LESSONS LEARNED FROM THE LEBANON WAR: LONG-TERM RESULTS OF VASCULAR INJURIES AND REPAIRS

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Disclosures

• I have nothing to disclose

BACKGROUND:

Vascular injuries are manifested by life threatening hemorrhage or by limb loss. Such injuries, with a single entry and/or exit wound, lead to surgery, immediately after the primary assessment in the emergency room.

With multiple injuries, or the presence of only soft signs for a possible vascular injury, imaging is necessary for diagnosis and the choice of the preferred treatment.

Hard Signs

• Active arterial bleeding
• Expanding or pulsating hematoma
• Ischemia (pallor, pulselessness, paresis/paralysis)
• Thrill/Bruit

Soft Signs

• History of a moderate hemorrhage
• Hypovolemic shock
• Decreased but present peripheral pulses
• Peripheral neurologic deficit
• Proximity to a named artery
AIMS:

CT scan is routinely performed as part of the trauma patient work up. Intravenous administration of contrast medium, according to study protocol, at the same time provides enhancement of the arterial tree.

Thus, CTA by virtue of its availability, quick data acquisition and reconstruction becomes a major triage tool and thus angiography is utilized for endovascular treatment.

RESULTS:

- Time: 33 days (July 12, 2006 – August 15, 2006)
- 116 days (June 6, 1982 – September 27, 1982)
- Admissions: 2,687 injured patients (excluded are stress / mental)
- 126 Vascular Injuries (4.7% total; and 7.6% in 2006!)
- 1621 Soldiers (60% of all injured pts.) and 1066 civilians.
- Mean age: 29 years (range 19 - 54 years).
- Average time from injury to hospital 6.57 hrs.
  - 24% after more than 10 hrs. (4% over 20 hrs.)
- All injuries were accompanied by additional insult to soft tissue, bone or viscera.
- All injuries were secondary to high velocity penetrating missiles, shrapnels or from multiple pellets stored in long range missiles.

8 mm
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Actual Number of CTAs performed daily

- 60% CTAs performed
- 13% Angiographies followed (for treatment or when CTAs was non-conclusive 1 case)
- 40% immediate operations

Injuries According to Anatomy

<table>
<thead>
<tr>
<th>Anatomy</th>
<th>Arteries</th>
<th>Veins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head &amp; Neck</td>
<td>16 (13%)</td>
<td>6 (16%)</td>
</tr>
<tr>
<td>Abdomen &amp; Pelvis</td>
<td>15 (12%)</td>
<td>6 (16%)</td>
</tr>
<tr>
<td>Upper Extremities</td>
<td>36 (28%)</td>
<td>8 (21%)</td>
</tr>
<tr>
<td>Lower Extremities</td>
<td>75%</td>
<td>59 (47%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>67.5%</td>
</tr>
<tr>
<td>Total</td>
<td>126 (100%)</td>
<td>37 (100%)</td>
</tr>
</tbody>
</table>

Mean ISS 32

- Vessel extraction
- Master cut
- Rt. Vertebral Artery injury
- Shrapnel between Sternum and the aortic arch
Femoral Artery Injury

Pelvic #
With bleeding

Selective Angio Bilateral A-V Fistula Bilateral A-V Fistula
Rt. Subclavian artery injury

Utilizing Tourniquet

A 3D Reconstruction with a splint on

Multiple shrapnels
Which shrapnel should be extracted???

Open fasciotomy
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Vascular Repair Employed

- Interposition Graft – 54 (43%)
- End to End Anastomosis – 31 (26%)
- Patch/Lateral Repair – 22 (17.5%)
- Ligation – 11 (8%)
- Observation – 3 (2.5%)
- Endovascular – 5 (4%; and 13% in 2006)

No synthetic grafts or patches
World Statistics of Vascular Injuries

- WWII (no vascular reconstruction) 60%
- Korean War (start of vascular reconstruction) 13%
- Vietnam 12%
- Croatia & Chechnya 10%
- Iraq 9%
- Ireland 5%

 Extremities are injured in 50-80%
 harboring a mortality rate of 2.5%-10%

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Late Results

<table>
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<tr>
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<th>82&quot;</th>
<th>06&quot;</th>
<th>FU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>June-Sept (3 months)</td>
<td>July-August (1 month)</td>
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</tr>
<tr>
<td></td>
<td>87 pts.</td>
<td>39 pts.</td>
<td></td>
</tr>
<tr>
<td>Mortality</td>
<td>1%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>Amputation</td>
<td>2%</td>
<td>0%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Thrombosis</td>
<td>9%</td>
<td>5%</td>
<td>8%</td>
</tr>
<tr>
<td>Infection</td>
<td>39%</td>
<td>24%</td>
<td>31%</td>
</tr>
<tr>
<td>Re-Intervention-Late:</td>
<td>Surgery 1 pt (0.07%)</td>
<td>Endovascular 3 pts (2.5%)</td>
<td></td>
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Conclusions

1. A high index of suspicion/awareness for a possible vascular injury.
2. A liberal use of CTA for diagnosis; angiography for treatment - endovascular treatment is increasing.
4. Work in a multi-disciplinary team. (priorities, temp. shunt)
5. Arteries should (mostly) be reconstructed (unless only one of calf/arm arteries is injured) and covered (muscle flaps).
6. Liberal use of fasciotomy and Heparin when possible.
7. Aggressive and recurrent debridement of necrotic tissues to prevent infection.

Hoping for peace

Thank You