

The Knickerbocker Technique – an Under-utilised and Highly Effective Strategy for False Lumen Management in Chronic Aortic Dissection

Andrew Holden, MBChB, FRANZCR
Auckland Hospital
Auckland, New Zealand

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Disclosures

Andrew Holden, MBChB, FRANZCR:

Medical Advisory Board Member for Medtronic, Gore, Philips, Boston Scientific

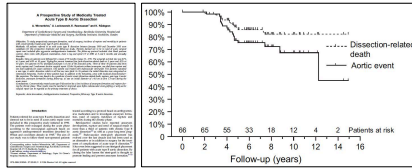
Clinical Investigator for Bard-BD, Boston Scientific, Cagent Medical, Cook Medical, Eferomol, Endologix, Endospin, Gore Medical, Intact Vascular, Medtronic, Nectero, Philips, Reflow Medical, Shape Memory, Shockwave Medical, Terumo

No other disclosures



Long Term Survival in Chronic Aortic Dissection

- It has long been known that there is significant mortality associated with chronic aortic dissection
- Most of the late mortality is aorta and dissection related – rupture of a post-dissection aneurysm
- Thoracic aorta usually dilates earlier and more significantly than the abdominal aorta

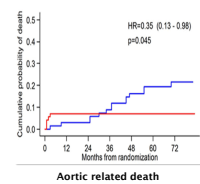


Eur J Vasc Endovasc Surg 2006;32:349-355-166



Extended Follow-Up in INSTEAD Trial

Superior survival in patients treated with TEVAR, especially if achieved aortic re-modelling



Late Deaths (>12 months)	
BMT	BMT + TEVAR
7 aortic rupture	No deaths
4 sudden death	
1 Type A dissection	

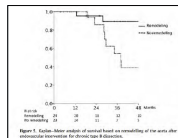
Aortic related death
Nienaber C et al, Circ Cardiovasc Int 2013;6:407



False Lumen Thrombosis and Aortic Remodeling in Chronic TB Dissection

Predictors of Outcome after Endovascular Repair for Chronic Type B Dissection
K. Mani^{1,2,3,4}, R.E. Clough^{1,3}, O.T.A. Lyons^{1,2,3}, R.E. Bell¹, T.W. Carrell^{1,3}, H.A. Zayed¹, M. Waltham^{1,2}, P.K. Taylor^{1,2,3}

Mid-term survival was higher in patients with aortic remodelling, which occurred with extensive false lumen thrombosis.



Mani et al Eur J Vasc Endovasc Surg 2012;43:386-91

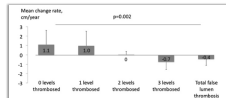
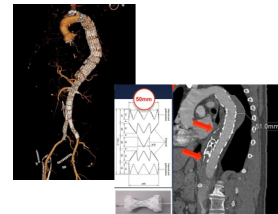


Figure 4. Change rate in aortic diameter based on the extent of false lumen thrombosis (defined as lack of contrast enhancement in the false lumen on arterial phase CT imaging). False lumen thromborescence assessed at 1) 1 week, 2) 2 wks, 3) total thrombosis and 4) total to the stentgraft. Error bars represent standard deviation.



Methods to Achieve Thoracic Aortic False Lumen Thrombosis

- Complete Thoracic and Abdominal Aortic Dissection Repair (open and endoluminal)
- False lumen embolization (eg Candy Plug)
- Knickerbocker Technique



Knickerbocker Technique

- Focal dilatation of a segment of endograft in the descending thoracic aorta
- Aim to disrupt intimal flap and achieve complete or near complete occlusion of the false lumen at that level
- Hopefully achieve false lumen thrombosis and aortic remodeling above that level
- First described using a custom manufactured graft¹

Courtesy Kelly Feng, Junior Doctor, Auckland City Hospital

1. Kolbel et al. J Endovasc Ther 2014;21:117-122

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Knickerbocker Technique – Reported Experience

- Multicentre experience 2013 – 2016¹
 - 15 patients treated
 - Technical success 93%
 - No complications such as aortic rupture or SCI
 - Complete FL thrombosis in all cases although required additional embolization
- Single centre experience 2012 – 2016²
 - Some overlap in above report
 - 16 patients treated
 - Technical success 94%
 - No complications such as aortic rupture or SCI
 - Positive aortic remodeling in 75%, remainder stable

1. Kolbel et al. J Endovasc Ther 2014;21:117-122
2. Rohlfss et al. J Endovascular Ther 2023;30:609-614

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Knickerbocker Modified Technique – Auckland Hospital

- Technical Tips
 - Size an endograft component equal to (or close to) the outer diameter of the aorta at the planned site for Knickerbocker
 - Perform at least 5 cms above bottom of endograft
 - Reduced SBP where possible
 - Use a compliant balloon over a stiff guidewire
 - If possible, have a long sheath just below the balloon
 - Slowly inflate until endograft dilatation occurs
- Advantages of Knickerbocker
 - Part of the index procedure using standard endograft components
 - Simple and safe
 - Cheap

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Knickerbocker Experience– Auckland Hospital

- 20 cases of chronic aortic dissection (Type B and treated Type A)
- Median age 64; Male 16, Female 4
- Time from dissection to KB 59 months (20, 122)
- KB Endografts:
 - Gore CTAG 11, Medtronic 4, NEXUS 4, Cook TX2 1
 - Stent Graft Diameter at KB site: 37mm
 - Stent graft coverage distal to KB site: 58.5mm (IQR 48,72)
- 65cm GORE® DRYSEAL Flex Introducer Sheath using in 75% cases
- Cook Coda®, Medtronic Reliant®, Gore MOB compliant balloons used

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Knickerbocker Experience– Auckland Hospital

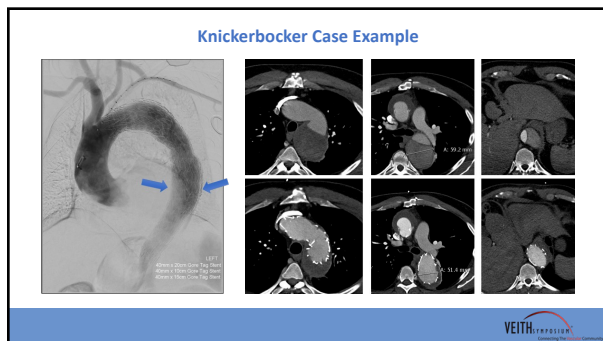
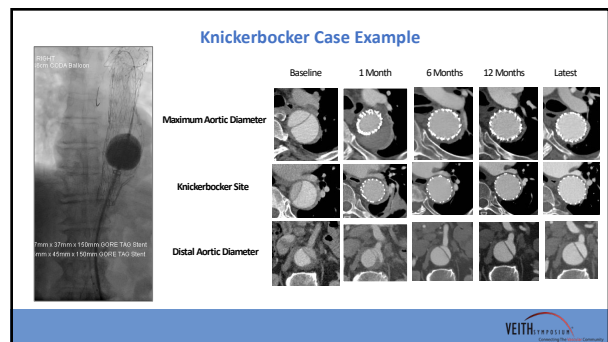
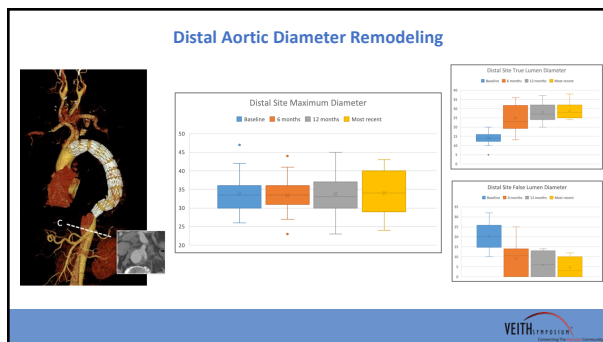
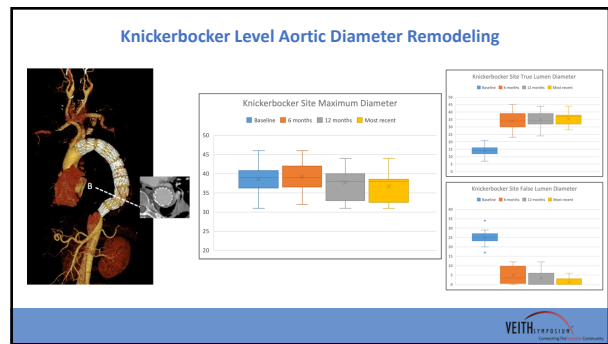
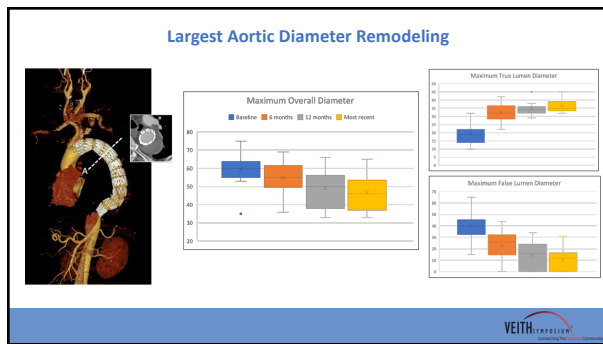
- 30-day Outcomes:
 - No deaths
 - No aortic ruptures
 - 1 retrograde type A and minor stroke – not related to Knickerbocker
- Mid-term Clinical Outcomes (median 24 months)
 - 2 deaths – 1 respiratory, 1 unknown
 - 1 aortic re-intervention (distal extension with CMD, 9.7 years post KB)

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Knickerbocker Experience – Aortic Remodeling

- Aorta measured at baseline, 6, 12 months and latest follow-up
- Descending thoracic aorta measured at 3 levels:
 - A - Largest aneurysmal segment descending thoracic aorta
 - B - Aorta at the Knickerbocker location
 - C - Distal aorta (SMA level)
- Centre-line reconstructions with orthogonal axial images
 - True lumen diameter
 - False lumen diameter
 - Overall aortic diameter

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Knickerbocker Technique – Conclusions

- False lumen thrombosis and aortic remodeling are strong predictors survival in chronic AD
- The Knickerbocker Technique is probably an under-utilized technique globally
- Technique has evolved and improved
- Early results show excellent safety and promising efficacy
- Low cost, minimal additional procedure time and radiation
- May reduce aortic related mortality – unproven!
- May delay or prevent the need for distal aortic re-intervention – unproven!