Cerebrospinal Fluid Leaks

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Grand Rounds Presentation
May 26, 1999
Introduction

- Cerebrospinal fluid surrounds and cushions brain
- Pathologic communication with outside world can lead to problems
- Multiple etiologies of CSF fistulae
- Multiple diagnostic modalities
- Treatment varies and depends on etiologies
History

- 2nd Century -- described by Galen
- Middle Ages -- association made with head trauma
- 1897 -- Escat describes and treats fistulous EAC
History

- 1926 -- Dandy describes intracranial repair
- 1948 -- Dohlman describes extracranial repair
- 1981 -- Wigand describes endoscopes in repair
Basic Science

- CSF is essentially an ultrafiltrate of plasma
- Adult averages 140 mL, renewed three times daily
- Mostly made in choroid plexus
- Traverses ventricles, convexities, uptaken by arachnoid villi
- Normal pressure between 50-180 mm H2O
Classification

- Terminology not consistent
- Traumatic
  - Surgical
  - Non-surgical
Classification

- Non-Traumatic
  - High-pressure
  - Normal-pressure
- Spontaneous -- poor term but refers to leak with no antecedent history of trauma
- High-flow versus Low-flow
Epidemiology

- 80% trauma (non-surgical), 16% surgical, 3-4% non-traumatic

- Occur in:
  - 3% closed head injuries
  - 9% penetrating head injuries
  - 10-30% basilar skull fractures

- Meningitis
  - 10-25% of traumatic (non-surgical) CSF leaks
  - Mortality 10%
Diagnosis, General

- High index of suspicion
- Rhinorrhea may be of aural source
Diagnosis, History and Physical

- **Suspect with:**
  - History of trauma
  - Unilateral rhinorrhea
  - Recurrent meningitis
  - Child with malformatons of otic capsule
Diagnosis, History and Physical

- May note salty taste
- Reservoir sign
- Halo sign
- Handkerchief test
Diagnosis, Laboratory

- **Glucose**
  - Greater than 30 mg/dL generally indicative
  - Can have false-positives and false-negatives

- **Beta-2-Transferrin (Tau-Transferrin)**
  - Gold Standard
  - Found in CSF, perilymph, vitreous humor
  - Our lab -- 1 ml of nasal secretions, 1 gold-top tube, 4 days for result
Diagnosis, Radiologic

- Radionuclide cisternography
  - Test best-suited for ruling in a fistula
  - Pledgets in nose at various points
  - Compare counts to serum
  - Technetium or Indium depending on half-life

- CT Cisternography

- MRI adjunctive if encephalocele

- Fluorescein
Treatment, Non-surgical

- In order to work body needs to be able to heal itself
  - Chronic fistula probably won’t heal
  - Surgical reduction of fractures may allow spontaneous closure
- Appropriate if patient can afford to wait
Treatment, Non-surgical

- Specifics:
  - Elevate head of bed
  - Lumbar drain -- but not too much
  - Avoid sneezing, coughing, straining at stool
  - Anti-hypertensives, analgesics
  - Antibiotics controversial
  - Questionable role of diuretics, fluid restriction
Treatment, Surgical

- Tailored to individual
- Intracranial versus extracranial
- Endoscopic versus microscopic
Treatment, Surgical

- **Specifics:**
  - **Exposure**
  - **Grafts/flaps**
    - fat, fascia, muscle, cartilage, mucosa
    - simple or composite
  - **Biological glue**
    - collagen, fibrin, cyanoacrylate
  - **Gelfoam, Merocel**

- **Postop** -- bedrest, similar to medical management
Controversies

- Antibiotics
- Intracranial versus extracranial
- Choice of repair
Complications

- Meningitis
- Tension pneumocephalus
Future Developments

- Refinement of endoscopic techniques
- More studies of specifics of care
- Improved biomaterials
- Improve radiological techniques
Case Study

- 33 yo WF, chief complaint “runny nose”
- Comes and goes, usually right side, takes Contac with some relief
- PMH:
  - thinks she was hospitalized once with “brain infection”, migraines
  - born deaf in left ear
  - fell off seawall after high school prom
Case Study

- Exam: clear rhinorrhea right nare, ?polyp middle meatus
- Lab: positive for glucose; beta-2-transferrin pending
- CT scan
- Postop -- goofy
Conclusion

- CSF fistulae arise from a variety of etologies
- Diagnosis based on physical, laboratory and radiologic techniques
- Treatment divided into surgicical and non-surgical
- Future holds refinement of existing techniques, development of new ones
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