CRITICAL CARE NURSING
MANAGEMENT OF
ENDOVASCULAR VASOSPASM
PATIENTS

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ACKNOWLEDGEMENTS: DHEERAJ GANDHI (MD), TIM MILLER (MD),
GARAUV JINDAL (MD) ANASTASIA WHITE RT (R)(VI)
CEREBRAL ANEURYSMS

- Relatively small incidence < 6% of the population
- SAH approx. 30,000 per year
- Risk of rupture increases with age
- Average age, 55 years
- 10%-15% of persons have multiple aneurysms
- Usually develops in the walls of major cerebral arteries at branching points
VASOSPASM

• A focal or diffuse narrowing of intracranial arteries
• Usually most severe in arteries adjacent to the ruptured aneurysm
• Results from the presence of blood products in subarachnoid space
• Predicted by amount of blood in subarachnoid space detected by CT
VASOSPASM
VASOSPASM

• Usually more severe in older persons and women
• Usually not present within first 2-3 days after ictus, peaks at 7-14 days, then resolves
• Causes brain ischemia secondary to decreased cerebral blood flow
• TDC or CTA
CLINICAL ASSESSMENT

- Frequent neurologic exams are critically important during the high-risk time window (3-14 days)

- Any of the following should raise concern:
  - Confusion
  - Delirium
  - Decreased consciousness
  - New focal neurologic deficits
Bedside evaluation:
Transcranial doppler ultrasonography (TCD)

Rule out rehemorrhage or hydrocephalus:
Non-contrast head CT

Initial angiographic evaluation:
Computed tomography angiography (CTA)

Perfusion evaluation:
Computed tomography perfusion (CTP)

Definitive angiographic evaluation:
Digital subtraction angiography (DSA)
62 YO WOMAN WITH RUPTURED ACOM ANEURYSM, DEVELOPS CONFUSION AND SLEEPINESS 6 DAYS AFTER CLIPPING

Transcranial Doppler Ultrasound (TCD)

TCD reveals markedly elevated MCA peak systolic velocities (163 cm/s) suggesting vasospasm

CTA angiogram (CTA)

CTA confirms right M1 segment vasospasm
AP view: right ICA injection

6 days later

AP view: right ICA injection

Courtesy Of D. Gandhi MD
Patient with symptomatic vasospasm

Established infarct

Contraindication to aggressive therapy

Regions of established infarct have minimal chance of functional recovery and have a high risk of reperfusion hemorrhage
Patient with symptomatic vasospasm

Salvageable parenchyma

1st line for most patients

Medical Therapy
- hypertension, hemodilution

Patient cannot tolerate hemodynamic therapy

Endovascular Therapy
- Intra-Arterial (IA) Vasodilator Infusion
- Transluminal Balloon Angioplasty (tBA)
- Combination
AP: left ICA

Lateral: left VA

AP: right ICA

A1  
M1  
ICA

A1  
M1  
ICA

P1  
BA

Courtesy Of D. Gandhi MD
VERAPAMIL (A)
- Calcium Channel Blocker
- Acts on smooth muscle cells
- Produces vasodilation
- Quick onset

NICARDIPINE (A/V)
- Calcium Channel Blocker
- More selectivity for vascular smooth muscle cells
- Systemic Vasodilatation resulting in DECREASE BP
- Onset within minutes
TRANSLUMINAL BALLOON ANGIOPLASTY
CONSIDERATIONS FOR PROCEDURAL PLANNING

- Locations that are amenable for angioplasty include:
  - Proximal vessels of Circle of Willis
    - Vertebral arteries
    - Basilar artery
    - Supraclinoid internal carotid artery
    - M1 segment
  - Immediate distal branches
    - A1
    - Proximal A2
    - M2
    - P1, P2
<table>
<thead>
<tr>
<th>Right MCA</th>
<th>Right ACA</th>
<th>Right Supraclinoid ICA</th>
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<tbody>
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<table>
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<th>Left MCA</th>
<th>Left Supraclinoid ICA</th>
<th>Basilar Artery</th>
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*Courtesy Of D. Gandhi MD*
CASE STUDY VASOSPASM

- 55 yo Female
- Past medical hx of 2 cardiac stents
- WHOL at work : 911
- CT = SAH
- GCS 11, EVD placed ICP’s 10-16
- Ruptured ACOM
- Post Bleed, day 6 exam worsened, Neuro IR steps in
LEFT ACA VASOSPASM
PHENYLEPHRINE NEO-SYNEPHRINE

• Alpha-1 adrenergic stimulant
• Beta-1 effect – sometimes bradycardia
• Vasoconstriction – increase BP and Systemic Vascular Resistance
• Dosing by MD: 100 – 200 mcg IV bolus; may repeat every 10-15 min
• Dosing: IV gtt 40 – 60 mcg/min and Titrate to goal SBP
• BP > at least 140 systolic or per MD parameters to maintain adequate cerebral flow
RIGHT ACA VASOSPASM
LEVOPHED (NOREPINEPHRINE)

• Alpha-/Beta adrenergic agonist; constrict peripheral arterial system

• Increase BP by Increase afterload

• Dosing for severe Hypotension start at 8-12 mcg/min titrate to goal SBP

• BP > at least 140 systolic or MD parameters to maintain adequate cerebral blood flow
VASOPRESSIN

- Antidiuretic hormone
- Increases BP by peripheral vascular resistance (vasoconstriction)
- Dosing 0.04 units/min
VASOSPASM PATIENT

• IDEAL
• Vented
• Central line
• Foley
• IVC
• A-line

• Minimal Recommendations
• 2 Large bore PIV
• Foley
• Maintain Sats > 95 % flat
PLAN OF ACTION
• IR Nurses
• Neuro IR Attending's and Team
• Neuro ICU critical care team
• Neurosurgery
• Anesthesia
• CCRU critical care team
VASOSPASM CODE
Medfusion Syringe Pump

Equipment for IA treatments:

- Syringe pump (Medfusion 3500)
- 60 ml or 30 ml syringe (luer lock tip ONLY)
- High pressure tubing x 2 (Arterial line tubing)- dropped STERILE on field
- Drug of choice (made up to concentration per MD)
- 0.9 NSS IV to mix with drug for MD chosen concentration
- NO AIR IN TUBING!!
THANK YOU FOR YOUR TIME AND ATTENTION