Stroke
Brain Anatomy and Physiology

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Fig. 6  The major arterial supply to the brain. ACA, anterior cerebral artery; MCA, middle cerebral artery; PCA, posterior cerebral artery; PAD, pia, arachnoid, dura.
Fig. 11 The major venous circulation of the brain.
The Neuron

- Dendrites
- Cell body
- Junction of axon hillock and initial segment of axon
- Axon
- Axon terminals and synaptic end bulbs (or varicosities)
An action potential consists of depolarization and repolarization.

Key:
- Resting membrane potential: Voltage-gated Na⁺ channels are in the resting state and voltage-gated K⁺ channels are closed.
- Stimulus causes depolarization to threshold
- Voltage-gated Na⁺ channel activation gates are opening
- Absolute refractory period
- Voltage-gated K⁺ channels are opening; Na⁺ channels are inactivating
- Relative refractory period
- Voltage-gated K⁺ channels are still open; Na⁺ channels are in the resting state

Which channels are open during depolarization? During repolarization?
Synapse (GABA)
Florence Nightingale (1820 — 1910)
Stroke
Stroke is ......

• A clinical syndrome:
of acute loss of focal cerebral function (symptoms
lasting > 24H00)
due to (presumed ?) vascular pathology

• 3rd leading cause of death

• Most common reason for adult disability
Natural History

• ± 5 Million stroke deaths/year worldwide

• Age adjusted incidence rates
  100-300/ 100 000 population

• Stroke mortality - 20-25% in 1st month

• Risk of being disabled after stroke ± 50%

• Risk of recurrent stroke - 10% in 1st year
  - 5 % / year
Stroke Pathology

• 70 – 80 % - Ischaemia

• 15 – 20 % - Haemorrhage

• 5 – 10 % - Undefined
Stroke Types

Fig. Frequency of different types of strokes.
Types of stroke

• 80% Ischaemic
  – -40% Large artery disease (atherosclerosis)
  – -30% Cardio-embolic
  – -10% Small vessel disease (Lacunes)

• 20% Haemorrhagic
  – -15% Intracerebral
  – -5% Sub Arachnoid
The LifeTime Risk of stroke

Framingham Study
• Cohort of 4897, stroke free at age 55
• Followed up to 51 years (115,146 person yrs)

• LTR of stroke = 1 in 5 woman
  = 1 in 6 men

• Similar at age 55, 65 and 75

• If normal BP (<120/80) – 50% less risk


**Transient Ischaemic Attacks**

- TIA’s are mimics of acute ischemic stroke. Focal deficit resolves in less than 24 hours.

- The majority (80%) of TIA’s last only 7-10 min.

- TIA’s carry a 30% 5 year stroke risk.
  - 15% in the first 14 days.
Time = Brain
Florence Nightingale (1820 — 1910)
Warning signs of Stroke/TIA
“Brain attack”

- Sudden weakness/numbness of the face, arm or leg on one side of the body

- Sudden dimness or loss of vision, particularly in one eye

- Loss of speech or trouble talking or understanding speech

- Sudden, severe headaches without known cause

- Sudden dizziness, unsteadiness or falls
Pre-Hospital / FIELD

- Last *known well* time – normal function
  - Maximum time = 4.5 hours

- Identify stroke – warning signs

- Call 911/EMS

- Load & Go
FACE—ask patient to smile or show teeth:
  Look for NEW lack of symmetry—tick 'Yes' if there is an unequal smile or grimace, or obvious facial asymmetry.
Arm movements—lift the patient's arms together to 90° if sitting, 45° if supine and ask them to hold the position for 5 s then let go.
  Does one arm drift on its own or fall rapidly?
Speech—if the patient attempts a conversation, look for NEW disturbance of speech:
  Check with companion.
  Look for slurred speech.
  Look for word finding difficulties. This can be confirmed by asking the patient to name commonplace objects that may be nearby, such as a cup, chair, table, keys, pen.
  If there is a severe visual disturbance, place an object in the patient's hand and ask them to name it.
FAST / FIELD / ER

NORMAL ABNORMAL
Emergency Medical Services Response
From first response to arrival at hospital...
EMS Response: Vital Functions

- **Airway**
  - intubate if: coma, hypoventilation, risk of aspiration

- **Breathing**
  - pulse oxymetry
  - aim for normoventilation

- **Circulation**
  - i.v. line, Normal saline, no glucose
  - ECG
  - BP

- Check blood glucose to exclude hypoglycaemia
- No hypotensives, except in extreme situations
- Treat hypotension/dehydration and fever
EMS Response: Neurostatus*

• Glasgow coma scale if reduced consciousness

• FASTest
  – Facial droop or gaze deviation
  – Arm/leg weakness or drift
  – Speech clarity and accuracy
  – Hemianopia or major sensory deficit

• Are symptoms improving or deteriorating?

• Evidence of seizures, trauma or stiff neck?
  *Allow 2 minutes maximum for making this assessment
EMS Response:
Preparation for Transfer (1)

**Do:**

- Document onset of stroke symptoms (timing, progression, preceding factors)
- Stabilise for immediate transport
- Notify receiving team at stroke unit/ER
Do not:
• Declare low priority in cases of doubt
• Sedate unnecessarily
• Lower blood pressure
• Delay transportation to stroke centre
• Give glucose (except in hypoglycaemia)
• Allow anoxia or hypoventilation
• Allow arterial hypotension
• Administer large amounts of fluids
• Neglect family members - they will be needed at stroke unit/ER
EINDE
EERSTE
SESSIE