Thrombectomy for Acute Ischemic Stroke: Where we are.

Barbara Albani, MD
Chair, Department of Neurointerventional Surgery
ChristianaCare
Objectives

• Background and pathophysiology of acute ischemic stroke
• Discuss the decision making in acute stroke care
• Discuss the role of imaging in acute stroke
• Explore current endovascular practices in stroke treatment
What is a stroke?

- Clinical
  - When we lose function of a part of the brain that manifests as a focal neurological deficit.
    - Bleeding (hemorrhagic)
    - Lack of flow (ischemic)

- Imaging (silent)
  - Cell death, ICH, or SAH without neurological deficits are also considered strokes
Stroke Subtypes

- **Ischemic stroke: 87%**
  - Mechanism: Thrombotic vs. Embolic vs. Hypoperfusion
  - Large vessel vs. Small vessel

- **Hemorrhagic stroke: 13%**
  - Intracerebral hemorrhage
  - Intraventricular hemorrhage
  - Subarachnoid hemorrhage

Adapted from Heart and Stroke Foundation of Canada
Ischemic Stroke Causes

- Cardioembolic: 30-35%
- Small artery occlusion (Lacunar): 26%
- Large Vessel disease artery to artery emboli: 15-20%
- Other: 5%
  - hypoperfusion, hypercoagulable states, dissection
- Cryptogenic: 20-30%
Pathophysiology of Acute Large Vessel Ischemic Stroke

- Infarct core
- Ischemic penumbra
Infarct core
Following abrupt occlusion of a cerebral artery, local cerebral blood flow is reduced below a critical threshold for cellular viability. A region of maximal ischemic insult can be expected to be irreparably damaged within minutes as a result of oxygen deprivation, resulting in cytotoxic edema.
Ischemic penumbra – By comparison, a surrounding area of less severely compromised perfusion may remain viable for a variable period of time depending on the degree and extent of collateral vascular supply – Penumbral tissue may convert to infarct core if not quickly reperfused.

Pathophysiology of Acute Large Vessel Ischemic Stroke
Outcome linked to time to vessel opening

For every 30 minute delay in reperfusion, the probability of a good outcome is reduced by 10%.
STROKE IMAGING
Normal ASPECTS = 10. Subtract 1 point for each area of acute ischemia.
CT Angiogram

LEFT M1 OCCLUSION
CT Perfusion - late strokes

CBF

A

Tmax

CBF < 30%: 53 ml
Mismatch volume: 91 ml
Mismatch ratio: 2.7

Tmax > 6.0s: 144 ml
Treatment options

**IV tPA / TNK**
Gold-standard in ischemic stroke care. Drug is designed to break apart the clot.

**Medical Management**
Monitor vitals and provide secondary stroke prevention.

**Endovascular Clot Removal**
Mechanical disruption or removal of the clot using standard endovascular approaches.

**Combo Therapy**

---
Endovascular Treatment

- Intra-arterial Thrombolysis (historic interest)
- Mechanical Thrombectomy (Standard of care in eligible pts)
Intra-Arterial Thrombolysis
ELVO, MEVO, DEVO (large, medium and distal vessels)

MECHANICAL THROMBECTOMY
Lesional aspiration

• ‘Bain vacuum’

• First approved 2009, continues to improve

• ADAPT technique
  – Track the catheter to the clot face and aspirate
  – Then pull out / engulf clot
• First FDA clearance in March 2012
• Good vessel opening >88%
• Now used in combo with aspiration
CASES.....
Case 1

• Clinical presentation...
  – 37 y/o female
  – Acute onset (3 hours)
  – Symptoms
    • complete right hemiparesis
    • global aphasia
    • left gaze preference
    • NIHSS 21

• THOUGHTS......
  • Based on time, she is eligible for meds
  • Based on deficit we are concerned for a large vessel occlusion
Case 2

• 87-year-old female with known atrial fibrillation, off Coumadin for minor surgical procedure (cause?)

• Wakes up with acute stroke symptoms including dysarthria, diplopia, ataxia, and right upper extremity weakness. NIHSS 25

• Woke up with symptoms
CTA

RIGHT ICA OCCLUSIONS
CT Perfusion

CBF

A

Tmax

○ CBF<30%: 31 ml

Mismatch volume: 150 ml
Mismatch ratio: 5.8

○ Tmax>6.0s: 181 ml

LARGE PERFUSION MISMATCH
Lesional aspiration
Lesional aspiration
Case 3

- 60-year-old female with HTN, DM and heavy smoker
- Heartbeat was irregular on examination
- Sudden onset left sided weakness, hemispatial neglect forced and gaze to the right
- NIHSS 18
- 2 hours since symptoms began
RIGHT M₁ OCCLUSION
CTP

CBF

A

Tmax

CBF<30%: 0 ml

Mismatch volume: 86 ml
Mismatch ratio: infinite

Tmax>6.0s: 86 ml

PERFUSION MISMATCH
CTA

RIGHT M1 OCCLUSION
THE DARK SIDE
Reperfusion injury
Vessel Perforation
Cannot keep the vessel open
New frontiers

1- Idea of salvageable brain taking over for ridged time windows with advanced imaging

2- Benefit for revascularization even in large core infarcts

3- Advances in device technology and technique allows for opening smaller size vessels (MEVO, DEVO) with good outcome
FAST Criteria

If you suspect a stroke, think F.A.S.T
F-Facebook announcement with your suspicions.
A-Ask for thoughts prayers
S-Search google for your symptoms
T-Try lavender oils.
KEY points - RAP

- **RECOGNIZE**
  - Fast criteria
  - Can happen to anyone!!
  - Look out for others

- **ACT**
  - Time is brain

- **PREVENT**
  - Modify risk factors

Stroke – there’s treatment if you act FAST.

- Face
  - Look uneven?
- Arm
  - One arm hanging down?
- Speech
  - Slurred speech?
- Time
  - Call 911 NOW!
“Mr. Osborne, may I be excused? My brain is full.”
Journey from door to recanalization

ED arrival

ED eval- ?is it a Neurological

Neurology eval- Is it a stroke?

Imaging NCCT/CTA – CTP >4.5 hrs

Supportive care

Acute intervention

Meds only

Interventionist

Meds + MT

MT only
Clinical Decision Making

- How do we decide who gets treatment?
- How do we decide what treatment people get?

**Risks**
- Bleeding
- Accessibility
- Little penumbra
- Pt wishes/baseline fct

**Benefits**
- Outcome
- Bad natural hx stroke
- Reasonable penumbra
- Pt wishes/baseline fct