NEUROSURGEON VS. HOSPITALIST

Pediatric Hospital Medicine meeting
Nashville, TN
July 21, 2017*

*no pediatricians were harmed in the making of this presentation

±nonetheless, please do not try this at home

NEUROSURGEON VS. HOSPITALIST

Round 1
Hospitalist consults Neurosurgeon

• History & Physical exam:
• Jimmy is a 4 year old male with a 2 day history of nausea, vomiting, and headache
• He is not as interactive as usual, but his neurological exam is nonfocal

What additional information do you need?
What are the signs of shunt malfunction?

• Trick question!
• No history of shunt malfunction
• History of shunt malfunction

No history of shunt malfunction

• Signs and symptoms of increased ICP
  – Lethargy
  – Bulging or full fontanel
  – Increased head circumference
  – Headache
  – Irritability
  – Increased seizures
  – Vomiting
  – Papilledema
  - Ataxia
  - Neck pain
  - Back pain
  - Blurred vision
  - Sun setting eyes
  - Behavioral change

• Also
  – Swelling or erythema around shunt tract
History of shunt malfunction

• **Typical** signs and symptoms of increased ICP for that patient
  – Swelling or erythema around shunt tract
  – Bulging or full fontanel
  – Increased head circumference
  – Headache
  – Irritability
  – Increased seizures
  – Vomiting
  – Papilledema
  - Lethargy
  - Ataxia
  - Neck pain
  - Back pain
  - Blurred vision
  - Sun setting eyes
  - Behavioral change
  - Not acting right

• Most predictive?
  – Vomiting, lack of fever, parental suspicion

Hospitalist consults Neurosurgeon

• History & Physical exam:
  • Jimmy is a 4 year old male with a 2 day history of nausea, vomiting, and headache
  • He is not as interactive as usual, but his neurological exam is nonfocal
  • His shunt has failed twice before, and this is how he presented in the past
What additional information do you need?

Diagnostic studies

• Shunt series
  – Plain radiographs of skull, neck, chest, abdomen
  – Used to detect disconnections, kinks, and migration of catheters
  – Proximal and distal catheters are radiopaque, reservoirs are radiolucent
• Head CT/ fast or flash or HASTE MRI
  – Demonstrates location of proximal catheter tip and size of ventricles
  – Comparison to prior study is critical
Hospitalist consults Neurosurgeon

- History & Physical exam:
- Jimmy is a 4 year old male with a 2 day history of nausea, vomiting, and headache
- He is not as interactive as usual, but his neurological exam is nonfocal
- His shunt has failed twice before, and this is how he presented in the past
- Shunt series (and head CT) show disconnected catheter
Shunt Malfunction

• Most common complication, seen in 30-40% of shunt procedures and 67% of patients with shunts

Shunt Malfunction

• Most common complication, seen in 30-40% of shunt procedures and 67% of patients with shunts
• Usually caused by simple obstruction
  – Debris, fibrosis, choroid plexus, or parenchymal occlusion of proximal catheter (first 2 years after placement in general)
  – Kinking, knotting, breaking, obstruction, migration of distal catheter (after 2 years after placement)
• Also caused by disconnection of shunt components, catheter migration, inadequate drainage, overdrainage

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Round 2
Hospitalist consults Neurosurgeon

• History & Physical exam:
• Jimmy is a 4 year old male with a 2 day history of fever, nausea, vomiting, and headache
• He is not as interactive as usual, but his neurological exam is nonfocal
• He has never had a shunt fail before

What additional information do you need?
What are the signs of shunt infection?

• Trick question!
• Time since last surgery is critical (6 months)

What are the signs of shunt infection?

• Vague signs and symptoms
  – Swelling, erythema, cellulitis, or wound infection around shunt tract
  – Fever
  – Nausea
  – Lethargy
  – Headache
  – Feeding problems
  – Shunt malfunction
  – Vomiting
  – Irritability
  – Change in sensorium

• When VP shunt is present, additionally:
  – Abdominal pain
  – Diarrhea
  – Peritonitis
Hospitalist consults Neurosurgeon

- History & Physical exam:
- Jimmy is a 4 year old male with a 2 day history of fever, nausea, vomiting, and headache
- He is not as interactive as usual, but his neurological exam is nonfocal
- He has never had a shunt fail before
- His first shunt ever was placed three weeks ago

What additional information do you need?
Prior Comparison
Hospitalist consults Neurosurgeon

- History & Physical exam:
- Jimmy is a 4 year old male with a 2 day history of nausea, vomiting, and headache
- He is not as interactive as usual, but his neurological exam is nonfocal
- His shunt has failed twice before, and this is how he presented in the past
- Ventricles are enlarged and shunt tap shows many Gram positive cocci

Shunt Infection

- Second most common complication, seen in 2-30% of shunt procedures
- Increased risk in children under 1 year of age, a short duration from shunt procedure (6 months)
- Most common organisms:
  - Coagulase-negative Staph species
  - Staph epidermidis
  - Staph aureus
  - Gram negative rods (6-20%)
  - Pathogens that cause meningitis (more remote)
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Round 3

Hospitalist consults Neurosurgeon

- History & Physical exam:
- Jimmy is a 4 year old male with a 2 day history of nausea, vomiting, and abdominal pain
- He is not as interactive as usual, but his neurological exam is nonfocal
- His shunt has failed twice before, but this is not how he presented in the past
- Shunt series and head CT are normal
Hospitalist consults Neurosurgeon

- History & Physical exam:
  - Jimmy is a 4 year old male with a 2 day history of nausea, vomiting, and abdominal pain
  - He is not as interactive as usual, but his neurological exam is nonfocal
  - His shunt has failed twice before, but this is not how he presented in the past
  - Shunt series and head CT are normal
  - Abdominal CT shows pseudocyst
Abdominal Pseudocyst

- Abdominal pseudocyst
  - Seen in 0.8-10% of patients
  - Decreased appetite, abdominal pain, tenderness, distention, mass, and guarding; increased ICP and shunt malfunction
  - Foreign body reaction with chronic granulomatous inflammation
  - Infection criteria

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RECAP
Shunt Work-Up

- Q: Shunt Failure or Infection Consult?
- Q: Proximal and distal terminus?
- History
- Physical Exam
- Imaging: fMRI/CT and Shunt Series

Shunt Failure Consult?

H&P:
- Signs/Symptoms concerning for VPSF?
- Past VPSF? Similar to that?
- Recent valve change or reprogramming?

Imaging:
- Shunt Series:
  - Fracture or disconnection?
  - Valve type and setting?
- fMRI/CT:
  - Compare to prior functioning and failure scans
  - Do vents increase with VPSF?

Shunt Tap:
- Tap Shunt if:
  - Vents don’t increase with prior VPSF
  - Vents up and last shunt surgery in prior 6 months (to r/o nascent infection)
  - Data disparate and concerned for failure
  - Patient needs emergent CSF removal

Shunt Infection Work-up

Last VPSI/VPSR within 6 months?
T>101 F; No obvious source?

Yes
Tap shunt as primary work-up
Send CSF for:
- Gram stain
- Culture
- Cell Count
- Glucose/Protein

CSF (+)
Remove shunt
Place EVD

CSF (+)
Follow Cultures for 48hrs, then sign off

No
Tap shunt as secondary work-up, if all primary work-up is negative

Shunt Infection Consult?
- Refer to Shunt Infection Work-Up

Concern for Pseudocyst?
- Refer to Pseudocyst Work-Up
Abdominal Pseudocyst

Concern for Abdominal Pseudocyst

Obtain CT abdomen/pelvis without contrast (Low dose NSGY protocol)

CT abd/pelvis (+) Pseudocyst/Abscess

- Tap Shunt
- Send CSF for routine studies & Anaerobic Cx

CSF (+) Remove Shunt, Place EVD
CSF (-) Externalize Shunt

CT abd/pelvis (-)

Nothing to do

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Thank you!