OSSICULOLOPLASTY
Case Evaluation

- Ossicular chain
- Other ear aspects
- Patient general condition
CHAIN CLASSIFICATION

Applications

- Describe Pathology
- Evaluate Technique / Prosthesis / Surgeon
- Compare Series
- Plan Surgery
- Prognostication
- Patient Counselling

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OSSICULAR CLASSIFICATION

Prior techniques

- Austin 1972
- Kartush 1994
- Black 1995
- Dornhoff 2001
Austin ossicular classification. This recognised that in COM cases the incus was absent or removed in the great majority of cases, but did not clarify the time of classification or the status of the stapes footplate.
Austin ossicular classification. Diagrammatic illustration of the common ossicular pathology groups, but omitting the difficult compromised stapes group.
Kartush ossicular classification. Initial surgical findings. The need for an attic fixation category is uncertain. These, the normal chain, and other cases will be subject to change during surgery.
Dornhoffer Ossicular classification, initial surgical findings. Note that normal chain cases will be substantially changed if chain repair is necessary, or excluded from a series if not. Stapes fixation cases are a significant and substantially compromised group, difficult to manage successfully.
Compromised Stapes:

a. SSS fibrosed
b. SSS tympanosclerosis
c. SSS ossified
d. SSS displaced
e. Ossified tendon
f. Otosclerosis
g. SFP tympanosclerosis
h. SFP ossified
i. SFP fractured
j. SFP subluxed
k. SFP penetrated
l. Post-stapedectomy
m. Residual cholesteatoma
n. VII overhang
o. Stapedial artery
Black ossicular classification: The threat of the compromised Stapes was recognised; The classification stipulates the status of the chain at the moment of repair; the malleus +/- status indicates a present/absent functionally useful handle. The classification may be used pre-operatively by visualising the status at repair, but is intended to provide a basis for more accurate ossiculoplasty research by indicating the prognostic threats.
CHAIN STATUS CHANGES

Initial Visit → Pre-Ossicular

N=753 (unpublished data)

Austin % Pre-Ossiculoplasty
(Malleus – Stapes > 45º = M-)

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Ossicular status: Distribution of the ossicle pathology comparing the Austin and Black methods. Greater numbers of poorer prognoses in the latter.

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CHAINS RECLASSIFICATION
Effect on Outcomes, ABG < 20 db
N=753

<table>
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<th>Austin</th>
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<th>Black Pre-Ossicular (Malleus – Stapes &gt; 45º = M-)</th>
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Outcomes of Austin and Black groupings. The shift of poorer pathology to groups C and D has improved A and B case outcomes,
OSSICULOPLASTY

Technical Options

Columella
- Drum-stapes
- Drum-footplate

Assembly
- Malleus-stapes
- Malleus-footplate

Niche Methods
- Incus supplements
- Stapedial replacement

Other

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Austin groupings with suggested reconstruction methods. Note that PORP and TORP prostheses are applicable to groups A and B respectively. MSA/MFA: malleus-stapes/footplate assembly.
Application of prosthetic models to the Austin group situations. PORPs and TORPs may replace the illustrated Spanner models in groups A and B.
Malleus-stapes relationship. The situation varies according to the respective xyz dimensions, and, especially, the malleus-stapes angulation $A^0$.
The effect of malleus-stapes angulation. Assemblies are effective in cases of lesser angulation, but columellas are preferable when greater angulation dissipates vector forces.
Malleus stapes assembly: ideal direct angulation situation.
The common group A situation: Malleus handle present with a direct angulation, Stapes superstructure present.
Management of a group A case with a direct malleus-stapes assembly strut.
Group A case of minor incudal necrosis resulting in the loss of the lenticular process and part of the long process, common in Stage III adhesive otitis drum collapse cases.
Niche ossiculoplasty. Replacement of the incus tip with an Applebaum hydroxylapatite prosthesis. Useful only in minor necrosis. The latter may continue and compromise the outcome.
Malleus-stapes angulation. Dissipation of forces and “wobble” effect. Instability on the head of the stapes.
Indirect/inverted-L malleus-stapes assembly. Stable with good transmission of forces in direct angulation situations. May achieve an additional columellar effect in flat drums.

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## EFFECT OF MALLEUS ANGULATION

### Spanner MSA Cases

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Angulation of an indirect/L-strut malleus-stapes assembly producing pressure under the drum and resultant extrusion risk. Less stability on the stapes.
Malleus footplate angulation causing a “footplate skid” effect. This may be partly overcome using an L-strut prosthesis, but this may incur drum reaction risks.
“Wobble” effect of greater angulation in assembly cases. The vector forces dissipate, and the prostheses become unstable. Columellas adapt better in these cases.
Complications of columellar prostheses: extrusion, displacement, fixation to the scutum.
PORP columellar complication: toppled prosthesis under an intact drum.
Complications of columellas: early extrusion of a polyethylene PORP.
Columella complications: total extrusion of a hydroxyapatite columella
Group C ossicular situation. The handle of the malleus is lost or unsuitable for reconstruction (angulation, necrosed or displaced).
Ossiculoplasty employing a titanium partial ossicular replacement prosthesis (PORP) with a cartilage composite graft covering the head flange to avoid extrusion.
Group D ossicular situation. The malleus handle is lost or unusable. The stapes superstructure has necrosed, but the footplate is mobile and free of disease.
Repair of a group D case. A titanium total ossicular replacement prosthesis is sited on the stapes footplate, with the head flange protected from extrusion by a cartilage-perichondrium composite graft.
The group E ossiculoplasty problem. In infected ears, a stapedectomy is unwise, risking labyrinthitis, and should be left to a second stage surgery.
Group E ossiculoplasty. Removal of the stapes footplate requires grafting to seal the site, but the graft may not support a columella adequately, necessitating 3rd stage repairs.
Group E ossiculoplasty. Columellar complications on an unstable oval window graft. If the prosthesis is too short, displacement may occur.
Columellar ossiculoplasty in a group E case with an unstable footplate graft. Excessive prosthetic length may cause vestibular penetration.
Group E ossiculoplasty cases. A malleus-stapes piston provides a stable reconstruction, provided the handle is suitably positioned for optimal transmission of forces.