

# Cerebrospinal Fluid Leaks

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# 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 H<sub>2</sub>O

# 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 surgical and non-surgical
- Future holds refinement of existing techniques, development of new ones

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