STAPEDECTOMY
Surgical Management
Small fenestrum stapedotomy with a teflon-wire prosthesis.
Stapedectomy surgery is done under operating microscopy. Local anaesthesia is commonly used but may be distressing. GA is preferred by many patients.
Anatomical relations of the stapes footplate. The structures of the inner ear must be avoided during stapedectomy surgery.
Lignocaine/adrenaline infiltration, best done immediately after skin preparation for optimal action. Liberally infiltrate the vascular strip, avoid anterior infiltration (VII block).
Avoid bony canal infiltration – this narrows access.
Plan of the tympano-meatal flap, 12 to 6 o’clock. Failure to pass adequately anterior is a common exposure fault.
Initial flap elevation. A 2.4 mm Sheehy “weapon” (Olympus/Gyrus) is ideal to cut without tearing the tissues.
Flap elevation. A Lumsden elevator (Storz Gmb) is ideal (longer and robust), but if the skin is fragile, careful elevation with the Sheehy may be preferred.
Elevation of the superior flap. The tissues of the vascular strip are thicker than those inferiorly. Division with micro-scissors expedites exposure.
Progressive flap elevation reveals the posterior extent of the fibrous annulus at 9 o’clock.
Avoid tearing the flap. Keep the elevating knife hard on to bone, elevating the soft tissues intact with fine scraping/swivelling strokes.
Initial middle ear access. The transparent mucosa is seen as the fibrous annulus is raised, working inferiorly, and can be divided with a needle or scissors.
Progressive flap elevation down to 6 o’clock reveals the round window and provides optimal middle ear exposure as the tympano-meatal flap is raised.
Progressive flap elevation superiorly encounters the chorda at 10-11 o’clock, under a variable degree of scutum overhang.
Progressive elevation exposes the chorda further. Enclosing mucosa or fibres are cleared with a fine needle or Kley knife (Storz Gmb).
Superior final flap elevation. The view of the stapes is very variable and may require considerable scutum reduction in men of heavier build.
Clearance of scutum overhang by a 2 mm Skeeter drill (Xomed) or by manual curettage. Avoiding section or trauma of the chorda requires vigilance.
To avoid the chorda, the scutum is “egg-shelled” and elevated with a fine curette.
Manual scutum curettage. This may take effort and may obscure access. A sharp curette is strongly advised. The bone will be harder in mature age cases.
Care of the chorda. The bony prominence is thinned with a diamond burr and the remnants removed with a fine curette.
Exposure after scutum reduction. Full exposure of the incus long process is essential to permit piston insertion.
Care of the chorda during scutum reduction. The chorda may overlie or be contained within a bony projection just deep to the plane of the scutum.
Clearance of fine mucosal veils that may obscure the footplate.
Testing stapes mobility by observing the incudo-stapedial joint under slight tension.
Palpation of the stapes to check for fixation. Avoid force that may sublux the footplate.
Division of fine mucosal webs that may occlude adequate stapedial inspection.
Bimanual operating technique. A Holmgren bivalve speculum (Storz Gmb) may facilitate access without an endaural incision.
The vertical orientation of the stapes varies. Commonly, it tilts mildly towards the promontory side affording a partial view of the footplate, otherwise straight or tilted further.
Division of the incudostapedial joint. A dedicated round knife or a $90^0$ pick may be used.
Division of the joint between the incus and stapes using an incudo-stapedial joint knife or right-angled pick.
Division of the incudostapedial joint. Anterior-directed action avoids footplate fracture that may result from cross-action force.
Testing for attic fixation after division of the incudo-stapedial joint. Attic fixation of the incus/malleus is an uncommon but difficult complication of otosclerosis.
After division of the joint, mobility of the lateral ossicles (malleus and incus) is tested.
Micro-scissor division of the Stapedius tendon.
Section of the Stapedius muscle with microscissors.
Removal of the stapes superstructure using a curved needle.
Down-fracture of the stapes superstructure.
Micropick partial stapedectomy. A sharp needle is required. A .3mm pick elevates the posterior fragment.
Depressed footplate fragment. Technique for elevation.

Avoid entering the vestibule.
Creation of a small stapedotomy with a microdrill.
Stapedectomy surgery 1. Elevation of the tympano-meatal flap. Incision from 12 to 6 o’clock is important. Scissor dissection may be required superiorly.
Stapedectomy 2. Exposure of the posterior mesotympanum, showing the incus and stapes, left, and the chorda tympani, central.

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Stapedectomy 4. Removal of the superstructure.
Stapedectomy 5. A stapedotomy has been created using a micro-drill, and the piston prosthesis is being crimped on to the long process of the incus.
Stapedectomy, temporal bone dissection, Hopkins telescope view. 1. Tympano-meatatal flap elevation.
2. Exposure of the posterior mesotympanum.
3. Removal of the stapes superstructure.
4 Footplate status subsequent to the superstructure removal.
5. Partial footplate removal.
Skeeter microdrill (Xomed) stapedotomy. A .6-1.0 mm diamond burr is optimal, depending on the piston diameter.
Placement of a stapedotomy piston.
Siting the shepherd’s crook loop on the long process of the incus. The device is best sited near the lenticular process.
Positioning of the shepherd’s crook on the incus with a notched chisel (strut guide) and closing the wire with a crimper.
Completed siting of the stapes piston through the stapes fenestra into the vestibule.
Sealing around the prosthesis with blood.
If a large defect is left in the footplate, this may be sealed with a fine soft tissue sheet.
Once in position, the piston loop is crimped on to the stapes. The platinum loops have little “memory” and are thus ideal.
“Rocker” action in crimping alligator forceps is avoided by resting the distal end on structures near the middle ear.
Piston insertion. The prosthesis is sited ready for the loop to be crimped onto the long process.
Once crimped correctly, the loop provides stable transmission of sound, but sometimes may be forced open in unusual positive middle ear pressure events.
Nitinol prostheses avoid the need for mechanical crimping, but incur expense. The heat activated metal crimps to the incus with the application of laser energy.
Suctioning blood from the footplate site. Avoid direct suction on the stapedotomy site to avoid vestibular damage.
Once crimped in position, the piston mobility is tested gently by both incudal and malleolar pressure.
If in doubt, check the piston depth/mobility within the stapedotomy.
A short prosthesis may become dislodged when subjected to mild elevation (right). If this occurs, the prosthesis is replaced with one 0.25 mm longer.
Soft tissue used to seal a larger stapedotomy may be harvested from the thicker upper tympano-meatal flap or from a small incision in the superficial EAC.
Siting a fine soft tissue graft around the piston.
Larger footplate defects are best managed with a fine graft sheet underlying the piston (a “bucket” model is illustrated.)
Left stapedectomy, initial footplate microdrill technique.
Microdrill technique, 1 mm stapedotomy completed.
Stapedotomy technique, teflon-platinum piston in situ.
Stapedectomy, right ear. A microdrill stapedotomy has been performed to receive the piston device.
Teflon and platinum ribbon Richards stapedectomy piston in situ.
Stapedectomy piston in situ, detail of the stapedotomy in the posterior footplate.

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Management of obliterative otosclerosis. Using a 1.0 mm diamond burr the footplate is thinned until a blue region has been created. A routine small fenestra opening may then be formed.
When saucerising the footplate in obliterate otosclerosis, it is important to create an adequate thinned area. If thick, the prosthesis will be impeded if even slightly off line.
Biscuit footplate removal is difficult. The mass tends to become mobile or depressed. If possible, transect and remove. Do not drill on a mobile footplate.
One technique for dealing with a biscuit footplate. A thin trough or burr-hole is drilled on the promontory side and the footplate is rolled up on its side. Experience optimal.
Laser division of the Stapedius tendon.
Use of the laser to divide the posterior crus. This provides a lesser risk of footplate avulsion during superstructure removal.
Once the posterior crus is divided, the anterior can be broken mechanically, being more fragile, and as the anterior footplate is fixed by otosclerosis.
Fenestration of the footplate using a laser. A rosette is created then the bone charcoal removed with a fine pick.
Final rosette of bone char that is removed with micropicks.
A variety of piston models are available. The bottom right is a heat-closing Nitinol “Smart” model.
Causse Teflon piston. These are slightly more cumbersome to insert but resist displacement off the incus better.
Dilatation of a Teflon piston loop to just permit siting on the long process. The loop closes spontaneously if not overstretched.
Siting the Teflon piston. The loop needs to be adequately dilated to avoid pressure during insertion that might displace the incus.
Teflon piston in situ, tissue sheet over a larger stapedotomy/partial stapedectomy.
Harvesting tragal perichondrium for use as a footplate seal. Turn the cartilage forwards and use a cosmetic posterior surface incision.
Harvesting tragal perichondrium. Use scissors, or sharp dissection (preferred) to raise the skin, then separate off the perichondrium and harvest.
Use a fine sheet that overlaps the stapedectomy site liberally, to avoid inadvertent sitting into the vestibule.
Stapes mobilisation, an early technique used for otosclerosis, and which may be useful in congenital stapes fixation.
Final flap positioning. If curling under, tease out with a fine sucker, +/- patting flat with a small spatula.
Drum, post-stapedectomy. Mild scarring in the postero-superior pars tensa.
Moderate scarring of the left posterosuperior drum after a prior stapedectomy.
Drum fibrosis and evidence of curettage of the scutum after previous stapes surgery.
Subsequent to stapedectomy, a scutum curettage defect is evident at 2 o’clock on the left drum.
Heavy scarring and a considerable scutum defect after stapes surgery. A small pars flaccida pocket is present above the lateral process of the malleus.