Emergency Treatment Of Vascular Injuries With Stent-Grafts (Covered Stents): Which Stent-Graft For Which Injuries And Other Tips And Tricks In Their Use

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Disclosure Statement of Financial Interest

I, Maria Antonella Ruffino, DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.

Covered Stent For Vascular Injuries

ANATOMIC SUITABILITY:
- Proximal artery lesions
- Aneurysm prone and distal neck
- Se to 80 mm length of artery before and after the lesion without anatomic division of artery or lesion
- Vessel path allowing for safe catheter navigation

Low morbidity compared to embolization or surgery in appropriate candidates, mostly than to preserved perfusion

Data reported in literature about their employment in the treatment of arterial injuries are limited to small series or case reports.

Which Stent-Graft For Which Injuries?

The ideal stent-graft does not exist yet
- Low profile device (all sizes in 7 Fr sheath)
- Good flexibility
- High radial force
- High conformability after deployment
- Easy navigation
- Good stent retention during navigation/stenosis negotiation
- Precise deployment
- Possible tapering
- Good overdistension with minimal foreshortening

2000 - Circular saw lesion of CCA
Peripheral Stent Graft, Jomed
3-8 mm, 28 mm

2012 – in-stent restenosis

Current Available Covered Stents

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<tr>
<th>Attribute</th>
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<tr>
<td>Radial strength / recoil resistance</td>
<td></td>
<td>+</td>
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<tr>
<td>Conformability / flexibility</td>
<td>+</td>
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<tr>
<td>Diameter adjustment</td>
<td>-</td>
<td>+</td>
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<tr>
<td>Deployment accuracy</td>
<td>-</td>
<td>+</td>
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<td>Compression recovery</td>
<td>-</td>
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 WHICH STENT-GRAFT FOR WHICH INJURIES?

- **Tortuous vessel**
  - High conformability
  - SELF-EXPANDABLE STENT-GRAFT
  - Viabahn 6x50mm, Gore

- **Straight artery**
  - Accurate deployment
  - BALLOON-EXPANDABLE STENT-GRAFT
  - BeGraft 10x37 mm, Bentley

- **ICA rupture**
- **CCA rupture**

- **IATROGENIC LEFT COMMON ILEIAC VEIN LESION**
  - Atrium Advanta V12 14x41 mm, Maquet

- **POST TRAUMATIC SUBCLAVIAN ARTERY BLEEDING**
  - Protected deployment of the stent-graft:
    - Vascular sheath of sufficient length for target acquisition and stability
    - Go distally to the lesion with the sheath and pull it back just before the stent deployment

- **VERTEBRAL ARTERY BLEEDING**
- **POST INADVERTENT ARTERIAL PUNCTURE**
  - GraftMaster, Abbott Vascular 3.5x26 mm

PROCEDURE MUST ALWAYS BE TAILORED ACCORDING TO LESION

STABILIZE YOUR POSITION:
- angiographic catheter of the right shape (5 Fr better than 4 Fr)
- 0.035" guide-wire better than 0.018-0.014" guide-wire
- 5 Fr catheter

POST YOUR VASCULAR ACCESS:
- Left axillary access 5 Fr
- 6 Fr long vascular sheath engaged at the ostium of the vessel

PROCEDURE MUST ALWAYS BE TAILORED ACCORDING TO LESION

PROTECTED DEPLOYMENT OF THE STENT-GRAFT:
- Vascular sheath of sufficient length for target acquisition and stability
- Go distally to the lesion with the sheath and pull it back just before the stent deployment

ReGraft 7x37 mm, Bentley
PERSONAL SERIES JANUARY 2010 - OCTOBER 2015

54 patients (34 male, mean age 64.6 y, SD 12.5)
evacuation of covered stent for vascular injuries
16/54 patients (30.4%) hemodynamically unstable

INDICATIONS (%):
- active bleeding: 30 (55.5)
- pseudoaneurysm: 16 (29.6)
- arterovenous-fistula: 5 (9.3)
- dissection: 1 (1.9)
- vein rupture: 2 (3.7)

ARTERY TREATED (%):
- vertebral a.: 1 (1.9)
- carotid a.: 6 (11)
- subclavian a.: 3 (5.5)
- common iliac a.: 3 (5.5)
- external iliac a.: 8 (14.8)
- internal iliac a.: 1 (1.9)
- common femoral a.: 3 (5.5)
- superficial femoral a.: 8 (14.8)
- profunda femoral a.: 4 (7.4)
- popliteal a.: 1 (1.9)
- fem-pop. Bypass: 3 (5.5)
- aorto-subfemoral bypass: 1 (1.9)
- celiac trunk: 2 (3.7)
- common hepatic a.: 5 (9.3)
- splenic a.: 2 (3.7)
- celiac a.: 1 (1.9)
- celiac a.: 1 (1.9)

Patients were administered antibiotic prophylaxis during the procedure.

In hemodynamically unstable patients with coagulation disorder, no heparin or dual antiplatelet therapy was given.

In hemodynamically stable patients, aspirin (100 mg per day) and clopidogrel (75 mg per day) for 1 to 3 months, and aspirin 100 mg per day then after.

PERSONAL SERIES RESULTS

IMMEDIATE TECHNICAL SUCCESS: 54/54 (100%)
Clinicalluccess: 53/54 (98.1%)
- Immediate improved hemodynamic status or within a few hours after the procedure or resolution of symptoms related to pseudoaneurysms, or both, and at 6 hours later (successful distal flow)
- 1 death at 24 h (hypovolemic shock post CIA rupture)
- Perioperative mortality: 1.9%

PERCUTANEOUS MORTALITY: 1.9%

RECURRENT: 1/53 (1.9%)
- 1 pt. with recurrence bleeding at 8 hours

INTENSIVE CARE UNIT LENGTH OF STAY: mean 9 days, range 0-15
HOSPITAL LENGTH OF STAY: mean 23, range 9- 38

PERSONAL SERIES JANUARY 2010 - OCTOBER 2015

FOLLOW UP (months): 3-84 months, mean 31.7 ± 19.1

OVER ALL MORTALITY: 3/54 (5.5%)
- 1 death at 24 h and 2 deaths at 12 mos. not related to the lesion, procedure, device

STENT PATENCY: 50/53 (94.3%)
- 1 stent in SFA at 2 weeks
- 2 stent in SFA at 6 and 36 months

STENT FRACTURE: 0/53 (0%)
- 1 stent in SFA at 2 weeks
- 2 stent in SFA at 6 and 36 months

CONCLUSIONS

Placement of covered stent, with preservation of distal flow, even if limited by anatomic suitability, is minimally invasive and effective in the management of emergency arterial injuries.

In these situations, stent-grafts represent a valuable alternative to surgical repair.
- Rapidity of treatment
- Reduce morbidity
- Possibility to treat patients with multiple comorbidities

The type of the stent-graft to be implanted must be chosen according to anatomy, vessel characteristics (tortuosity), and target lesion.

Particular care must be posed to each procedure step.