



# How to manage complications of acute stroke interventions

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# DISCLOSURE STATEMENT OF FINANCIAL INTEREST

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below

## AFFILIATION/FINANCIAL RELATIONSHIP

- Grant/Research Support
- Consulting Fees/Honoraria
- Major Stock Shareholder/Equity
- Royalty Income
- Ownership/Founder
- Intellectual Property Rights
- Other Financial Benefit

## COMPANY

- Medtronic
- Bayer, Boehringer Ingelheim, Pfizer, Daiichi Sankyo  
i-MHS, CLP
- HOT-TIA
- HOT-TIA
- HOT-TIA

# DISCLOSURE STATEMENT OF FINANCIAL INTEREST

I, (Devesh Sinha) DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.

# Complications of acute stroke intervention

## Pre procedure

Angioedema from IV tPA  
Allergy to Contrast  
Haemorrhagic Conversion

## Device-related complications

Vasospasm  
Arterial perforation and dissection  
Device detachment / misplacement

## Stroke related problems

Symptomatic intracerebral haemorrhage  
Subarachnoid haemorrhage  
Embolization to new or target vessel  
Re-Infarction

## Access-site problems

Vessel/nerve injury  
Access-site hematoma  
Groin infection  
Pseudoaneurysm  
Limb ischemia

## Other complications

Anesthetic- Cerebral Re-Perfusion Syndrome  
Extra-cranial haemorrhage (RP)  
Radiation risks, Radiocontrast-Mediated Acute Kidney Injury (RCM- AKI)

# Pre procedure

- While patient is shifted on the Angio table –
- Angioedema from IV thrombolysis
- Allergy to Contrast
- Hemorrhagic Conversion post IV thrombolysis

# Angioedema

- 1-5% of patients treated with IV rtPA
  - Acute, transient, well-demarcated swelling that involves deep layers of skin.
  - Face, genitalia, upper respiratory airways and the intestinal epithelial lining.
  - Linked to ACE-Inhibitor use and hereditary deficiency in C1-esterase
- 
- Prevent Angioedema
- 
- Proforma monitoring for Angioedema
  - Nurses pathway to evaluate post tPA patients for throat/ mouth oedema
  - Look for any difficulty breathing due to angioedema if CS

# Treat Angioedema

- Initial goal of therapy is airway management with early intubation if CS.
- tPA infusion should be discontinued.
- Treat patient with
  - Histamine antagonists
  - Corticosteroids
  - Admit to the Neurocritical Care Unit

# Contrast Allergy

- Newer low-osmolarity nonionic agents ↓ in the incidence of contrast reactions
- Around 3% of patient -some reaction (Severe reactions are -0.004%)
- Most are self-limited and do not require treatment
  - Dyspnea
  - Hypotension
  - Loss of consciousness
  - Cardiac Arrest

# Prevent Contrast Allergy

- High risk patients can be prospectively identified
- Most commonly risk groups include:
  - Previous reactions to iodinated contrast material
  - Patients with asthma
  - Patients who have any allergies
- Cardiac arrhythmia's
- Myasthenia graves (central type)
- Sickle cell anemia
- Pheochromocytoma

# Treat Contrast Allergy

- Corticosteroid prophylaxis -no level 1 evidence supporting its use of the prevention of severe reactions to low osmolar contrast media
- Most severe reaction occurs ~20 minutes of dye
  - Oxygen
  - Adrenelin
  - H1 antihistamines (Chlorpheniramine)
  - H2-receptor blockers (Ranitidine)

# Will you stop procedure?

- Are these complications reasons to abort endovascular therapy?
- Early Haemorrhagic Conversion should exclude a patient from MT therapy?
- Will you use more/different contrast
- Anaesthetic ?

# Access-site problems

## Retro Peritoneal Bleed- RP

- Bleeding that occurs behind the serous membrane lining walls of the abdomen/pelvis
- Occurs more if access is made above the inguinal ligament or penetration of the posterior wall.
- In PCI studies vascular complications ~ 6%
- More frequent with patients on antiplatelet
- Women are at higher risk than men

# RP Bleed Clinical Findings

- Severe back pain with ipsilateral flank pain, Abdominal distention
  - Ecchymosis and decrease in Hb and Hct-late signs
  - Hypotension and tachycardia
  - Diagnosed by CT scan of Abd/Pelvis
- 
- Monitoring
- 
- Vascular Injury can occur anywhere post procedure
  - Monitor Pulses, Monitor Urine Output, Watch for Possible renal artery injury

# Treatment of RP Bleed

- Provide Iv Fluid
- Maintain prolonged bed rest
- Serial hemoglobin and hematocrit counts
- Stop tPA, Lab values for reversal DOAC if medically necessary
- Blood transfusion, if indicated
- If severe, may require surgical evacuation

# Other Complications

- Limited data in literature, most are of expert opinion
- Major complications can occur during and following acute stroke interventions
  - Radiocontrast-Mediated Acute Kidney Injury (RCM- AKI)
  - Cerebral Re-Perfusion Syndrome
  - Seizures

# Treatment of RCM-AKI

- Standard IV protocol after AIS is warranted
- Normal Saline 75-125 ml/hr

# Cerebral Re-perfusion Syndrome

- This is a rare < 1% , but serious complication
- A rapid ↑ in ipsilateral CBF- well above the metabolic demands of the brain tissue : 100% or greater ↑ in CBF compared to baseline
- Frequently reported in post carotid procedures
- Triad of symptoms
  - Ipsilateral headache
  - Contralateral neurological deficits
  - Seizures
- Symptoms can occur immediately after to 1 month after revascularization but most are symptomatic within first week
- Cerebral hyperperfusion syndrome after carotid endarterectomy. International Journal of Stroke. 7. 14-14. Ramadurai, G & Sinha, D. (2012)

# Treatment of Cerebral Reperfusion Syndrome

- BP can be reduced gently with antihypertensives that do not increase CBF or cause excessive vasodilatation
  - Labetalol
  - Nicardipine
- No specific parameters have yet been set for optimal BP after stroke intervention :Standard postoperative Neurosurgery standards

# Epileptic Seizure

- Seizures after AIS incidence 2.2% - 10.5%
- High incidence of seizures after AIS with haemorrhagic conversion
- Seizures reported within first 24 hours of stroke onset after endovascular therapy has been reported to have worse long-term outcomes

# Device related : Vasospasm

- 13-15%
- Retraction
- Nimodipine 0.5 mg /saline flush during while controlling BP
- Effective, for lowering BP = close monitoring of MT stroke patients.
- GTN prophylaxis patch ?

# Device detachment/misplacement

- Leaving the stent in place and performing angioplasty
- Removal of the detached stent and replacement with another thrombectomy stent within the treatment time window

# Arterial dissection

- Intravenous tPA stop immediately
- Current treatment options are reversal of bloods profile +/- platelets
- Standard APT for 3 months.
- If progressive flow disturbance in the vessel- stent
- Acute stent placement, the use of dual antiplatelet -risks of ICH

# Vascular perforation

- 1–9%, which may be fatal.
- The contrast extravasation at the site exacerbate the haemorrhage appearance
- Withdrawal of microcatheter is not recommended-SAH is exacerbated with tPA.
- A thrombus proximal to perforation likely to protects from haemorrhage.

# Vascular perforation

- All ongoing tPA or anticoagulants should be stopped or reversed.
- Ask Anaesthetics for lowering the blood pressure
- Leaving the microcatheter in place
  
- Coiling
- Gluing with n-butyl cyanoacrylate injection or Onyx

# Vascular perforation

- Further manipulation of the microcatheter could tear the wall > result in uncontrolled haemostasis.
- Difficulty with coiling or gluing the site is that the exact location and extent of rupture on angiograph.
- Neurosurgical trapping of the perforated site could be considered
- Transferring the patient to the theatre in the setting of a large AIS with new SAH is probably means high risks for complications because of the mobility required with transfer and risk of dislodging the microcatheter.

# Stroke related complications

- Asymptomatic intracerebral haemorrhage
- Symptomatic haemorrhage NIHSS >4
- Subarachnoid haemorrhage
  
- Haemorrhagic complications definitions
  - PH (1/2)- Parenchymal Haemorrhage
  - HI (1/2)- Haemorrhage in Infarct
  
- Embolization to new or target vessel territory

# Haemorrhagic complications- Who bleeds?

- Low **A**SPECTS score
- Very low cerebral **B**lood flow
- Large ischemic **C**ore
- **D**iabetes
- **E**longated Thrombus >14mm
- **F**ast or slow/ Prolonged thrombectomy procedural time
- **G**eriatric Age group
- Baseline **H**igh NIHSS

# Re-Infarction

- Defined as embolization into a different/same vascular territory
- Symptomatic and Asymptomatic
- ~10-15% of patients with revascularization have re-occlusion
- Some case reports of repeated IA therapy

# Complications of acute stroke intervention

- Some complications are life-threatening and many lead to ↑ length of stay.
- Complications ↑ costs and delay the rehabilitation.
- Some are preventable; the impact of others can be minimized by early detection
- ↑ Use of MT for the treatment of AIS, incidence and outcome of complications will need to be carefully monitored by stroke INR teams.



# We are Recruiting Neuro-intervention Consultants at London Neuro-intervention Fellows at London

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