Insight about ultrasound in planning, access and control of BTK angioplasty.
State of the art of BTK-CLI treatment

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Disclosure

Speaker name:

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
Ultrasound in planning an Endovascular infrapopliteal approach
The high-resolution images and accurate hemodynamic information provided by modern duplex scanners makes them a reliable tool for preoperative, intraoperative and postoperative surveillance of infrainguinal endovascular treatments.
Karacagil

- 480 segments in 40 extremities Diagnostic in 97% of the cases
- False positive 44 (occluded in the echo-Doppler, Arteriography in permeable) - 21 correspond to Peroneal artery

Koelemay

- non diagnostic studies: 0' 7% with Eco-Doppler, 6' 2% with Arteriography. 12% in both in the foot.
- Global Kappa 0'47 - varies between 0'11 in distal Peroneal and 0'75 in Tibialis anterior proximal. Worse results in TTP and distal Peroneal with both tests
### Similar Results

<table>
<thead>
<tr>
<th>AUTOR</th>
<th>S (%)</th>
<th>E (%)</th>
<th>VPP (%)</th>
<th>VPN (%)</th>
<th>KAPPA (I.C.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZEUCHNER</td>
<td>96'4</td>
<td>92'3</td>
<td>98'8</td>
<td>80</td>
<td>96% (fiabilidad)</td>
</tr>
<tr>
<td>KARACAGIL 1996 &quot;</td>
<td>76-80</td>
<td>58-87</td>
<td>71-80</td>
<td>74-89</td>
<td>0'57-0'64 (NA)</td>
</tr>
<tr>
<td>SENSIER 1998 B</td>
<td>21</td>
<td>98</td>
<td></td>
<td></td>
<td>0'5 (0'39-0'61)</td>
</tr>
<tr>
<td>SENSIER 1998 B*</td>
<td>70</td>
<td>91</td>
<td></td>
<td></td>
<td>0'63 (0'50-0'74)</td>
</tr>
<tr>
<td>KOELEMAY1998&quot;</td>
<td>53-72</td>
<td>80-95</td>
<td>75-90</td>
<td>55-76</td>
<td>0'51 (0'48-0'55)</td>
</tr>
<tr>
<td>ALY 1999</td>
<td>82</td>
<td>99</td>
<td>82</td>
<td>100</td>
<td>0'81 (0'75-0'87)</td>
</tr>
<tr>
<td>ESTUDIO ACTUAL</td>
<td>65</td>
<td>80'6</td>
<td>77'1</td>
<td>69'7</td>
<td>0'46 (0'42-0'49)</td>
</tr>
<tr>
<td>ESTUDIO ACTUAL*</td>
<td>58'4</td>
<td>86'3</td>
<td>73'1</td>
<td>76'5</td>
<td>0'46 (0'43-0'50)</td>
</tr>
</tbody>
</table>
Arterial Eco-Doppler vs Arteriography
INFRAPIPLEAL SECTOR

- Duplex Ultrasound Arterial Mapping (DUAM), permits the design of medical, surgical, or endovascular treatment plans with a high level of concurrence with the findings acquired during the revascularization procedure.

- The DUAM can be used as the sole preoperative mapping modality in a proper vascular laboratory setup, where doctors have direct access to the operating room, where they can compare their findings with the intraoperative lesions and improve their understanding of the procedure performed.
A 3-D ULTRASOUND IMAGING ROBOTIC SYSTEM TO DETECT AND QUANTIFY LOWER LIMB ARTERIAL STENOSES: IN VIVO FEASIBILITY

Marie-Ange Janvier,† Samir Merouche,† Louise Allard, Gilles Soulez,†§ and Guy Cloutier†§

Fig. 1. F3 CRS robotic arm used in the 3-D ultrasound (US) imaging robotic system.

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Access of BTK angioplasty: Probe preparation
US: Popliteal embolic diagnosis
Ecoguided Embolectomy
Ecoguided Embolectomy
• Antegrade common femoral
• Retrograde common femoral
• Superficial femoral/ Popliteal artery access
• Pedal or distal tibial (PT and AT) artery access
• Evaluation of lumens/guidewire control
• Evaluation of hemodynamic results
Rationale
Puncture Ultrasound Guidance

• Reduce access site complications
  – Lower risk of hematoma, bleeding, AV fistula
  – Single puncture, first pass, single wall
  – Avoid-branches, calcified plaques, previous surgical access.....

• • Optimal use of closure
• – Avoid arterial access site disease
• – Best choice of US guided closure techniques
What should we do if our initial strategy in BTK PTA fails?

1. Unable to cross the lesion... What options do I have? Other GW? Other devices.............................................. US guided retrograde access
2. Recoil, Dissection..... Re-angioplasty?? US hemodynamics
3. Rupture, AVF,?........................................ US diagnosis

Appropriate technical endpoint for BTK intervention has remained unclear... but US helps!!!!!
Common alternative access points in patients with advanced lower extremity PAD and/or CLI.

In our opinion, the use of duplex-guided access is the most feasible technique for accessing the pedal/tibial vessels.
Case or lower limb endovascular revascularization. US in the OR.
Case or lower limb endovascular revascularization. US in the OR.
Case or lower limb endovascular revascularization. US in the OR.
Completion duplex ultrasound predicts early graft thrombosis after crural bypass in patients with critical limb ischemia

Salvatore T. Scali, MD, Adam W. Beck, MD, Brian W. Nolan, MD, David H. Stone, MD, Randall R. De Martino, MD, Catherine K. Chang, MD, Eva M. Rzucidlo, MD, and Daniel B. Walsh, MD, Gainesville, Fla; and Lebanon, NH

Table I. One-year bypass patency stratified by distal graft end-diastolic velocity (EDV)

<table>
<thead>
<tr>
<th>EDV category</th>
<th>Primary</th>
<th>Primary-assisted</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDV &gt;15 cm/s (28)</td>
<td>84%</td>
<td>88%</td>
<td>88%</td>
</tr>
<tr>
<td>EDV 5–15 cm/s (41)</td>
<td>64%</td>
<td>70%</td>
<td>72%</td>
</tr>
<tr>
<td>EDV &lt; 5 cm/s (22)</td>
<td>32%</td>
<td>32%</td>
<td>38%</td>
</tr>
</tbody>
</table>

P value .04 .001 .003

Fig. Primary-assisted patency stratified by end-diastolic velocity (EDV) (± other risk predictors).
Hemodynamically significant lesions were defined as a peak systolic velocity (PSV) >180 cm/s or PSV velocity ratio >2.0.

The initial duplex ultrasound study was done within 30 days.
PTA PROCEDURE

PTA-SITE ARTERIOGRAM

NORMAL

PSV<180 CM/SEG
Vr<2

ABNORMAL

RESIDUAL ESTENOSIS
PSV 180-300 CM/SEG
Vr>2

INTRAOPERATIVE DECISION
• No Flow
• Monophasic flow, low amplitude, AT retarded
• EDV < 5 cm/seg
• PSV > 180-200 cm/seg
• PSV Ratio >2-2,5
• Other non hemodynamic: AVF; “bleeding”, pseudoaneurysm............
PSV ratio > 3 → Re-angioplasty
Duplex-guided endovascular treatment for occlusive and stenotic lesions of the femoral-popliteal arterial segment: A comparative study in the first 253 cases

Enrico Ascher, MD, Natalie A. Marks, MD, RVT, Anil P. Hingorani, MD, Richard W. Schutzer, MD, and Manikyam Mutyala, MD, Brooklyn, NY
Both techniques offer different information and can be complementary to each other.

<table>
<thead>
<tr>
<th>No. cases</th>
<th>Procedure/difficulty</th>
<th>Duplex assistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Failed re-entry to popliteal artery during subintimal dissection of SFA</td>
<td>Confirmation of wire position in the false popliteal lumen</td>
</tr>
<tr>
<td>2</td>
<td>“Flush” SFA occlusion</td>
<td>Initiation of subintimal dissection</td>
</tr>
<tr>
<td>2</td>
<td>Popliteal stenosis in patient with knee prosthesis</td>
<td>Popliteal artery angioplasty</td>
</tr>
<tr>
<td>1</td>
<td>Severe stenosis of the SFA origin in patient with hip prosthesis</td>
<td>SFA cannulation</td>
</tr>
<tr>
<td>1</td>
<td>Peroneal artery subintimal dissection</td>
<td>Confirmation of wire position in the true peroneal lumen</td>
</tr>
<tr>
<td>1</td>
<td>Guidewire deviation from the occluded SFA anatomic location</td>
<td>Guidewire found to be in the short occluded prosthetic bypass (not identified before surgery)</td>
</tr>
<tr>
<td>1</td>
<td>Failure to enter SFA occlusion with the guidewire at the midthigh level</td>
<td>Absent SFA (ligated after old war injury), procedure aborted</td>
</tr>
</tbody>
</table>
Duplex-guided infrainguinal balloon angioplasty and stenting. A 4-year experience.

Technical success:
- femoral-popliteal segment was 95% (342/360 cases)
- infrapopliteal segment was 96% (77/80 cases)

“Duplex guided balloon angioplasty and stent placement appears to be a safe and effective technique for treatment of femoral-popliteal and infrapopliteal arterial occlusive disease”.
USG approach : Closure device
Conclusions

- Duplex scans should be performed at all stages of every endovascular case
- To confirm technical adequacy of the procedure
- To help assess significance of residual stenoses
- To rule-out distal embolization
- To check the proximal or distal access points
Conclusions

In our practice, duplex scanning has evolved from an essential diagnostic and surveillance tool to an integral part of endovascular interventions.