Mastoid Surgery

Calmette - AEC

Categorising mastoid surgery

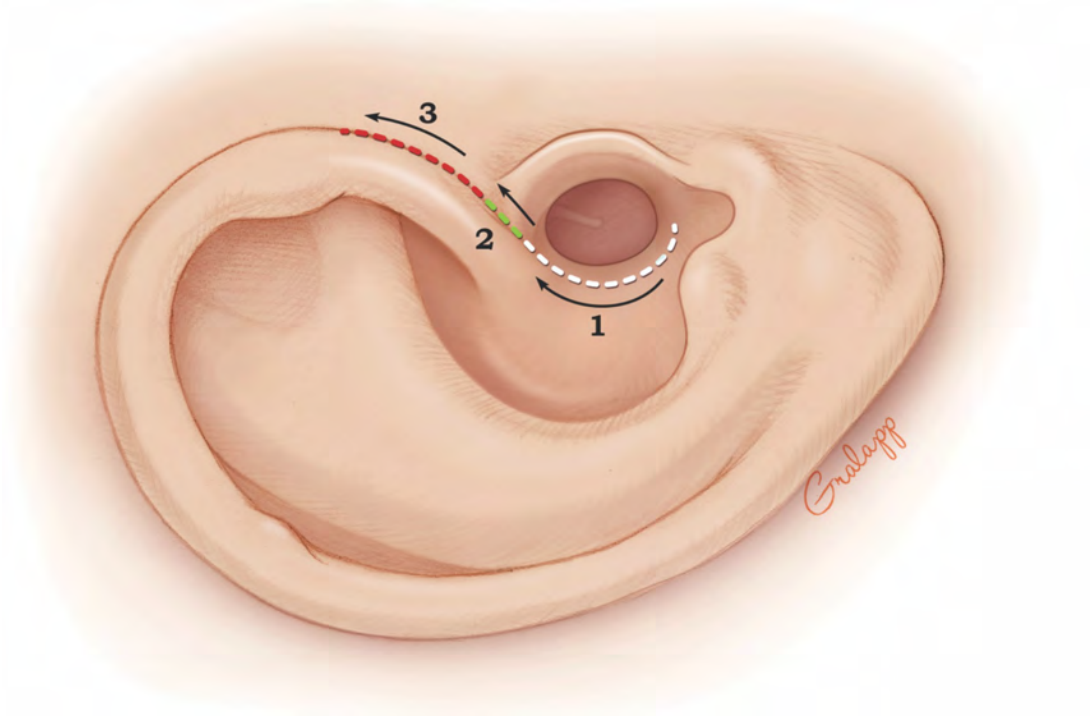
- There are a range of options available to the surgeon:
  - Cortical Mastoidectomy
  - Atticotomy, Attico-antrostomy, Modified Radical Mastoidectomy, (Radical Mastoidectomy)
  - Canal Wall Up/Canal Wall Down
  - Front-to-back (aka ‘small cavity technique’) / back-to-front
  - Endoscopic assisted surgery / EES
- The chosen option depends on disease size, anatomic considerations, surgical experience and preference, and availability of equipment

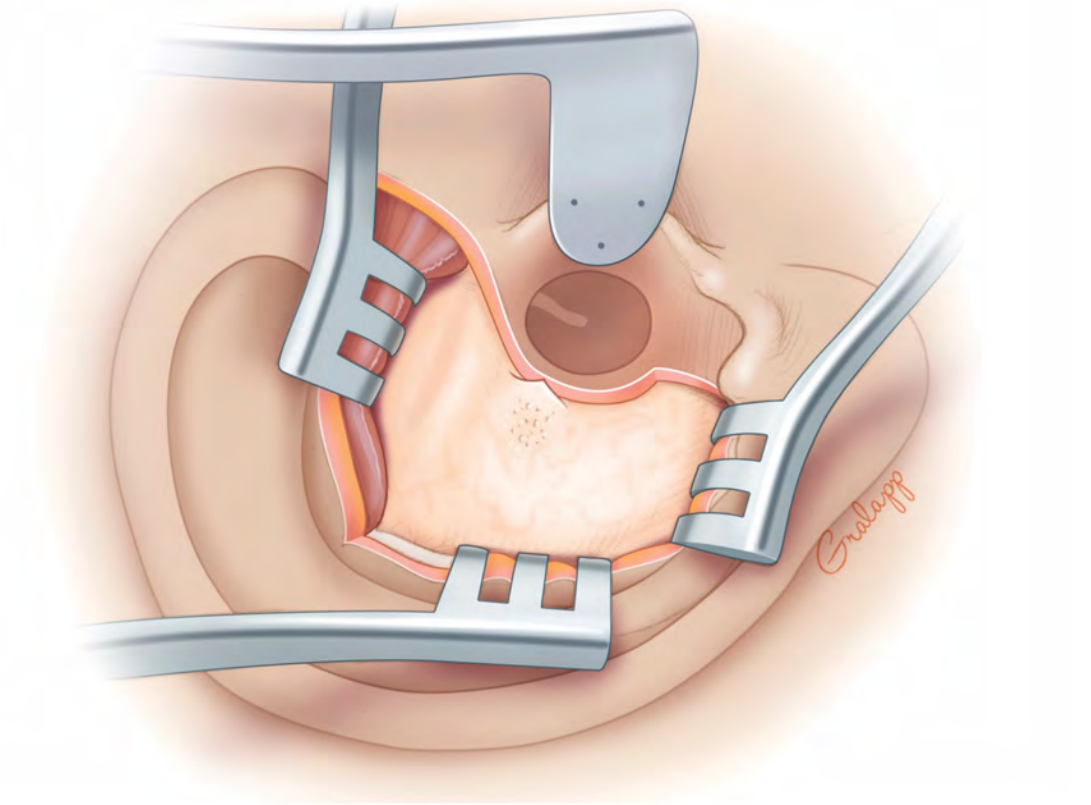
General Approaches

- Per-meatal Surgery – done through external ear canal
- Endaural surgery – done through anterior incision
- Postaural surgery – done through posterior incision

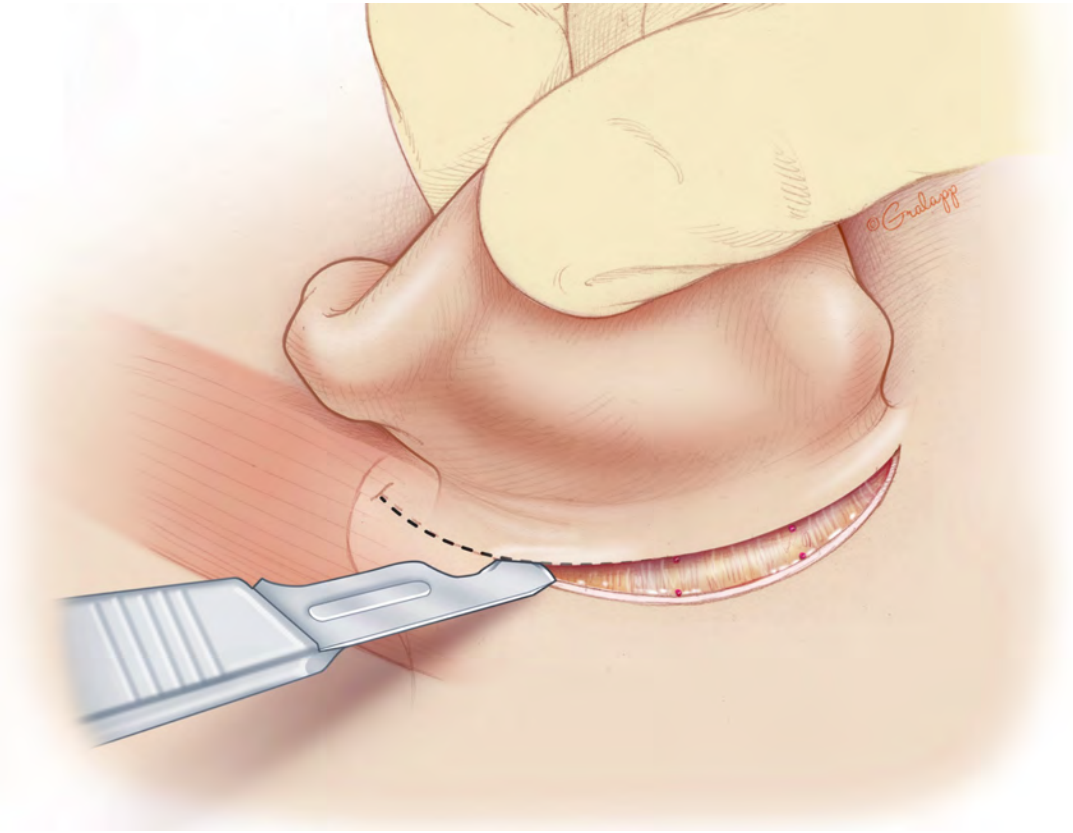
- Choose the approach that gives the best visibility and access to the disease

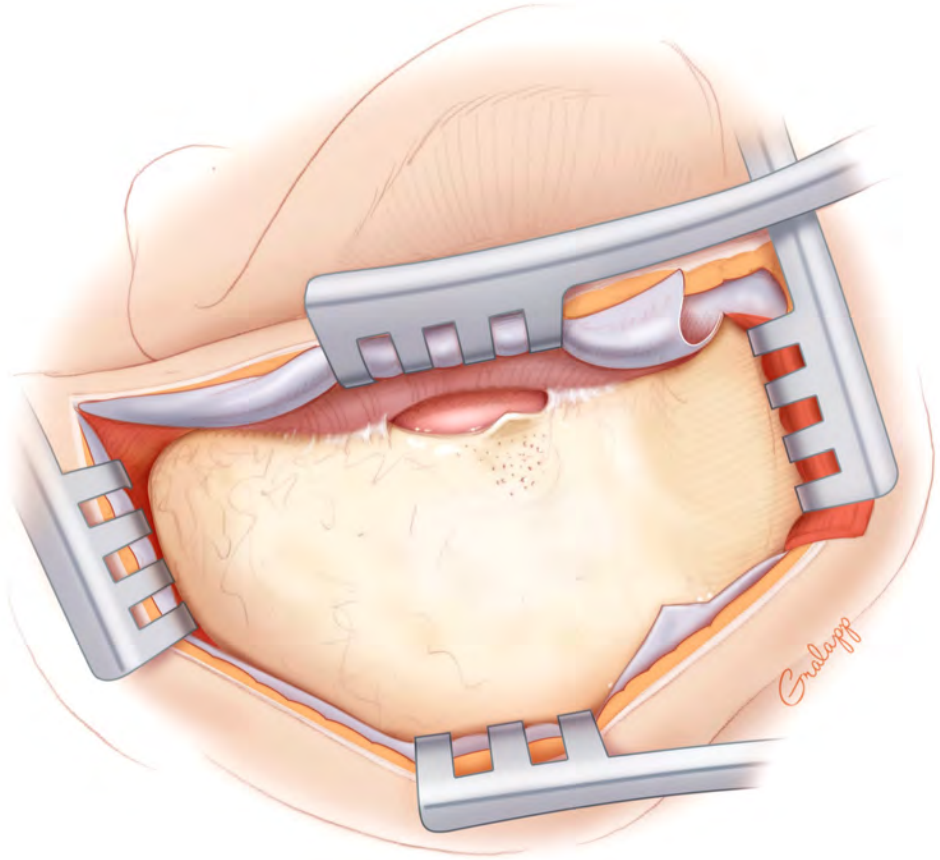
Endaural Incision





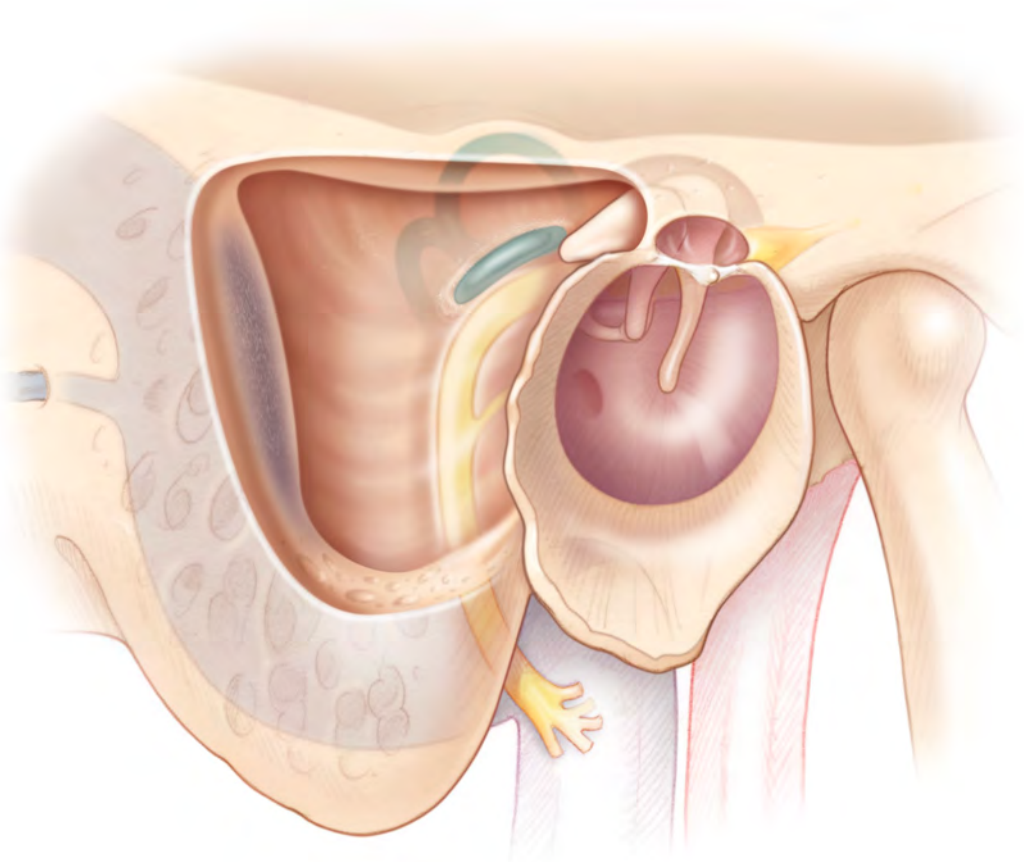
Postaural Incision



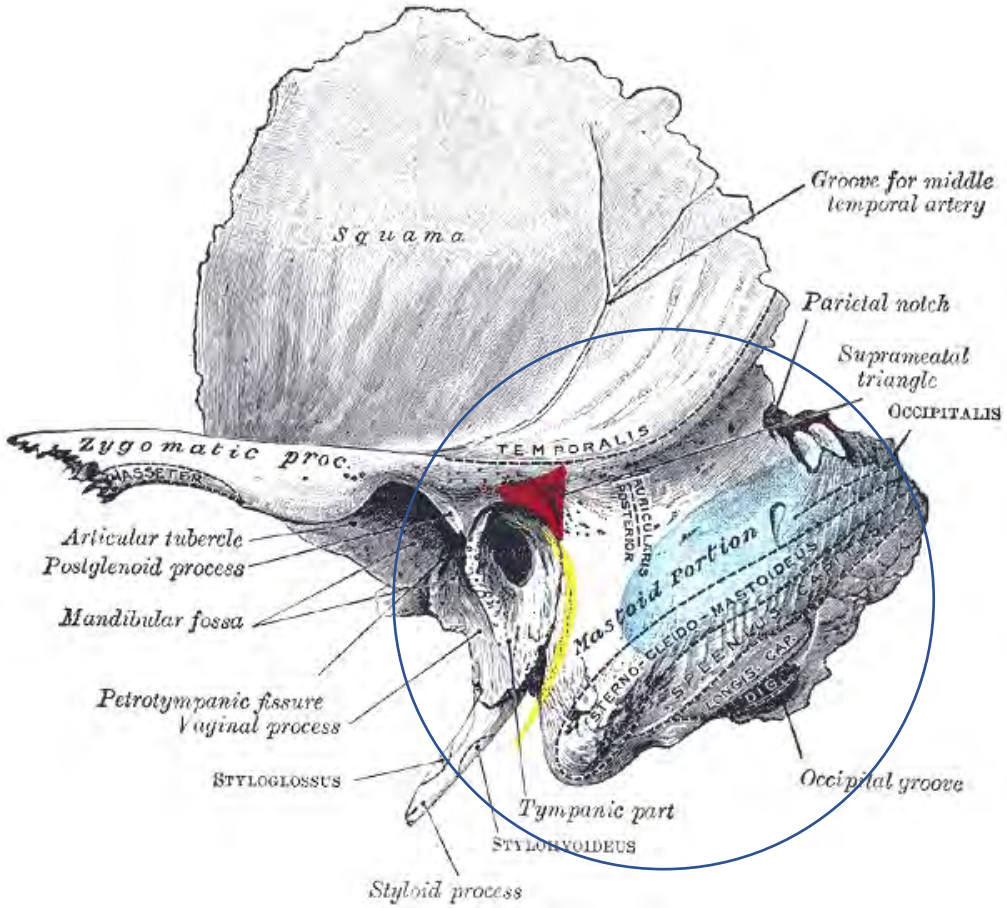


Cortical Mastoidectomy – the First Mastoidectomy that you will do as a New Ear Surgeon

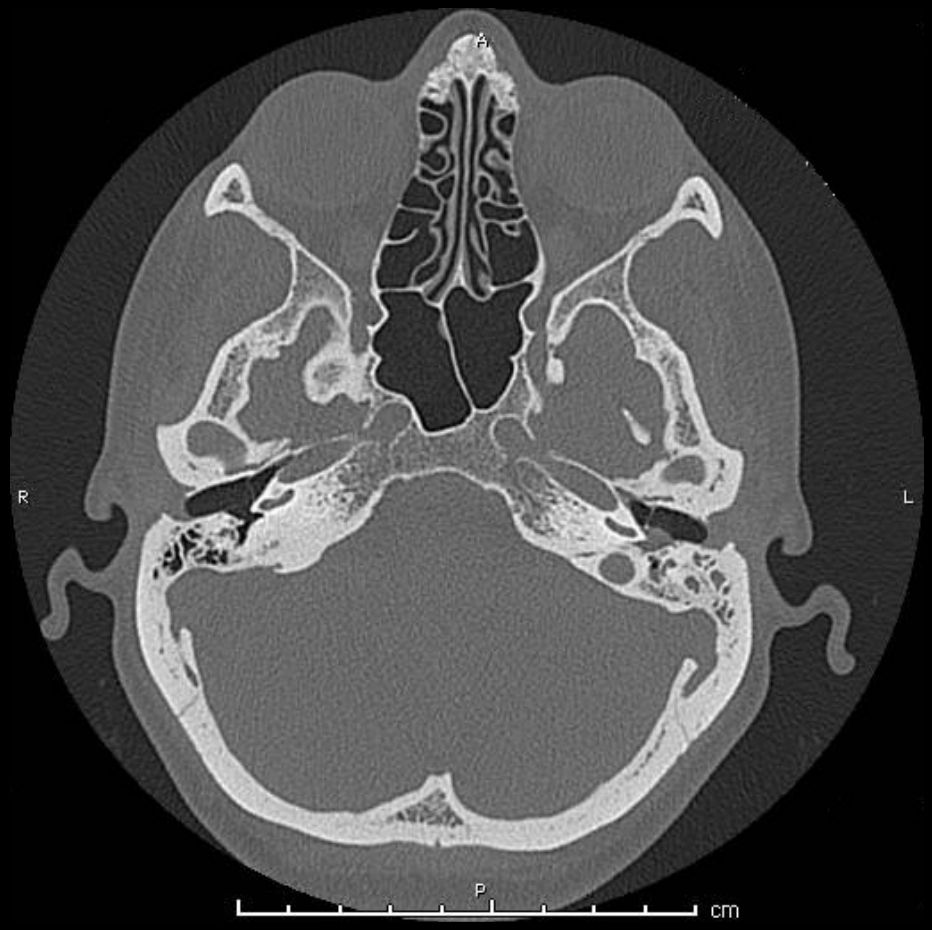
- Simple procedure, in the main, for:
  - Subperiosteal abscesses
  - Access to cholesteatoma & extension into MRM or CAT
  - Cochlear Implants
  - Closing CSF leaks
  - Access for labyrinthectomy
- Lift the skin over the mastoid bone
- Drill the cortex off
- Drill out the air cells within
- Close the skin incision

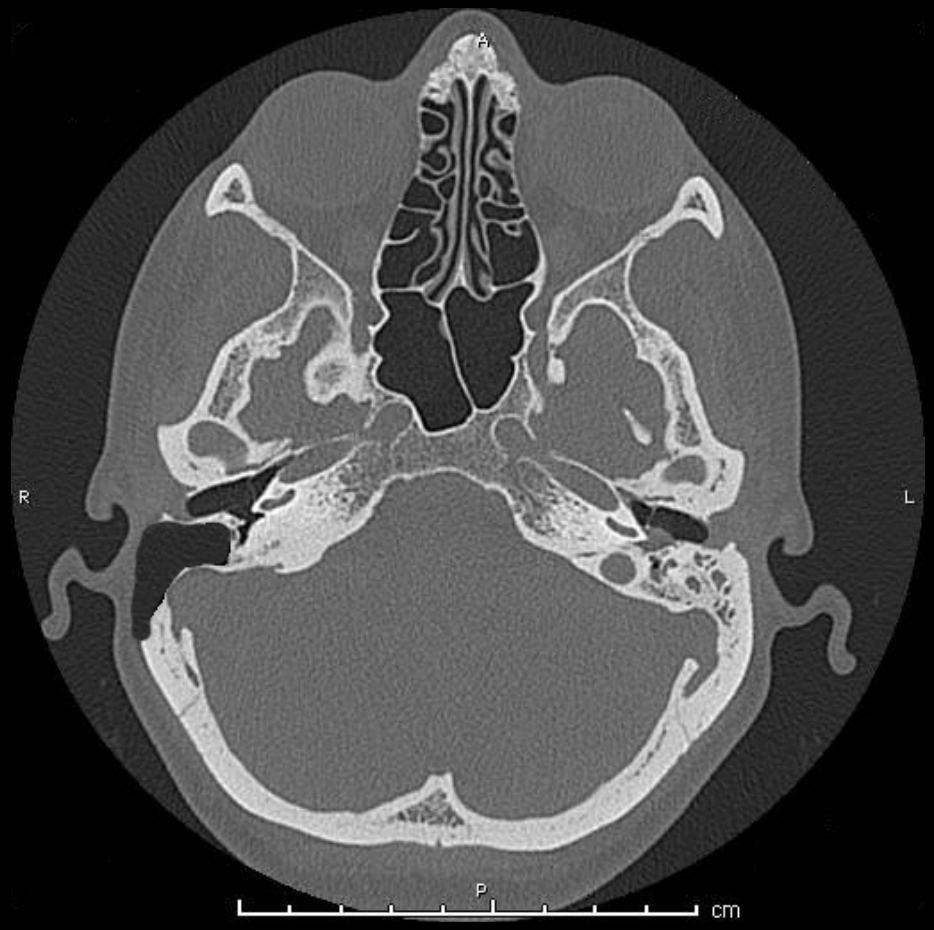


Cortical Mastoidectomy



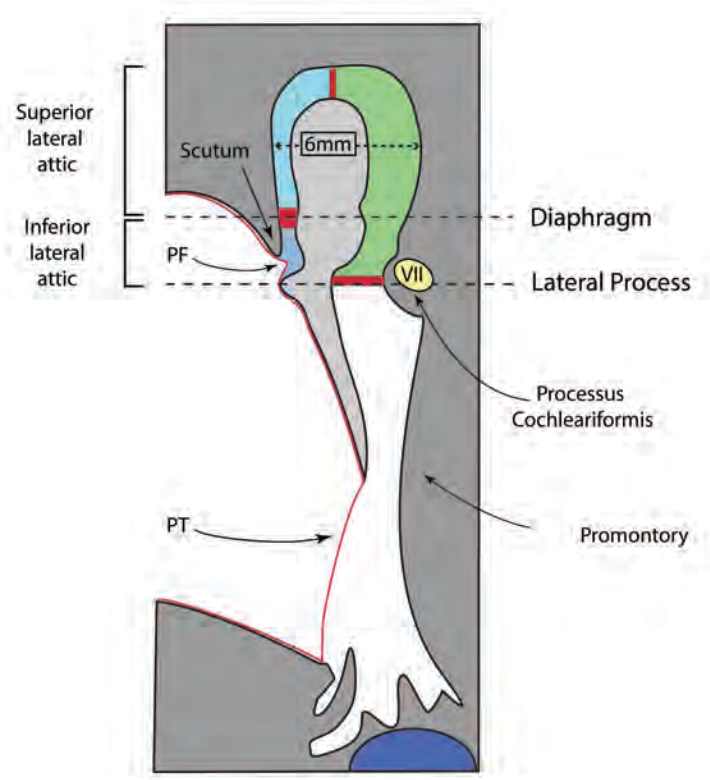
Cortical Mastoidectomy – Axial View



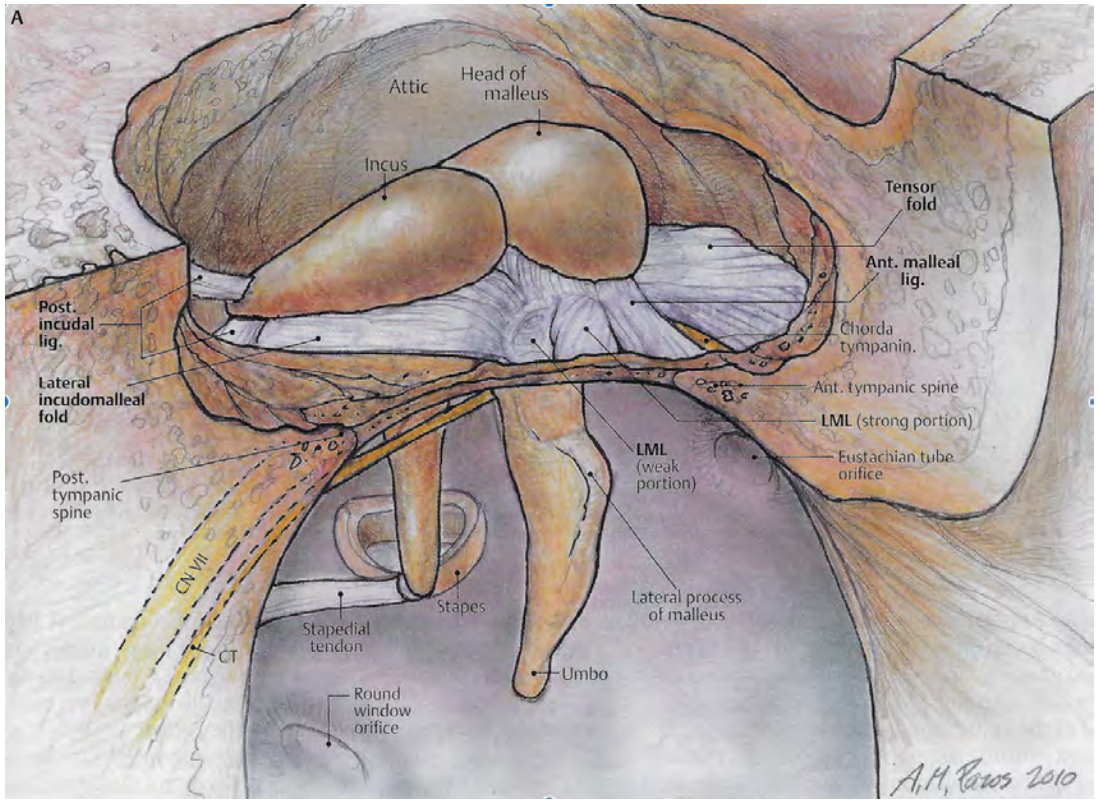


Atticotomy

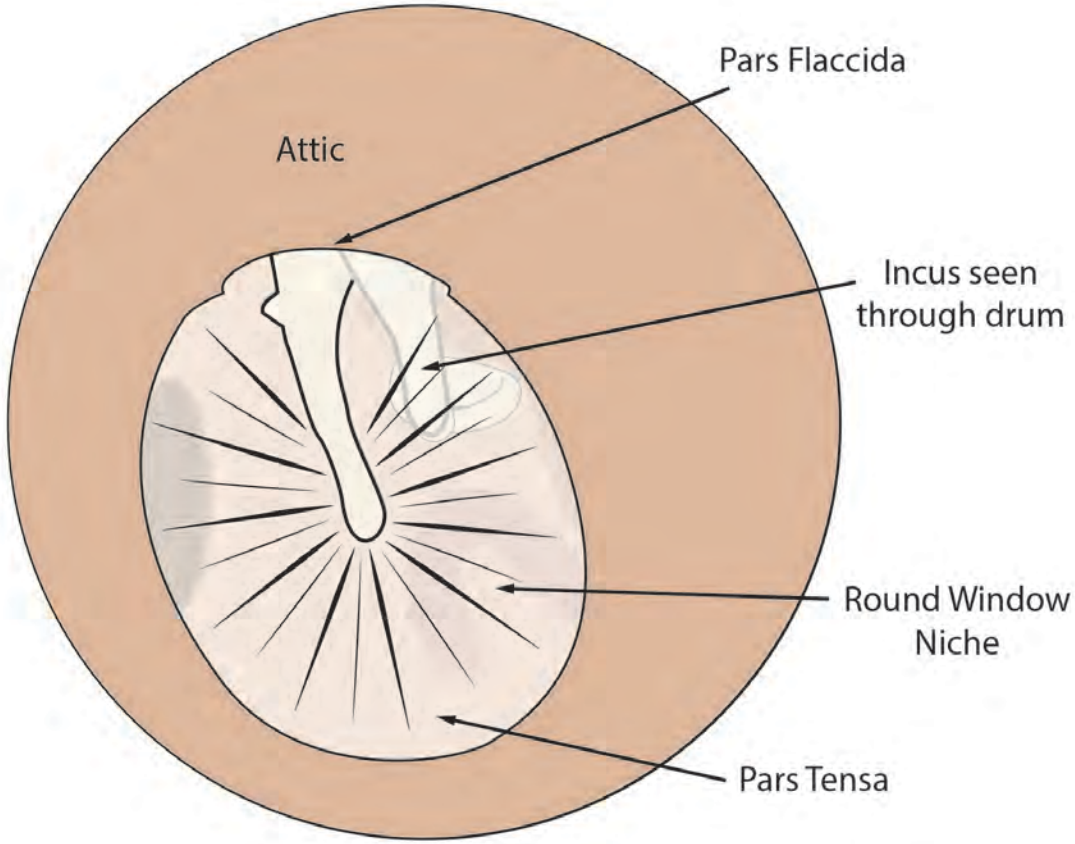
The Epitympanum & the Epitympanic Diaphragm



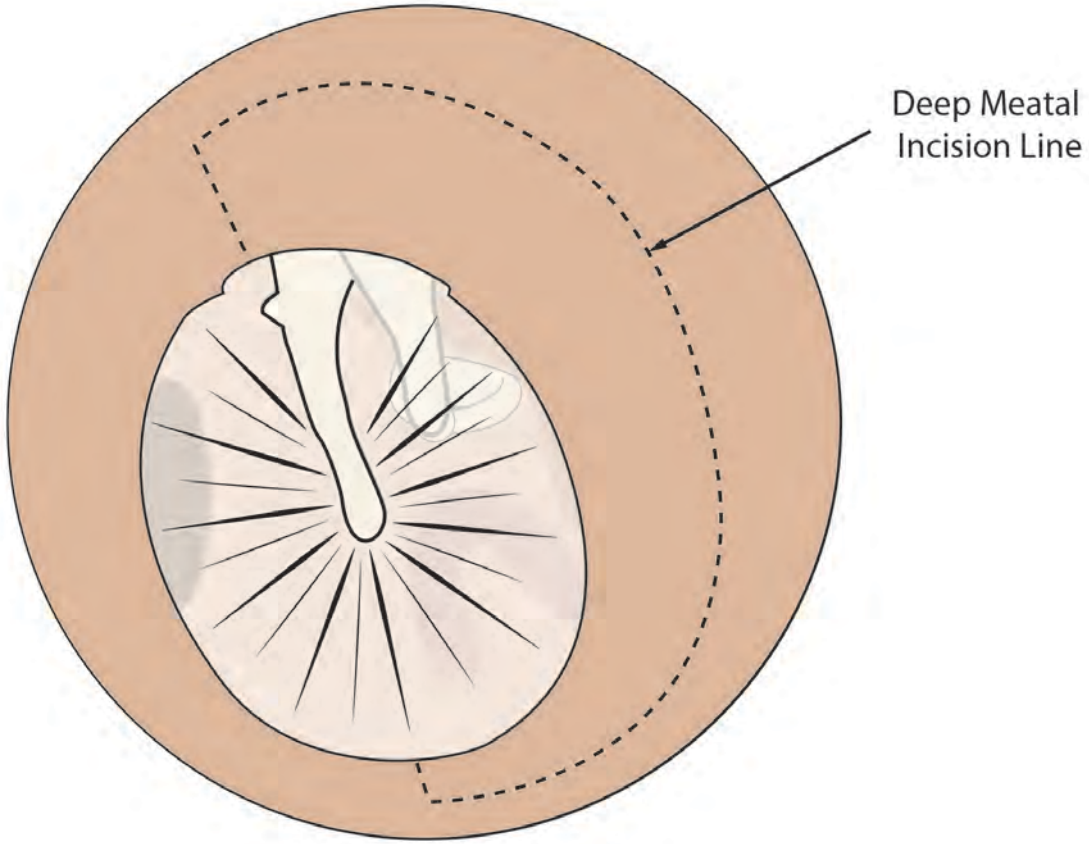
Anatomy of the epitympanum (coronal)



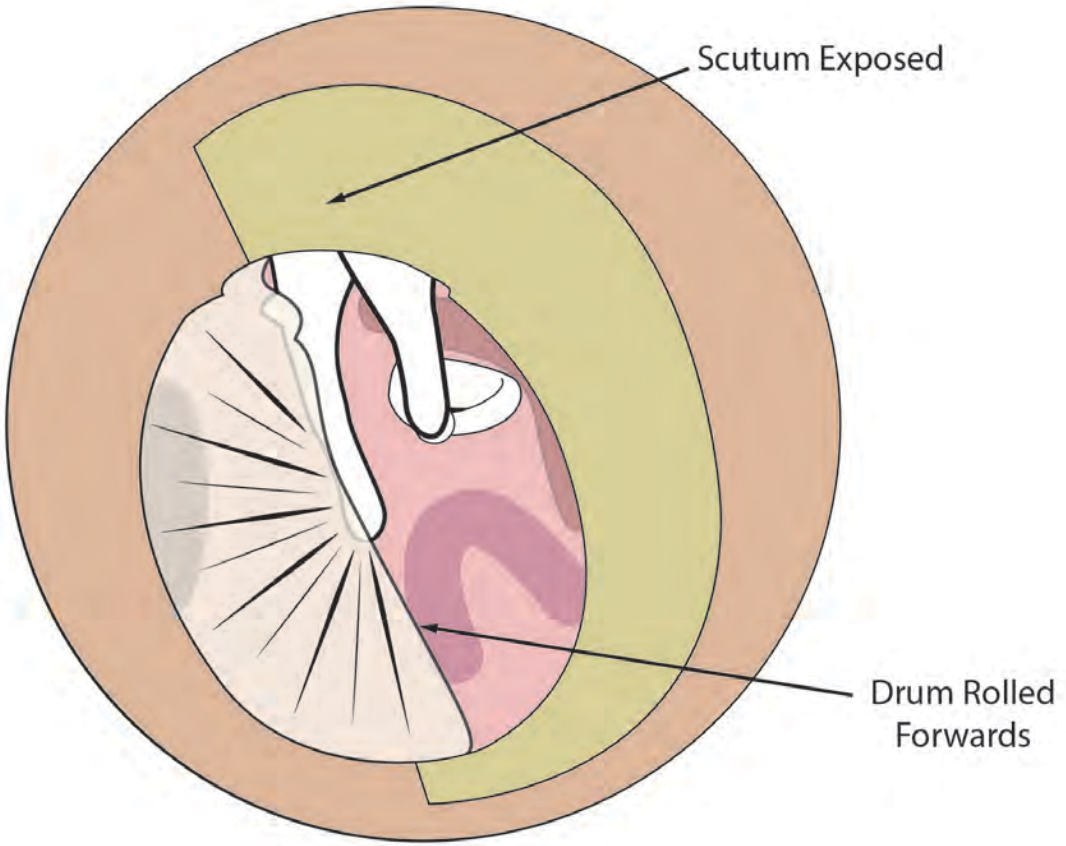
Atticotomy – Parasagittal (Surgical) View



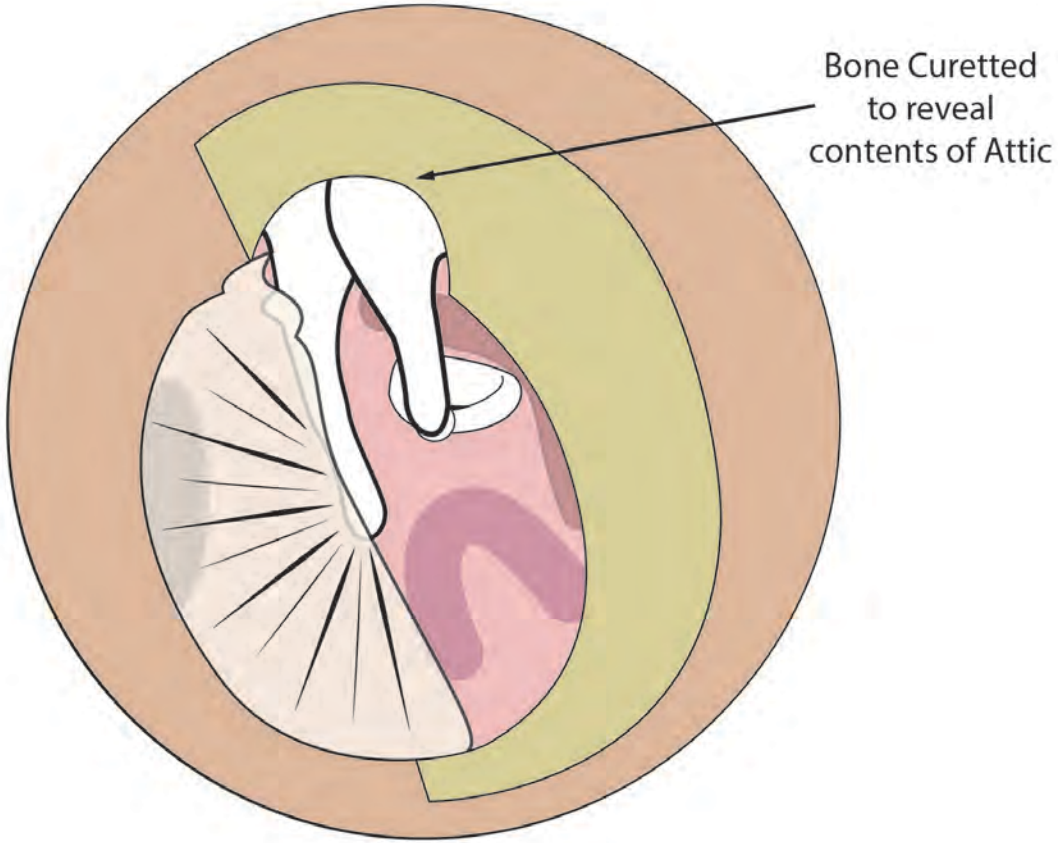
Atticotomy – Canal Incision



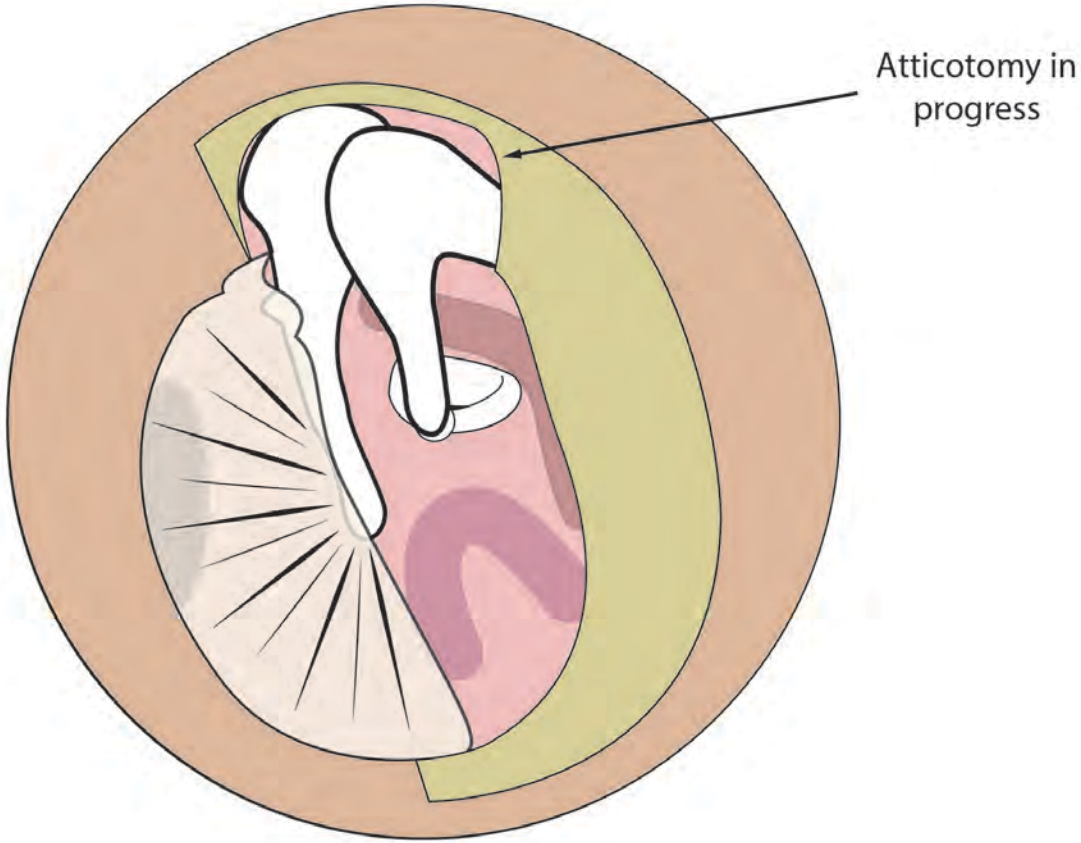
Atticotomy – Tympanomeatal Flap Raised



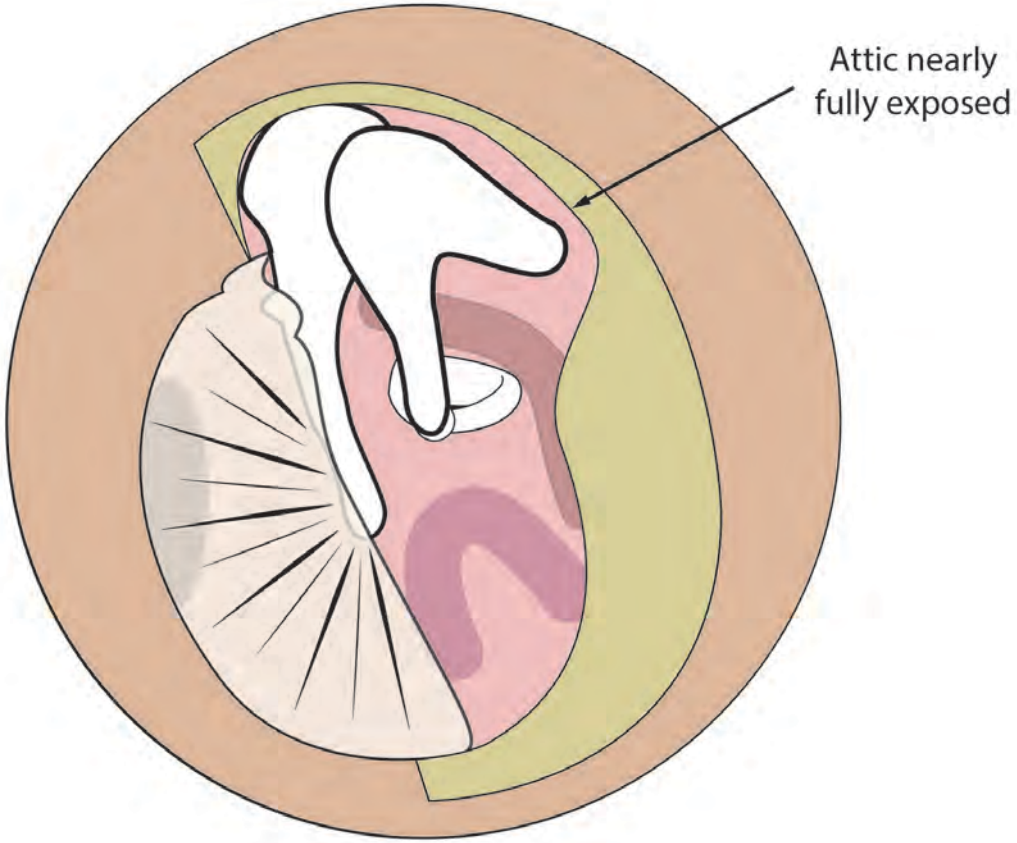
Atticotomy – Initial Bony Removal



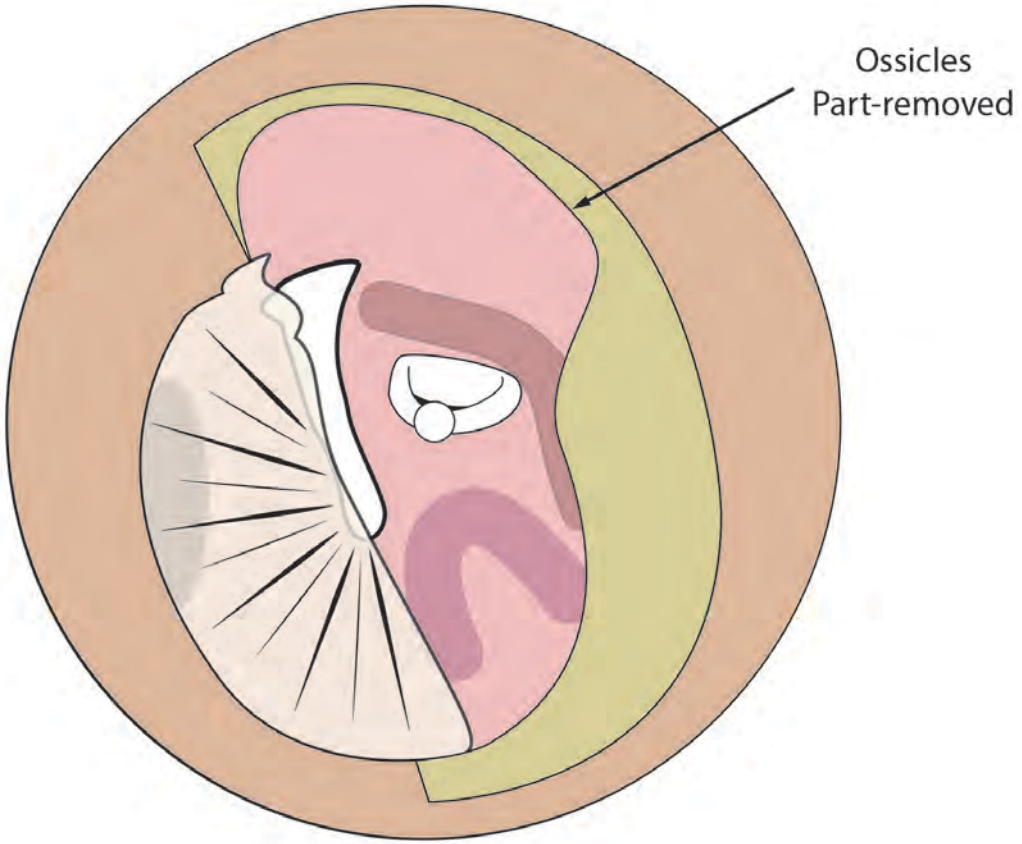
Atticotomy – Further Bony Removal



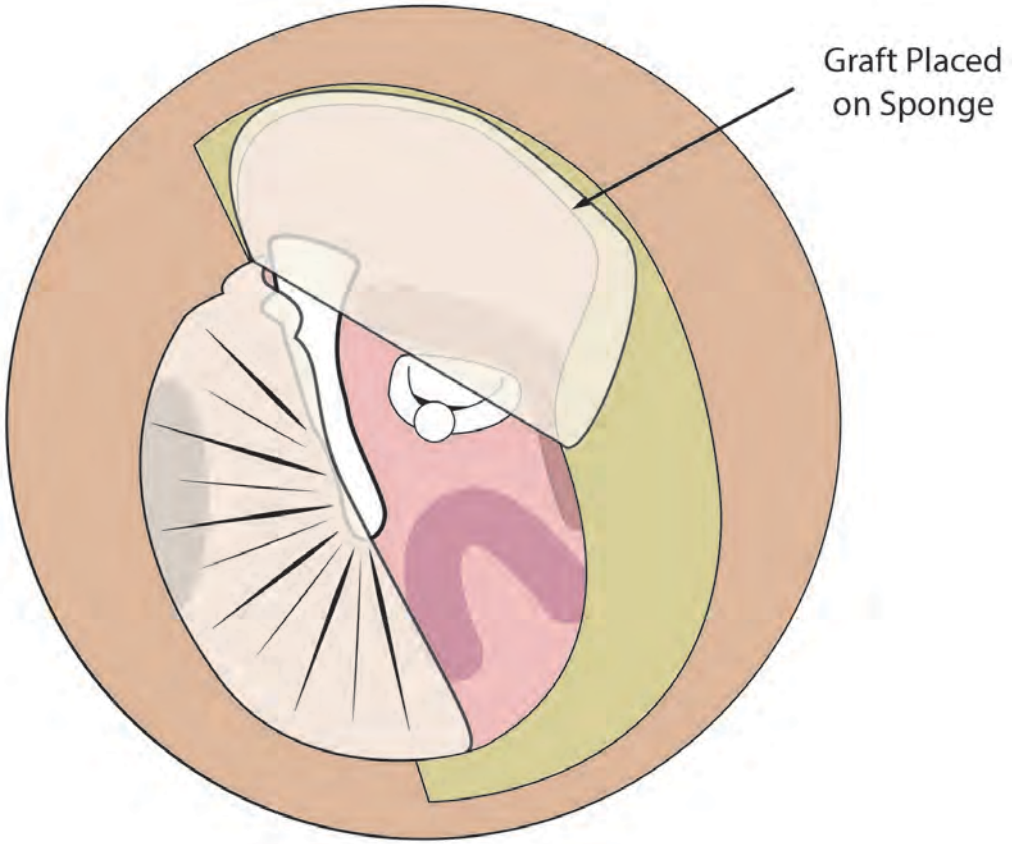
Atticotomy – Pre-graft



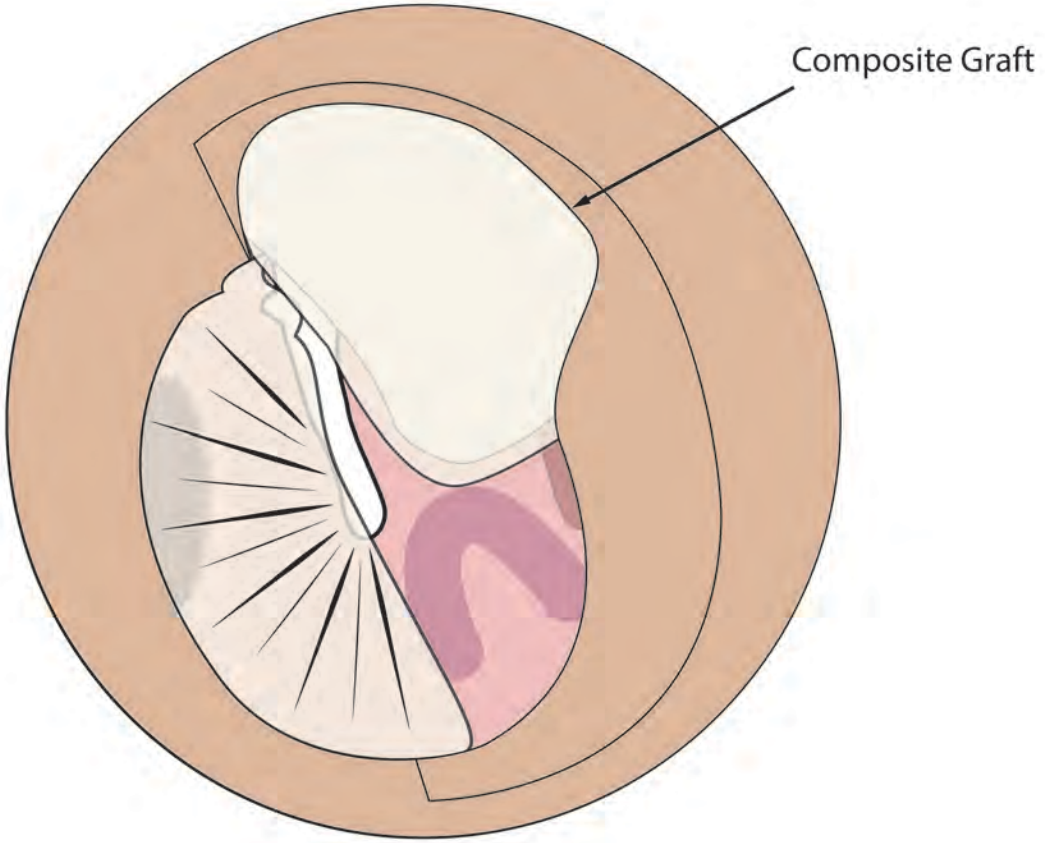
Atticotomy – Ossicles Removed if Necessary



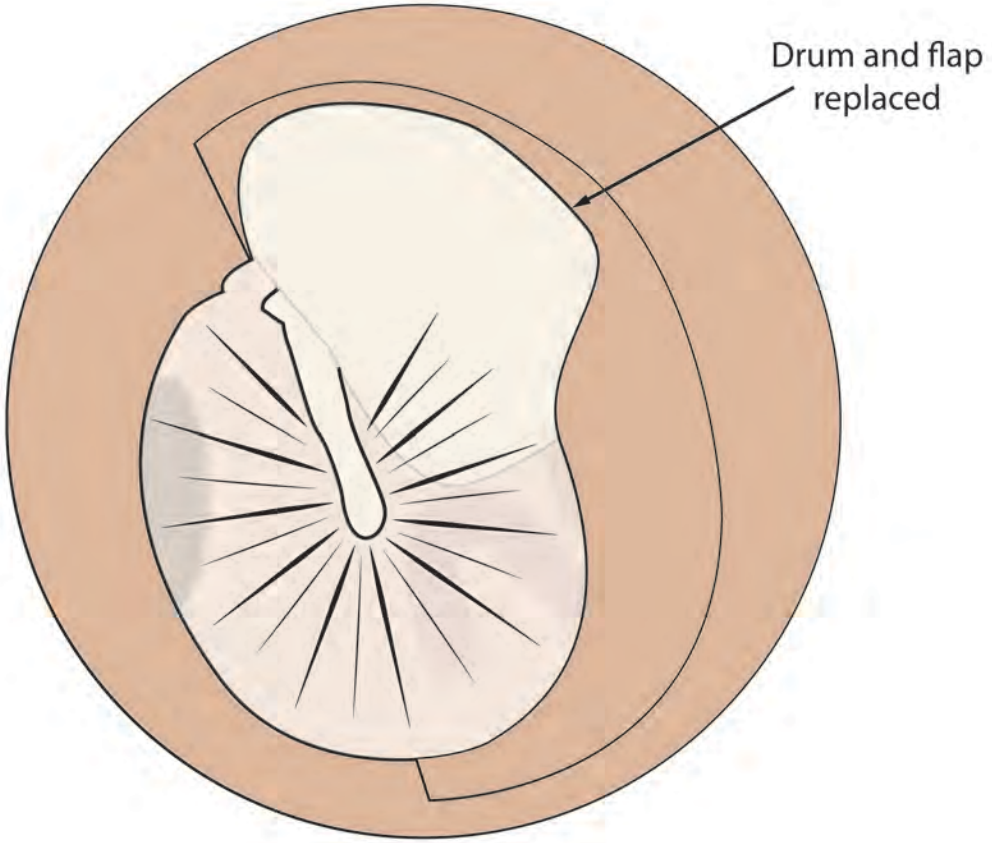
Atticotomy – Grafted with Fascia



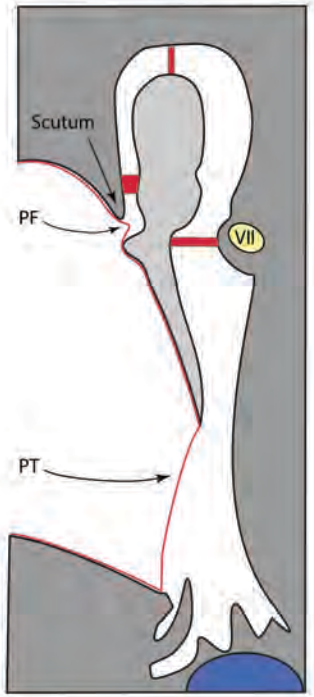
Atticotomy – Composite Graft



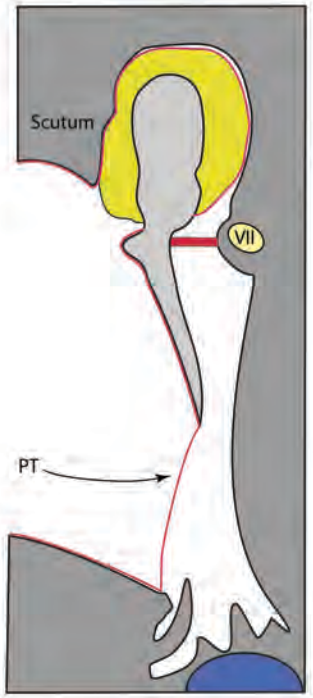
Atticotomy – Grafted



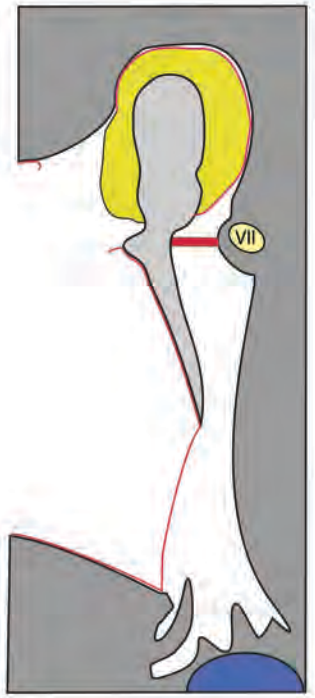
Atticotomy – Coronal View



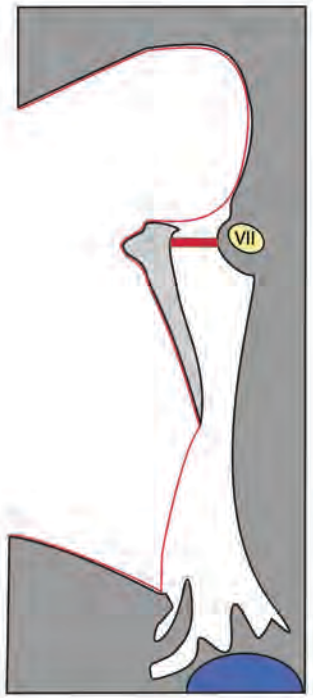
Normal Epitympanic Anatomy



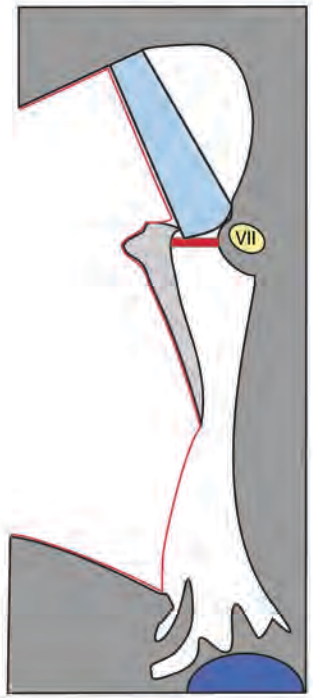
Epitympanic Cholesteatoma



Atticotomy

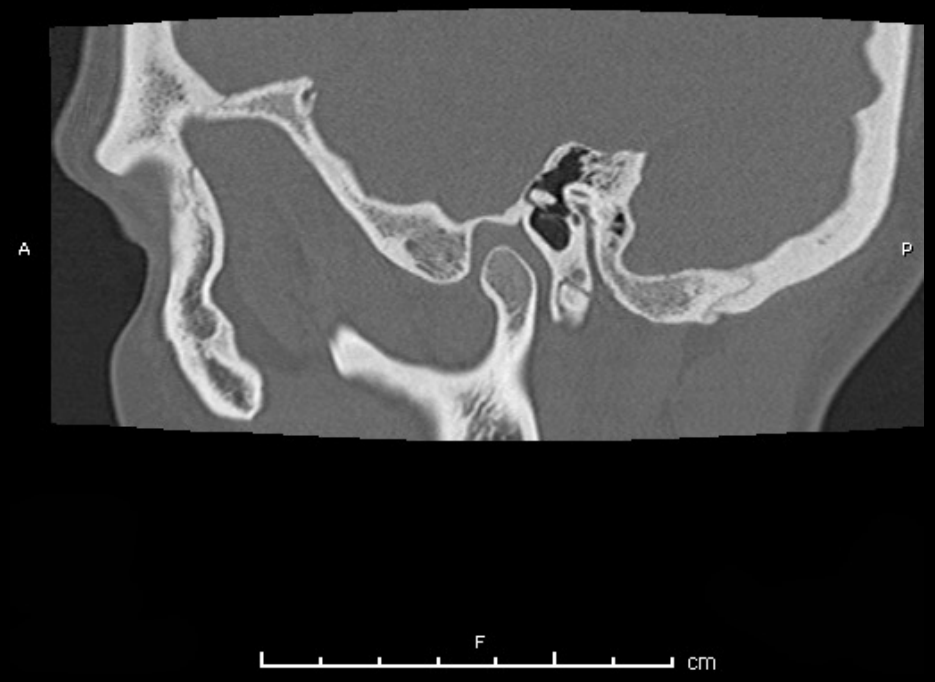


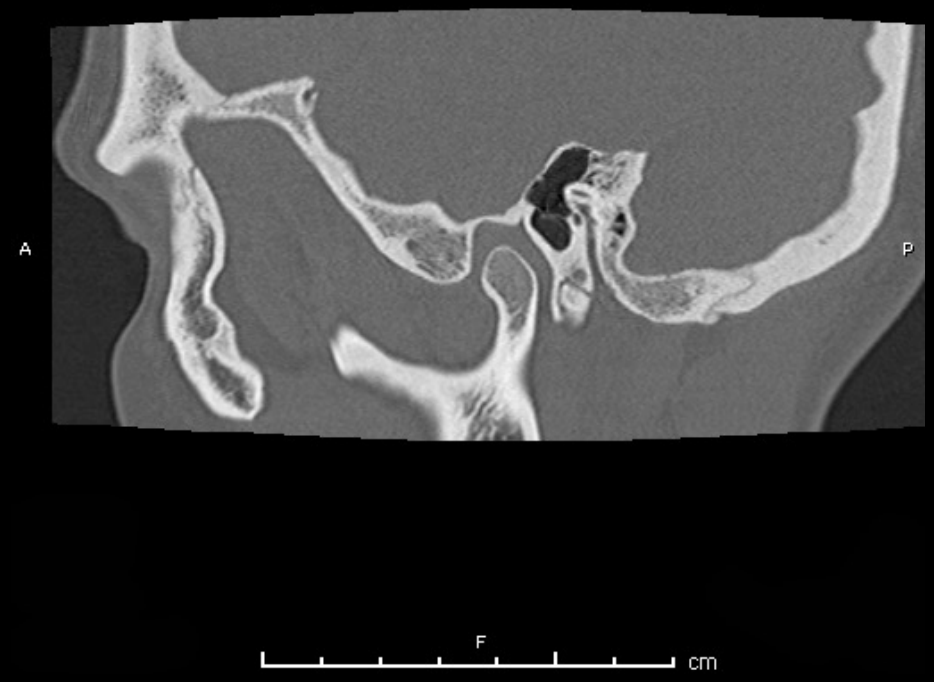
Atticotomy with graft

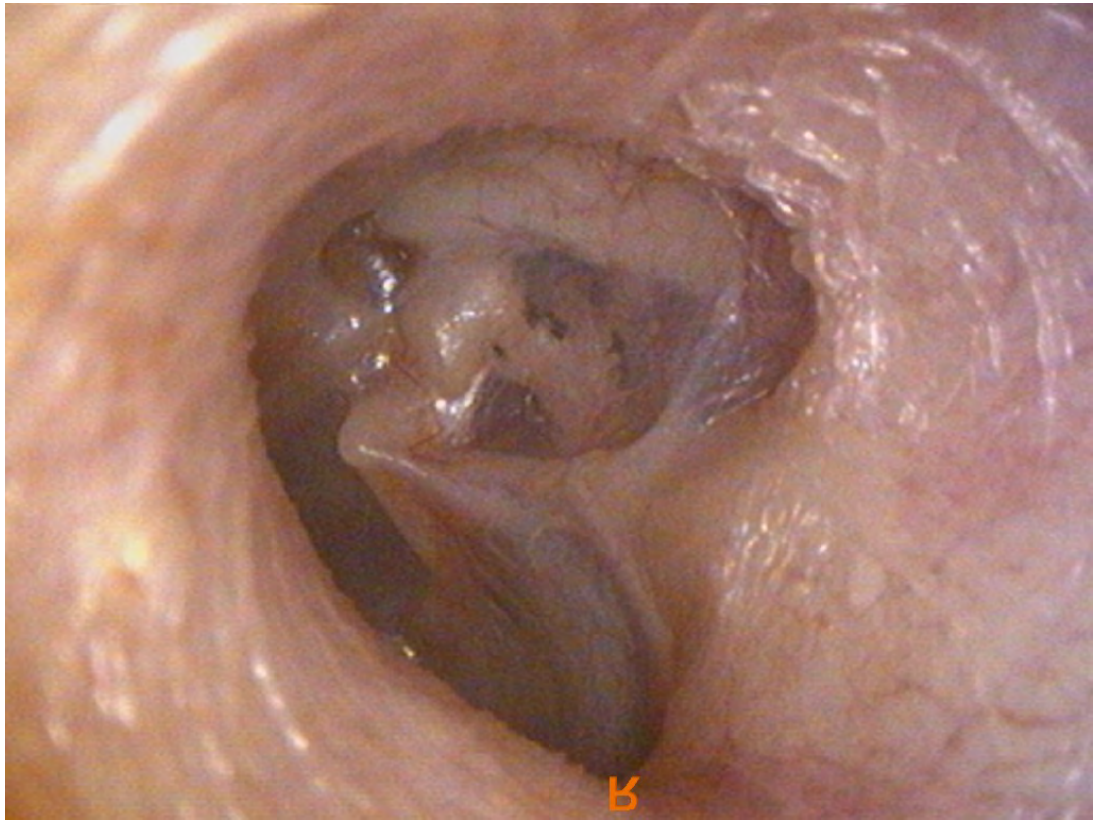


Atticotomy with Cartilage

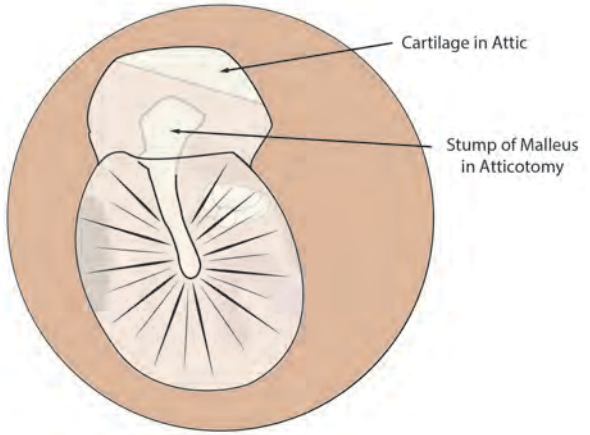
Attic and Atticotomy in Parasagittal View

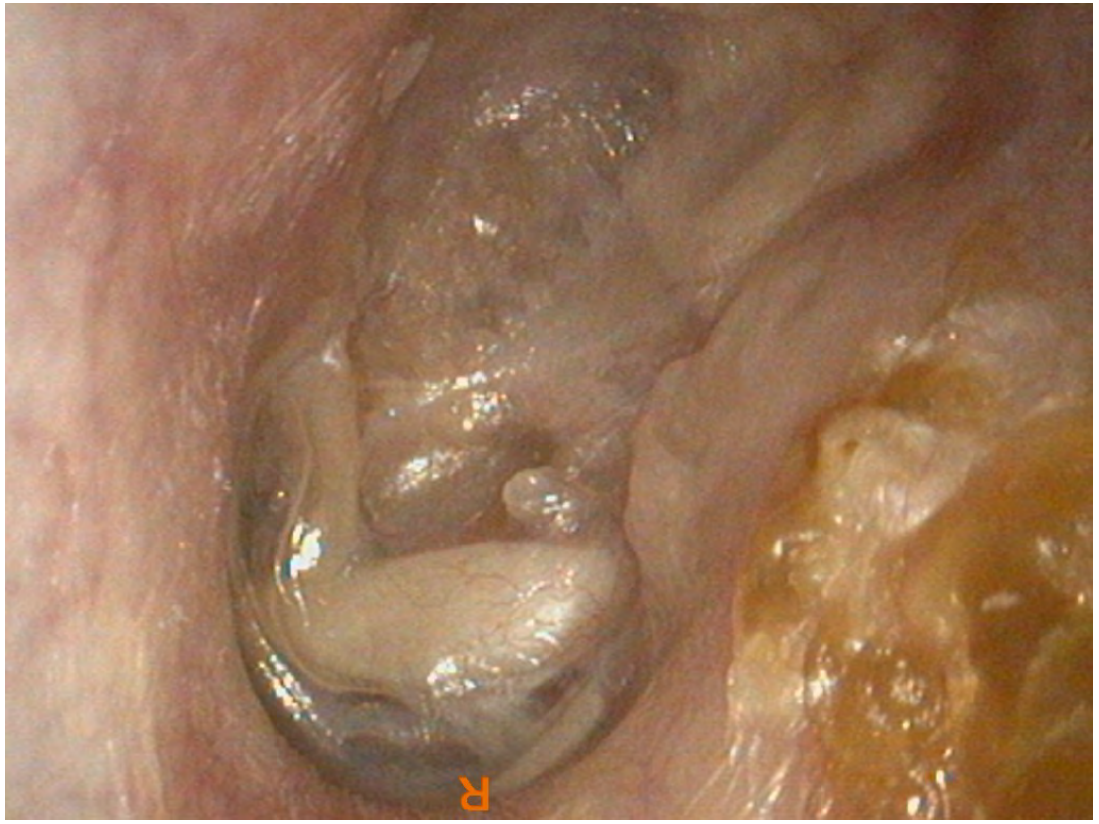




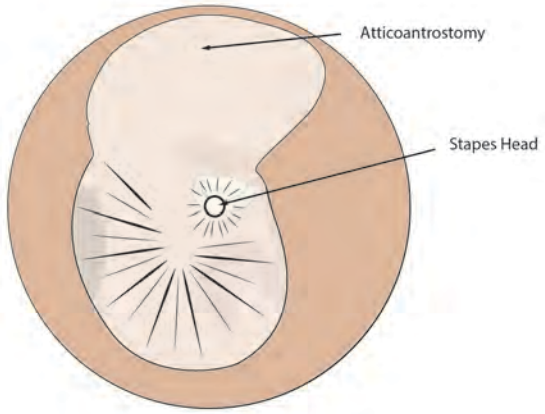


- An atticotomy
- Incus has gone
- Malleus head is a stump
- The cavity looks self-cleaning

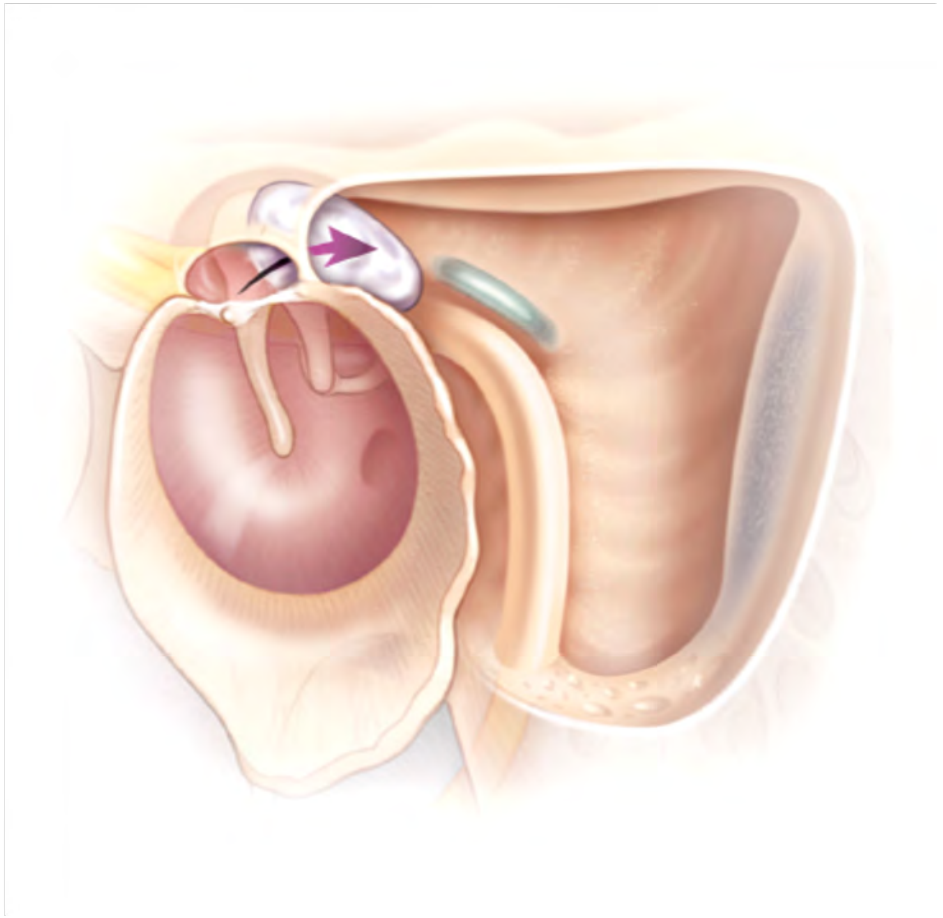


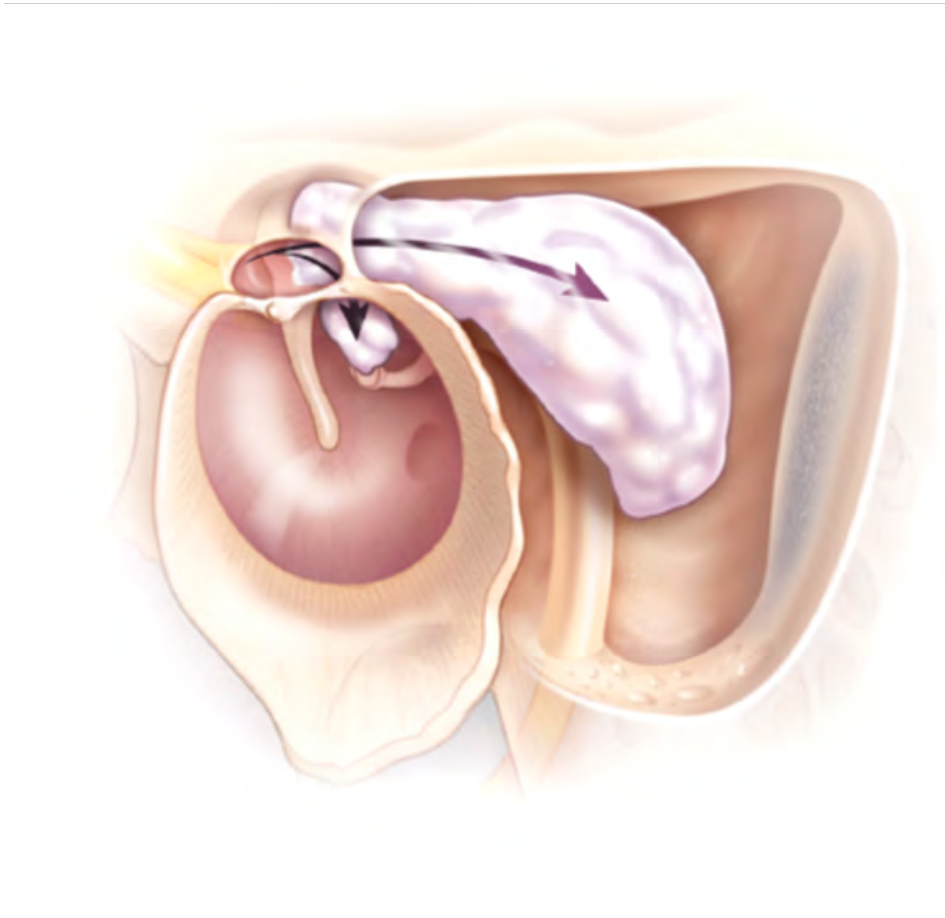


- Attico-antrostomy
- Front to back dissection to open the antrum
- Self cleaning



Disease Bigger than Epitympanic





What if the Disease Extends into the Mastoid?

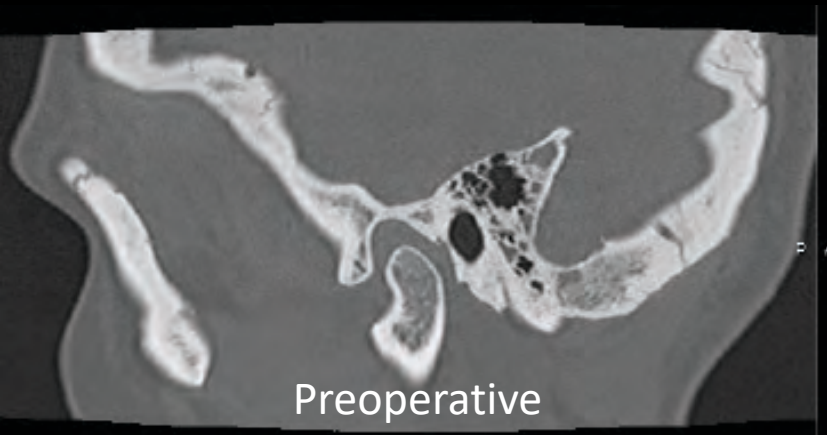
- Larger diseases need more dissection of bone
  - Atticotomy (Attic opened only)
  - Atticoantrostomy (Attic opened further back to the antrum)
  - Modified Radical Mastoidectomy (Attic and mastoid opened) OR
  - Combined Approach Tympanoplasty (CAT)/endoscopic assisted
- MRM takes the posterior canal wall down and CAT leaves it up

- Review of Coronal Anatomy

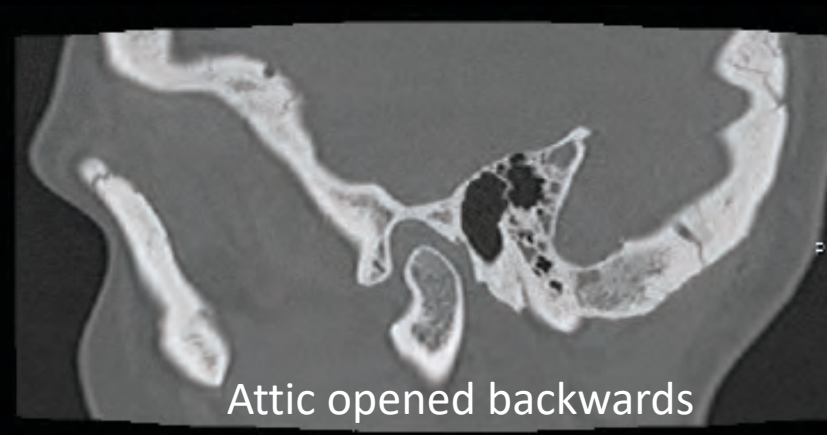
Modified Radical and Combined Approach

- Both exenterate disease from the mastoid air cells and attic
- MRM leaves an open cavity viewable from the EAM (CWD)
- CAT leaves the posterior wall up so that the cavity isn't visible (CWU)
- Both have advantages but MRM is probably becoming less common in the UK as the primary procedure due to advances such as scanning, CAT and eCAT (unofficial term)

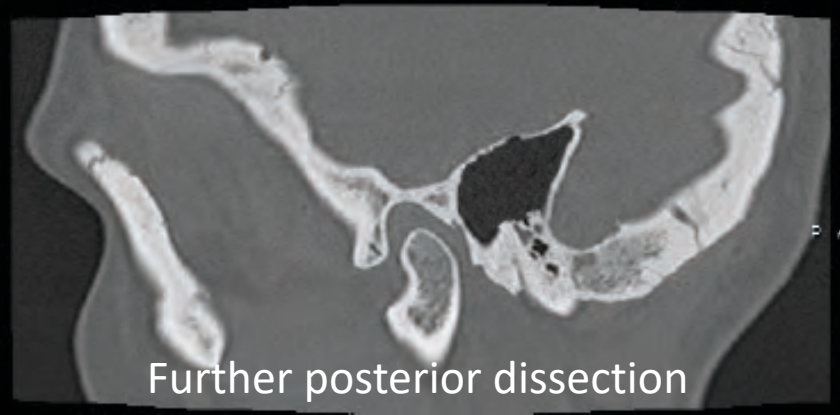
MRM – Front-to-Back Dissection

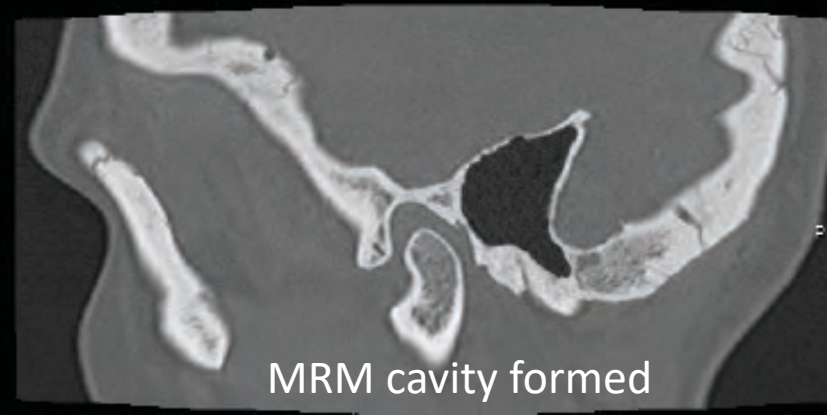

Preoperative


Scutum is drilled

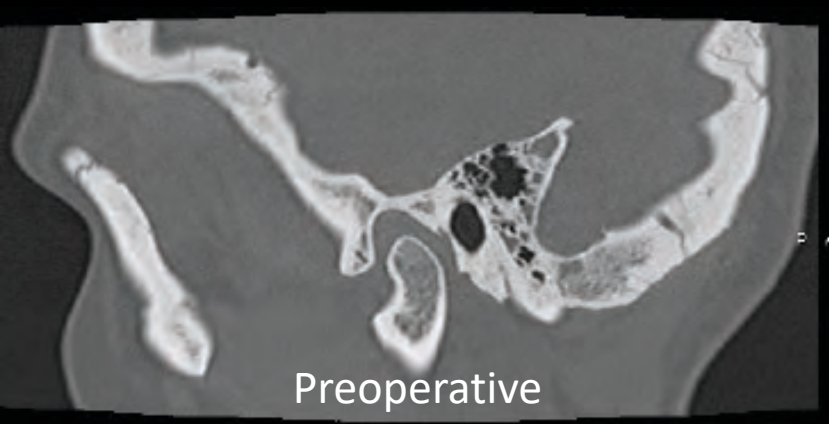

Attic opened backwards


Attic opened into antrum

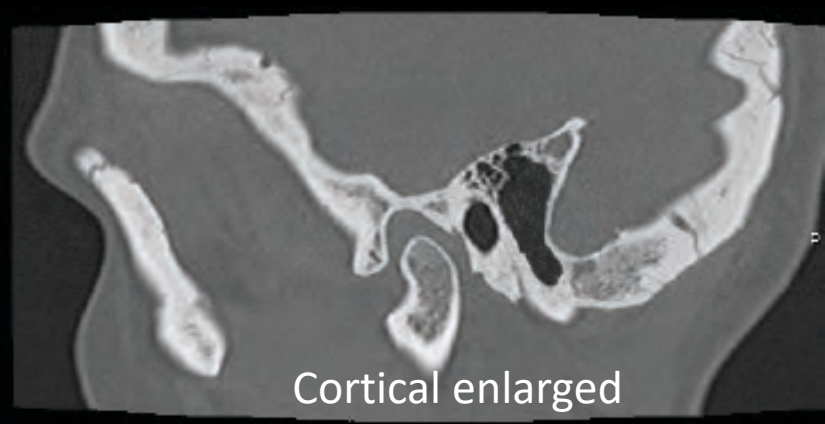

Further posterior dissection


MRM cavity formed

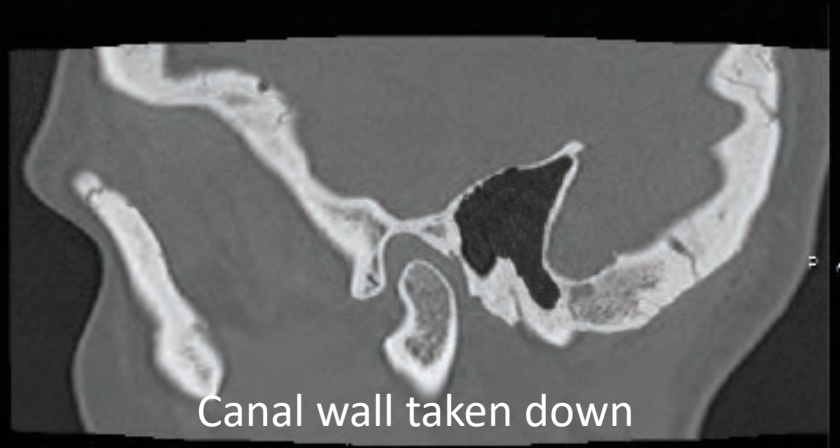
MRM – Back-to-Front Dissection

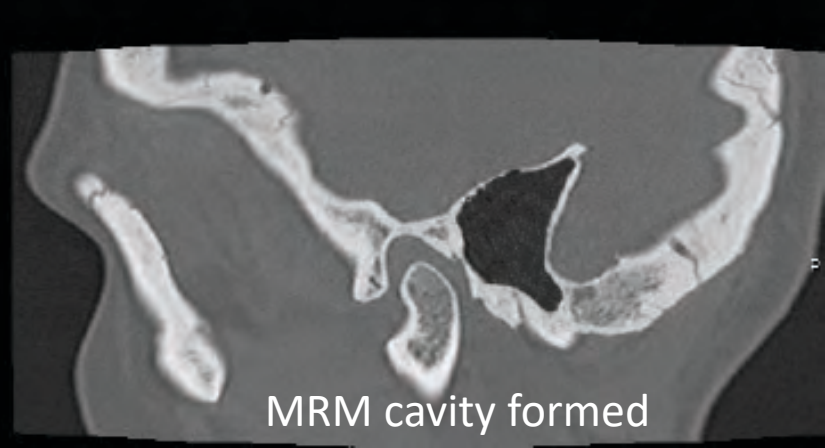

Preoperative

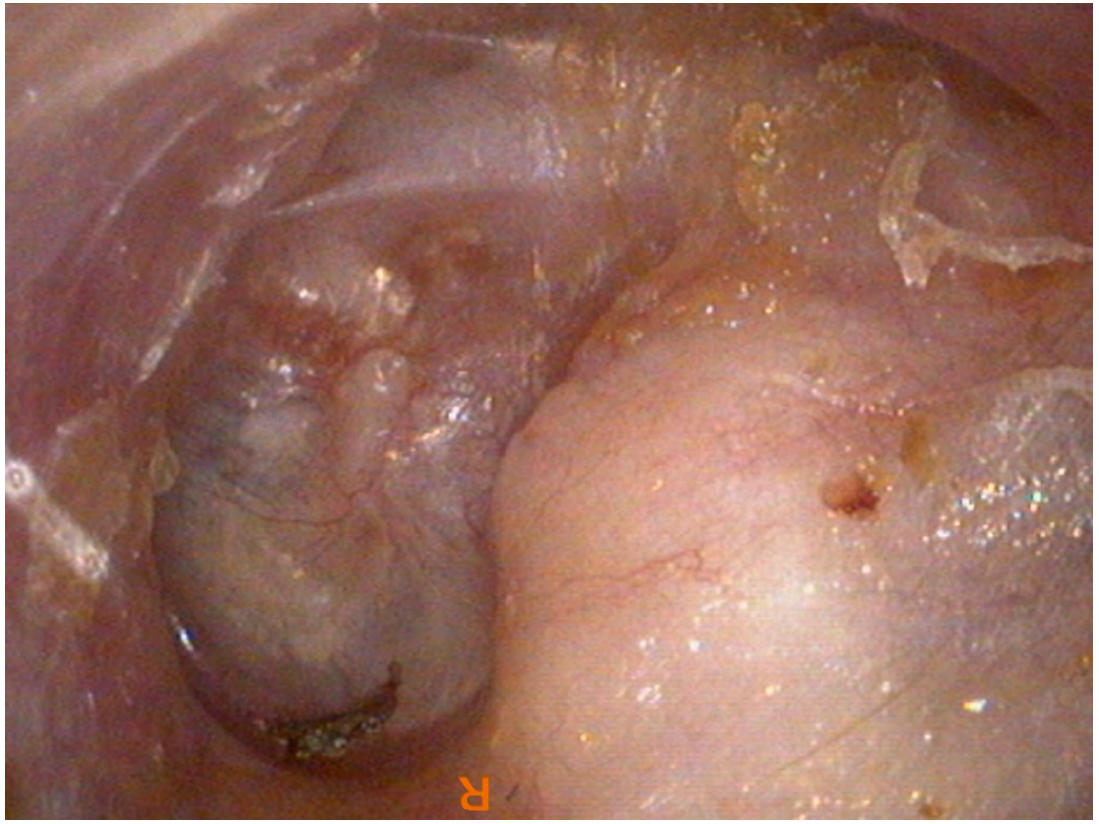

Cortical mastoid started


Cortical enlarged


Cortical finished


Canal wall taken down


MRM cavity formed



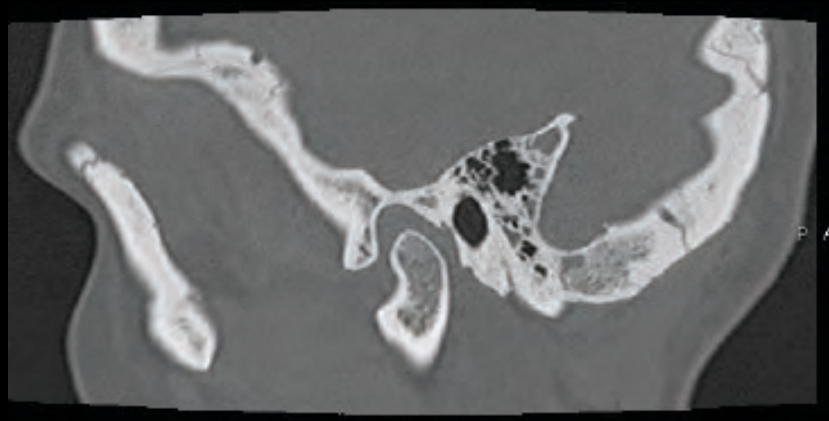
- Big open cavity
- No posterior wall (CWD)
- Can be created back-to-front or front-to-back

Front-to-Back or Back-to-Front

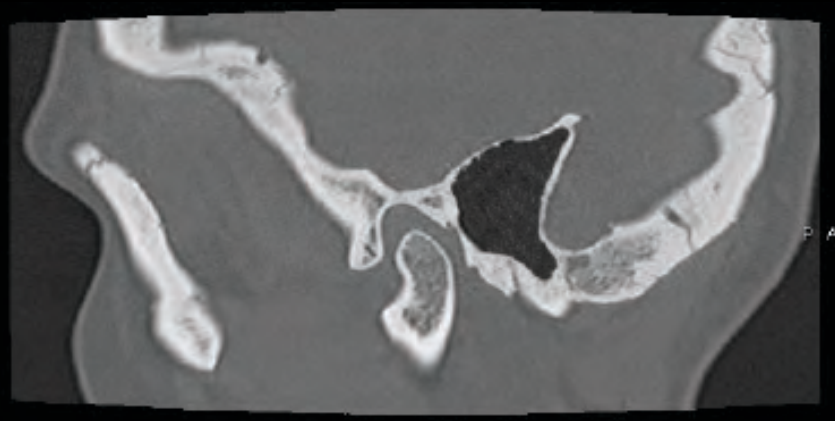
- Front to back allows the possibility of a small cavity if the disease is small (remember that we don't always know how far the disease goes into the mastoid even after a CT). You just keep drilling until you reach the end of the disease.
- Back to front always gives a big cavity because it starts with a cortical mastoid and works towards the disease.

- These days, a back to front dissection can become a CAT insteadof an MRM because of advances in surgical technique and philospophy, and the advent of the endoscope.

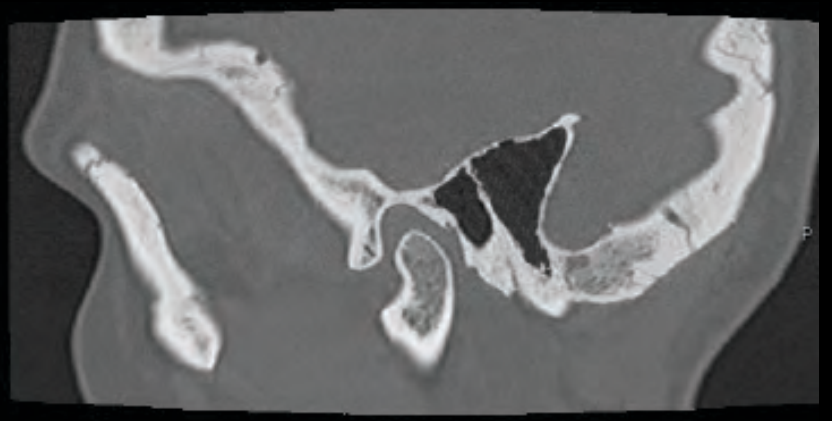
Combined Approach Tympanoplasty



Pre-op Anatomy



CWD - MRM



CWU - CAT

Advantages / Disadvantages - Contested

- MRM exposes the cavity to easy view
- Easy to clean
- Easy to diagnose recurrence of disease
- Should keep it dry
- May require many visits to OPD over a lifetime

- CAT hides the cavity (apart from the attic part)
- Should be self-cleaning
- Usually allows water ingress
- Allows earlier discharge to GP
- Requires a ‘second look’ procedure (or 3rd)

Glossary

- Front-to-back surgery
  - An operation that follows the disease from the attic backwards. Keeps the cavity small. Can be done via post-aural and endaural incision. Small diseases can be done permeatal/endoscopic
- Back-to-front surgery
  - An operation that starts with a cortical mastoidectomy and works forwards into an atticotomy. Cavity is large. Can be done via post-aural and endaural incision. Not done permeatal/endoscopic.
- Atticotomy
  - Exteriorises the attic only. Small cavity. Can be done via post-aural or endaural incision, via permeatal or endoscopic surgery
- Atticoantrostomy
  - Exteriorises the attic and the mastoid antrum. Smallish cavity. Can be done via post-aural or endaural incision, via permeatal or endoscopic surgery

- Modified Radical Mastoidectomy
  - Can be achieved back-to-front or front-to-back. Can be done via post-aural or endaural incision. These are the cavities that you see most often in clinic. Canal wall has gone so easy to see into and clean. Must be kept dry.
  - Drum is present. Cavity should be smooth and without ridges and have a good meatoplasty.
- CAT
  - A combination of a cortical mastoid and an atticotomy. Canal wall is up. Posterior tympanotomy used by many surgeons to see into posterior middle ear. This can be avoided if an endoscope is used.

- Endoscopic Ear Surgery
  - One of many techniques available to the surgeon to assist in exenteration of disease. The endoscope gives optimum visibility, illumination and magnification without loss of image quality. Needs a one-handed technique and good anaesthetic practices.
  - Used alongside the microscope – is not a complete replacement for the microscope.
  - Possible to see down to the cellular level.

List of resources

- https://www.youtube.com/watch?v=WUGSjPkPbQs (Radiologic anatomy)
- http://www.ear-anatomy.com/right_temporal_bone_3.htm (Histology slides - good for anatomy)
- https://radiopaedia.org/cases/normal-temporal-bone-ct-1?lang=gb (high def CT temporal bone)