Angioaccess ultrasound guided dilatation / stenting is a reliable technique

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Disclosure

Speaker name:
Gary Maytham

☐ I have the following potential conflicts of interest to report:

☐ Consulting

☐ Employment in industry

☐ Shareholder in a healthcare company

☐ Owner of a healthcare company

☐ Other(s)

☒ I do not have any potential conflict of interest
Haemodialysis access

Angioaccesses prone to developing stenosis causing dysfunction or failure.

Require corrective action

• Surgical (revision, declotting, jump grafts)
• Endovascular (PTA & Stenting)
Endovascular intervention

Historic treatment of stenotic lesions
Percutaneous transluminal angioplasty (PTA)
  • Stenting

Current Imaging modalities:
1. Fluoroscopic guidance (traditional)
   • Radiation (patient & staff)
   • Contrast medium (nephrotoxic & allergic reaction)
2. Ultrasound guidance (alternative)
   • Comparable results to conventional fluoroscopy
# UGI published literature

## U/S guided AV access intervention (PTA only)

<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Location</th>
<th>Technical Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>Wakabayashi</td>
<td>Japan</td>
<td>97% (4288/4414)</td>
</tr>
<tr>
<td>2012</td>
<td>Gorin</td>
<td>The Netherlands</td>
<td>95% (52/55)</td>
</tr>
<tr>
<td>2010</td>
<td>Fox</td>
<td>USA</td>
<td>98% (219/223)</td>
</tr>
<tr>
<td>2009</td>
<td>Ascher</td>
<td>USA</td>
<td>100% (32/32)</td>
</tr>
<tr>
<td>2007</td>
<td>Ascher</td>
<td>USA</td>
<td>100% (11/11)</td>
</tr>
<tr>
<td>2007</td>
<td>Marks</td>
<td>USA</td>
<td>100% (10/10)</td>
</tr>
<tr>
<td>2007</td>
<td>Kim</td>
<td>Korea</td>
<td>100% (10/10)</td>
</tr>
<tr>
<td>2000</td>
<td>Bacchini</td>
<td>Italy</td>
<td>100% (12/12)</td>
</tr>
<tr>
<td>1996</td>
<td>Wittenberg</td>
<td>Germany</td>
<td>97% (38/39)</td>
</tr>
</tbody>
</table>

94% primary patency rate at one month  
(Wakabayashi et al, 2012)
UGI at St George’s Hospital

• February 2014 to February 2016
  - 29 UGI cases (13 PTA / 16 Stent)
• Theatre suite & local anesthetic
• Intervention: vascular consultant *(access & endovascular experience)*
• U/S guidance: vascular sonographer *(access experience)*
Diagnostic Ultrasound

U/S assessment:
- Anatomy & configuration of access
- Stenotic lesions
- Lumen diameter
- Volume flow
- Suitability for UGI

UGI inclusion criteria:
- Clinical abnormal finding
  - Transonic flow or physical assessment
- >50% stenosis on U/S
- Adequate U/S views of treatment site
- No suspected central venous obstruction
UGI work-up

Comments:
On the right no evidence of arterial inflow obstruction. There is a 2 cm diameter aneurysm of the cephalic vein in the forearm. There is a >75% stenosis at the distal end of the aneurysm. The cephalic vein is widely patent distally. The axillary vein, subclavian vein and innominate vein are widely patent. The estimated flow in the brachial artery is 400 ml/min.
Brief overview of UGI PTA/stenting

1. On table U/S assessment:
   - Confirm access patency
   - Mark treatment site on skin

2. Sheath & guidewire (GW):
   - Advance GW beyond stenosis
Brief overview of UGI PTA/stenting

1. On table U/S assessment:
   - Confirm access patency
   - Mark treatment site on skin
PTA

1. Balloon placement & inflation
   - Advance balloon over stenosis
   - Inflate and look for balloon waisting
Gore Viabahn stent

1. Nitinol metal stent with ePTFE liner and heparin bioactive surface

2. Flexible & durable
   • Transverse tortuous vessels
   • Conform to complex anatomy

3. FDA approved for A-V access using fluoroscopic guided imaging
   • U/S guided imaging is considered ‘off label’
Viabahn stent placement

1. Distal end of stent:
   • Unique U/S appearance (Stent/GW diameter difference)

2. Proximal end of stent:
   • Starting from the distal end of the stent, measure proximally the length of the stent being used.
Viabahn stent deployment

1. Tip to hub deployment system

2. Balloon inflation of stent
Pre/post intervention comparison

Pre stenting
Vol flow: 350 ml/min

Post stenting
Vol flow: 900 ml/min (+174%)
2-3 days post intervention

Complete U/S visualisation of Viabahn stent possible
## Results to date

<table>
<thead>
<tr>
<th>Access type</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA Graft</td>
<td>7</td>
</tr>
<tr>
<td>BVT</td>
<td>7</td>
</tr>
<tr>
<td>RC AVF</td>
<td>7</td>
</tr>
<tr>
<td>BC AVF</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>29</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intervention type</th>
<th>Success</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTA only</td>
<td>100%</td>
<td>13</td>
</tr>
<tr>
<td>Stent</td>
<td>93.7%</td>
<td>16</td>
</tr>
<tr>
<td>All interventions</td>
<td>96.6%</td>
<td>29</td>
</tr>
</tbody>
</table>

### Volume flow pre/post UGI

<table>
<thead>
<tr>
<th>Volume flow</th>
<th>PTA (n=13)</th>
<th>Stent (n=16)</th>
<th>Overall (n=21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre VF average (ml/min)</td>
<td>507</td>
<td>468</td>
<td>485</td>
</tr>
<tr>
<td>Post VF average (ml/min)</td>
<td>1072</td>
<td>1080</td>
<td>1076</td>
</tr>
<tr>
<td>VF increase average (ml/min)</td>
<td>564</td>
<td>613</td>
<td>591</td>
</tr>
<tr>
<td>Average VF increase</td>
<td>2.1</td>
<td>2.3</td>
<td>2.2</td>
</tr>
</tbody>
</table>
Primary patency

At time of reporting:

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Primary patency (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTA</td>
<td>282.5</td>
</tr>
<tr>
<td>Stented</td>
<td>271.8</td>
</tr>
<tr>
<td>All</td>
<td>277.4 (r = 13 - 770 days)</td>
</tr>
</tbody>
</table>

7 patients required further procedures  
( mean primary patency = 160.4 days )

2 patients died during the study - fistula running satisfactorily.
Ultrasound Guided Intervention (UGI)

**Advantages:**
- ✓ No contrast
- ✓ Patent & occluded vessels can be seen
- ✓ Morphology of vessel can be examined
- ✓ Direct measurement of treatment site
- ✓ Real-time haemodynamic information
- ✓ Can be performed in clinic setting without need for radiation protection

**Disadvantages:**
- ✗ Operator dependent
- ✗ Poor image quality at depth
- ✗ Limited field of view – due to the size of the U/S probe
Conclusion

1. UGI for vascular access can be performed safely and effectively.

2. UGI is now our preferred method for intervention.

3. Key to successful UGI:
   - Pre-intervention planning using diagnostic U/S
   - Patient selection
   - Physician & Sonographer with access and endovascular experience
Thank You