aura</td>
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<tr>
<td>Heart diseases</td>
<td>Sickle-cell anemia</td>
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<tr>
<td>Coagulopathies</td>
<td>Family history</td>
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</tbody>
</table>
STROKE: Clinical signs

- CNS symptoms:
  - paresis (muscle weakness), sensory disturbances (e.g., numbness), ataxia, speech disturbances, visual disturbances, dizziness, cranial nerve signs, etc.
  - loss of consciousness, seizure, headache
  - increased ICP signs

- Clinical signs depend on the neurological localisation of the vascular lesion

- Onset of the symptoms: is sudden
STROKE: Diagnostic procedures

- Blood pressure monitoring
- Brain CT/MRI scans (angiography: CTA/MRA/DSA if necessary)
- Ultrasound/doppler of carotid and vertebral arteries
- Electrocardiography (ECG)
- Echocardiography (TTE or TEE)
- Holter ECG monitoring
- Routine blood tests (serum glucose, lipids, uric acid, polyglobulia/polycythaemia)
- Special blood tests (thrombophilia - for coagulopathies, homocysteinaemia, autoimmune factors - for vasculitis)
For diagnosing **ischemic stroke** (in the emergency setting):
- CT scan:
  - sensitivity = 16%
  - specificity = 96%
- MRI scan:
  - sensitivity = 83%
  - specificity = 98%

For diagnosing **hemorrhagic stroke** (in the emergency setting):
- CT scan:
  - sensitivity = 89%
  - specificity = 100%
- MRI scan:
  - sensitivity = 81%
  - specificity = 100%
STROKE: MRI sequences
SUMMARY

- Sudden-onset neurological signs → suspicion for **STROKE**
- Stroke is an urgent condition – **needs emergency management**
- Urgent CT or MRI scan – to differentiate ischemic or hemorrhagic cerebro-vascular lesion
- Cardio-vascular investigations are needed
  - Carotid/vertebral ultrasound, ECG, echocardiography
- Monitoring: BP, HR, ECG, blood glucose level

TIME LOST IS BRAIN LOST
WHAT IS STROKE

SYMPTOMS
- Stroke happens when part of the brain is damaged due to interrupted blood supply.
- Symptoms include slurred speech, numbness or weakness on face, arm, and leg on one side, double vision and loss of balance.
- These symptoms may occur during sleep and be noticed only on waking up.

FACTORS
- Older age
- Male gender
- High blood pressure
- Cigarette smoking
- Diabetes
- High cholesterol
- Irregular heartbeat
- Certain heart diseases
- Previous stroke

TREATMENTS
Depending on the type of stroke, options include:
- Blood thinners
- Surgery

SOURCE: SINGHEALTH
TNP GRAPHICS: CEL GULAPA
Stroke – there’s treatment if you act FAST.

Face
Face look uneven?

Arm
One arm hanging down?

Speech
Slurred speech?

Time
Call 911 NOW!

1623
New York State Department of Health

4/07
To be continued...

NEXT WEEK
THANK YOU FOR YOUR ATTENTION
Questions?