American College of Radiology
ACR Appropriateness Criteria®

Soft Tissue Vascular Anomalies: Vascular Malformations and Infantile Vascular Tumors (Non-CNS)-Child

Variant 1: Infant. Clinical signs or symptoms of infantile hemangioma. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations 1	2	3	4	5	6	7	8	9
US area of interest	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	9	9	0	0	1	1	0	0	3	3	11
References				Study Quality											
14 (31421839)				3											
21 (10715041)				4											
US duplex Doppler area of interest	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	9	9	0	0	1	0	0	2	2	2	12
References				Study Quality											
14 (31421839)				3											
21 (10715041)				4											
MRI area of interest without and with IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	5	5	1	1	0	2	6	7	0	0	1
References				Study Quality											
17 (21607598)				4											
MRA and MRV area of interest without and with IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	5	5	2	0	0	5	8	2	0	0	1
References				Study Quality											
15 (21594550)				4											
CT area of interest with IV contrast	May be appropriate	Limited	Varies	Varies	4	4	6	1	1	6	3	1	1	0	0

		References		Study Quality												
		20 (15671395)		4												
MRI area of interest without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	2	2	8	2	6	2	0	1	0	0	0
US area of interest with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	2	2	7	7	3	0	1	0	0	0	0
CT area of interest without IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	16	3	0	0	0	0	0	0	0
CT area of interest without and with IV contrast	Usually not appropriate	Limited	Varies	Varies	1	1	14	2	3	0	0	0	0	0	0
		References		Study Quality												
		20 (15671395)		4												
Radiography area of interest	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	11	4	2	2	0	0	0	0	0
Arteriography area of interest	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	17	1	0	1	0	0	0	0	0
CTA and CTV area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	15	2	2	0	0	0	0	0	0

Variant 2: Infant. Multiple cutaneous infantile hemangiomas, screening for infantile hepatic hemangiomas. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
US duplex Doppler abdomen	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	9	9	0	1	0	0	1	0	2	4	10
		References		Study Quality											
		26 (29957348)		2											
		25 (30244993)		4											

US abdomen	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	0	0	1	0	1	1	5	4	7

References	Study Quality
13 (28089471)	4
23 (33285272)	2
26 (29957348)	2

US abdomen with IV contrast	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	1	2	0	2	6	2	3	2	0

References	Study Quality
28 (29019750)	4
27 (31967502)	4
26 (29957348)	2

MRI abdomen without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	2	2	8	3	2	1	3	1	1	0	0
MRI abdomen without and with IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	2	2	8	8	2	0	0	0	0	0	0

References	Study Quality
25 (30244993)	4

CT abdomen with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	14	3	1	0	0	0	0	0	0
CT abdomen without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	17	1	1	0	0	0	0	0	0
CT abdomen without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	16	3	0	0	0	0	0	0	0
Arteriography abdomen	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	17	1	0	1	0	0	0	0	0

Radiography abdomen	Usually not appropriate	Expert Consensus	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	1	1	16	2	1	0	0	0	0	0	0
CTA and CTV abdomen with IV contrast	Usually not appropriate	Expert Consensus		☢☢☢☢☢ 10-30 mSv [ped]	1	1	16	1	1	0	1	0	0	0	0
MRA and MRV abdomen without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	10	3	3	2	0	1	0	0	0

Variant 3: Child. Clinical signs or symptoms of vascular anomaly (tumor or malformation) not suggesting infantile hemangioma. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
MRI area of interest without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	1	1	5	8	3
		References		Study Quality											
		31 (21918047)		4											
US duplex Doppler area of interest	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	8	8	0	0	1	0	0	1	5	3	9
		References		Study Quality											
		36 (24147487)		4											
MRA and MRV area of interest without and with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	1	0	0	0	1	0	1	11	4
		References		Study Quality											
		32 (32548214)		4											
		31 (21918047)		4											
		30 (26905867)		2											
		29 (11959728)		1											
US area of interest	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	1	0	0	2	10	3	3

		References	Study Quality													
		21 (10715041)	4													
		37 (29219827)	3													
		36 (24147487)	4													
MRI area of interest without IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	5	5	0	1	1	3	11	1	0	0	1	
		References	Study Quality													
		31 (21918047)	4													
US area of interest with IV contrast	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	1	1	0	1	9	4	2	0	0	
		References	Study Quality													
		28 (29019750)	4													
		27 (31967502)	4													
		26 (29957348)	2													
MRA area of interest without IV contrast	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	1	1	0	1	10	3	1	1	0	
		References	Study Quality													
		34 (15306760)	4													
		33 (33893543)	4													
Radiography area of interest	Usually not appropriate	Limited	Varies	Varies	3	3	9	0	2	2	4	2	0	0	0	
		References	Study Quality													
		35 (30300008)	3													
CTA and CTV area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	2	2	9	3	3	2	2	0	0	0	0	
CT area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	10	3	4	1	1	0	0	0	0	
CT area of interest without IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	16	2	1	0	0	0	0	0	0	

CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	15	2	1	1	0	0	0	0	0
Arteriography area of interest	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	16	1	0	0	1	1	0	0	0

Variant 4: Child. Ultrasound features raise suspicion for vascular malformation. Next imaging study.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
MRI area of interest without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	8	8	0	0	2	0	2	2	0	6	7
References				Study Quality											
31 (21918047)				4											
MRA and MRV area of interest without and with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	1	0	0	0	1	1	3	6	7
References				Study Quality											
47 (22840741)				3											
46 (31425807)				3											
32 (32548214)				4											
30 (26905867)				2											
29 (11959728)				1											
CT area of interest with IV contrast	May be appropriate	Limited	Varies	Varies	5	5	1	0	0	3	13	0	0	1	0
References				Study Quality											
41 (27517361)				4											
40 (32145596)				4											
39 (25625123)				4											
CTA and CTV area of interest with IV contrast	May be appropriate	Limited	Varies	Varies	5	5	1	1	0	2	13	0	1	0	0
References				Study Quality											

		45 (31559161)		4												
		42 (30057879)		4												
		41 (27517361)		4												
		40 (32145596)		4												
		39 (25625123)		4												
CT area of interest without and with IV contrast	Usually not appropriate	Limited	Varies	Varies	2	2	8	7	3	0	0	0	0	0	0	
		References		Study Quality												
		43 (26560716)		2												
		42 (30057879)		4												
		41 (27517361)		4												
		40 (32145596)		4												
		39 (25625123)		4												
MRI area of interest without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	2	2	3	7	7	1	0	0	0	0	0	
Radiography area of interest	Usually not appropriate	Limited	Varies	Varies	2	2	9	4	2	3	1	0	0	0	0	
		References		Study Quality												
		35 (30300008)		3												
Arteriography area of interest	Usually not appropriate	Limited	Varies	Varies	2	2	7	4	3	1	3	0	0	0	0	
		References		Study Quality												
		38 (15466793)		2												
US area of interest with IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	2	2	6	5	7	0	0	0	0	0	0	
		References		Study Quality												
		48 (25110772)		4												
CT area of interest without IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	13	2	4	0	0	0	0	0	0	

Variant 5: Child. Established diagnosis of vascular malformation presenting with new or persistent signs or symptoms. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
US duplex Doppler area of interest	Usually appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	1	1	0	4	10	2
MRI area of interest without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	0	10	7	1
		References		Study Quality											
		31 (21918047)		4											
MRA and MRV area of interest without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	2	0	0	0	2	4	2	6	3
		References		Study Quality											
		29 (11959728)		1											
		47 (22840741)		3											
US area of interest	May be appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	6	6	0	0	1	0	7	6	1	2	1
US area of interest with IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	5	5	1	1	1	4	7	3	1	0	0
		References		Study Quality											
		50 (26444594)		3											
CT area of interest with IV contrast	Usually not appropriate	Limited	Varies	Varies	3	3	7	0	4	6	1	1	0	0	0
		References		Study Quality											
		39 (25625123)		4											
MRI area of interest without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	3	3	4	3	5	4	2	1	0	0	0
Radiography area of interest	Usually not appropriate	Limited	Varies	Varies	3	3	7	1	3	2	6	0	0	0	0

		References		Study Quality												
		35 (30300008)		3												
Arteriography area of interest	Usually not appropriate	Limited	Varies	Varies	2	2	7	7	2	2	0	0	0	0	0
		References		Study Quality												
		49 (23101921)		1												
CTA and CTV area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	2	2	7	4	5	1	1	1	0	0	0
CT area of interest without IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	14	2	2	0	0	1	0	0	0
CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	13	1	5	0	0	0	0	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.**