



THE UNIVERSITY OF  
TENNESSEE  
HEALTH SCIENCE CENTER.

# CSF Rhinorrhoea: Practical Pearls

Shivanand Maharaj, MD

Assistant Professor

Endoscopic Sinus & Skull Base Surgery



North  
Atlantic  
Ocean

At its closest point, Trinidad is just under 7 miles from Venezuela

Trinidad

Tobago



# Trinidad – Maracas Bay



# Tobago – Pigeon Point Beach



# No Disclosures

# Outline

- No p-values today
- Key points/Background
- Diagnosis: history, examination, labs, imaging
- Tips to optimize surgical outcomes

# History

- Unilateral clear, watery, positional rhinorrhea
  - Worse with straining or bending forward.
- Salty or metallic taste
- Onset: Hx of head trauma, prior sinus/ skull base surgery, spontaneous, intermittent in nature
- Hyposmia if cribriform involved
- Associated Sx: headaches, recurrent 'sinus infections', meningitis, dizziness, tinnitus

# Examination

- Reservoir sign
  - Asking the patient to lean forward may elicit rhinorrhoea
- Halo Sign
  - Clear ring surrounding central blood spot on bed sheets, tissue or filter paper.
- Nasal endoscopy
  - Clear fluid from the sphenoethmoidal recess, cribriform & frontal recess
  - Meningocele, meningoencephalocele –  
**avoid biopsy!**



# Red Flags for Idiopathic Intracranial Hypertension

- Middle-aged female
- Obesity (BMI >30)
- OSA
- Prior history of IIH
- Pulsatile tinnitus
- Visual symptoms
- Headaches

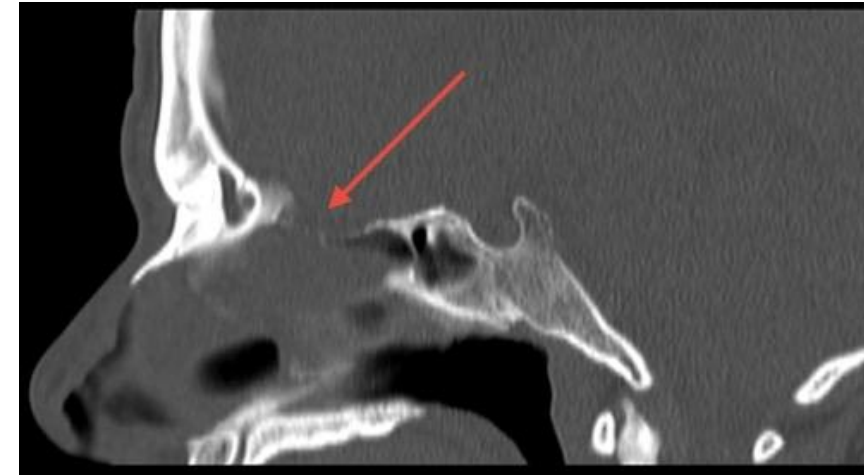
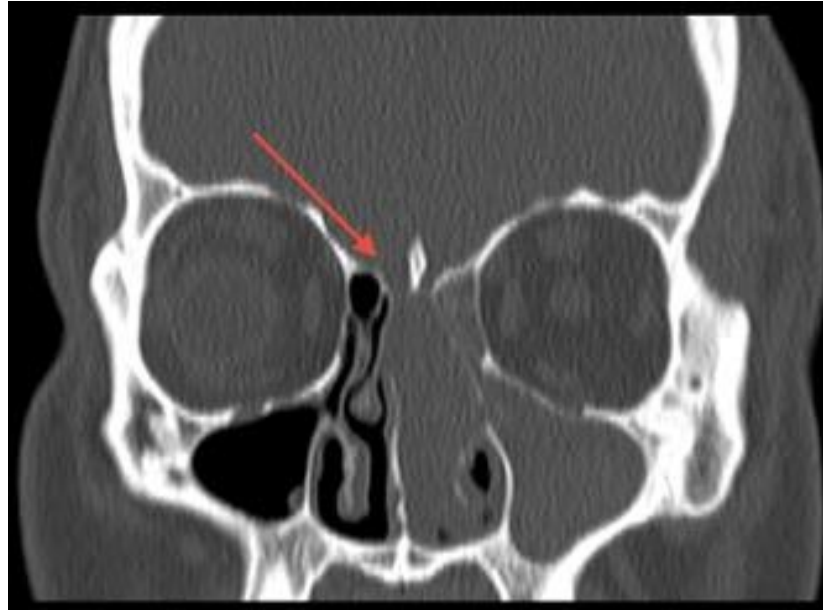
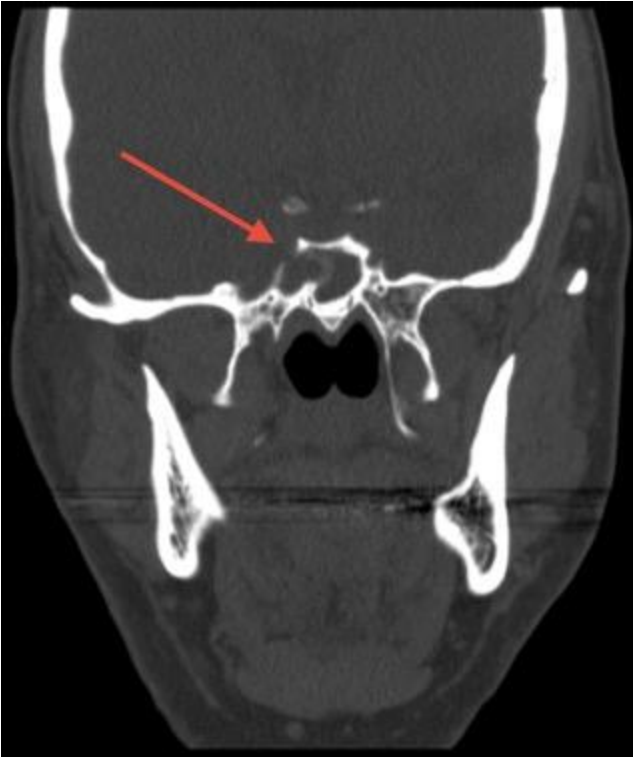
# Lab fluid analysis

- Glucose testing
  - >30mm/dL
  - False positive: blood, nasal mucus, tears
- Beta-trace protein
  - 91% sensitivity & 100% specificity
  - Faster turnaround time than Beta-2 transferrin. *No widely available in the US*
- Beta-2
  - **Gold standard**, 97% sensitivity & 99% specificity.
  - Collect 0.5mls can store refrigerated for 1 week

# Imaging

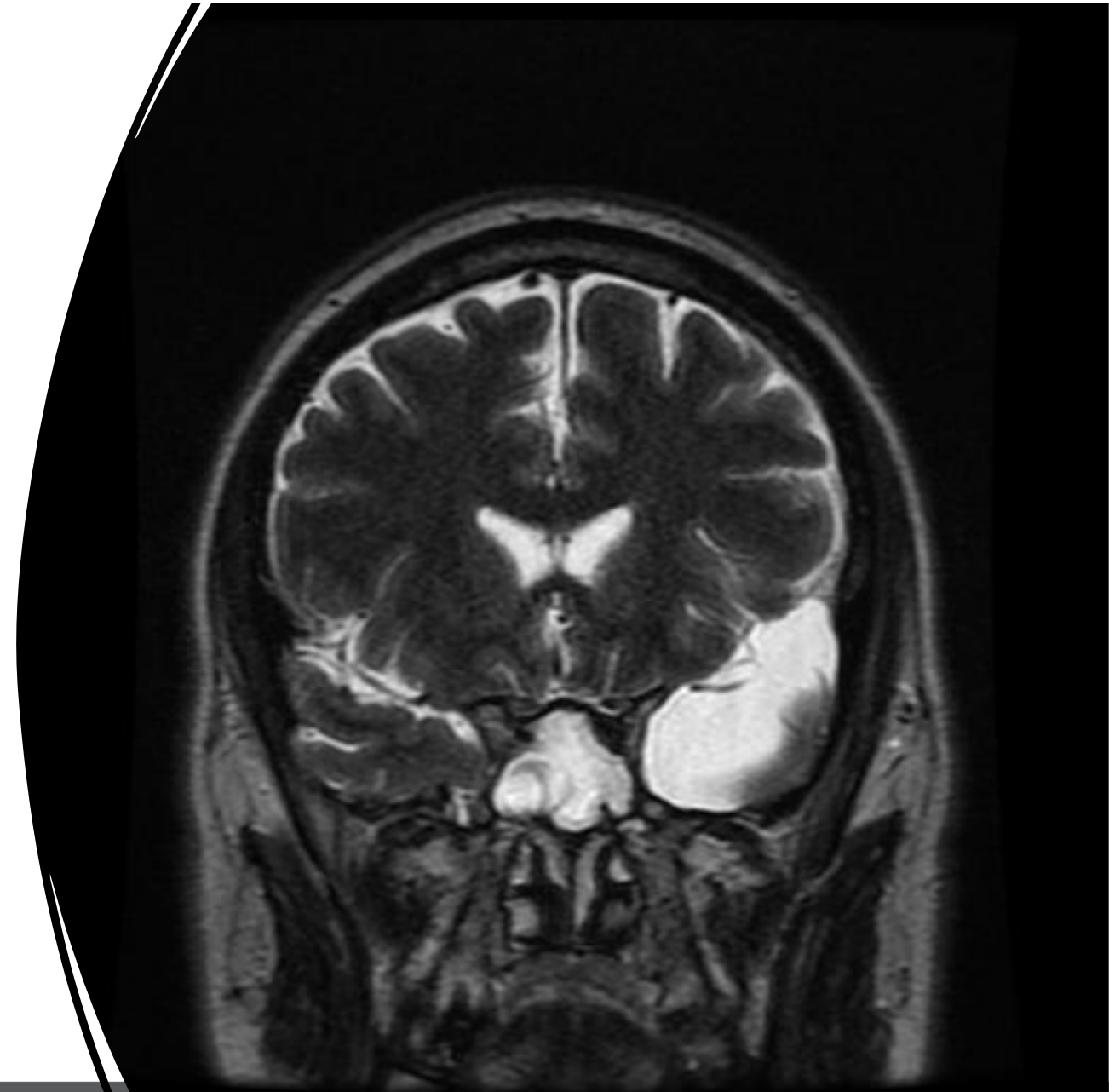
- High-resolution CT (<1mm cuts)
  - Identification of the skull base defect ( 92% sensitivity & 100% specificity)
  - Bony defect next to mucosal thickening or soft tissue
  - Axial: frontal sinus posterior table & posterolateral wall of sphenoid
  - Coronal & sagittal: cribriform, ethmoid roof & lateral recess/roof of sphenoid

# HRCT



# MRI

- T2 weighted MR
  - Useful for identifying CSF and differentiating herniated intracranial contents (meningocele vs meningoencephalocele)
  - MR with contrast helps r/o other intracranial pathology
- Idiopathic intracranial hypertension (IIH)
  - Empty sella, posterior scleral flattening, increased optic nerve tortuosity, enlarged Meckel's caves
- MRV/CTV
  - *Rules out cerebral venous sinus thrombosis*

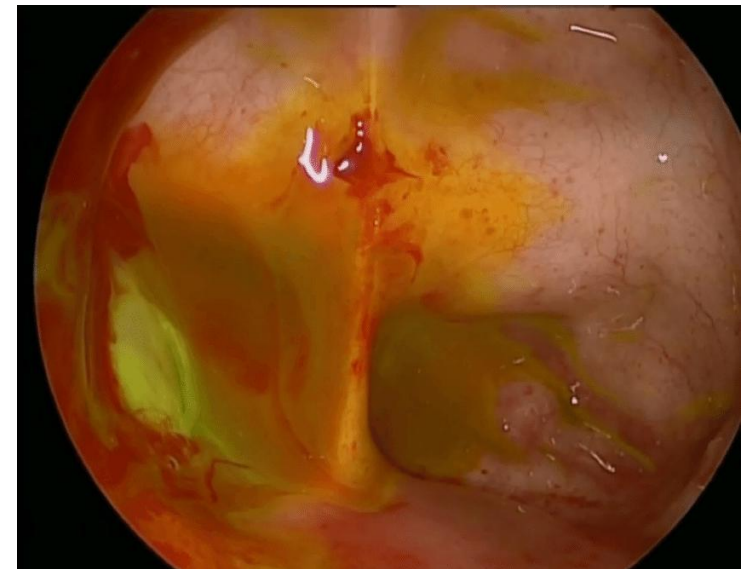
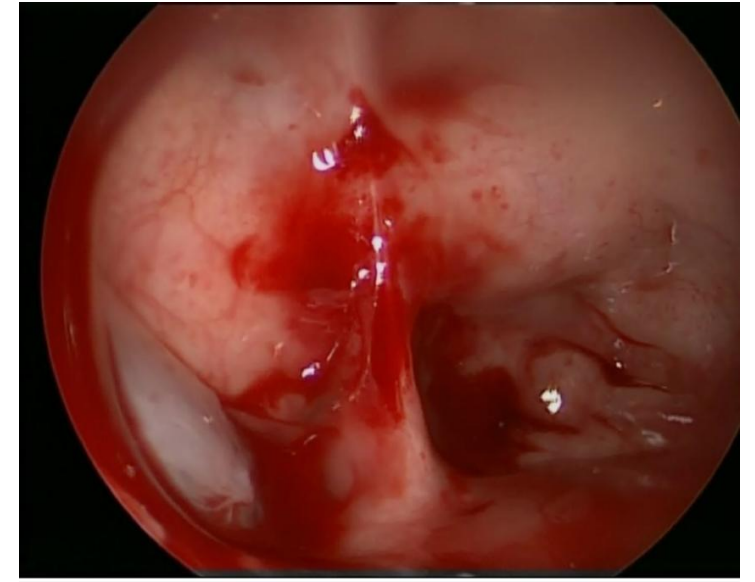


# MR & CT Cisternogram

- MR cisternogram
  - 87 – 89% sensitivity
  - Useful for cases with multiple skull base defects.
  - Less sensitive for bony detail
  - May miss low flow or intermittent leaks

# Intrathecal Fluoroscein

- Useful adjunct to precisely localize the defect as well as other sites of leaking
- 84% sensitivity, 100% specificity
- Not FDA approved
- Side effects: seizures, allergic reactions
- 0.1mls of 10% Fluoroscein mixed with 9.9 mls of CSF and injected slowly over 10-15 minutes. Trendelenberg 45 mins



Bubshait, Rawan & Moumen, Ali. (2021). The Endonasal Endoscopic Management of Cerebrospinal Fluid Rhinorrhea. Cureus. 13. 10.7759/cureus.13457.

# Management

- Traumatic

- 75-85% of traumatic leaks resolve spontaneously
- CSF leak precautions 1-2 weeks.
- Antibiotics? – No high-quality evidence to support routine use.
- Lumbar drain?
- If persistent, repair may be needed to minimize the risk of meningitis

- Spontaneous (IIH)

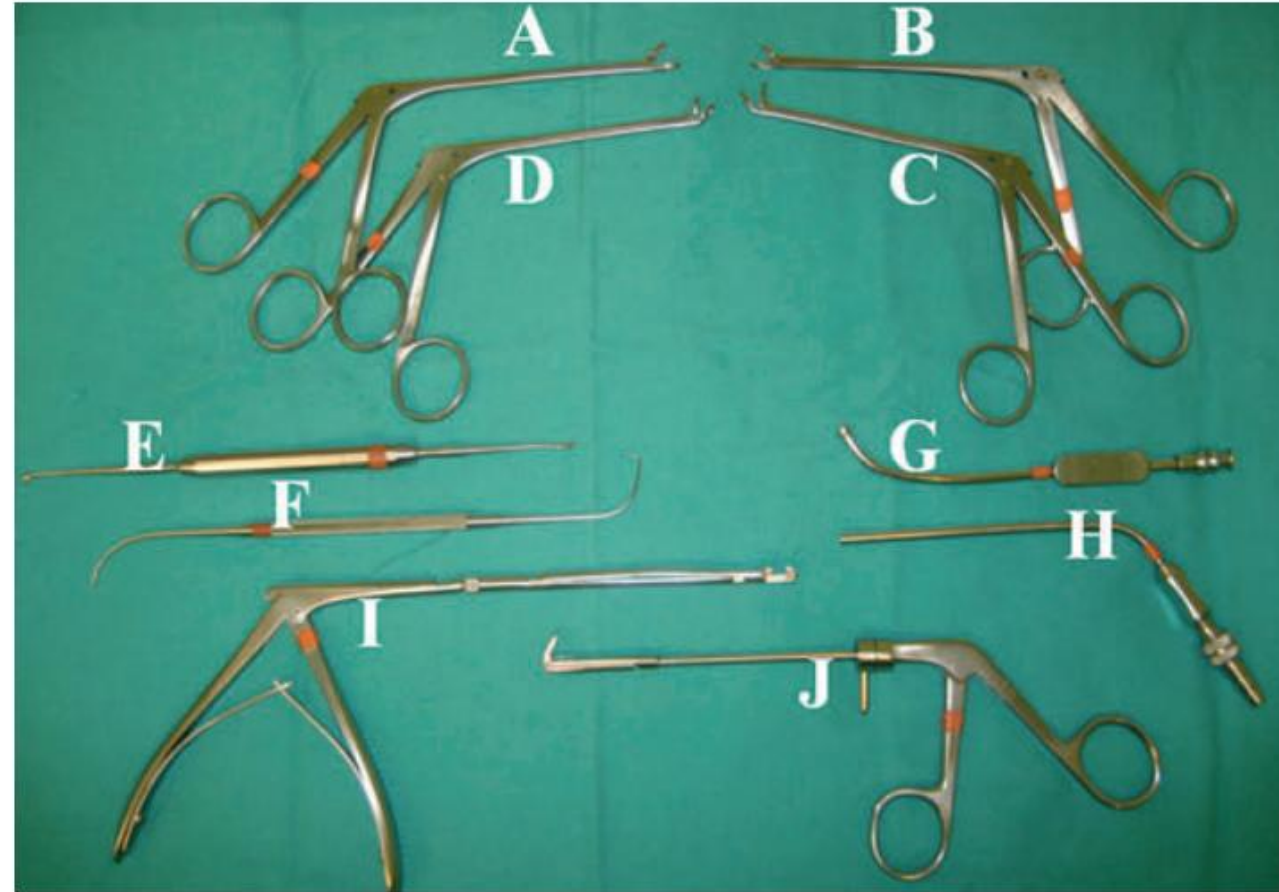
- Surgical repair

- Iatrogenic

- Surgical repair

# Instruments

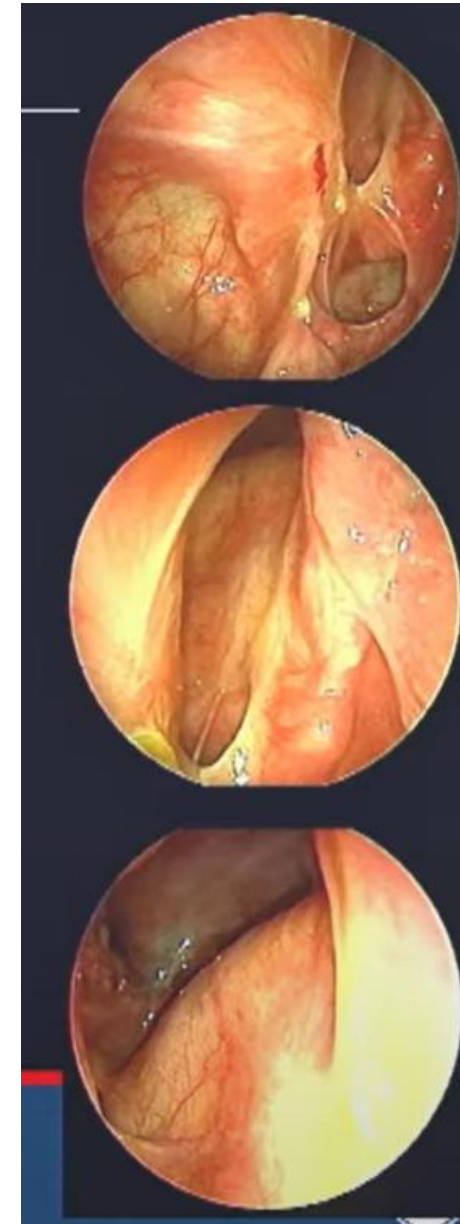
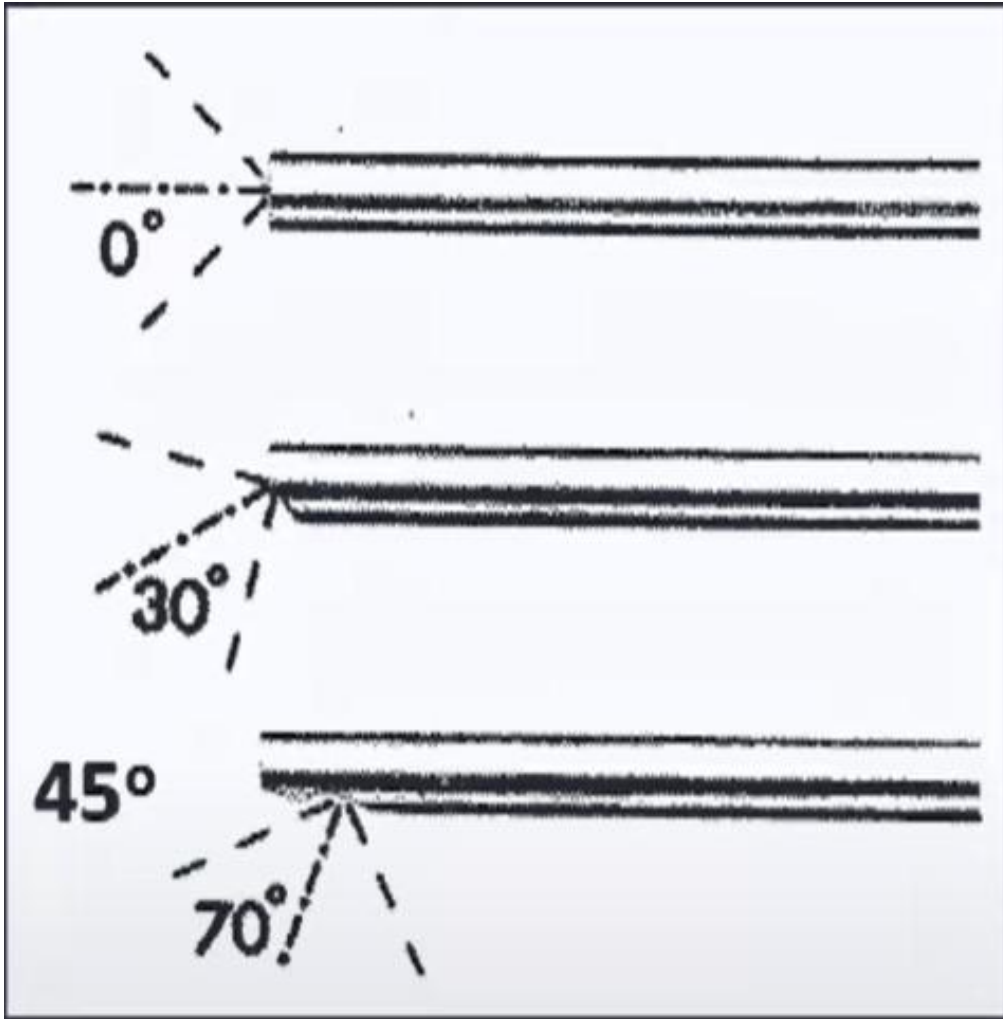
1. 3.5 mm straight Blakesley (non-cutting)
2. 3.5 mm up-biting Blakesley (non-cutting)
3. 3.5 mm straight through-cut forceps
4. 3.5 mm up-biting through-cut forceps
5. Cottle elevator
6. Maxillary/Frontal ostium seeker
7. 4 mm long curved suction
8. Straight (Frazier) suction
9. 360-degree backbiting forceps
10. 2mm Kerrison Rongeur or Sphenoid punch
11. J-curette



# Instruments

- Angled endoscopes: 30, 70 deg
- Microdebrider with angle blades and burs
- Endoscopic bipolar!
- Needle tip bovie





# Intraoperatively

## Hemostasis

- Hypotensive anesthesia: aim MAP 65-70 mmHg
- Reverse tren/ head-up: 30 degrees
- Pedgets/neuropatties: 1:1000 Epi, Oxymetazoline (Affrin/Otrivin)
- Tranexamic acid (TXA): topical, intravenous
- Jump from side to side if necessary
- Surgiflo, Gelfoam, Surgicel etc

# Basic Principles of Skull base repair

## 1. Localize

- IT fluorescein, image guidance if available

## 2. Expose

- Reduce encephalocele with bipolar

## 3. Prepare

- Remove septations and mucosa around the defect, **hemostasis!**

## 4. Repair & support

# Repair

- Graft

- Autograft: free mucosa, cartilage, fat, Fascia lata, vascularized flap
- Allograft: Alloderm (Acellular dermis), Cook Biodesign, Medpore

- Support/buttreass

- Absorbable pack: Novapak, Nasopore
- Non-absorbable: Merocel
- Fibrin sealant/glue

- Watertight seal

- Valsalva 40mmHg

# Post-op

- CSF precautions for 2-3 weeks
  - Avoid straining/nose blowing, coughing or sneezing, stool softeners
- Antibiotics?
  - As clinically indicated. Not routinely used
- Management of IIH
  - Acetazolamide, weight loss, shunt if needed, ophthal follow-up
  - Lumbar drains? – not routinely used

Douglas JE, Adappa ND, Choby G, Levine CG, Rabinowitz MR, Sindwani R, Wang EW, Woodworth BA, Kuan EC. American Rhinologic Society expert practice statement part 2: Postoperative precautions and management principles following endoscopic skull base surgery. Int Forum Allergy Rhinol. 2024 Nov;14(11):1724-1738. doi: 10.1002/alr.23406. Epub 2024 Jul 12. PMID: 38995330.

Practice Guideline

➤ Int Forum Allergy Rhinol. 2024 Sep;14(9):1413-1425. doi: 10.1002/alr.23346.

Epub 2024 Mar 30.

## **American Rhinologic Society expert practice statement part 1: Skull base reconstruction following endoscopic skull base surgery**

Jennifer E Douglas<sup>1</sup>, Nithin D Adappa<sup>1</sup>, Garret Choby<sup>2</sup>, Corinna G Levine<sup>3</sup>, Mindy R Rabinowitz<sup>4</sup>, Raj Sindwani<sup>5</sup>, Eric W Wang<sup>2</sup>, Bradford A Woodworth<sup>6</sup>, Edward C Kuan<sup>7</sup>

Practice Guideline

➤ Int Forum Allergy Rhinol. 2024 Sep;14(9):1413-1425. doi: 10.1002/alr.23346.

Epub 2024 Mar 30.

## **American Rhinologic Society expert practice statement part 1: Skull base reconstruction following endoscopic skull base surgery**

Jennifer E Douglas<sup>1</sup>, Nithin D Adappa<sup>1</sup>, Garret Choby<sup>2</sup>, Corinna G Levine<sup>3</sup>, Mindy R Rabinowitz<sup>4</sup>, Raj Sindwani<sup>5</sup>, Eric W Wang<sup>2</sup>, Bradford A Woodworth<sup>6</sup>, Edward C Kuan<sup>7</sup>

# Key Pearls

- Unilateral clear, watery rhinorrhoea is a CSF leak until proven otherwise.
- Never perform an office biopsy of a sinonasal lesion that can be associated with the skull base without imaging.
- Diagnosis: Beta 2 transferrin & HRCT (<1mm cuts)
- Intrathecal fluorescein is a useful intra-op adjunct to precisely identify the site of the leak.
- Principles of Repair: Localize, Expose, Prepare, Repair & support
- Multidisciplinary approach in treating IIH



Thank you!

