American College of Radiology  
ACR Appropriateness Criteria®  

Osteonecrosis

**Variant 1:** Clinically suspected osteonecrosis. Initial imaging.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Appropriateness Category</th>
<th>SOE</th>
<th>Adults RRL</th>
<th>Peds RRL</th>
<th>Rating</th>
<th>Median</th>
<th>Final Tabulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiography area of interest</td>
<td>Usually appropriate</td>
<td>Limited</td>
<td>Varies</td>
<td>Varies</td>
<td>9</td>
<td>9</td>
<td>0 0 0 0 0 0 0 1 11</td>
</tr>
<tr>
<td>CT area of interest with IV contrast</td>
<td>Usually not appropriate</td>
<td>Expert Consensus</td>
<td>Varies</td>
<td>Varies</td>
<td>1</td>
<td>1</td>
<td>10 2 0 0 0 0 0 0 0</td>
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<tr>
<td>CT area of interest without IV contrast</td>
<td>Usually not appropriate</td>
<td>Expert Consensus</td>
<td>Varies</td>
<td>Varies</td>
<td>1</td>
<td>1</td>
<td>10 1 0 0 1 0 0 0 0</td>
</tr>
<tr>
<td>CT area of interest without and with IV contrast</td>
<td>Usually not appropriate</td>
<td>Expert Consensus</td>
<td>Varies</td>
<td>Varies</td>
<td>1</td>
<td>1</td>
<td>10 1 0 0 1 0 0 0 0</td>
</tr>
<tr>
<td>MRI area of interest without IV contrast</td>
<td>Usually not appropriate</td>
<td>Expert Consensus</td>
<td>O 0 mSv</td>
<td>O 0 mSv [ped]</td>
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<td>1</td>
<td>11 1 0 0 0 0 0 0 0</td>
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<tr>
<td>MRI area of interest without and with IV contrast</td>
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<td>Expert Consensus</td>
<td>O 0 mSv</td>
<td>O 0 mSv [ped]</td>
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<td>1</td>
<td>10 0 0 1 0 0 1 0 0</td>
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<tr>
<td>Bone scan area of interest</td>
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<td>Limited</td>
<td>☢☢☢ 1-10 mSv</td>
<td></td>
<td>1</td>
<td>1</td>
<td>9 2 0 0 1 0 0 0 0</td>
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</tbody>
</table>

**References**  
27 (32767711)  
28 (26088795)  
30 (12163624)  
29 (3336682)
Variant 2: Clinically suspected osteonecrosis. Normal radiographs or radiographs that show findings suspicious for osteonecrosis. Next imaging study.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Appropriateness Category</th>
<th>SOE</th>
<th>Adults RRL</th>
<th>Peds RRL</th>
<th>Rating</th>
<th>Median</th>
<th>Final Tabulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI area of interest without IV contrast</td>
<td>Usually appropriate</td>
<td>Moderate</td>
<td>O 0 mSv</td>
<td>O 0 mSv [ped]</td>
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<td>9</td>
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References

| Study Quality | 5 (25019438) | 13 (18310696) | 43 (29973239) | 47 (27519911) | 40 (27905865) | 48 (28355130) | 46 (30676781) | 14 (18350349) | 28 (26088795) | 42 (26009009) | 24 (24966252) | 44 (30112253) | 45 (26397350) |

CT area of interest without IV contrast

| May be appropriate (Disagreement) | Expert Opinion | Varies | Varies | 5 | 5 | 1 | 0 | 1 | 0 | 6 | 1 | 1 | 2 | 0 |

References

| Study Quality | 36 (2732252) | 37 (12540435) | 38 (19234700) |

MRI area of interest without and with IV contrast

<p>| May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 0 | 0 | 1 | 2 | 6 | 1 | 2 | 0 | 0 |</p>
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Appropriateness</th>
<th>SOE</th>
<th>Adults RRL</th>
<th>Peds RRL</th>
<th>Rating</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT area of interest without IV contrast</td>
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<td>Strong</td>
<td>Varies</td>
<td>Varies</td>
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<td>8</td>
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<tr>
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<td>Expert Consensus</td>
<td>Varies</td>
<td>Varies</td>
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<td>1</td>
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<tr>
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<td>Limited</td>
<td>O 0 mSv [ped]</td>
<td>O 0 mSv</td>
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</table>

**Variant 3:** Known osteonecrosis with articular collapse by radiographs. Surgery planned. Next imaging study.
<table>
<thead>
<tr>
<th>References</th>
<th>Study Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 (18310696)</td>
<td>4</td>
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<td>52 (18712375)</td>
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</tr>
<tr>
<td>14 (18350349)</td>
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</tr>
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</table>

**MRI area of interest without and with IV contrast**

- Usually not appropriate
- Limited
- O 0 mSv
- O 0 mSv [ped]
- 2
- 2
- 6
- 0
- 1
- 3
- 1
- 1
- 0
- 0
- 0

<table>
<thead>
<tr>
<th>References</th>
<th>Study Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>51 (30697641)</td>
<td>3</td>
</tr>
</tbody>
</table>

**CT area of interest with IV contrast**

- Usually not appropriate
- Expert Consensus
- Varies
- Varies
- 1
- 1
- 9
- 1
- 2
- 0
- 0
- 0
- 0
- 0
- 0

**CT area of interest without and with IV contrast**

- Usually not appropriate
- Expert Consensus
- Varies
- Varies
- 1
- 1
- 9
- 1
- 2
- 0
- 0
- 0
- 0
- 0
- 0

**Bone scan area of interest**

- Usually not appropriate
- Expert Consensus
- ☢☢☢ 1-10 mSv
- 1
- 1
- 8
- 0
- 2
- 2
- 0
- 0
- 0
- 0
- 0
- 0

**MR arthrography area of interest**

- Usually not appropriate
- Expert Consensus
- O 0 mSv
- O 0 mSv [ped]
- 1
- 1
- 11
- 0
- 0
- 1
- 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](http://www.acr.org/ac).