Advances In Covered Stent Treatment of Aortic Coarctation: Value of New Balloon Expandable Stent-Grafts: Are Bare Stents Ever Indicated

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Potential conflicts of interest

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- Consulting (Maquet Getinge, NH)
- Consulting (Bentley, Germany)

Repair of Coarctation

- Stent implantation is effective with very low procedural mortality and low morbidity

- Potential advantages of covered vs. bare stents vs. angioplasty to prevent AWI
  - reduction of the extent of intimal tear
  - creation of longitudinal framework for endothelial growth
  - control over integrity of vessel wall at coarc and below
  - usefulness when aneurysm is present or there is a risk

Although AWI after endovascular treatment of CoA seems to be declining in frequency, it remains one of the most important potential adverse outcomes. Long-term surveillance for new AWI and monitoring of existing AWI is mandatory, with institution of appropriate treatment when necessary.
Aortic BeGraft

- Bentley ePTFE covered outside – cobalt chromium open cell
- W 12, 14 - 20, 16, 18 - 24mm, 20, 22, 24 - 30mm L 29-59mm
- Premounted on Bentley MP balloon
- Sheath size 9-14Fr
- Can be further dilated with balloons
- Minimal recoil

Covered Stents for CoA

- Covered stents – need to consider:
  - Vascular access damage due to large delivery systems
    - 12mm - Bentley 9Fr
    - CP 11-12Fr
  - Stent integrity
    - CP - Platinum-Iridium – Fractures
    - Bentley – CoCr – Strong radial force
  - Covering integrity
    - CP - Incomplete sealing of leaks
    - Bentley – complete cover

COAST I [BARE]

- A total of 105 patients underwent attempted implantation of an uncovered stent, with 104 successes. All patients experienced immediate reduction in upper- to lower-extremity blood pressure difference.
- There were no serious AEs and no deaths.
- Four patients were found to have small aortic aneurysms on angiography following compliance testing. All were clinically stable. NuMED Covered CP stents were implanted for CoA therapy, and to prevent further AWI. One patient developed a localized dissection after CP stent implant with perhaps a small aneurysm at its upper margin.
- One CP stent migrated distally.
- 2 serious access site complications
- At intermediate follow up there were a total of six aortic aneurysms identified: 5 were successfully treated with covered stent placement, and 1 resolved without intervention.
- 23 stent fractures were noted though none resulted in loss of stent integrity, stent embolization, aortic wall injury, or reobstruction.

COAST II [COVERED]

- A total of 158 patients with 83 having pre-existing AWI.
- Complete coverage of pre-existing AWI was achieved in 76 of 83 patients (92%).
- 7 patients had minor endoleaks.
- Four patients experienced important access site vascular injury.
- There were no acute AWI, repeat interventions, or deaths.
- Conclusions: The CCPS can effectively treat and potentially prevent AWI associated with CoA. Access site arterial injury is the most common important complication. Longer-term follow-up is necessary to define mid- and late-term outcomes.

Bentley Aortic BeGraft

9 yr old girl with native CoA treated with BeGraft

10 yr old girl with CoA s/p endovasculitis and aneurysm
CoA endovasculitis, aneurysm s/p CP covered with leak treated with BeGraft

Bentley Aortic BeGraft

CoA BeGraft for CoA

- 2/2017-10/2019
- 35 pts [26M, 9F] , median age 14.2yrs [5.7-38.1] , weight 40.1kgs [19.2-104.7]
- CoA [16 native, 13 s/p stent, 6 s/p surgery]
- 3 aneurysms 2 s/p Tx Covered CP stent
- BeGraft Aortic [12 (31) or 14 (4)] via a 9-11Fr , femoral artery, implanted and post dilated through the same delivery sheath.

- Systolic peak gradient decreased from 21.2±9.9 to 4.7±4.1mmHg [p=0.001]
- CoA diameter increased from 7.5±3.6 to 13.2±1.9mm [p=0.0001].
- There was no acute aortic wall injury nor other immediate complications
- 2 patients underwent successful occlusion of the pre-existing aneurysms.
- 3 patients further dilation during first 12 months [1 endovasculitis – Aneu - 2nd stent]

Conclusions

- Covered stents are safe and effective for acute treatment of coarctation of the aorta and associated with less AWI than BMS and balloon angioplasty
- Reintervention for further dilation is often required

- Choice of covered stent - need to consider
  - Delivery system – sheath size
  - Maximal diameter of stent
  - Stent integrity - fracture / infolding
  - Covering integrity - incomplete sealing of leaks

- Long term follow up imaging is essential
- Bare stents reserved for small pts or important side branches or protrusion in to transverse arch