Total Endovascular Repair
Type A Dissection

Eric Herget
Interventional Radiology
65 year old male

Acute Type A Dissection

Severe Aortic Regurgitation

No co-morbidities

Management?
Part II – “Evolving Global Paradigm Shift in the Treatment of Type A Aortic Dissection (TAAD)
Outline

Epidemiology

Traditional Management – Surgery vs. Medical
  Goals, complications and contraindications

Diagnostic Imaging work-up
  Current practice vs. future direction

Endovascular Treatment Options
  Technical factors
  Risks and contraindications
  Review of early worldwide outcomes
Epidemiology of TAAD

Most common aortic catastrophe

Thoracic aortic dissection incidence 2.9-4.3/100,000/yr

  2/3 of these are Type A which translates into 40-60 cases/yr in Southern Alberta

Average age 64 years old

Men > Women

Risk Factors

  HTN, aortic dilatation, bicuspid valve, connective tissue disorders
Traditional Management of TAAD

Mortality 1% per hour during the 1st 48hrs

Emergent surgery unless contraindications are present

Acute mortality related to

- Rupture
- MI
- Acute aortic insufficiency
- Malperfusion

Operative mortality 10-20%

- iRAD – 25% (526 patients 1996-2001)
- GERAADA – 17% (>3000 patients 2006 – current)

Specific causes of operative mortality not well elucidated
Surgical Treatment of TAAD

Goals of open surgical repair

- Resect 1° intimal tear (PIT)
- Replace ascending aorta
- Occlude false lumen
- Restore aortic valve competence
- Limit distal dissection

Aortic valve replacement or coronary reimplantation required in approximately 10-20% of cases

Increasing utilization of varying surgical and endovascular techniques to accomplish extended distal aortic repair in the setting of TAAD
Medical Management of TAAD

High mortality associated with non-operative management

Definition of a non-surgical candidate in the setting of TAAD is controversial
Medical Management of TAAD

High mortality associated with non-operative management

Definition of a non-surgical candidate in the setting of TAAD is controversial
Potential Candidates for Total Endovascular Repair TAAD

Non-surgical candidates

Key determining factors in this decision

- Functional status of the patient (co-morbidities)
- Advanced age
- Prior Aortic Valve Replacement?
- Cerebral malperfusion?
Non-Surgical Candidates in TAAD

Advanced Age

Literature on operative mortality in the setting of TAAD and octogenarians is conflicting

Neri $^1$ intra-op mortality 33%, overall hospital mortality 83%, 0% 6-mo survival post discharge
Shah $^2$ no significant difference in mortality in those >80 vs. <80
Mehta $^3$ intra-op mortality 40-50%

Some groups advocate medical management only in this age group, reporting equivalent survival of those making it through the first 48hrs

Non-Surgical Candidates in TAAD

Prior aortic valve replacement

Some advocate non-surgical management ¹

TAAD in this patient subgroup more equivalent to a Type B dissection
Protected from aortic insufficiency
RCA protected by prior aortotomy
Post-op adhesions protect against rupture

Conflicting reports on some of these hypotheses ²

Increased operative mortality due to post-op adhesions

1. Elefteriades. Cardiol Clin 2010;28:325-331
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Diagnostic Work-Up

Many imaging tools available

CT
MRI
Echo
IVUS
Diagnostic Work-Up

Increasing complexity in the types of CT protocols available

CT angiogram (CTA)
Dissection Protocol (nonenhanced CT and CTA)
Diagnostic Work-Up

Increasing complexity in the types of CT protocols available

CT angiogram (CTA)
  Dissection Protocol (nonenhanced CT and CTA)
  CT Pulmonary Embolism Protocol (CTA timed to opacify PA's)
Diagnostic Work-Up

Increasing complexity in the types of CT protocols available
- CT angiogram (CTA)
  - Dissection Protocol (nonenhanced CT and CTA)
  - CT Pulmonary Embolism Protocol (CTA timed to opacify PA’s)
- ECG Gated CTA
Diagnostic Work-Up

Who decides which tool to use?
Diagnostic Work-Up

Who decides which tool to use?

Are all tools available all the time?
Diagnostic Work-Up

Who decides which tool to use?

Are all tools available all the time?

Who interprets the study?
Diagnostic Work-Up

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Diagnostic Work-Up

Goals of Imaging

Successful verification of dissection

\textit{ddx: IMH, PE, MI, aortic ulcer, pneumonia}

Characterization of PIT

- Location
- Size

\textit{Gated CTA}

Complicating Features

- Rupture
- Malperfusion
- Acute False Lumen Dilatation
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Endovascular Treatment TAAD

Goals of endovascular repair

Cover PIT
Exclude false lumen
Limit distal dissection

Candidates – Gated CTA and echo

Landing zones (PIT vs. coronaries/innominate)
Appropriate sized device on the shelf
Access (iliacs/carotid)
Absence of significant aortic insufficiency
Computed tomography-based anatomic characterization of proximal aortic dissection with consideration for endovascular candidacy

Michael C. Moon, MD, a Roy K. Greenberg, MD, a,b Jose P. Morales, MD, b Zenia Martin, MD, b Qingsheng Lu, MD, b Joseph F. Dowdall, MD, b and Adrian V. Hernandez, MD, PhD, a Cleveland, Ohio

Endovascular Approaches to Acute Aortic Type A Dissection: A CT-Based Feasibility Study

J. Sobocinski a, N. O’Brien a, B. Maurel b, M. Bartoli c, Y. Goueffic d, T. Sassard e, M. Midulla f, M. Koussa a, A. Vincentelli a, S. Haulon a, * France

Cleveland Clinic
CT Feasibility Studies

Cleveland Clinic 2004-2006

Methods

Inclusion: Acute proximal dissection with ‘interpretable’ gated CTA

Criteria for suitability of an endovascular repair

Proximal landing zone

- Diameter ≤38mm
- Length ≥10mm (sinotubular junction to PIT)

Absence of CABG from ascending aorta
CT Feasibility Studies

Cleveland Clinic 2004-2006

162 patients

47% had a gated CTA

32% of those had anatomy suitable for endovascular repair
CT Feasibility Studies

5 Hospitals in France 2006-2009

Methods

Inclusion

Acute TAAD with ‘work-able’ CTA

Results

212 Patients

48% with ‘work-able’ CTA

36% suitable for endovascular repair (tubegraft)

57% suitable (tubegraft, +/- carotid bypass +/- branched)
CT Feasibility Studies

The FMC Experience

Research project under way looking to validate the two previous studies

Interventional Radiology CTA review

All acute TAAD patients considered, regardless of ‘work-ability’ of the CT used to make the diagnosis

Early results

Vast majority of TAAD’s diagnosed using non-gated CTA

Confident characterization of the PIT and sizing of aortic root challenging on routine dissection protocol
CT Feasibility Studies

The FMC Experience
Endovascular Treatment TAAD Technique

Optimize hostile hemodynamics of ascending aorta during deployment

Temporary Pacing

Pharmacologic (adenosine)

Partial Right Atrial Inflow Occlusion

1. Endovasc Today 2009; 10:39-44
Endovascular Treatment TAAD Complications

Stroke

Embolic

Dissection related

Acute hemodynamic alterations following false lumen exclusion
Endovascular Treatment TAAD Complications

Stroke

Embolic

Dissection related

Acute hemodynamic alterations following false lumen exclusion

Left ventricular Rupture

Guidewire

Nose-cone
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<th>Country</th>
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Case Reports

Stanford 2004

89 year old female, diffuse IMH with limited Type A dissection, poor surgical candidate
Case Reports

Stanford 2004

40 x 100 mm Gore Excluder, bare metal stent inominate
Case Reports

Stanford 2004

89 year old female

Discharged home POD #8

Follow-up CTA shows resolution of thoracic false lumen.
Case Reports

China 2004

46 year old female, 2 weeks after presentation, 38 x 70 mm Z-stent
Case Reports

China 2004

Presented 1yr post-op with severe aortic valve insufficiency and severe impaired left ventricular contractility (LVEF <30%)
Case Reports

China 2004

Bentall repair (stentgraft removed surgically prior to placement of prosthesis)
Case Reports

Austria 2006

89 year old male, subacute TAAD, intermittent paraplegia, 46x85mm Jotek with overdrive pacing, discharge home POD #7, uneventful follow-up
Case Reports

Turkey 2007

66 year old male, cardiac co-morbidities, Medtronic 46 x 100mm
Case Reports

Turkey 2007

Small endoleak, discharged home POD #5, uneventful follow-up
Case Reports

UK 2011

68 year old female, IMH → TAAD, ARF, Zenith 34mm with overdrive pacing. “Successful” recovery and resolution of ARF.
## Series

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<td>Cook Zenith TX2</td>
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Series

Lu et al. 2013

Inclusion criteria

Non-surgical candidate (>70yrs, ASA ≥ 4, New York Heart Association classification ≥ IIIC)

Exclusion criteria

Proximal or distal landing zone <20mm
Coronary involvement
Acute MI
Severe aortic regurgitation (grade 3 or 4)
Non-suitable iliac access
Connective Tissue disorders
Series

Lu et al. 2013

Follow-up 16-35 months

Complete false lumen thrombosis in ascending aorta in 100% (one patient required additional endovascular branched arch procedure 3 months post-op)

No incidence of aortic insufficiency during follow-up

Rapid pacing not required during deployment due to 100% of patients developing ventricular tachycardia when nose cone inserted into LV
FMC Experience
FMC Experience
85 year old male

Acute Type A Dissection

Mild Aortic Regurgitation

Multiple co-morbidities

Prior sternotomy

Management?