Evidence suggests it is safe to wait to give a blood transfusion; however, for those who have suffered a heart attack, there is a lack of high quality evidence to guide transfusions. The study’s results will influence transfusion practice worldwide.

• DESCRIPTION:
  MINT is a multicenter randomized clinical trial comparing red blood cell transfusion strategies for patients who have had a myocardial infarction and are anemic (positive troponins and a hemoglobin of less than 10 g/dL).
  The trial will enroll 3500 hospitalized patients diagnosed with myocardial infarction who are anemic (have blood counts less than 10 g/dL) to receive either a liberal or a restrictive transfusion strategy. Patients will be followed for 6 months to assess how well they are recovering from their heart attack.

• CRITERIA LIST/ QUALIFICATIONS:
  Inclusion
  Positive Troponin and a hemoglobin of less than 10 g/dL
Disclosures

• No conflict of interests…
• Well…
• I really like it
Objectives

1. Understand the benefits of multidisciplinary approach to complex aortic pathology
2. Identify the patients that benefit from complete aortic reconstruction in Type A dissection
3. Describe the strategies of cerebral protection during complex aortic surgery
Components of Type A/ Type I Repair
**Goal**

Thrombosis of false lumen and aortic remodeling (healing)!!!!

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**Type B Aortic Dissection: INSTEAD-XL**

**Endovascular Repair of Type B Aortic Dissection**

Long-term Results of the Randomized Investigation of Stent Grafts in Aortic Dissection Trial

Christoph A. Nienaber, MD, PhD; Stephan Kische, MD; Hervé Rousseau, MD, PhD; Holger Egggebrecht, MD; Tina C. Rehders, MD; Guenther Knaul, MD, PhD; Arnie Glass, MA; Dirk Schünemann, MD, PhD; Martin Czerny, MD, PhD; Tilo Kleinke, MD; Burkhard Ziepfel, MD; Louis Labrousse, MD; Rosella Patroni, MD, PhD; Hüsseyin Ince, MD, PhD; for the INSTEAD-XL trial

**Background**—Thoracic endovascular aortic repair (TEVAR) represents a therapeutic concept for type B aortic dissection. Long-term outcomes and morphology after TEVAR for uncomplicated dissection are unknown.

**Methods and Results**—A total of 140 patients with stable type B aortic dissection previously randomized to optimal medical treatment and TEVAR (n=72) versus optimal medical treatment alone (n=68) were analyzed retrospectively for aortospecific, all-cause outcomes, and disease progression using landmark statistical analysis of years 2 to 5 after index endovascular repair. Cox regression was used to compute coefficients between groups. All analyses were based on intention to treat. The risk of all-cause mortality (11.1% versus 19.3%; P=0.13), aortospecific mortality (4.9% versus 19.3%; P=0.04), and progression >27.6% aortic diameter reduction after 5 years was lower with TEVAR than with optimal medical treatment alone. Landmark analysis suggested a benefit of TEVAR for all end points between 2 and 5 years; for example, for all-cause mortality 60% versus 16.9% (P=0.02), aortospecific mortality 90% versus 16.9% (P=0.005), and for progression 41.1% versus 28.1% (P=0.001). Landmarking at 1 year and 1 month revealed consistent findings. Both improved survival and less progression of disease at 5 years after elective TEVAR were associated with stent graft induced false lumen thrombosis in 90.6% of cases (P=0.001).

**Conclusion**—In this study of survivors of type B aortic dissection, TEVAR in addition to optimal medical treatment is associated with improved 5-year aortospecific survival and delayed disease progression. In stable type B dissection with suitable anatomy, preemptive TEVAR should be considered to improve late outcomes.

**Clinical Trial Registration**—URL: http://www.clinicaltrials.gov. Unique identifier: NCT01415804 (Cite Cardiovasc Interv. 2013;6(4):407-416.)
Components of Type A/ Type I Repair

- Traditional:
  - Confirm on CT
  - Examine the patient- neurological; vascular
  - Go to OR
  - Cool
  - Replace ascending aorta
  - Address the root (AVR, re-suspend AV, Bentall)
  - Hemiarch- DHCA, look for tears, sew graft, re-clamp, rewarmed
**Traditional Approach**

- **Limitations of Traditional Approach to Type A repair**
  - High rate of re-interventions and specifically aortic events
    - 20-30% at 5 years (false lumen patency - up to 100%!!)
    - Reinterventions often large/risky operations
      - No landing zone for endo
        - Arch branch devices limited in chronic dissection flaps
      - Limitation of options for staging
        - Increased risk of spinal cord ischemia
        - Patients older, sicker
Components of Type A/ Type I Repair

- Interdisciplinary (TEAM) approach:
  - Meet in ED (Cardiac, Vascular, Anesthesia, ...)
  - Examine the patient- neurological; vascular
  - Review imaging- preliminary plan for type of surgery/ extent/ stratify the risk
  - Hybrid room- EACH TIME !
  - CPB/ hypothermia/ cerebral and spinal protection strategy
  - Cannulation strategy/ IVUS/ aortogram

- Interdisciplinary approach:
  - addressing malperfusion simultaneously with a proximal repair- maximize elimination of tears in arch and proximal descending aorta
  - Arch vessels repaired first- shorter cerebral and spinal ischemia- elimination of majority of dissection flaps from head vessels
  - In case of a need for future repair of descending aorta- stable landing zone (endovascular) and no need for arch surgery
Total Arch Replacement with Trifurcated Graft and Frozen Elephant trunk- FET
IVUS

Addressing Malperfusion

• Evaluation of visceral vessels intraoperatively
  – Dynamic vs static obstruction
Brain Perfusion and Protection

- Selective, followed by bilateral Antegrade Cerebral Perfusion (ACP) - 0.8 → 1.2 l/min (1ml/kg/min)
- Deep hypothermia - 18 degrees Celsius
- NIRS monitoring

Bilateral NIRS
Branches of vertebral artery
1. Meningeal branch
2. Posterior Spinal Artery
3. Anterior Spinal Artery
4. Medullary Arteries
5. Posterior Inferior Cerebellar Artery (PICA)


Bilateral NIRS
Bilateral NIRS


Total Arch Replacement with Trifurcated Graft and Frozen Elephant Trunk- FET
ML- 43 yo Male with Type I Aortic Dissection

• HPI: acute shortness of breath while vacationing in Duluth (PMH- Marfan- S/P “pectus excavatum” repair)
• Respiratory failure- BiPAP→ aspiration→ intubation
• Echo- severe AI, LVEF 20-25%
• CT chest, abdomen, pelvis- type I dissection
  – flap ending just distal to LSCA

ML- Presentation at ANW

• Accepted for transfer with a diagnosis of type I dissection
• Intubated, “aspiration pneumonia”
• Metabolic acidosis
  – Lactate 4
• Liver failure
  – INR 2.9
• Renal failure
  – Cr 2.2
ML- presentation at ANW

- ICU, cardiac and vascular surgery consulted
- Emergent OR for a repair
OR- 6/9/2018

- Aortic root replacement using a composite valve graft made of 29 mm Magna Ease bioprosthetic valve and 34 mm Valsalva Gelweave graft, coronary implantation, total aortic arch replacement using trifurcated graft to debranch the head vessels, FET 31 mm X10 to zone 0, ascending aortic replacement, axillary cannulation, IVUS, central ECMO placement using right axillary artery graft and percutaneous 25-French venous cannula through the left groin

OR- 6/9/2018

- CARDIOPULMONARY BYPASS DATA:
  - 1. Cardiopulmonary bypass time 432 minutes.
  - 2. Cross clamp time 247 minutes.
  - 3. Circulatory arrest time 6 minutes.
  - 4. Lower body ischemia time 94 minutes
  - DHCA 18 Celsius
  - SACP and BACP
ECMO Weaning

- LVAD evaluation- eligible
- Resolving liver and renal failure
- Head CT- normal
- EEG- no seizure activity
OR- 6/12/2018

- Chest washout and chest closure
OR- 6/14/2018

• ICU bedside ECMO decannulation
  – Successful ECMO “weans”
• No LVAD
• Extubated 6/19/2018
• Slow BiPAP wean, no need for reintubation
• Transfer to telemetry- 6/25/2018
• Echo- 20-25%
2 weeks out

- 72yo male
- PMH: diverticulitis treated medically
- Otherwise healthy
Operative Course

- Ascending replacement with resuspension of the aortic valve
- Total Arch Repair with trifurcated graft – Proximal anastomosis from ascending graft
- Frozen elephant trunk – 34mm X 150mm CTAG
- Circulatory arrest time 19 minutes – 20 degrees Centigrade

Postoperative Course

- Extubated POD #0
- Transferred to floor POD #1
- Chest pain/ST elevation noted POD 3
MM Report

• Acute anterior MI occurring as a result of an ACS occurrence and not as a complication immediately related to the surgical procedure, i.e., flap dissection or embolization. A very nice result was obtained…

Postoperative Course

• Abdominal pain- elevated WBC- POD#14
  – General surgery consult
• OR- Lap sigmoidectomy, Hartman colectomy with end colostomy
• Discharged 10 days later
TS- Loeys- Dietz Syndrome (LDS)

- AD disease, discovered in 2005
- Mutations in Transforming Growth Factors Beta Receptors 1 and 2 (TGFBR 1 and 2)
- Arterial tortuosity, hypertelorism, bifid uvula
- Very high risk of aortic ruptures, dissections (earlier ages, smaller diameter)

Cardiovascular operations for Loeys-Dietz syndrome: Intermediate-term results

Nishant D. Patel, MD, Todd Crawford, MD, J. Trent Magruder, MD, Diane E. Alejo, BA, Narutoshi Hibino, MD, James Black, MD, Harry C. Dietz, MD, Luca A. Vricella, MD, and Duke E. Cameron, MD

TS- 36 year-old Male

• PSH:
  – 2004: aortic root replacement with mechanical CVG for an acute type A dissection (age 22)
  – 2009: left vertebral artery dissection with coil embolization
  – 2011: redo upper hemi- sternotomy, RSCA aneurysm repair
  – 2012: Descending aortic stent- graft placement (?rupturing pseudoaneurysm)
  – (continued enlargement of RSCA aneurysm)
TS- 36 year-old Male

- PSH:
  - 2016: right vertebral artery ligation
  - (continued enlargement of RSCA aneurysm)
  - 2018: decision to address remaining ascending aorta, aortic arch, RSCA aneurysm, LSCA aneurysm
Seems easy

Operative Planning

• Single vs multi-stage procedure
• CPB, hypothermia, cannulation
• The biggest question: HOW TO ACCESS ALL LOCATIONS AT THE SAME TIME- **SURGICAL APPROACH!!**
Options

• Sternotomy… cannot reach to the sides
• Sternotomy + thoracotomy… maybe
• Hemi-clamshell… maybe
• Sternotomy + hemi-clamshell… maybe
• Clamshell… I THINK SO!!!

• Phone call to a friend…
  • “… through a clamshell you will be able to see another OR if you need to…”
First Stage

• Left subclavian- left carotid bypass
First Stage

• Extubation
• Quick recovery
Second Stage

- 2 arterial lines
- Left axillary cannulation
- Right groin cut-down
- Inframammary incision
- 3rd intercostal space clamshell thoraco-sternotomy
- Mobilization
- Cannulation of the heart; cooling; heart protection
- Circulatory arrest

Second Stage - 2 Days Later

- Debranching of arch vessels
- Restoring upper body CPB
- Antegrade deployment of FET
- Ascending aortic graft to FET
- Sewing all pieces together
- Clamps off, rewarming
- Break- for us and the patient- ICU
Third Stage- 36 Hours Later

- Exploration and ligation of right subclavian aneurysm
- Partial resection of the aneurysm sac
- Oops... innominate vein is thrombosed...

- Thrombectomy of left innominate vein
- Reconstruction of the confluence of the right and left innominate vein with SVC using a bovine pericardial patch
Postoperative Course

• Extubated POD #2- BiPAP
• TPN, naso- jejunal tube feeds
• 1 week in ICU- telemetry
• 6 days later- epistaxis- ICU, packing reintubation, IR embolization x2
• Extubation
• Discharged 1 month after surgery
Multidisciplinary Team

- CV Surgery (Cardio- Vascular- !!!)
- ANESTHESIA !!!
- Cardiology- Interventional/ AHF/ General
- ICU
- General Surgery
- Neurology
- Interventional Radiology

Is Hybrid Room a Necessity

YES !!!
Patients that Benefit the Most from Complete Aortic Repairs

• Risk vs benefit
  – Young people
  – Tear in arch
  – Any evidence of malperfusion
  – Connective tissue disorder!!!!!

Cases Presented

• Low LVEF; profound heart failure, ECMO support, malperfused
• 72 year old
• Multiple redo surgeries

• Morbidly obese
• Von Willebrand Disease- 4 joints replaced
Patients that Benefit the Most from Complete Aortic Repairs

Maybe ALL OF THEM??

Summary

1. Multidisciplinary (TEAM) approach allows simultaneous treatment of primary pathology in Type A aortic dissections (proximal repair) and malperfusion complications (arch, descending aorta, revascularization of end organs)

2. Cannulation strategy, hypothermia, and addressing the arch vessels first allows uninterrupted perfusion to the brain and quick restoration of blood flow to upper body
Summary

3. Performing FET across the arch instead of distal to left subclavian artery minimizes the risk of spinal cord ischemia

4. Complete hybrid proximal aortic repair (root, ascending, arch vessels, arch, proximal descending aorta) promotes aortic healing (remodeling), decreases the risk of needing re-intervention

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Thank you!!!