Progress and Challenges In Ascending Aortic Endograft Treatment

Rodney A. White, MD
Medical Director, Vascular Services
MemorialCare Heart & Vascular Institute
Long Beach Memorial Hospital
Long Beach, California
Vascular Surgeon, Harbor-UCLA Medical
Emeritus Prof. of Surgery, UCLA School of Medicine

Disclosures
Speaker name: Rodney A. White, MD

I have the following potential conflicts of interest to report:

- Clinical & Research Support: Medtronic, Turomo Bolton, Volcano
- Consultant & Speakers Bureau: Medtronic, Turomo Bolton
- Advisory Board: Cardioiris, Intact Vascular

Off-Label Use of devices discussed only in context of FDA approved IDE studies
PSIDE using Medtronic Ascending Endograft

Device delivery & Deployment
Long-term stability
- Healing with migration
- Long-term hemodynamic effects
Arch branch deployment
Embolization
Aortic valve & cardiac reconstruction

Endovascular stent grafting for ascending aorta repair in high-risk patients
Eric E. Brashé, MD, Ishanah A. Sacht, MD, Reg. K. Grozberg, MD, Douglas R. Johnson, MD, and Bruce W. Lytle, MD

Objective: Standard treatment of ascending aortic pathology is open repair, but some patients are too high risk. This study evaluates the use of an interventional device for the treatment of ascending aorta pathology in high-risk patients. We report the outcomes of 23 patients who underwent an interventional device for repair of the ascending aorta with the use of a modular, expandable, self-expanding stent-graft system.

Methods: Twenty-three patients underwent an interventional device for repair of the ascending aorta. The device consists of a modular, expandable, self-expanding stent-graft system. The device is composable of four distinct sections: the abdominal portion, the common iliac portion, the arch portion, and the iliac portion. The device is designed to provide a low profile and to be deployed in a controlled manner. The device is composed of four distinct sections: the abdominal portion, the common iliac portion, the arch portion, and the iliac portion.

Results: Twenty-three patients underwent an interventional device for repair of the ascending aorta. The device consists of a modular, expandable, self-expanding stent-graft system. The device is composable of four distinct sections: the abdominal portion, the common iliac portion, the arch portion, and the iliac portion. The device is designed to provide a low profile and to be deployed in a controlled manner. The device is composed of four distinct sections: the abdominal portion, the common iliac portion, the arch portion, and the iliac portion.

Conclusion: The use of an interventional device for repair of the ascending aorta is feasible and safe. The device provides a low profile and can be deployed in a controlled manner. The device is composed of four distinct sections: the abdominal portion, the common iliac portion, the arch portion, and the iliac portion. The device is designed to provide a low profile and to be deployed in a controlled manner. The device is composed of four distinct sections: the abdominal portion, the common iliac portion, the arch portion, and the iliac portion.

Feasibility of endovascular repair of ascending aortic pathologies as part of an FDA-approved physician-sponsored investigational device exemption
Ali Khairnabid, MD, PhD, Carrie S. Demayo, MD, Scott Wallis, MD, Matthew C. Kompfmann, MD, George S. Kogutoff, MD, and Rodney A. White, MD

Objective: Endovascular repair of ascending aortic pathologies has been reported, but to date, no FDA-approved study has been performed. The purpose of this study was to evaluate the safety and feasibility of endovascular repair of ascending aortic pathologies using an FDA-approved physician-sponsored investigational device exemption.

Methods: Twenty-three patients underwent an interventional device for repair of the ascending aorta. The device consists of a modular, expandable, self-expanding stent-graft system. The device is composable of four distinct sections: the abdominal portion, the common iliac portion, the arch portion, and the iliac portion. The device is designed to provide a low profile and to be deployed in a controlled manner. The device is composed of four distinct sections: the abdominal portion, the common iliac portion, the arch portion, and the iliac portion.

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Deployment & long-term stability
- Accurate deployment & stability possible for “tubular” lesions, i.e. penetrating ulcers, pseudoaneurysms, dissections but repair limited by maximum 46 mm devices
* Aneurysms in most cases not possible due diameters > 46 mm, and inadequate landing zones proximal & distal

Ascending Endografts
Progress & Challenges

Technical challenges for Endovascular Repair
- Anatomical
  - Size discrepancy between the LSCA and LCCA
  - Arch aneurysms
- Anatomical – arch stent graft
- Technical
  - Device delivery
  - Ostial narrowing / conformability
- Physiological
  - Coronary/renal perfusion
  - High transmural forces
- Complications
  - Infection, type A dissection, valve in valve

Assessment of Aortic Arch Compliance
- Assess compliance of the aorta arch across the spectrum of thoracic aortic diseases
  - Acute dissection
  - Chronic dissection
  - Transsection
  - Thoracic aortic aneurysm
  - Penetrating ulcer
Within each pathology type, compliance does not change between the ascending and aortic arch.
- Compliance significantly lower in aneurysmal disease and penetrating aortic ulcers.
- Compliance decreases significantly with age.
- Transection and dissections have highest compliance.

Arch Branch deployment & treatment of false lumen perfusion in dissections - significant progress with newer branch technologies and CT fusion image advances.
Strokes following peripheral and abdominal endovascular repairs comparable to open procedures and are quite low similar and frequently better than open procedures - related to underlying patient co-morbidities and atherosclerotic burden

Thoracic, carotid, arch & ascending endo repairs have increased stroke risk and undetermined cognitive effect related to wire, catheter & device manipulations

Transcranial Doppler findings during Thoracic endovascular aortic repair

The total number of microembolic events (20 DTA procedures) for the diagnostic phase and during TEVAR placement and remainder of the treatment phase for all cases combined was 1081 and 1141, respectively

Highest MES counts during pigtail placement, device deployment

Embolic counts to R/L side overall were equal. In diagnostic phase, an average of 9 MES were seen R/L, during treatment 45 & 43 were seen R/L.

Transcranial Doppler findings during Thoracic endovascular aortic repair

Significant association was found between the total number of MES and postoperative stroke, TIA (P<.0055), and death (P<.0053)

Concluded that TCD can detect microemboli during TEVAR and is able to identify the procedural aspects most associated with cerebral embolism.


Technical Note

Carbon Dioxide Flushing Technique to Prevent Cerebral Arterial Air Embolism and Stroke During TEVAR

Tilo Köhlme, MD, PhD, Fiona Rothlis, MD, Sabine Winger, MD, PhD, Sebastian W. Carpenter, MD, Elke Sebastian Delos, MD, PhD, and Nikolaus Tallimpars, MD, PhD

Abstract

Purpose: To describe the technique of carbon dioxide (CO2) flushing of thoracic stent-grafts to reduce the risk of cerebral embolization. Technique: To remove air, thoracic stent-grafts were sequentially flushed 3 times with carbon dioxide introduced via a 9F balloon catheter. The flushing chamber of the device was directly injected with CO2 and flushed immediately. This was followed by the removal of intra-foam. Forty six patients undergoing thoracic endovascular aortic repair (TEVAR) involving the ascending aorta and the aortic arch received CO2 flushed thoracic endografts. One patient with a highly calcified arch experienced a minor stroke. Conclusion: Arterial embolism is a potentially underrecognized problem of aortic endografting, especially in the proximal segments of the aorta. CO2 flushing may have the potential to reduce air embolization during TEVAR.

Air Embolism During TEVAR: Carbon Dioxide Flushing Decreases the Amount of Gas Released From Thoracic Stent-Grafts During Deployment

Fiona Rothlis, MD, Nikolaus Tallimpars, MD, PhD, Vasili Salepitis, MD, Holger Dörner, MD, E. Sebastian Delos, MD, PhD, and Tilo Köhlme, MD, PhD

Abstract

Purpose: To investigate the amount of gas released from Thoracic thoracic stent-grafts using standard saline flushing vs the carbon dioxide flushing technique. Methods: In an experimental bench setting, 50 thoracic stent-grafts were separated into 3 groups of 10 endografts. One group of grids was flushed with 40 ml saline and the other group was flushed with carbon dioxide for 5 minutes followed by 60 ml saline. All grids were delivered into a water-filled container with a control grid. The deployment was recorded and released gas was measured using a calibrated setup. Results: Gas was released from all grids in both study groups during endograft deployment. The amount of released gas per grid was significantly lower in the study group with carbon dioxide flushing (229 vs 851 ml, p=0.008). Conclusion: Thoracic endografts release significant amounts of air during deployment if flushed according to the instructions for use. Application of carbon dioxide for the flushing of thoracic stent-grafts prior to standard saline flushing significantly reduces the amount of gas released during deployment. The additional use of carbon dioxide should be considered as a variant of flush technique for stent-graft deployment, especially in those complicated or proximal aortic segments, to reduce the risk of air embolism and stroke.
PSIDE for carotid stents
CEA compared to CAS with protection (balloon occlusion)
- Independent neurology evaluation (including neurocognitive) & with MR pre- and post-
to 5 years
*20-30% of patients evaluated with MR had "imaging events" which did not have 
clinical findings on neurologic exam
*both groups had improvement at 5 years 
(Type 1 error)

"Imaging" Events

Ascending Aortic Endograft PSIDE

Delayed Stroke Following Ascending Endograft

Personal Experience
2 strokes post-procedure (both post Zone 1 intervention, AHA anticoaguation)
Patient 1 - 75 yr old female with ascending pseudaneurysm. Included with initial
ecludix that failed. Partial hemiparesis 24 hr post.

Delayed Stroke Following Endograft Repair of 
Ascending Aortic Dissection

Patient 2
35 yr old male with ascending dissection and cardiovascular collapse. Rapid recovery 
with hemiparesis at 7 hrs - prolonged recovery.
Results: predictive factors of CMB

- a prolonged procedure (RR=1.21 [1.01-1.17]) for every increased 5 min of fluoroscopy time, p=0.04
- post-procedural acquired VWD (RR=1.42 [1.08-1.80]) for every lower “0.1 unit” of the HMW-multiomer ratio, p=0.004
- were associated with the occurrence of new post-procedural microbleeds (s).

Conclusions

- Occurrence of new microbleeds as measured 3 days after the procedure in 17% (2/12)
- Presence of microbleeds as detected after the procedure is impacting the 6-month neurological outcomes
- Procedural management and persistence of acquired VWD are predictors of the occurrence of microbleeds
- Importance of pre-procedural Cerebral MRI: 6% of patients had at least one cerebral embolic
**Ascending Aortic TEVAR with Potential Valve Replacement**

- Identify patients with ascending dissection with entry tear 1.5 cm or greater above the highest coronary
- Coronaries patent
- True lumen continuity with patent brachiocephalic arteries
- Aortic valve annulus intact with insufficiency requiring valve replacement (size limitations)

**ASCENDING DISSECTION FOLLOWING TAVR**

**Ascending Endografts Progress & Challenges**

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  - ? Long-term hemodynamic effects
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