

**American College of Radiology**  
**ACR Appropriateness Criteria®**

# Tinnitus

**Variant 1: Pulsatile tinnitus, unilateral or bilateral; No retrotympanic lesion on otoscopy. Initial imaging.**

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CTA head and neck with IV contrast	Usually appropriate	Limited	⊕⊕⊕ 1-10 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	8	8	0	0	0	0	2	2	3	3	8
		References		Study Quality											
		1 (16971601)		4											
		29 (21402614)		2											
		23 (17320776)		4											
		12 (18368578)		4											
		45 (22200123)		3											
		27 (23550183)		4											
		46 (30466644)		4											
MRI head and internal auditory canal without and with IV contrast	Usually appropriate	Limited	⊖⊖⊖ mSv	⊖⊖ mSv [ped]	8	8	0	0	0	0	1	1	4	9	3
		References		Study Quality											
		60 (18302544)		M											
		61 (17909826)		4											
		62 (15503045)		3											
CTA head with IV contrast	Usually appropriate	Limited	⊕⊕⊕ 1-10 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	7	7	0	0	0	0	3	2	8	1	4
		References		Study Quality											
		29 (21402614)		2											



CT temporal bone without IV contrast	May be appropriate (Disagreement)	Expert Opinion	☹☹☹ 1-10 mSv		5	5	5	6	2	0	2	2	1	0	0
		References	Study Quality												
		44 (22467283)	4												
		25 (24005164)	4												
		26 (24270723)	4												
		40 (16500440)	3												
		19 (24468899)	4												
		27 (23550183)	4												
		42 (32854043)	2												
		41 (30928582)	4												
MRA head without and with IV contrast	May be appropriate (Disagreement)	Expert Opinion	○ ○ mSv	○ ○ mSv [ped]	5	5	0	2	0	1	1	3	9	0	2
MRI head and internal auditory canal without IV contrast	May be appropriate	Limited	○ ○ mSv	○ ○ mSv [ped]	5	5	0	0	2	2	9	5	0	0	0
		References	Study Quality												
		60 (18302544)	M												
		61 (17909826)	4												
		62 (15503045)	3												
MRV head with IV contrast	May be appropriate	Limited	○ ○ mSv	○ ○ mSv [ped]	5	5	0	0	0	0	12	5	1	0	0
		References	Study Quality												
		66 (33757666)	2												
Arteriography cervicocerebral	Usually not appropriate	Strong	☹☹☹ 1-10 mSv	☹☹☹☹ 3-10 mSv [ped]	2	2	7	5	2	2	2	0	0	0	0
		References	Study Quality												
		36 (2296650)	4												
		29 (21402614)	2												
		23 (17320776)	4												
		37 (15068515)	4												

		38 (23632978)		3											
		35 (29561378)		2											
US duplex Doppler carotid artery	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	2	2	9	2	3	1	3	0	0	0	0
		References		Study Quality											
		69 (19453828)		3											
		68 (31928280)		2											
MRV head without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	2	2	7	3	4	3	1	0	0	0	0
MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	2	2	8	2	7	0	1	0	0	0	0
CT temporal bone with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv		1	1	10	6	1	1	0	0	0	0	0
CT temporal bone without and with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv		1	1	14	4	0	0	0	0	0	0	0
CT head with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗ 0.3-3 mSv [ped]	1	1	12	1	3	0	1	0	1	0	0
CT head without IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗ 0.3-3 mSv [ped]	1	1	13	1	2	0	1	0	1	0	0
CT head without and with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	1	1	13	0	3	0	1	0	0	1	0
US duplex Doppler transcranial	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	0	2	0	1	1	0	0	0
US head	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	0	2	0	0	1	0	0	0
MRI head and internal auditory canal with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	3	1	0	0	0	0	0	0

**Variant 2: Pulsatile tinnitus, unilateral or bilateral; suspected retrotympanic lesion on otoscopy. Initial imaging.**

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT temporal bone without IV contrast	Usually appropriate	Limited	⊕⊕⊕ 1-10 mSv		9	9	0	1	0	0	0	2	1	3	11
		References		Study Quality											
		39 (12856306)		4											
		36 (2296650)		4											
		1 (16971601)		4											
CTA head with IV contrast	May be appropriate	Limited	⊕⊕⊕ 1-10 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	6	6	0	0	0	2	5	11	0	0	0
		References		Study Quality											
		29 (21402614)		2											
		45 (22200123)		3											
		46 (30466644)		4											
CTA head and neck with IV contrast	May be appropriate	Limited	⊕⊕⊕ 1-10 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	6	6	0	1	0	2	3	11	1	0	0
		References		Study Quality											
		29 (21402614)		2											
		45 (22200123)		3											
		46 (30466644)		4											
CTV head with IV contrast	May be appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	5	5	0	0	2	3	6	7	0	0	0
MRA head without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	3	3	8	1	5	2	1	0	1	0	0
MRI head and internal auditory canal without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	3	3	6	2	5	2	3	0	0	0	0
MRA head with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	3	3	8	1	3	2	2	1	1	0	0

CT temporal bone with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		2	2	8	6	4	0	0	0	0	0
CT temporal bone without and with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	11	2	1	0	2	1	0	1
CT head with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼ 0.3-3 mSv [ped]	1	1	12	2	1	0	3	0	0	0
CT head without IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼ 0.3-3 mSv [ped]	1	1	12	2	2	1	1	0	0	0
CT head without and with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	13	1	1	0	2	1	0	0
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	13	1	2	0	1	1	0	0
MRA head without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	12	1	1	0	2	1	1	0
MRI head and internal auditory canal without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	10	1	2	0	3	1	0	1
US duplex Doppler carotid artery	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	12	4	0	0	2	0	0	0
US duplex Doppler transcranial	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	15	1	0	0	2	0	0	0
MRV head without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	13	1	3	0	1	0	0	0
US head	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	16	1	0	1	0	0	0	0
MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	12	2	2	0	1	0	1	0
MRV head with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	12	2	3	0	1	0	0	0

MRI head and internal auditory canal with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	2	1	0	0	0	0	0	0
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**Variant 3: Nonpulsatile tinnitus, unilateral; no hearing loss, and no neurologic deficit, and no trauma. Initial imaging.**

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
MRI head and internal auditory canal without and with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	1	0	1	0	0	0	3	6	7

	References		Study Quality												
	83 (20072012)		4												
	82 (12589857)		4												
	80 (19119337)		4												
	88 (20713245)		4												
	79 (21817934)		4												
	77 (19922702)		3												
	84 (30810586)		4												
	87 (31887752)		4												
	71 (32234748)		4												
	85 (31743294)		2												
	78 (32049565)		2												
	86 (28583226)		2												

MRI head and internal auditory canal without IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	5	5	1	0	0	3	7	6	1	0	0
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	References		Study Quality												
	90 (1642833)		4												
	91 (24612912)		4												

CTA head with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼☼ 3-10 mSv [ped]	1	1	14	0	1	0	2	1	0	0	0
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CT temporal bone with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	14	2	1	1	0	0	0	0	0
CT temporal bone without IV contrast	Usually not appropriate	Limited	☼☼☼ 1-10 mSv		1	1	14	2	0	1	0	1	0	0	0

References	Study Quality
76 (1562895)	4
75 (29283099)	2

CT temporal bone without and with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	17	1	0	0	0	0	0	0	0
CT head with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼ 0.3-3 mSv [ped]	1	1	13	1	1	1	1	1	0	0	0
CT head without IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼ 0.3-3 mSv [ped]	1	1	14	1	1	1	1	0	0	0	0
CT head without and with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	14	1	0	2	1	0	0	0	0
CTA head and neck with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	13	1	1	1	1	1	0	0	0
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	16	0	0	1	1	0	0	0	0
MRA head without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	1	1	0	1	1	0	0	0
MRA head without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	1	1	0	1	0	0	1	0
US duplex Doppler carotid artery	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	15	1	0	0	1	0	1	0	0
US duplex Doppler transcranial	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	15	1	0	0	1	1	0	0	0



MRV head without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	12	2	1	0	2	1	0	0	0
US head	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	16	1	0	0	0	1	0	0	0
CTV head with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	1	1	13	1	0	1	2	1	0	0	0
MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	15	1	0	0	2	0	0	0	0
MRA head with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	1	1	0	1	1	0	0	0
MRV head with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	13	2	0	0	1	1	0	1	0
MRI head and internal auditory canal with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	12	0	2	0	2	0	1	1	0

**Variant 4: Nonpulsatile tinnitus, bilateral; no hearing loss, and no neurologic deficit, and no trauma. Initial imaging.**

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CTA head with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	1	1	14	1	1	0	1	1	0	0	0
CT temporal bone with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv		1	1	14	1	1	0	1	1	0	0	0
CT temporal bone without IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv		1	1	15	3	0	0	0	0	0	0	0
CT temporal bone without and with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv		1	1	15	0	0	1	0	1	0	1	0

CT head with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼ 0.3-3 mSv [ped]	1	1	14	0	1	2	1	0	0	0	0
CT head without IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼ 0.3-3 mSv [ped]	1	1	14	1	1	1	0	1	0	0	0
CT head without and with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	14	1	1	1	1	0	0	0	0
CTA head and neck with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	14	2	0	0	0	1	0	1	0
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	15	1	0	1	1	0	0	0	0
MRA head without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	2	0	0	1	1	0	0	0
MRA head without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	2	0	0	1	0	0	1	0
MRI head and internal auditory canal without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	16	2	0	0	0	0	0	0	0
MRI head and internal auditory canal without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	16	2	0	0	0	0	0	0	0
US duplex Doppler carotid artery	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	15	1	0	0	1	0	1	0	0
US duplex Doppler transcranial	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	2	0	0	1	1	0	0	0
MRV head without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	13	0	1	1	2	1	0	0	0
US head	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	16	1	0	0	0	1	0	0	0
CTV head with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	12	3	0	0	2	1	0	0	0

MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	14	0	2	0	2	0	0	0	0
MRA head with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	14	1	1	0	1	1	0	0	0
MRV head with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	14	1	0	0	1	2	0	0	0
MRI head and internal auditory canal with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	13	1	1	0	1	0	1	1	0

## **Appendix Key**

A more complete discussion of the items presented below can be found by accessing the supporting documents at the designated hyperlinks.

**Appropriateness Category:** The panel's recommendation for a procedure based on the assessment of the risks and benefits of performing the procedure for the specified clinical scenario.

**SOE:** Strength of Evidence. The assessment of the amount and quality of evidence found in the peer reviewed medical literature for an appropriateness recommendation.

- **References:** The citation number and PMID for the reference(s) associated with the recommendation.
- **Study Quality:** The assessment of the quality of an individual reference based on the number of study quality elements described in the reference.

**RRL:** Relative Radiation Level. A population based assessment of the amount of radiation a typical patient may be exposed to during the specified procedure.

**Rating:** The final rating (1-9 scale) for the procedure as determined by the panel during rating rounds.

**Median:** The median rating (1-9 scale) for the procedure as determined by the panel during rating rounds.

**Final tabulations:** A histogram showing the number of panel members who rated the procedure as noted in the column heading (ie, 1, 2, 3, etc.).

Additional supporting documents about the AC methodology and processes can be found at [www.acr.org/ac](http://www.acr.org/ac).