CSF RHINORRHEA

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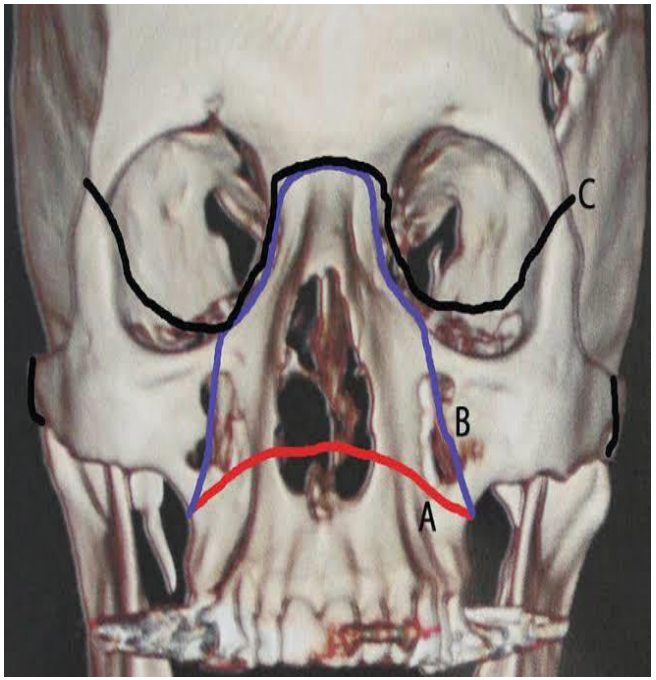
INTRODUCTION

- CSF Leak : presence of an abnormal communication of extracranial space to the subarachnoid space
- It is a potential risk factor for ascending infections to brain and meninges
- Hence correction of the defect holds great value in the management of CSF Leaks

CSF Rhinorrohea

- Leak of CSF into nose
- Csf rhinorrhea was first described by st clair thompson in 1899
- Since then for 30 yrs there was no successful surgical repair
- Dandy: craniotomy for repair of csf
- Faciomaxillary fractures are most common etiology for traumatic CSF RHINORRHEA



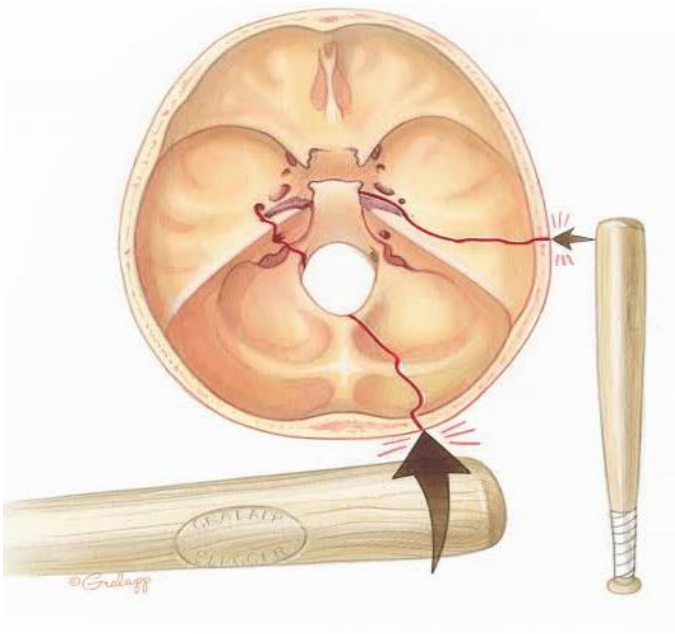
CSF OTORRHEA

Temporal bone fractures

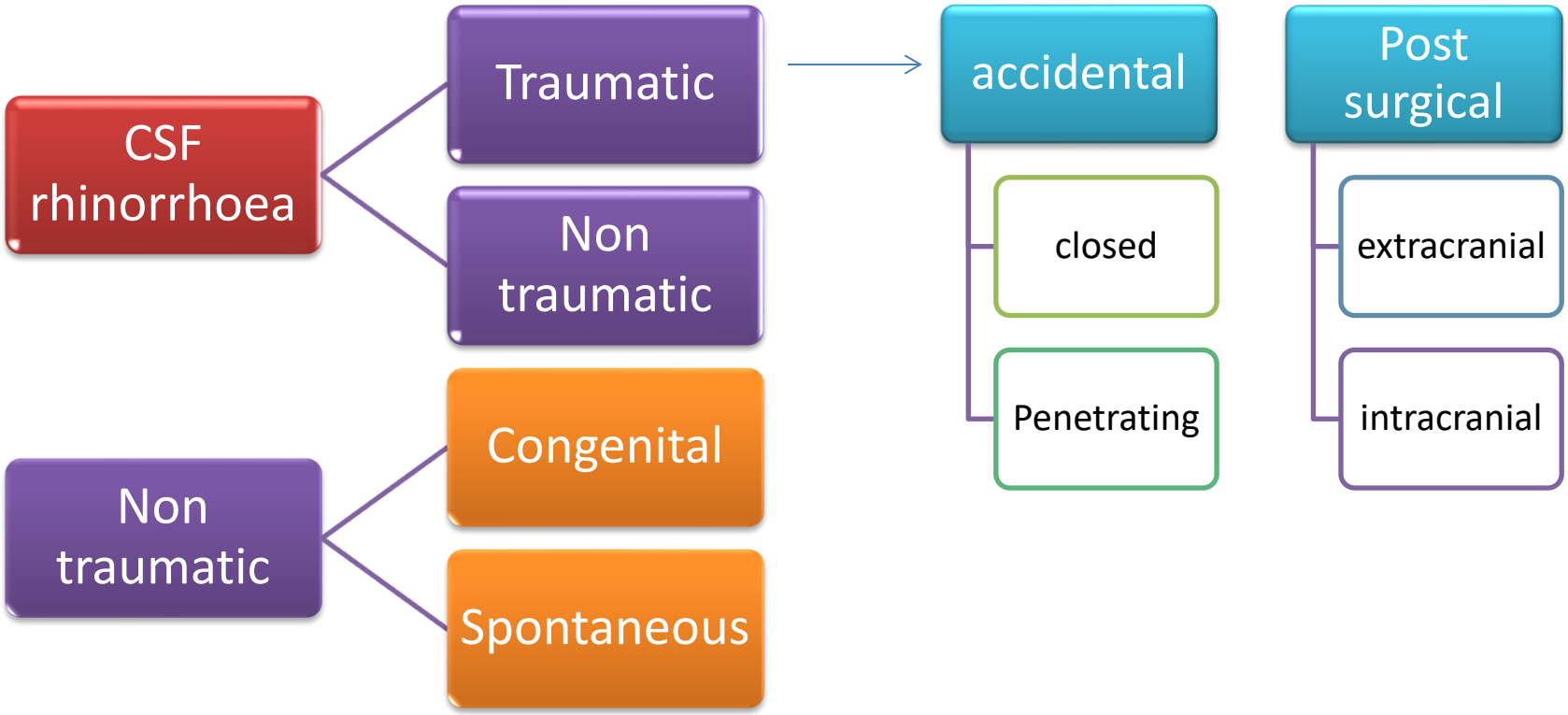
1. Longitudinal
2. vertical
3. Combination of both

Fracture with intact tympanic membrane

CSF OTORHINORRHEA



Aeitology


CSF rhinorrhoea
Traumatic
Non traumatic
accidental
closed
Penetrating
Post surgical
extracranial
intracranial
Non traumatic
Congenital
Spontaneous

Idiopathic

Cause unknown

Traumatic

Open surgery
Endoscopic sinus surgery
skull base
Transcranial
Trans temporal

Closed head injuries
Open or penetrating injuries
Post traumatic hydrocpehalus

Inflammatory

Erosive lesions: mucoceles,polypoid disease, cystic fibrosis,fungal sinusitis
Osteomyelitis of skull base
Postinfectious hydrocephalus

congenital

Meningocele or meningoencephalocele
Congenital skull base defects
Congenital hydrocephalus , mondini dysplasia

neoplasm

Neoplasms invading the skull base

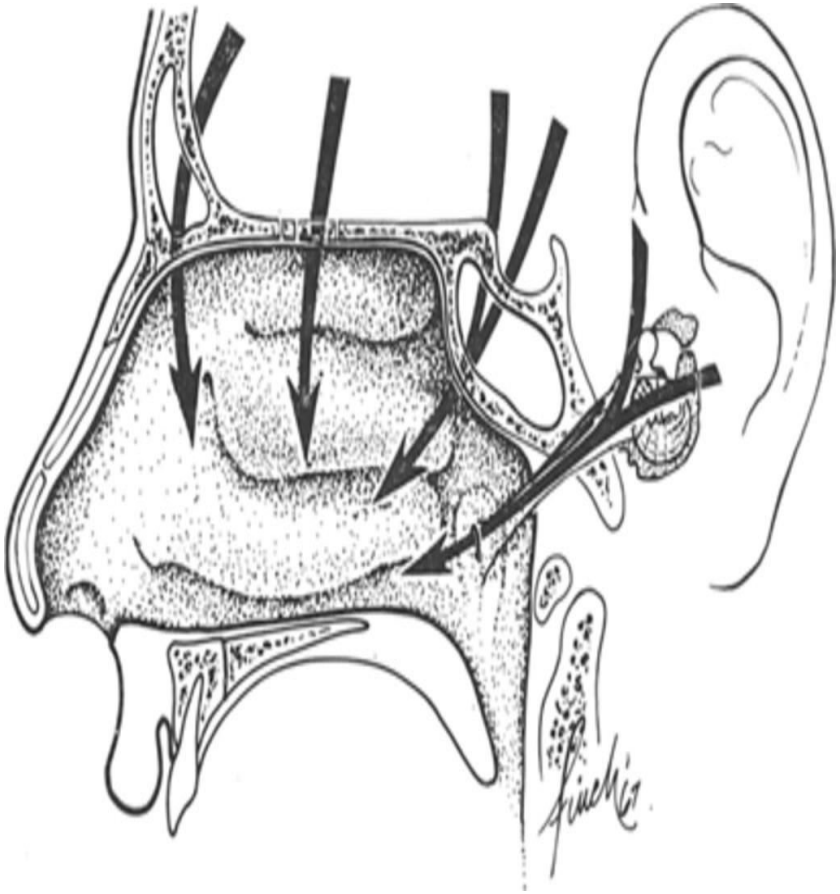
- SITES OF LEAKAGE

❑ Anterior cranial fossa:

i. Cribriform plate.

ii. Root of ethmoidal cells.

iii. Frontal sinus



❑ Middle cranial fossa :

- Injuries to sphenoid sinus
- Lateral recess of sphenoid

❑ Fracture Temporal bone:

- CSF reaches middle ear and then escapes through the eustachian tube into the nose (CSF otorinorrhoea)

DIAGNOSIS

Clinical evaluation of suspected CSF Rhinorrohea

- History : compatible with a breach in the skull base dura
- Most characteristic is the uncontrollable nature of the fluid
- No mucoprotien component
- No viscosity
- CSF cannot be sniffed back into the nasal cavity readily

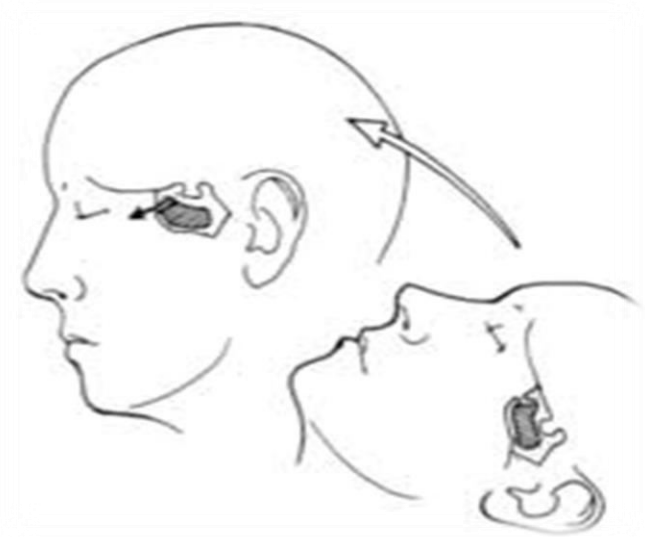
- Reports embarassing dripping that appears suddenly and without warning
- No sneezing, no lacrimation, no congestion and no response to anihistamines
- Leaning forward or valsalva can produce few drops

Halo sign

CSF rhinorrhoea after head trauma is mixed with blood shows this sign when collected on a piece of filter paper i.e. central red spot and peripheral lighter halo

Handkerchief stiffening

- "**Tea pot** " effect
- Sinus typically sphenoid is slowly filled with fluid to the level of its ostium
- Fluid comes out with a gush when its head is tipped forward to an ostium dependent position



Differences between CSF Rhinorrhea & Nasal secretions:

Features	CSF Rhinorrhea	Nasal secretions
History	Trauma/ Surgery/ Tumor	Sneezing, stuffinesss
Flow	Drops/ stream, not sniffed back	Continuous, sniffed back
Character	Clear, watery	Slimy
Taste	Sweet	Salty
Sugar +nt	>30 mg/dl	<10 mg/dl
Beta2 transferrin	Always present	Always absent

IMPULSE ON COUGHING : MENINGOCELE AND MENINGOENCEPHALOCELE

DDx

- Allergic rhinitis
- Vasomotor rhinitis

Glucose oxidase-peroxidase Tes-Tape

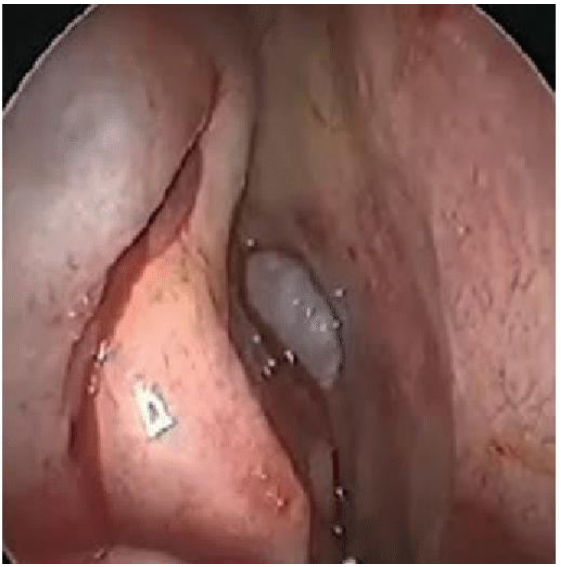
- Positive = glucose in the fluid = most probably CSF
- Negative repeatedly = chances of CSF significantly reduced, occasionally CSF can have low glucose content

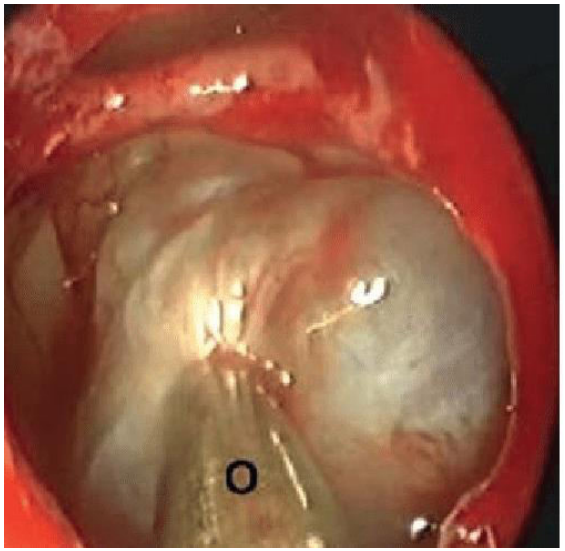
Investigations

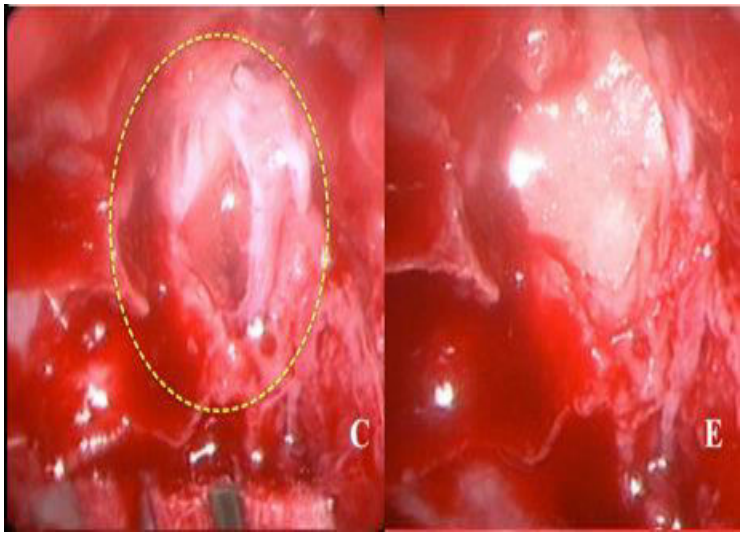
- **Beta -2 transferrin** is present in CSF, PERILYMPH and AQUEOUS FLUID
- The β2TF test is considered a reliable biochemical method for detecting CSF leakage.
- Transferrin (TF) is a glycoprotein important for maintaining human iron homeostasis.
- TF is modified to β2TF (asialo-transferrin) in the CSF through the action of brain neuraminidase ,affording the β2TF glycoform constituting up to 30% of total CSF transferrin
- Hence, the sensitive and reliable detection of β2TF is critical for determining CSF leakage.

Diagnostic nasal endoscopy

- Diagnostic nasal endoscopy to detect the defects of the nasal cavity

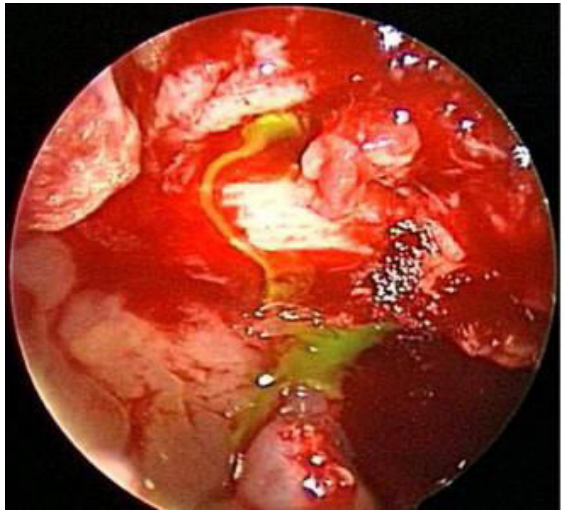


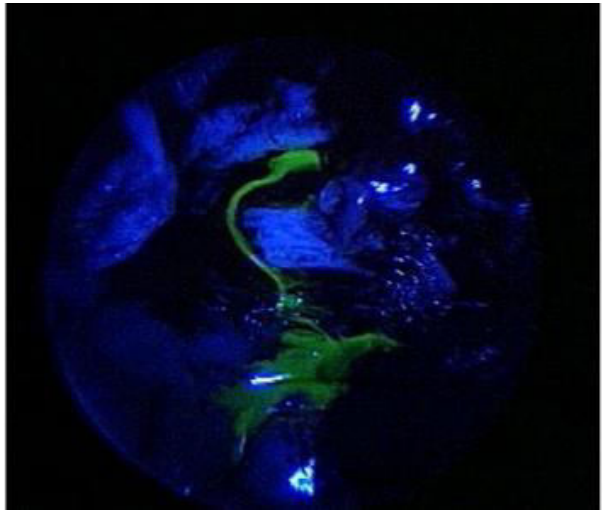




Intrathecal fluoroscein

- It is an invasive procedure, use of intrathecally.
- Lumbar drain placed and 10 ml CSF taken
- 40-60kg (0.2ml of 5% fl. Dye mixed with 10ml of CSF given for a peiod of 10 mins) injected. Patient lies in 10◦ head down position for sometime.
- Dye appears green when seen with a blue filter.
- Nasal pledgets are placed in different places in the nasal cavity



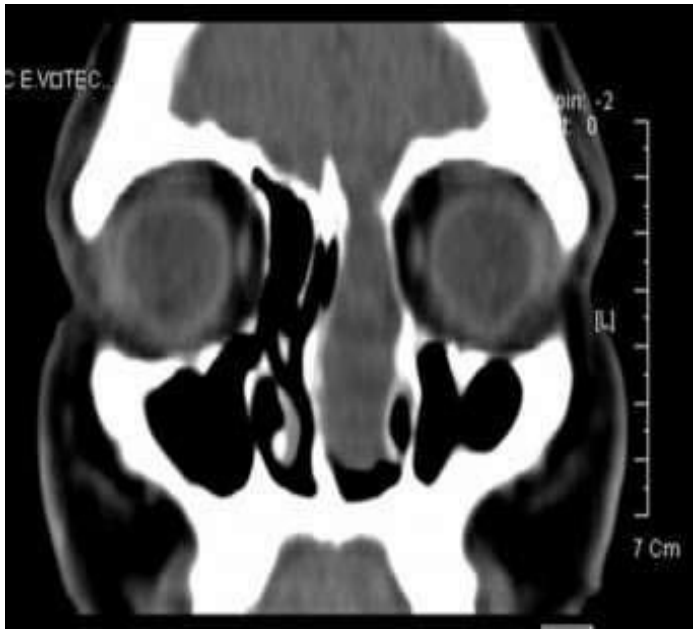


- **HIGH RESOLUTION CT SCAN**: Coronal and axial cuts to see bony defects.
- **HRCT**

Identifies the site of CSF fistula as dural and osseous defect.

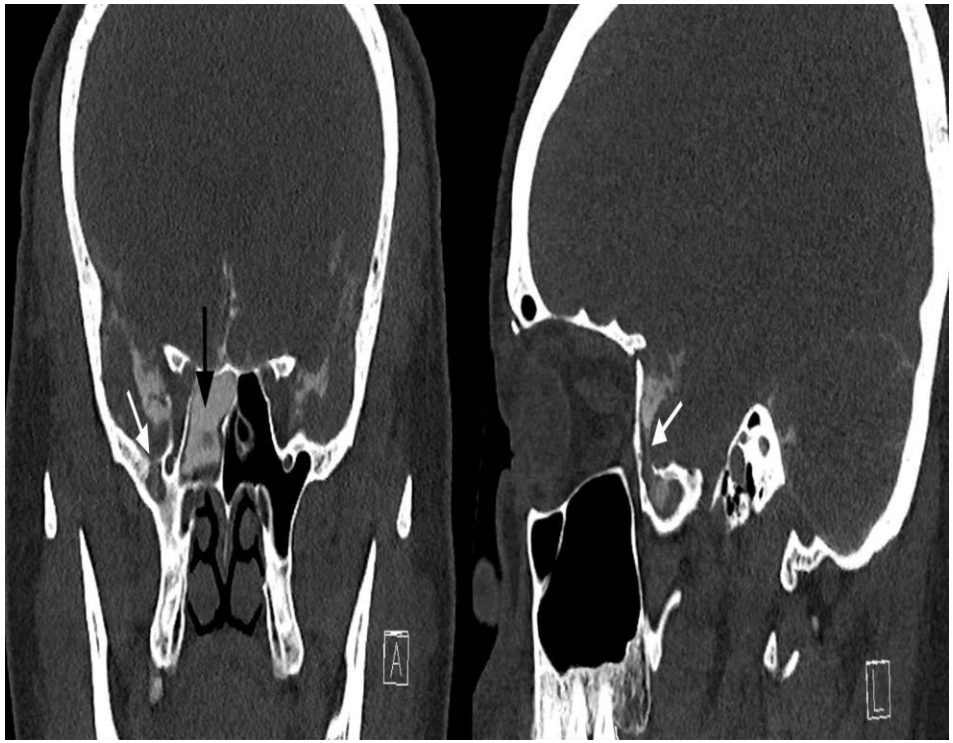
- **CT is less valuable**

Non-traumatic CSF leaks :
Meningocele
Meningoencephalocele.



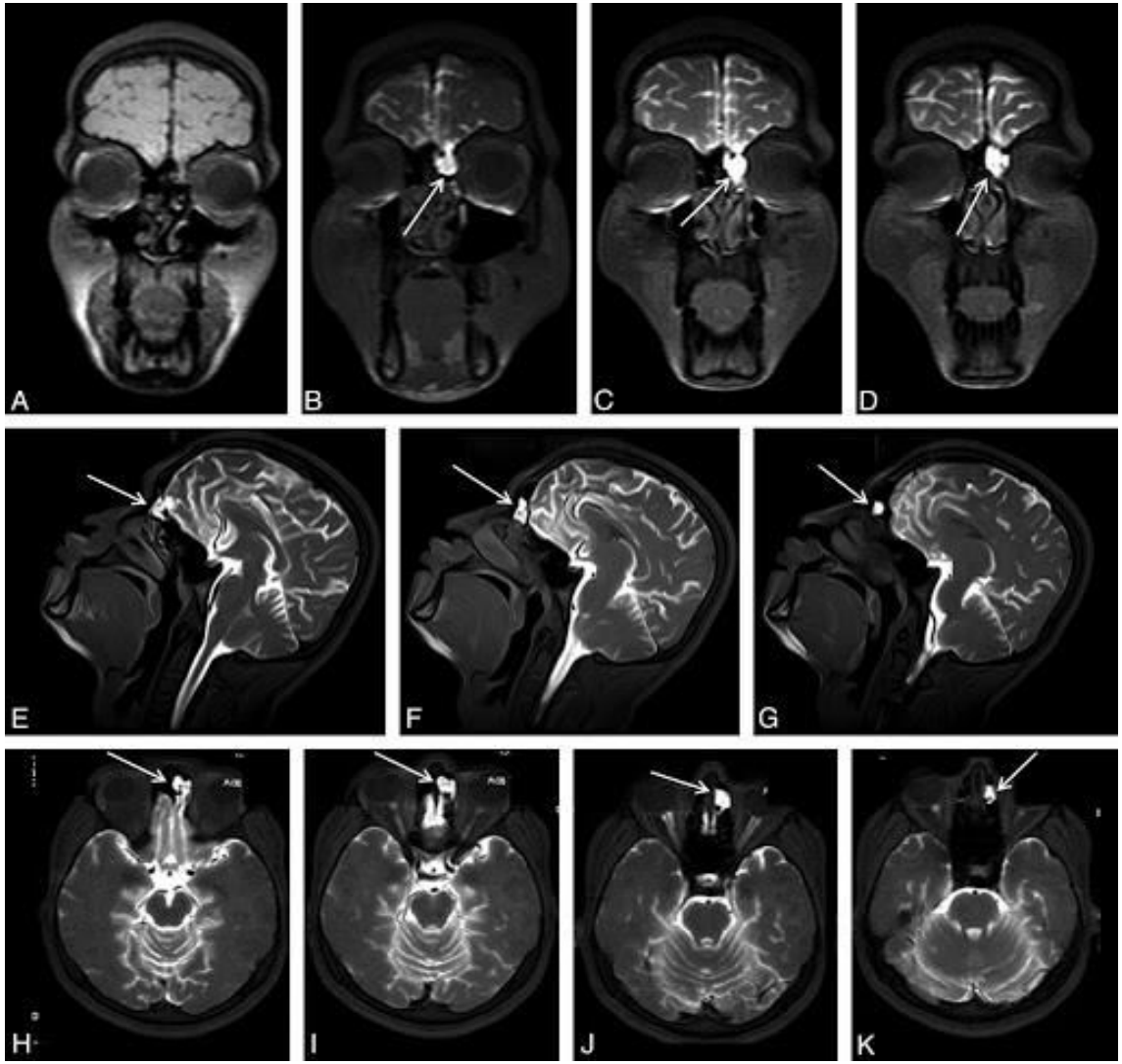
Ct cisternography

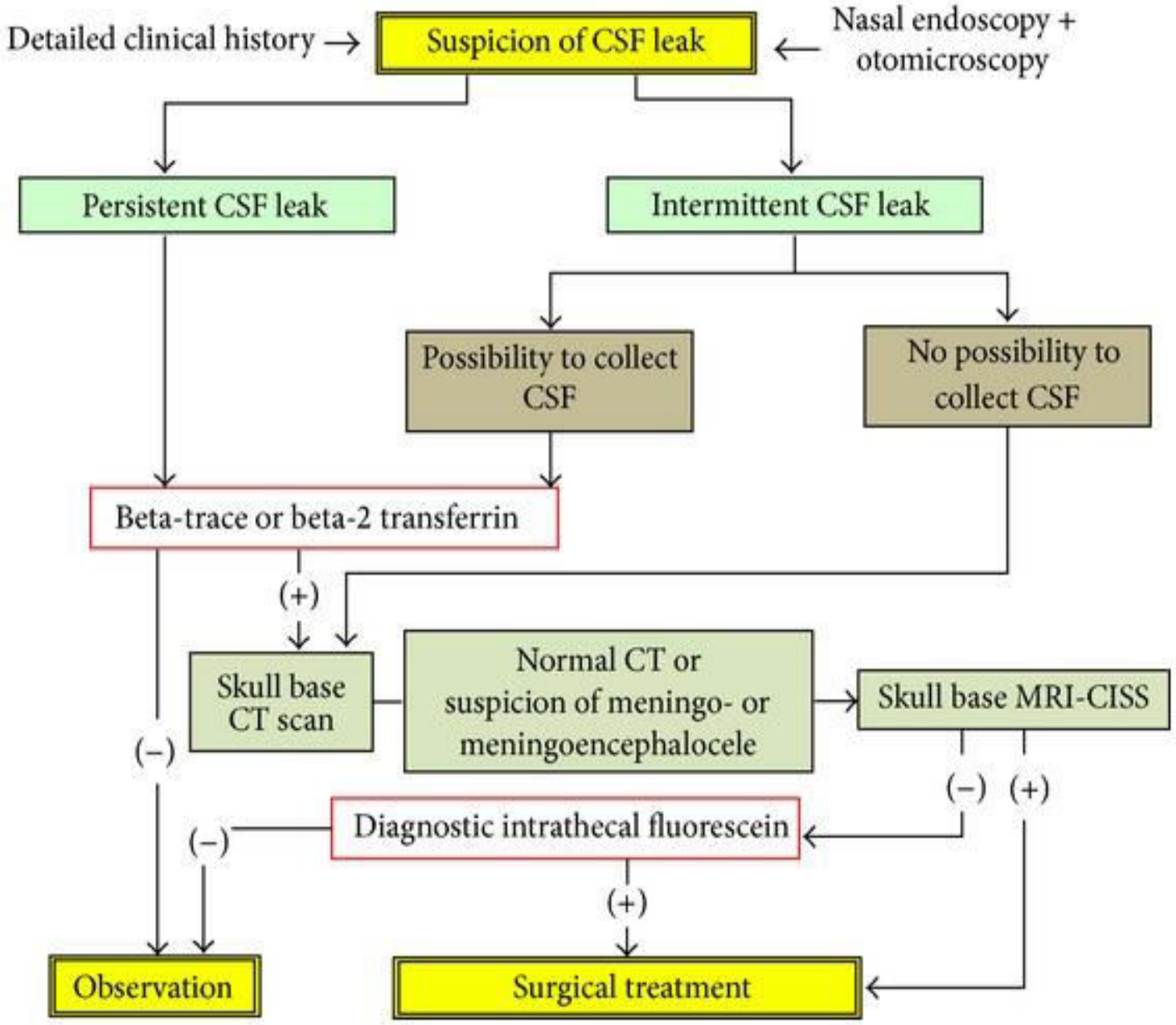
- The greatest advantage of this technique is precise anatomical localization of the osseous defect with definitive proof of CSF leak.
- CT cisternography is a minimally invasive procedure, but the major side effects include headache, meningeal irritation, and seizures. The possibility of seizures is quite low



MRI CISTERNOGRAPHY

- The principle of MR cisternography is to demonstrate a contiguous fluid signal between the cisternal space and nasal sinus on heavily weighted T2 images




Detailed clinical history
Suspicion of CSF leak
Nasal endoscopy + otomicroscopy
Persistent CSF leak
Intermittent CSF leak
Possibility to collect CSF
No possibility to collect CSF
Beta-trace or beta-2 transferrin
(+)
(−)
Skull base CT scan
Normal CT or suspicion of meningo- or meningoencephalocele
Skull base MRI-CISS
(−)
(+)
(−)
Diagnostic intrathecal fluorescein
(+)
Observation
Surgical treatment

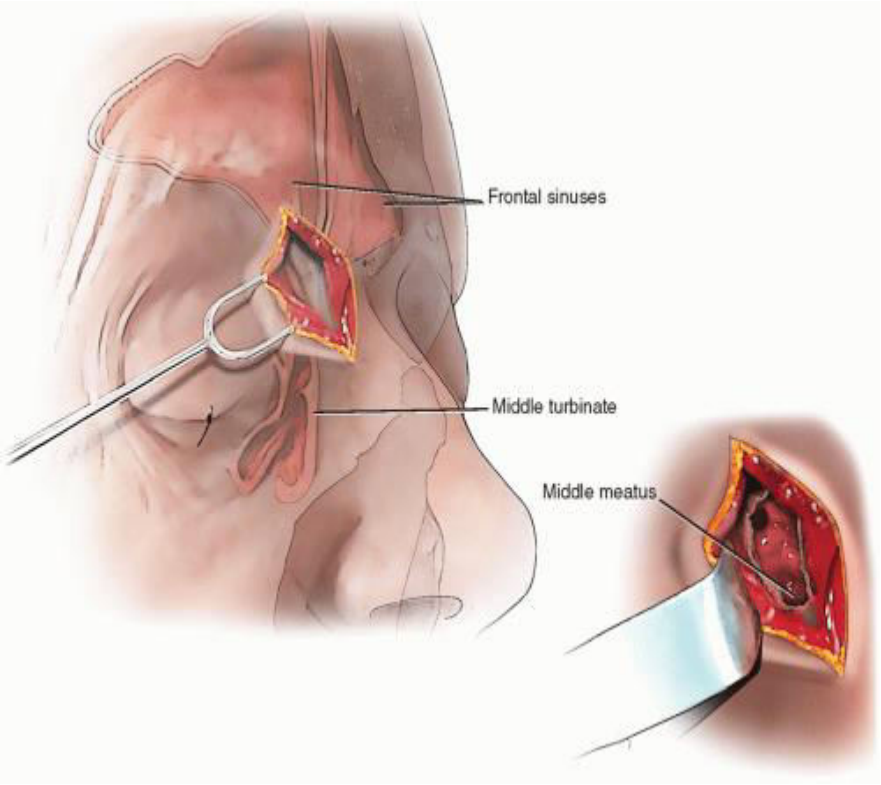
Rx

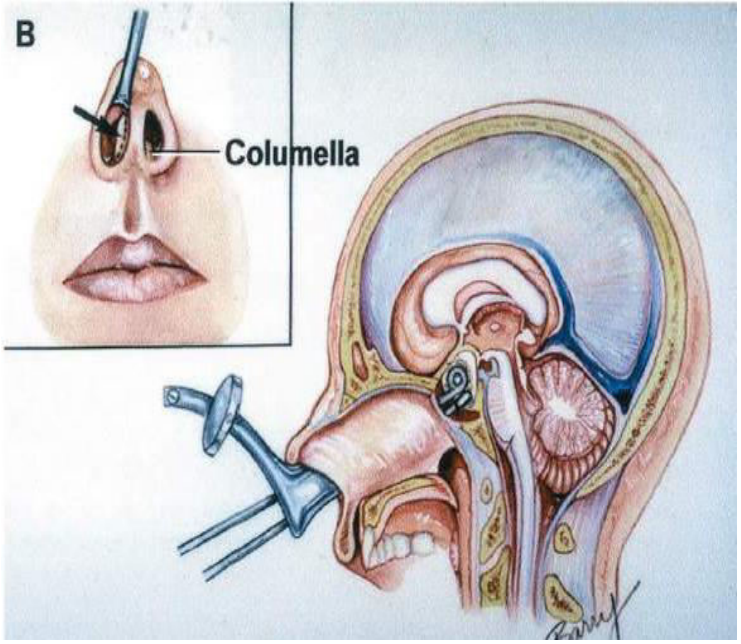
- Early cases of post-traumatic CSF leak can be managed by conservative measures such as bed rest, elevation of the head of the bed, stool softners, and avoidance of nose blowing, sneezing and straining.
- Prophylactic antibiotics can be used to prevent meningitis.
- These measures can be combined with lumbar drainage.

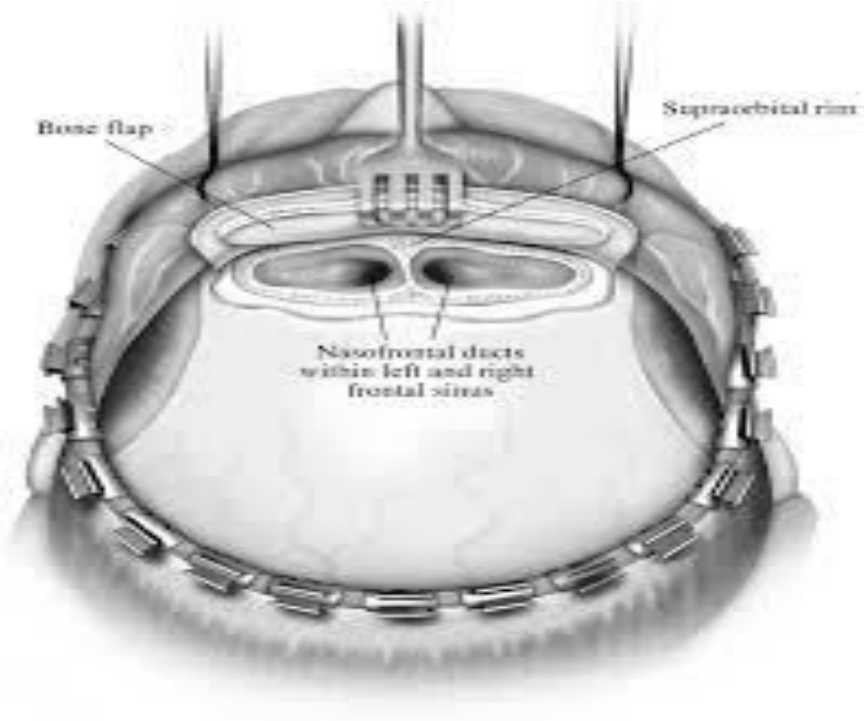
Surgical Repair

A. Neurosurgical intracranial approach.
B. Extradural approaches :

- External ethhmoidectomy for cribriform plate and ethmoid area.
- Trans-septal approach for sphenoid.
- Osteoplastic flap approach for frontal sinus leak.


Frontal sinuses
Middle turbinate
Middle meatus


B
Columella


Supraorbital rim
Nasofrontal ducts
within left and right
frontal sinus

Endoscopic surgical repair

Preferred

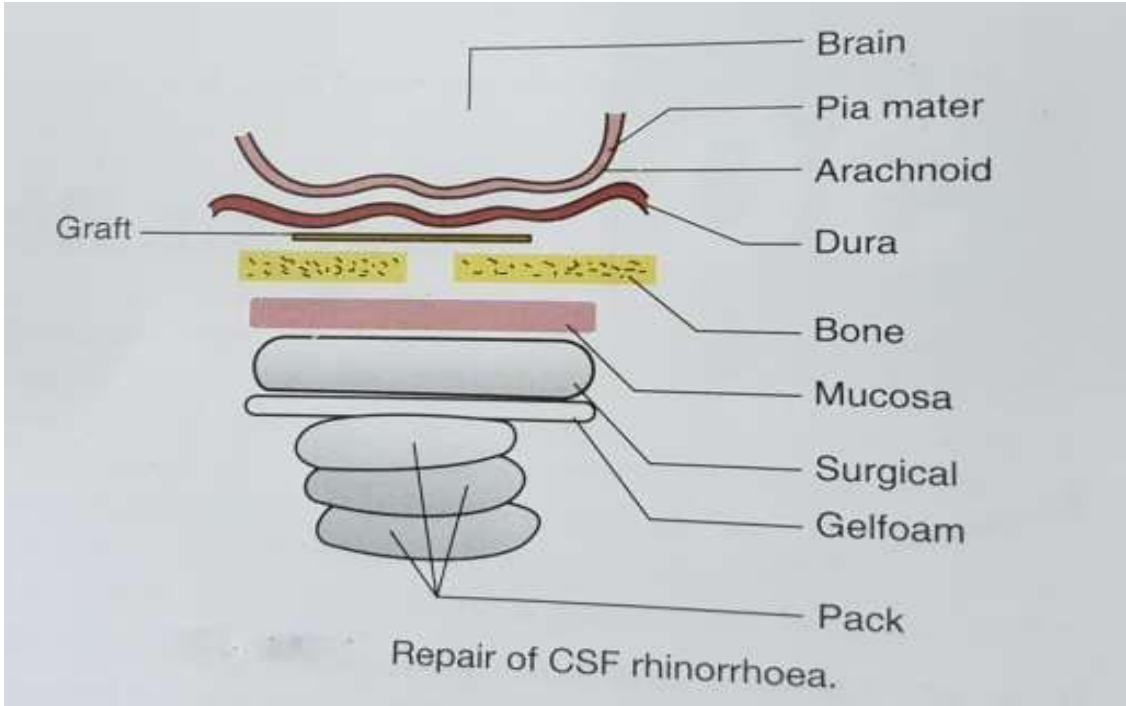
- Smell preserved
- Shorter stay
- No surgical scar
- Less morbidity
- Higher success rate

Transnasal endoscopic approach

- Most of the leaks from anterior cranial fossa and sphenoid sinus can be managed endoscopically
- Principles of repair:
- Defining the site of leak.
- Preparation of graft site.
- Underlay grafting of fascia extradurally followed by placement of mucosa.
- If bony defect>2cm, it is repaired with cartilage.
- Placement of surgical and gelfoam further strengthens area.

TYPES OF GRAFTS

- It depends on the size and location of the defect,
- If the defect is large it can be fixed with bone or cartilage graft taken usually from nasal turbinates.
- If the defect is small, it can be repaired with fascia lata grafts, temporalis fascia.
- Fibrin glue, surgicel, gelfoam is used to stabilize the graft
- High antibiotic smeared nasal packing.
- Sometimes fat from thigh or abdomen is used to plug the defect in place of fascia graft.
- Lumbar puncture if CSF pressure is high.



Repair of CSF rhinorrhoea.

• Historically smaller skull base defects were repaired using free grafts including mucopericondrium ad mucoperiosteum and or fascia
• In addition non cellular grafting materials like alloderm are used to repair dura
• High success rates were exhibited for smaller defects
•This lead to the introduction of vascularized flaps

Defect size	Graft used	Different types of flaps available
• 1mm to 0.5cm • 0.6 - 1.5cm • 1.6 cm	• Free mucosal graft • Multilayer closure / vascularised pedicle flap • Must use vascularised pedicle flap	**1.Middle tubinate flap** **2. Inferior turbinate flap** **3. Nasospetal hadad flap**

Hadad flap

- Pedicled nasoseptal flap
- It was first described in 2006 by Hadad *et al*. and Luis Bassagasteguy, and it is also known as the Hadad-Bassagasteguy flap (HBF)
- Indicated :
- Skull base reconstuction after endonasal surgery
- Prevents communication between brain and sinuses

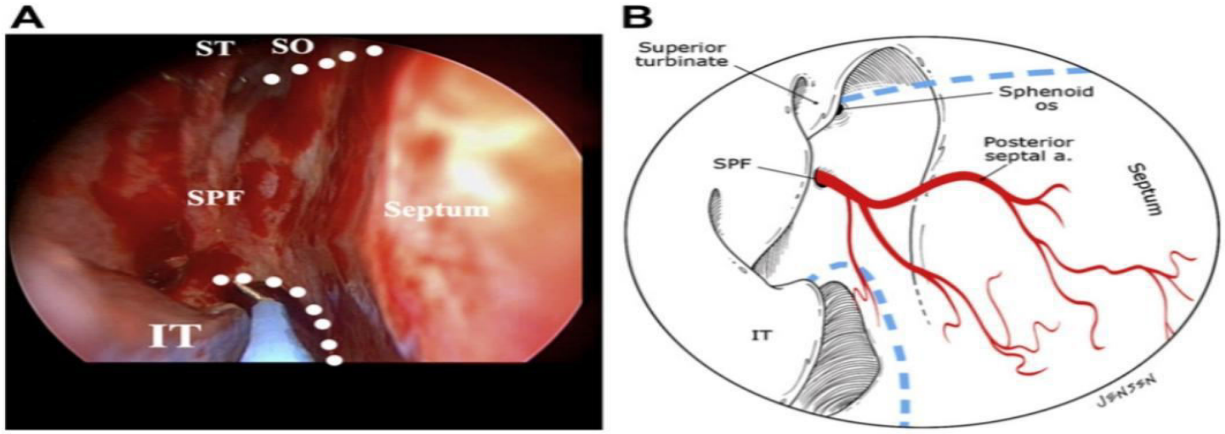
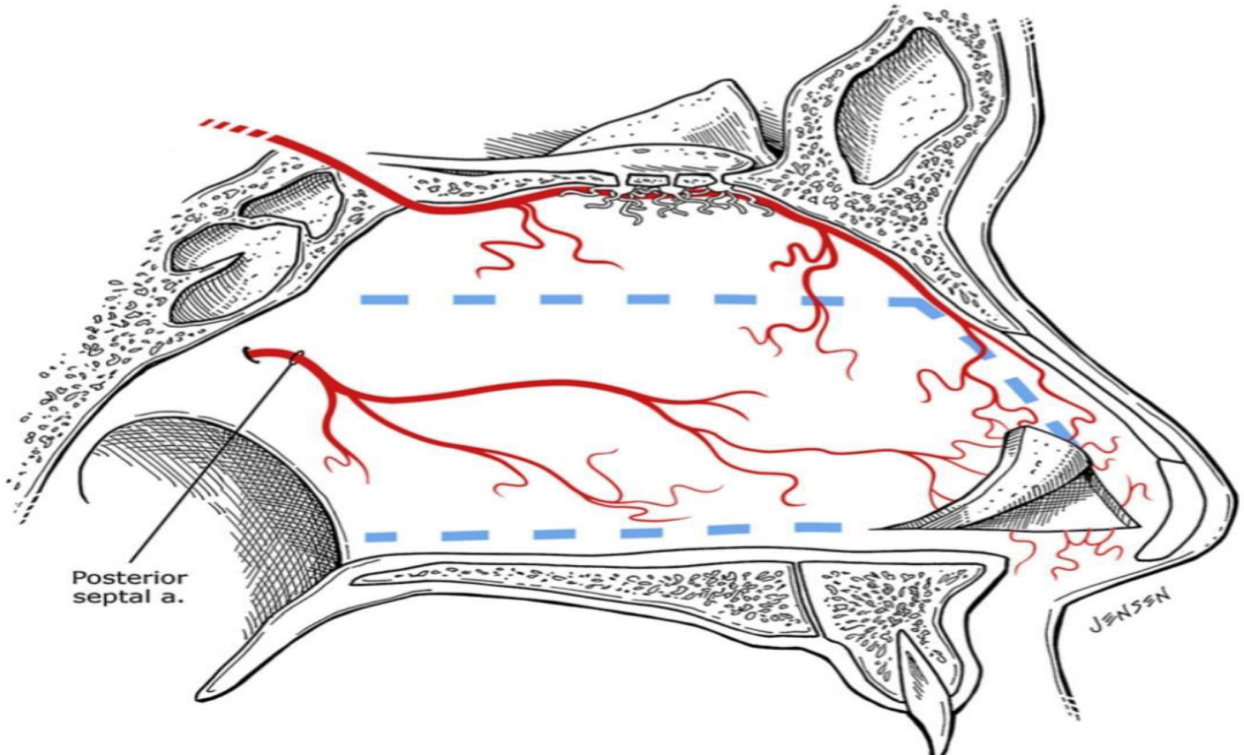
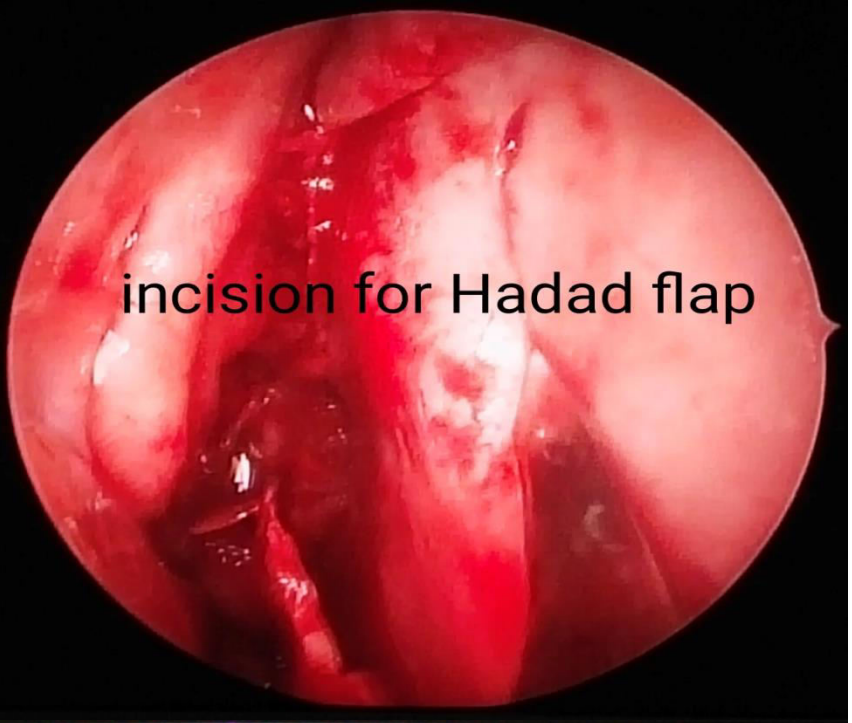


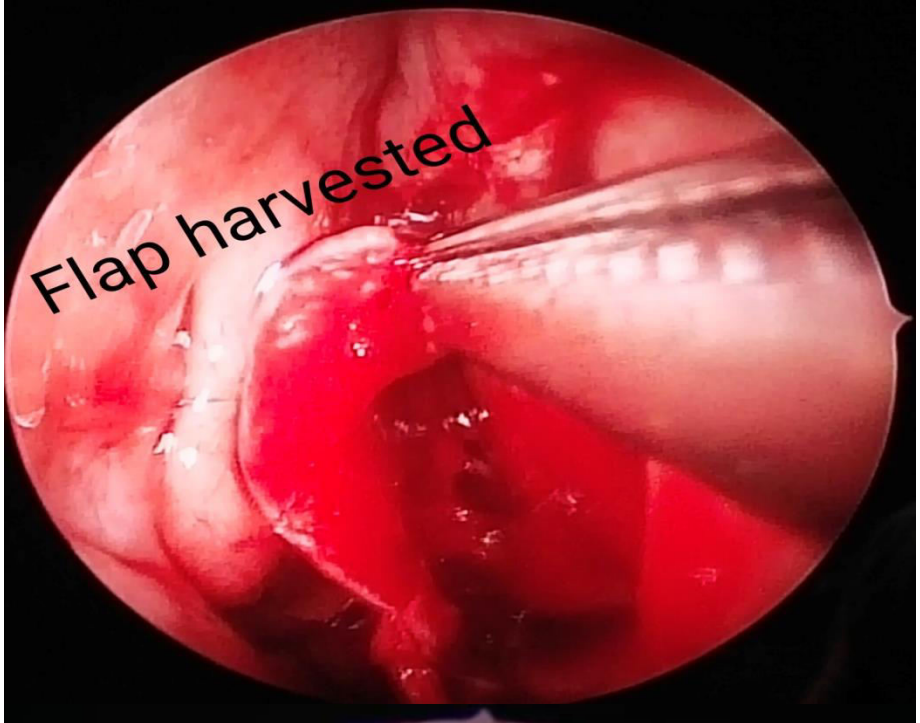
Fig. 4. Endoscopic view of the posterior nasal cavity (*A*) with an artist's representation of the same view (*B*). Dashed lines mark the location of cuts for the posteriorly based nasal septal flap. IT, inferior turbinate; SO, sphenoid os; SPF, sphenopalatine fossa; ST, superior turbinate.



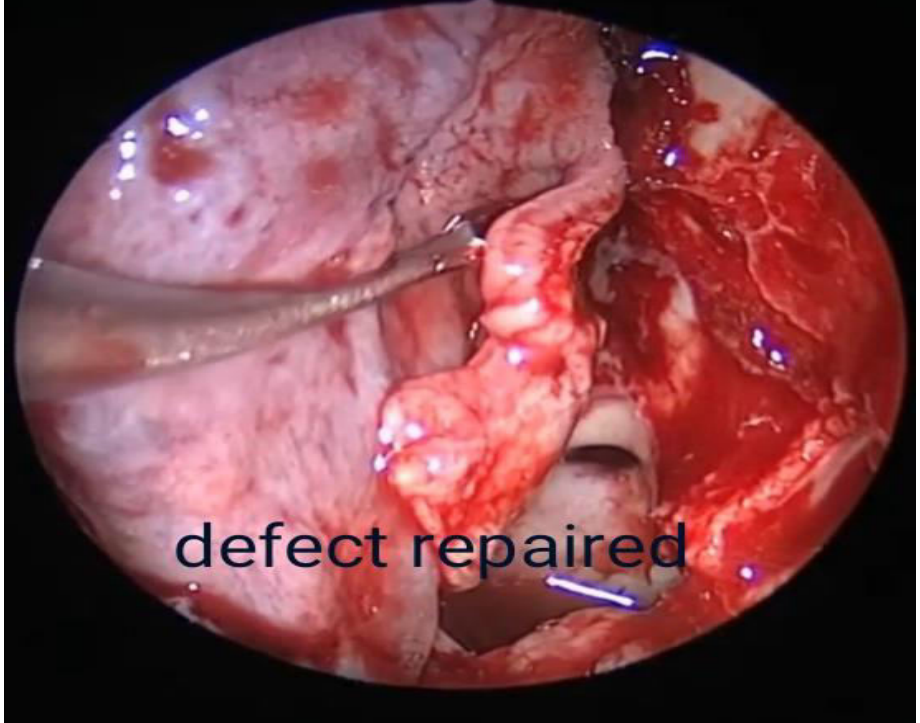
Advantages

- Well vascularised with robust pedicle
- Superior arc rotation
- Customizable surface area/ modifiable
- Provides enough surface area to cover the entire anterior skull base
- Can be stored in the nasopharynx during the explorative portion of procedure
- Promotes fast healing and decreases risk of csf leak
- Sturdy , pliable
- Re used in revision

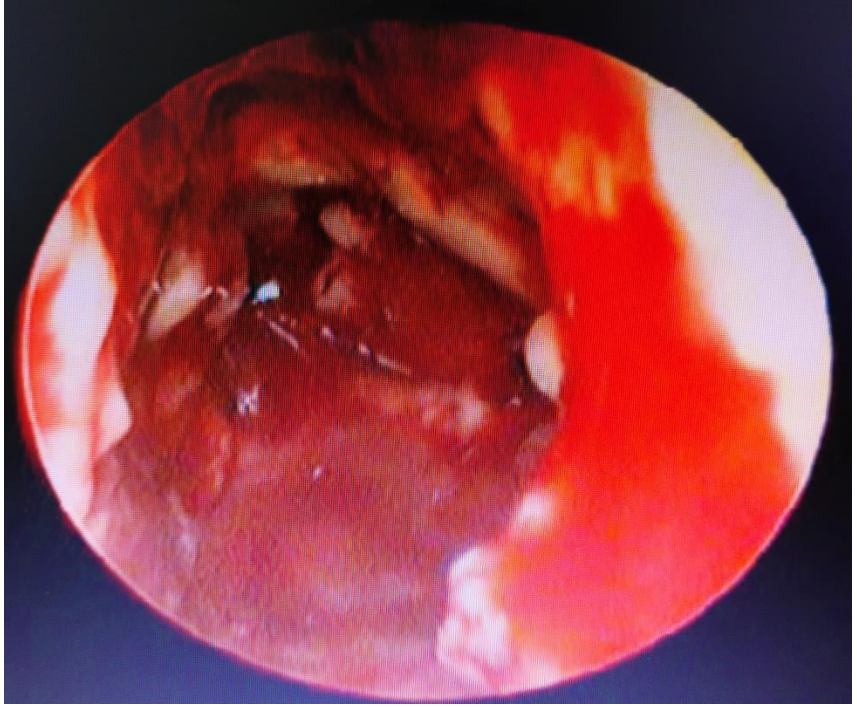

incision for Hadad flap


Flap harvested


sphenoid ostium


defect repaired

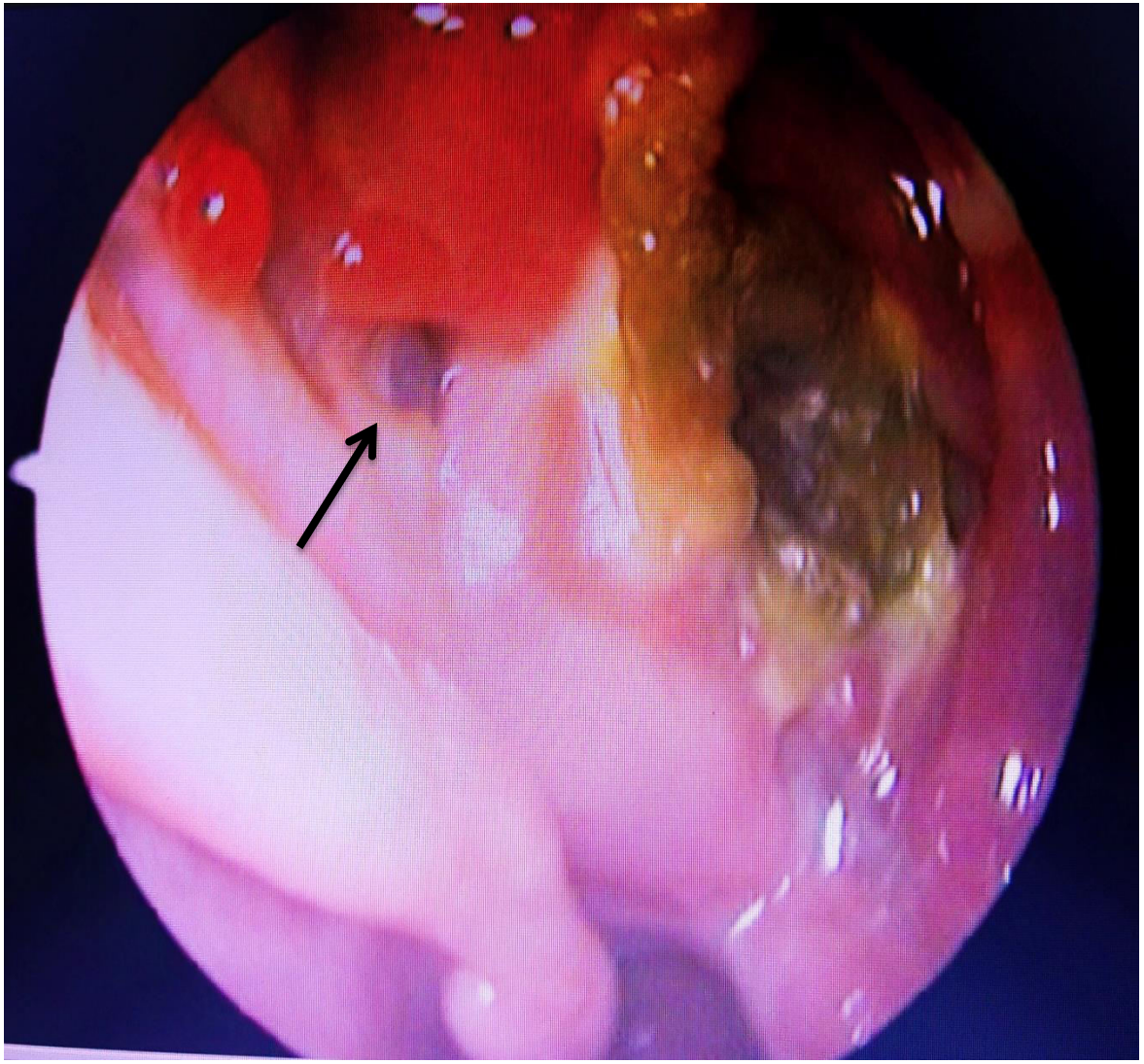

Graft placed




Graft Completely healed

OUR EXPERIENCE

- HADAD flap has yielded the best results so far as observed
- 20 cases were done in our institution in collaboration with the neurosurgical department
- Post covid 4 cases were taken up
- 2 cases in this year within 2 months of start
- Patients were followed up for 3 months postoperatively
- 95% of success rate irrespective of the site of defect
- 1 case reported of recurrence due to expansion of tumor




THANK YOU HEROES