MANAGEMENT OF CSF RHINORRHEA, MENINGIOCELES, and ENCEPHALOCELES

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CSF RHINORRHEA, MENINGIOCELES and ENCEPHALOCELES

- Anatomy and Physiology of Cerebrospinal Fluid
- Etiology of CSF Rhinorrhea
  - Iatrogenic
  - Traumatic
  - Spontaneous
- Evaluation of CSF Rhinorrhea
  - Physical Examination, β-2-transferrinase
  - CT, Coronal CT, CT Cisternogram
  - MRI
  - Flourescein
- Treatment of CSF Rhinorrhea
  - Endoscopic Grafts v Flaps v Bone or Cartilage
- Treatment of Meningoceles and Encephaloceles
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Cerebrospinal Fluid

Production
- 350-500 ml/day
- Choroid plexus in lateral, 3rd and 4th ventricles

Absorption
- Absorbed by arachnoid villi
- Opening pressure of arachnoid villi is 1.5-7 cm H₂O

Pressure
- 5-15 cm H₂O – assumes an intact intrathecal space

Iatrogenic
- Neurosurgical Injuries
- Sinus Surgery Injuries

Head Trauma
Tumors
Congenital
Spontaneous (increased ICP)
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Etiology of CSF Rhinorrhea

Iatrogenic

• Neurosurgical Injuries
• Sinus Surgery Injuries
  • Etiology
  • Incidence
  • Complications

Head Trauma
Tumors
Congenital
Spontaneous (increased ICP)

• Incidence – 1987, 1.1%; 2004, 0.1%; 2006, 0.04-6%
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Etiology of CSF Rhinorrhea

Iatrogenic
• Neurosurgical Injuries
• Sinus Surgery Injuries

Head Trauma
Tumors
Congenital
Spontaneous
• Obese, female>>male, ICP vs. skull base defect, +/- require shunting

Evaluation

History, Acute vs. Chronic Fistula
Physical Examination
• Complete Head and Neck Exam
• Provocative Exam
• β-2-transferrinase

Imaging
• Coronal CT
• MRI
• Contrast Cisternogram
Intrathecal Fluorescein
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Intrathecal Fluorescein

Lloyd, Radiology 2008

c. Sagittal T1MRI
d. Coronal T1 MRI postcontrast
e. Coronal >T2 MRI cisternogram

58 y/o obese female with spontaneous CSF rhinorrhea, s/p 3 attempted repairs of fistula into sphenoid sinus and meningitis
CSF RHINORRHEA, MENINGIOCELES and ENCEPHALOCELES

ACUTE vs CHRONIC CSF RHINORRHEA MANAGEMENT

- **Acute CSF Rhinorrhea**
  - **Intraoperative Fistula**
    - Immediate Repair using Intrathecal and Intranasal Fat or Graft, Tissue Glue, Absorbable Packing, +/- Lumbar Drainage
    - Intraoperative antibiotics
  - **Postoperative Fistula**
    - Perioperative Lumbar drainage for *Minimal Fistulas noted Postoperatively vs repair*
- **Postoperative CT Scan**
  - R/O Intracranial Injury

CSF RHINORRHEA WITH ACUTE INTRACRANIAL INJURY

- **Intracerebral Injury**
  - Beware of Indicators of Potential Intracranial Anomalies
  - Immediate Neurosurgical Intraoperative Consult
  - Anterior Cerebral Artery Injuries are Frequently Fatal, whereas Nonvascular Injuries Require Repair and Observation for Infection

Prof W Hosemann
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**ACUTE vs CHRONIC CSF RHINORRHEA MANAGEMENT**

- **Chronic CSF Rhinorrhea**
  - Treat the Etiology
  - Hx Meningitis?
  - Selective Use of Fluorescein
  - Repair using Graft, Tissue Glue, Absorbable Packing, Lumbar Drainage
  - Intraoperative antibiotics
  - Perioperative Lumbar Drainage
  - Postoperative CT Scan

**Grafting Considerations**

- Overlay, Underlay or Combined Grafting
- Grafting Material
  - Mucous membrane, fascia, fat, bone, dermis, pericranium, myocardium
- Intraoperative fluorescein
- **Bath Plug** - Wormald
- Graft Adhesion
- Packing - absorbable
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Grafting Considerations

• Overlay, Underlay or Combined Grafting
• Grafting Material
  • Mucous membrane, fascia, fat, bone, dermis, pericranium, flaps? (except posterior septal flap for sphenoid, sella and clivus, [ITF, MTF])
• Bath plug - Wormald
• Graft Adhesion – tissue glue
• Packing - absorbable
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Grafting Considerations, Revisited

- Combined Grafting
- Grafting Material
  - Best material – fat or fascia lata > dermis > mucous membrane > pericranium > nasal flaps?
  - No bone or cartilage
- Intrathecal graft must be water tight
- Packing - absorbable
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Flap Considerations, Revisited

• **Intranasal Flaps**
  - Axial
    - Posterior Septal
    - Inferior Turbinate
  - Random
    - Middle Turbinate

Kassam, 2008

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Treatment of Meningoceles/Encephaloceles

• Meningoceles/Encephalocele
  - Treat the Etiology
  - Meningitis precautions
  - Remove (cauterize) Dura/Encephaloceles
  - Selective Use of Fluorescein
  - Repair using Graft, Tissue Glue, Absorbable Packing
  - Lumbar Drainage
  - Intraoperative antibiotics
  - Perioperative Lumbar drainage
  - Postoperative CT Scan
Encephaloceles Considerations, Revisited

- **Cauterization**
- **Combined Grafting**
- **Grafting Material**
  - Fat intracranial, dermis intranasal
  - No bone, no cartilage since 1980’s
- **Packing - absorbable**

Vascular skull base brain

50 y/o female 10 yrs. s/p anterior cerebral artery aneurysm clipping
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Intrathecal Fluorescein

The spontaneous reporting number of adverse event caused by fluorescein sodium, fluorescein, fluorescite, and ak-fluor, US FDA data from 1968 to 2003 (number=187)

**FLUORESCEIN CONCLUSIONS**

1. No reported complication at <100mg intrathecal
2. Hypodense fluorescein sufficient for detecting intraoperative CSF rhinorrhea (ie, 0.5ml/100mg/ml diluted in 9.5ml = 5mg/ml, infuse 1-1.5ml)
3. Recommend 5-<50mg and legal consideration of informed consent
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Last Thoughts

1. Lumbar Drain ?
2. Antibiotics ?
3. Positive Pressure Ventilation, Nose Blowing
4. Patient Selection
5. Results