Diagnostic Imaging Pathways - Suspected Peripheral Arterial Disease

Population Covered By The Guidance

This pathway provides guidance on the imaging of adult patients with suspected peripheral arterial disease.

Date reviewed: May 2018
Date of next review: May 2021
Published: April 2019

Quick User Guide

Move the mouse cursor over the pink text boxes inside the flow chart to bring up a pop up box with salient points. Clicking on the pink text box will bring up the full text. The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>RRL</th>
<th>EFFECTIVE DOSE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Symbol]</td>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Minimal</td>
<td>&lt; 1 millisieverts</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Low</td>
<td>1-5 mSv</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Medium</td>
<td>5-10 mSv</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>High</td>
<td>&gt;10 mSv</td>
</tr>
</tbody>
</table>

Pathway Diagram
Superficial Femoral Artery Occlusion

Image 1a, 1b, 1c and 1d (Doppler Ultrasound): Occlusion of the right superficial femoral artery over approximately 25cm which reforms distally via collaterals at the adductor canal. Doppler images and spectral analysis are
Peripheral Arterial Disease

- The diagnosis of peripheral arterial disease begins with an accurate history 1
- Intermittent claudication must be differentiated from lower extremity pain occurring as a result of non-vascular aetiologies 1
- Measurement of ankle-brachial index (ABI) is recommended as a first-line non-invasive test for screening and diagnosis of lower extremity arterial disease – toe-brachial index and Doppler wave form analysis or pulse volume recording are alternatives if ankle arteries are incompressible 2
- Non-invasive imaging studies are useful in defining the location and extent of vascular lesions to guide the optimal revascularisation strategy 2
- Ultrasound, CTA and MRA can all reliably confirm or exclude the presence of peripheral arterial disease. All modalities have their own technical limitations when classifying the location, extent and severity of disease

Doppler Ultrasonography

- Recommended as first-line imaging method to confirm lower extremity arterial disease lesions 2
- Duplex ultrasound includes grayscale images and images from colour or power Doppler
- Older studies report 90-95% sensitivity and specificity for the diagnosis of >50% stenosis from the iliac arteries to the popliteal arteries. 3-7 Subsequently there have been significant improvements in ultrasound technology
- Limitations
  - Skilled operator required 2
  - Time consuming – can take over an hour
  - Calcified arteries may be difficult to assess
  - Additional studies often still required for preoperative arterial mapping 2,8,9

Computed Tomography Angiography (CTA))

- Modern multislice CT scanners enable rapid scanning of the entire arterial system, including visualisation of collaterals and arteries distal to occlusions that may not appear on catheter angiography
- Images can be reformatted into an arterial road map 10
- Good soft tissue contrast can also demonstrate non-vascular findings
- Studies from over 10 years ago report sensitivity and specificity of 90-100% compared to catheter angiography as the gold standard; 11-20 CT technology has continued to rapidly improve in this
time. A smaller recent study has reported similar accuracy 21

- Advantages
  - Rapid and widely available
  - Non-invasive
  - Able to show segments immediately distal to a point of occlusion
  - Less radiation exposure compared to catheter angiography with comparable or lower iodine loads
  - Better visualisation of stents than MRI 2

- Limitations
  - Exposure to iodinated contrast and ionising radiation 2
  - Less accurate for severely calcified lesions due to artefact, particularly in calf arteries 2,21

Click here for more information about the use of iodinated contrast in renal failure. For patients with eGFR

**Digital Subtraction Angiography**

- Was the reference standard in vascular imaging but its diagnostic role has been mostly replaced by non-invasive methods 2
- Can be undertaken to guide percutaneous intervention or to identify patent arteries for distal bypass 2
- Disadvantages:
  - Invasive procedure with a risk of morbidity and mortality 25,26
  - Requires skilled operator
  - Exposure to iodinated contrast and ionising radiation

**References**

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. Download the document

1. Ouriel K. **Peripheral arterial disease.** The Lancet. 2001;358(9289):1257-64. (Review article). View the reference
5. Leng GC, Whyman MR, Donnan PT, Ruckley CV, Gillespie I, Fowkes FG, et al. **Accuracy and reproducibility of duplex ultrasonography in grading femoropopliteal stenoses.** J


computed tomography angiography in peripheral arterial disease: a systematic review and meta-analysis. JAMA. 2009;301(4):415-24. (Level I evidence). View the reference


Information for Consumers

<table>
<thead>
<tr>
<th>Information from this website</th>
<th>Information from the Royal Australian and New Zealand College of Radiologists’ website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiation Risks of X-rays and Scans</td>
<td>Angiography</td>
</tr>
<tr>
<td>Angiography (Angiogram)</td>
<td>Computed Tomography (CT)</td>
</tr>
<tr>
<td>Computed Tomography (CT)</td>
<td>Contrast Medium (Gadolinium versus Iodine)</td>
</tr>
<tr>
<td>Gadolinium Contrast Medium</td>
<td>Angiography</td>
</tr>
<tr>
<td>Iodine-Containing Contrast Medium</td>
<td></td>
</tr>
<tr>
<td>Magnetic Resonance Angiography (MRA)</td>
<td>Magnetic Resonance Imaging (MRI)</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>Radiation Risk of Medical Imaging During Pregnancy</td>
</tr>
<tr>
<td>Ultrasound (Doppler)</td>
<td>Radiation Risk of Medical Imaging for Adults and Children</td>
</tr>
<tr>
<td></td>
<td>Ultrasound</td>
</tr>
<tr>
<td></td>
<td>Angioplasty and Stent Insertion</td>
</tr>
</tbody>
</table>

**Copyright**

© Copyright 2015, Department of Health Western Australia. All Rights Reserved. This web site and its content has been prepared by The Department of Health, Western Australia. The information contained on this web site is protected by copyright.

**Legal Notice**

Please remember that this leaflet is intended as general information only. It is not definitive and The Department of Health, Western Australia can not accept any legal liability arising from its use. The information is kept as up to date and accurate as possible, but please be warned that it is always subject to change.

**File Formats**

Some documents for download on this website are in a Portable Document Format (PDF). To read these files you might need to download Adobe Acrobat Reader.

Get ADOBE® READER®

**Legal Matters**