





MRA head with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	15	0	1	1	1	0	0	0	0	
MRV head with IV contrast	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	10	4	2	0	1	2	0	0	0	
		References		Study Quality												
		11 (30007749)		4												
MRI head with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	16	0	1	0	1	0	0	0	0	

**Variant 2: Primary migraine or tension-type headache. Normal neurologic examination. 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	2	1	0	2	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	2	1	1	1	1	0	0	0	
CT head without IV contrast	Usually not appropriate	Limited	⊕⊕⊕ 1-10 mSv	⊕⊕⊕ 0.3-3 mSv [ped]	1	1	15	0	1	1	0	0	0	1	0	
		References		Study Quality												
		26 (15606567)		3												
CT head without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	1	1	12	1	1	1	2	0	1	1	0	
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	1	1	15	3	0	0	1	0	0	0	0	
MRA head without IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	13	2	2	2	0	0	0	0	0	

MRA head without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	2	1	0	1	0	1	0	0	
MRI head without IV contrast	Usually not appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	1	1	16	0	2	0	0	0	0	0	0	
		References	Study Quality													
		26 (15606567)	3													
		24 (27441999)	4													
MRI head without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	15	0	2	1	0	0	0	0	0	
MRV head without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	13	3	1	0	1	1	0	0	0	
CTV head with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	1	1	14	2	1	1	1	0	0	0	0	
MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	13	4	0	0	1	1	0	0	0	
MRA head with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	15	2	0	1	1	0	0	0	0	
MRV head with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	2	1	0	0	2	0	0	0	
MRI head with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	13	2	0	2	1	0	1	0	0	

**Variant 3: Primary trigeminal autonomic cephalalgias (eg, cluster headache). 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 without and with IV contrast	Usually appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	8	8	0	0	1	1	2	0	2	5	7
		References	Study Quality												

34 (26857820)	4
33 (26092512)	4
31 (17210806)	4
30 (30074553)	2

MRI head without IV contrast	May be appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	4	4	7	0	2	2	7	0	0	0	0
CTA head with IV contrast	Usually not appropriate	Limited	☹☹☹ 1-10 mSv	☹☹☹☹ 3-10 mSv [ped]	1	1	10	3	2	1	2	1	0	0	0

References	Study Quality
34 (26857820)	4
33 (26092512)	4
31 (17210806)	4
30 (30074553)	2

CT head with IV contrast	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv	☹☹☹ 0.3-3 mSv [ped]	1	1	12	2	1	0	2	1	1	0	0
CT head without IV contrast	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv	☹☹☹ 0.3-3 mSv [ped]	1	1	15	0	2	0	0	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	12	2	1	0	2	1	0	0	1
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv	☹☹☹☹ 3-10 mSv [ped]	1	1	14	3	2	0	0	0	0	0	0
MRA head without IV contrast	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	11	2	2	3	0	0	0	0	0

References	Study Quality
34 (26857820)	4
33 (26092512)	4
31 (17210806)	4
30 (30074553)	2

MRA head without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	13	2	1	0	2	0	0	0	1
MRV head without IV contrast	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	11	3	3	0	1	1	0	0	0

References	Study Quality
34 (26857820)	4
33 (26092512)	4
31 (17210806)	4
30 (30074553)	2

CTV head with IV contrast	Usually not appropriate	Limited	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	12	4	3	0	0	0	0	0	0
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References	Study Quality
34 (26857820)	4
33 (26092512)	4
31 (17210806)	4
30 (30074553)	2

MRV head without and with IV contrast	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	12	2	2	1	1	1	0	0	0
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References	Study Quality
34 (26857820)	4
33 (26092512)	4
31 (17210806)	4
30 (30074553)	2

MRA head with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	14	2	1	0	2	0	0	0	0
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MRV head with IV contrast	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	11	2	4	0	1	1	0	0	0
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References	Study Quality
34 (26857820)	4
33 (26092512)	4

MRI head with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	16	0	1	1	0	0	0	0	0	0	0	0	0

**Variant 4: Headache with features of intracranial hypertension (eg, papilledema, pulsatile tinnitus, visual symptoms worse on Valsalva). 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 without and with IV contrast	Usually appropriate	Limited	0 0 mSv	0 0 mSv [ped]	8	8	0	0	1	1	1	1	5	5	5						
		References	Study Quality																		
		37 (12893694)	3																		
CT head without IV contrast	Usually appropriate	Limited	⊕⊕⊕ 1-10 mSv	⊕⊕⊕ 0.3-3 mSv [ped]	7	7	0	1	0	0	0	2	8	2	6						
		References	Study Quality																		
		37 (12893694)	3																		
MRI head without IV contrast	Usually appropriate	Strong	0 0 mSv	0 0 mSv [ped]	7	7	0	0	0	0	2	2	6	3	6						
		References	Study Quality																		
		35 (22309765)	2																		
		41 (22268442)	2																		
		42 (2409390)	4																		
MRV head without IV contrast	May be appropriate	Limited	0 0 mSv	0 0 mSv [ped]	6	6	0	0	1	0	7	9	1	0	0						
		References	Study Quality																		
		38 (23615489)	2																		
CTV head with IV contrast	May be appropriate	Strong	⊕⊕⊕ 1-10 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	6	6	0	0	1	2	4	8	3	1	0						

References	Study Quality
40 (30762716)	4
39 (26084237)	2
38 (23615489)	2

MRV head without and with IV contrast	May be appropriate	Limited	0 0 mSv	0 0 mSv [ped]	6	6	0	0	1	0	7	8	1	1	0
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References	Study Quality
38 (23615489)	2

MRV head with IV contrast	May be appropriate	Limited	0 0 mSv	0 0 mSv [ped]	6	6	0	1	0	0	6	10	1	0	0
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References	Study Quality
38 (23615489)	2

CTA head 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
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CT head with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼ 0.3-3 mSv [ped]	1	1	16	0	1	0	0	0	1	0	0
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CT head without and with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	16	0	1	0	0	1	0	0	0
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Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	14	2	1	1	1	0	0	0	0
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MRA head without IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	15	0	1	2	0	0	0	0	0
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MRA head without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	12	0	2	1	2	1	1	0	0
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MRA head with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	12	0	2	0	3	1	1	0	0
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MRI head with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	14	1	2	0	0	0	0	1	0
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**Variant 5: Headache with features of intracranial hypotension (eg, positional, worse when upright, better when lying down). 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 without and with IV contrast	Usually appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	9	9	0	0	1	0	1	0	3	2	12
MRI thoracic spine without IV contrast	May be appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	5	5	1	0	0	0	9	4	3	0	1
MRI thoracic spine without and with IV contrast	May be appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	5	5	1	1	0	0	12	3	1	0	0
MRI thoracic spine with IV contrast	May be appropriate (Disagreement)	Expert Opinion	○ 0 mSv	○ 0 mSv [ped]	5	5	5	1	0	0	8	4	0	0	0
CTV head with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	2	2	9	2	4	2	1	0	1	0	0
CTA head with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	1	1	11	1	4	1	0	1	1	0	0
CT head with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗ 0.3-3 mSv [ped]	1	1	15	1	1	0	0	0	1	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	0	0	0	0	1	1
CT head without and with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	1	1	16	0	1	0	0	1	0	0	0
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	1	1	15	1	2	0	0	0	0	1	0
MRA head without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	11	1	4	0	1	1	1	0	0



			16 (25862794)		2														
			12 (29274685)		4														
			11 (30007749)		4														
MRV head without IV contrast	May be appropriate	Limited	0 0 mSv	0 0 mSv [ped]	6	6	2	0	0	0	3	8	5	0	1				
			References		Study Quality														
			12 (29274685)		4														
CTV head with IV contrast	May be appropriate	Limited	⊗⊗⊗ 1-10 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	5	5	2	0	0	1	10	5	0	0	0				
			References		Study Quality														
			12 (29274685)		4														
CTA head with IV contrast	Usually not appropriate	Limited	⊗⊗⊗ 1-10 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	1	1	14	2	0	0	1	1	0	0	0				
			References		Study Quality														
			12 (29274685)		4														
			11 (30007749)		4														
CT head with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗ 0.3-3 mSv [ped]	1	1	14	1	3	0	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	0	4	0	0	1	0	0	0				
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	1	1	15	2	2	0	0	0	0	0	0				
MRA head without IV contrast	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	13	1	2	0	1	1	0	0	0				
			References		Study Quality														
			12 (29274685)		4														
MRA head without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	12	2	2	0	2	0	0	1	0				



MRV head without IV contrast	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	2	2	9	1	3	2	2	0	1	0	1
		References		Study Quality											
		53 (19068162)		4											
CTA head with IV contrast	Usually not appropriate	Limited	☹☹☹ 1-10 mSv	☹☹☹☹ 3-10 mSv [ped]	1	1	10	1	2	3	3	0	0	0	0
		References		Study Quality											
		56 (24228072)		4											
CT head with IV contrast	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv	☹☹☹ 0.3-3 mSv [ped]	1	1	14	2	1	0	0	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	14	1	2	0	0	0	1	0	0
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv	☹☹☹☹ 3-10 mSv [ped]	1	1	15	2	1	0	0	0	1	0	0
MRA head without IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	11	1	2	2	2	0	1	0	0
MRA head without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	11	1	2	1	2	0	1	1	0
CTV head with IV contrast	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv	☹☹☹☹ 3-10 mSv [ped]	1	1	11	0	3	3	1	1	0	0	0
MRV head without and with IV contrast	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	11	1	3	1	0	1	0	0	1
		References		Study Quality											
		53 (19068162)		4											
MRA head with IV contrast	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	13	1	1	2	2	0	0	0	0
		References		Study Quality											
		56 (24228072)		4											

MRV head with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	12	1	3	2	0	0	0	0	0
MRI head with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	13	3	1	0	0	0	1	0	0

**Variant 8: Headache without any of the following “red flags”: sudden onset (“thunderclap”), features of intracranial hypertension or hypotension, new onset or pattern during pregnancy or peripartum period, increasing frequency or severity, fever or neurologic deficit, history of cancer or immunocompromise, older age (greater than 50 years of age) of onset, or post-traumatic onset. 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	2	1	1	0	0	1	0	0
CT head with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv	⊕⊕⊕ 0.3-3 mSv [ped]	1	1	15	1	1	0	0	0	1	0	0
CT head without IV contrast	Usually not appropriate	Limited	⊕⊕⊕ 1-10 mSv	⊕⊕⊕ 0.3-3 mSv [ped]	1	1	14	1	1	0	0	2	0	0	0

References	Study Quality
61 (-3195131)	4
60 (11345271)	4
26 (15606567)	3

CT head without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	1	1	15	2	0	0	0	1	0	0	0
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	1	1	16	1	0	1	0	1	0	0	0
MRA head without IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	13	3	1	1	0	0	1	0	0
MRA head without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	14	2	1	1	0	0	1	0	0

MRI head without IV contrast	Usually not appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	1	1	14	3	0	0	1	0	0	0	0	
		References		Study Quality												
		60 (11345271)		4												
MRI head without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	17	0	0	0	0	0	0	1	0	
MRV head without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	13	2	1	0	2	0	1	0	0	
CTV head with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	1	1	14	2	1	1	0	0	1	0	0	
MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	13	2	1	0	2	0	1	0	0	
MRA head with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	2	1	1	0	0	1	0	0	
MRV head with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	13	2	0	1	2	0	1	0	0	
MRI head with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	15	2	0	0	0	0	1	0	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).