CT v MR Venography for assessment of venous disease

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<table>
<thead>
<tr>
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<th>CTV</th>
<th>MRV</th>
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<tbody>
<tr>
<td>Time</td>
<td>2 mins</td>
<td>30 mins</td>
</tr>
<tr>
<td>Radiation dose</td>
<td>7-12 mSv</td>
<td>zero</td>
</tr>
<tr>
<td>Contrast</td>
<td>Always, iodinated</td>
<td>Preferred, Gadolinium</td>
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<tr>
<td>Renal failure</td>
<td>Depends on eGFR</td>
<td>OK as NSF almost absent</td>
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<tr>
<td>General applicability from a technical point of view</td>
<td>Easy</td>
<td>More challenging</td>
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<tr>
<td>Post stenting</td>
<td>Can see thrombus + flow</td>
<td>Significant signal drop-out</td>
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<tr>
<td>Ability to combine with Pulmonary Art imaging</td>
<td>CTPA +CTV easy</td>
<td>Possible but really adds time (ECG gating)</td>
</tr>
<tr>
<td>Image quality distally</td>
<td>Can be difficult</td>
<td>Superior but technically challenging</td>
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Direct v Indirect Venography

• Direct means cannulation of a vessel on the side of the pathology e.g. dorsal vein foot, popliteal etc
  – Invasive but provides detailed anatomy
  – Must use compression or else deep veins get lost in a blizzard of superficial information

• Indirect- peripheral IV injection
  – Quicker, easier to standardise, less “impressive” images- they don’t look like CT Angiograms one is familiar with for EVAR etc
CTPA and CTV

• In our institution, every patient with an *acute* DVT being considered for endovascular management is imaged pre-operatively with
  – US (ipsilateral) leg focussing on popliteal vein
  – CTPA
  – (Indirect) CTV
    – Having tried the various combinations of echo, isotope scintigraphy, and CT we have arrived at this formula
    – We have limited access to MR otherwise I might well use this more
**Acute DVT**
- Large low attenuation vein
- Few collaterals
- Thrombus centrally located
- Stranding of the perivenous soft tissue – suggestive of oedema
- High attenuation rim, due to contrast in the vasa vasorum of the vessel wall

**Chronic obstruction**
- Small, high attenuation vein
- Collaterals ++
- Thrombus periph. located
- Normal perivenous fat, no stranding
- Thick walled, poorly enhancing, retracted veins
- Partial DVT recanalisation may result in heterogenous lumen and endoluminal stranding
- Endoluminal calcification
Direct CTV

• Needles in both feet- catheterised in the CT scanner
• Either 2 pumps or two hand injections
• Becomes more difficult with swollen limbs
• Following direct CTV sexy images courtesy of Dr. Frederic Thony Grenoble
(Indirect) CTV

- Standard peripheral IV injection at same sitting at CTPA
- 20G cannula wrist/elbow
- 150cc Iodinated contrast
- Image at 150s
- Diaphragm to mid calf 5mm cuts
- Images are NOT comparable to CTA (eg for EVAR), but with experience are easily adequate for diagnosis
Acute left leg DVT video from CT PERIPHERAL VENOGRAM_2872690

Here:

Note
1. Classic May Thurner
2. Acute thrombus in expanded Vein from LCIV down to ? Pop
3. Thrombus in L IIV and profunda also
4. FV thigh small- prob previous DVT
5. Contrast is difficult to see distally so US is performed of popliteal vein
6. Massive limb swelling
Chronic occlusion “Cross pelvic collateral thrombus and L iliac v stenosis”

- IVC filter
- Thrombosed cross pelvic collateral
- Stenosed L EIV with calcification
- Successfully treated by Stents IVC to L CFV
Patient presented with massive bilateral lower extremity swelling

CTV
Is this Tumour?
Thrombus?
Tumour thrombus?
Lymphadenopathy?

Actually no thrombus at all
Following stenting the patient lost 13.2kg from her legs over the next week
MRI acute thrombus
R popliteal vein

Images courtesy of
Professor John Moriarty
Department of Radiology
UCLA
MRI v DSA acute thrombus subclavian vein

Images courtesy of Professor John Moriarty
Department of Radiology
UCLA
MRV May Thurner
MRV May Thurner

Images courtesy of Professor John Moriarty
Department of Radiology
UCLA
May Thurner- time resolved

Images courtesy of Professor John Moriarty
Department of Radiology
UCLA
If you are really interested in MRV and modern techniques then please read Carsten Arnuldussen’s chapter in this book-

Wisepress

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Conclusion

- CTV and MRV have largely replaced ultrasound in pre-op assessment of venous disorders of the lower extremity
- We use indirect CTV (and CTPA) in acute DVT, and as follow up post stent placement
- We use direct CTV or MRV in chronic venous obstruction
- MRV is radiation free and provides excellent detail especially of IVC and iliac disease PRE stenting
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