Temporal Bone or Cholesteatoma Protocol (Contrast)

Field Strength: 1.5T or 3T **Coil**: Multi-channel head coil **Position**: Supine, arms down **Orientation**: Head first

Scan Prescription: Subcallosal plane to prescribe or reformat for axial **Coverage**: Axial - Mastoid Tip to top of Petrous Ridge *(see Appendix A)*
Coronal – Entire Petrous Ridge *(see Appendix A)*

Sequence	FOV (pFOV)	Thickness (Gap)	Resolution	Phase	TR	TE	Comments
Ax T1	180 mm	2 mm (0 mm)	256 x 192	A-P			Fat Sat optional
Cor T1	180 mm	2 mm (0 mm)	256 x 192	S-I			Fat Sat optional
Give Contrast – Single dose per site standards							
Ax T2 Posterior Fossa	220 mm	2 mm (0.5 mm)	256 x 224	A-P			Coverage from foramen magnum to top of Tentorium
Ax 3D CISS / FIESTA-C	160 mm	1.4 mm	320 x 320	A-P			Reformat to coronal
Ax *or* Cor DWI (non-EPI)	180 mm	3 mm	128 x 128				Axial or coronal plane Non-EPI (HASTE or PROPELLER, etc) 2 b-values = 0-10 and 800-1000 s/mm^2
Ax T1 Fat Sat Post Gad	180 mm	2 mm (0 mm)	256 x 192	A-P			
Cor T1 Fat Sat Post Gad	180 mm	2 mm (0 mm)	256 x 192	S-I			

Notes:

1. *This 20-30 minute delay from gad administration to post-gad T1w fat sat images will allow for greater differentiation between types of pathology, if present. Gadolinium does not produce a significant shortening of T2, therefore it is not seen on T2w images post gad of the head.*
2. *Non-echoplanar DWI is the imaging of choice in detecting cholesteatoma primarily due to the lack of air-bone susceptibility artefact and distortion at the temporal bones (see Appendix B).*
3. *Keratin content in cholesteatoma will return high signal intensity on high b-value compared to non-cholesteatomatous soft tissue such as granulation tissue, inflammation, and fluid, which will return lower or no signal on the high b-value (see Appendix C).*

Temporal Bone or Cholesteatoma Screening Protocol (Non-Contrast)

Field Strength: 1.5T or 3T **Coil**: Multi-channel head coil **Position**: Supine, arms down **Orientation**: Head first

Scan Prescription: Subcallosal plane to prescribe or reformat for axial **Coverage**: Axial - Mastoid Tip to top of Petrous Ridge *(see Appendix A)*
Coronal – Entire Petrous Ridge *(see Appendix A)*

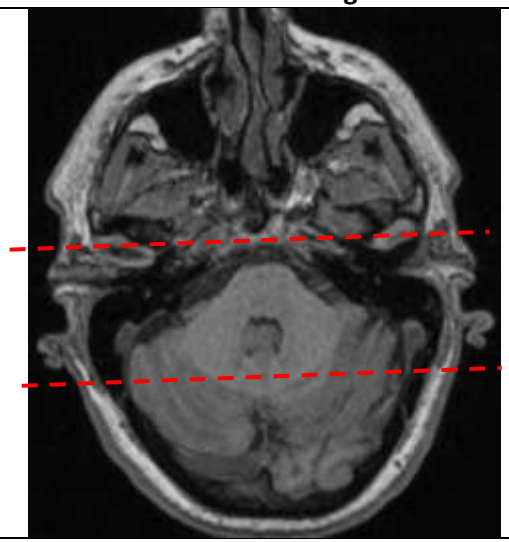
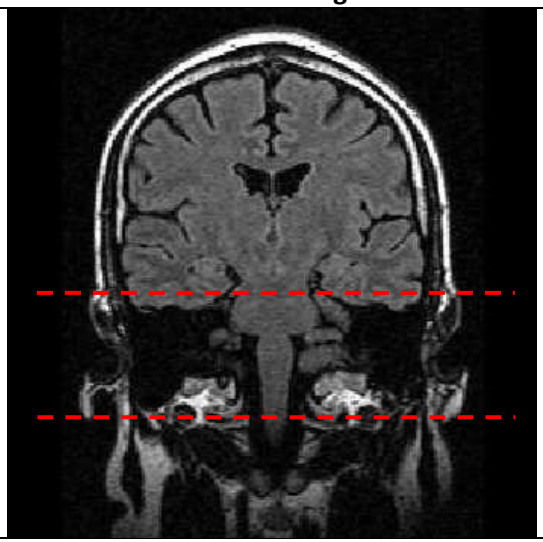
Sequence	FOV (pFOV)	Thickness (Gap)	Resolution	Phase	TR	TE	Comments
Ax T1	180 mm	2 mm (0 mm)	256 x 192	A-P			
Ax T2 Posterior Fossa	220 mm	2 mm (0.5 mm)	256 x 224	A-P			Coverage from foramen magnum to top of Tentorium
Ax 3D CISS / FIESTA-C	160 mm	1.4 mm	320 x 320	A-P			Reformat to coronal
Ax *or* Cor DWI (non-EPI)	180 mm	3 mm	128 x 128				Axial or Coronal Non-EPI (HASTE or PROPELLER, etc) 2 b-values = 0-10 and 800-1000 s/mm^2

Notes:

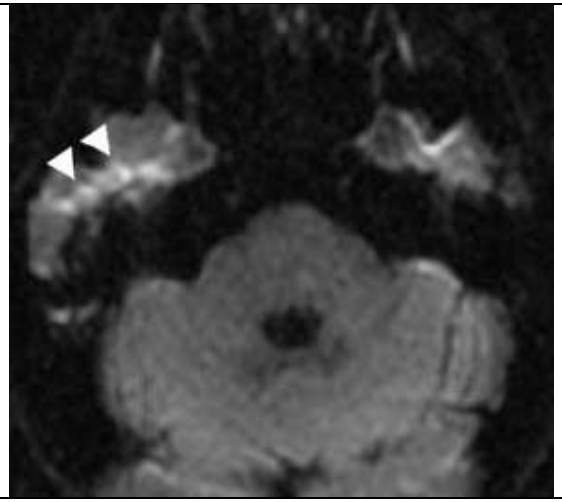
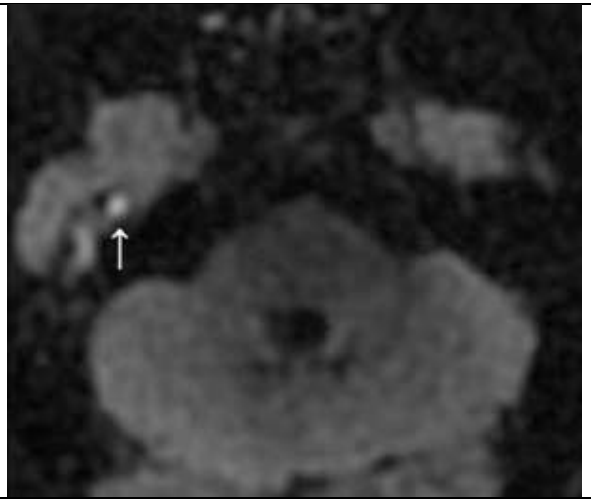
1. *CT temporal bone should be used as the initial imaging tool. If tissue confirmation is required, it is recommended that gadolinium be administered to differentiate between post-inflammatory changes and granulation tissue.*
2. *Non-echoplanar DWI is the imaging of choice in detecting cholesteatoma primarily due to the lack of air-bone susceptibility artefact and distortion at the temporal bones (see Appendix B).*
3. *Keratin content in cholesteatoma will return high signal intensity on high b-value compared to non-cholesteatomatous soft tissue such as granulation tissue, inflammation, and fluid, which will return lower or no signal on the high b-value (see Appendix C).*

Appendices

Appendix A: Coverage for Coronal and Axial images.

Coronal Coverage	Axial Coverage
	

Appendix B: EPI DWI versus non-EPI DWI.

EPI DWI	Non-EPI DWI
	

Source: Lehmann, P., Brochart, C., Page, C. & Saliou, G. (November 2008). 3T MR Imaging of Postoperative Recurrent Middle Ear Cholesteatomas: Value of Periodically Rotated Overlapping Parallel Lines with Enhanced Reconstruction Diffusion-Weighted MR Imaging. *American Journal of Neuroradiology*. 30(2):423-7

Appendix C: MRI findings on four sequences differentiating cholesteatoma from inflammatory/granulomatous lesions.

Tissue Type	T1W	T2W	Gad Enhancement	Restricted Diffusion
Cholesteatoma	Hypointense	Hyperintense	No	Yes
Granulation Tissue	Hypointense	Hyperintense	Yes	No
Scar	Hypointense/Intermediate	Hypointense/Intermediate	No/Delayed	No
Cholesterol Granuloma	Hyperintense	Hyperintense/Intermediate	No	Variable

Source: Juliano AF, Ginat DT & Mooris GM. (October 2013). Imaging Review of the Temporal Bone. *Radiology*. 269(1):17-33

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Owners: *(committee or position)*	MRI Regional Practice Lead, LMMI		

Revision History:	**Version**	**Date**	**Description/ Key Changes**	**Revised By** (Name and Position)
	1.0	06-OCT-2022	Initial Release	Samuel Yim, MRI RPL