Early outcomes of acute retrograde dissection in the aortic arch and the ascending aorta – data from IRAD

Foeke JH Nauta, MD, PhD
Resident Cardiothoracic Surgery,
Academic Medical Center, Amsterdam
Disclosure

Speaker name: Foeke JH Nauta

I have the following potential conflicts of interest to report:

- Consulting
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)

☐ I do not have any potential conflict of interest
Management of acute aortic dissection (AD) is predominantly based on the Debakey and Stanford classifications:
Background

- Management of acute aortic dissection (AD) is predominantly based on the DeBakey and Stanford classifications:

DeBakey I
Stanford A

DeBakey II

DeBakey III
Stanford B

Acute open surgery\(^1,2\)
Endovascular/Medical\(^1,2\)

\(^1\)Hiratzka, AHA Guidelines 2010
\(^2\)Erbel, ESC Guidelines 2014
Background

Retrograde Type A AD
Background

Retrograde Type A AD

Spontaneous or post-TEVAR
Acute Retrograde Dissection - IRAD

Background

- Presentations and outcomes may differ from classic type A dissection
Acute Retrograde Dissection - IRAD

Background

- Presentations and outcomes may differ from classic type A dissection
- However, guidelines recommend urgent surgical repair for both entities, associated with high mortality (17-25%)\(^3,4\)

\(^3\text{Kim, et al. Circulation 2014}\)
\(^4\text{Trimarchi, et al. JTCVS 2005}\)
Background

• Presentations and outcomes may differ from classic type A dissection

• However, guidelines recommend urgent surgical repair for both entities, associated with high mortality (17-25%)³,⁴

• Could these patients benefit from a less invasive approach?

⁴Trimarchi, et al. JTCVS 2005
Acute Retrograde Dissection - IRAD

Background

Outcomes of Acute Retrograde Type A Aortic Dissection With an Entry Tear in Descending Aorta
Joon Bum Kim, Suk Jung Choo, Wan Kee Kim, Ho Jin Kim, Sung-Ho Jung, Cheol Hyun Chung, Jae Won Lee and Jae-Kwan Song

Circulation 2014

N = 49 patients
Acute Retrograde Dissection - IRAD

Background

Outcomes of Acute Retrograde Type A Aortic Dissection With an Entry Tear in Descending Aorta
Joon Bum Kim, Suk Jung Choo, Wan Kee Kim, Ho Jin Kim, Sung-Ho Jung, Cheol Hyun Chung, Jae Won Lee and Jae-Kwan Song

Circulation 2014

N = 49 patients

Selected patients may benefit from medical therapy alone
Early Outcomes of Acute Retrograde Dissection From the International Registry of Acute Aortic Dissection

Foeke J.H. Nauta, MD, PhD,
Joon Bum Kim, MD, PhD,
Himanshu J. Patel, MD,
Mark D. Peterson, MD, PhD,
Hans-Henning Eckstein, MD, PhD,
Ali Khoynezhad, MD, PhD,
Marek P. Ehrlich, MD,
Marco Di Eusanio, MD, PhD,
Alessandro Della Corte, MD, PhD,
Daniel G. Montgomery, BS,
Christoph A. Nienaber, MD, PhD,
Eric M. Isselbacher, MD,
Kim A. Eagle, MD,
Thoralf M. Sundt, MD,
and
Santi Trimarchi, MD, PhD

Semin Thorac Cardiovasc Surg 2017
Acute Retrograde Dissection - IRAD

Methods

42 active sites

St. Michael's Hospital
Toronto General Hospital
Minneapolis Heart Institute
University of Calgary
University of Minnesota
Mayo Clinic
University of Chicago
Advocate Health
University of Michigan
University of Washington
Henry Ford Health System
University of Colorado
Washington University
Cedars-Sinai Medical Center
University of Pittsburgh
Mission Health
Emory University
University of Pennsylvania
University of Virginia
Duke University
Dartmouth-Hitchcock
University of Maryland
Massachusetts General Hospital
University of Massachusetts
Brigham & Women's Hospital
North Shore – LIJ Health System

Tromsø University Hospital
University of Rostock
Hôpital Bichat
Robert-Bosch Krankenhaus
University of Vienna
The Technische Universität München
Medical University of Graz
University of Tokyo
IRCCS Policlinico San Donato
University Hospital S. Orsola
Monaldi Hospital
University of Salerno
Medanta the Medicity
Hadassah University Hospital
Hospital General Universitari Vall d’Hebron
Hospital Universitario “12 de Octubre”
Royal Prince Alfred Hospital
Acute Retrograde Dissection - IRAD

Results

- All patients with a known entry tear between 1996 – 2015: N = 1433
Acute Retrograde Dissection - IRAD

Results

• All patients with a known entry tear between 1996 – 2015: N = 1433

7% Retro-A AD
N=101
Acute Retrograde Dissection - IRAD

Results

- All patients with a known entry tear between 1996 – 2015: N = 1433

```
Retro- A AD
N=101
```

```
MED
N=44
```
```
SURG
N=33
```
```
ENDO
N=22
```
```
HYBRID
N=2
```
Acute Retrograde Dissection - IRAD

Results – demographics

<table>
<thead>
<tr>
<th>Table 1. Demographics and Patients History</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>N (%)</td>
</tr>
<tr>
<td>Demographics</td>
</tr>
<tr>
<td>Age, y</td>
</tr>
<tr>
<td>Female (%)</td>
</tr>
<tr>
<td>Marfan syndrome (%)</td>
</tr>
</tbody>
</table>
# Acute Retrograde Dissection - IRAD

## Results – demographics

<table>
<thead>
<tr>
<th>Table 1. Demographics and Patients History</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>N (%)</td>
</tr>
</tbody>
</table>

Demographics

- **Age, y**
  - MED: 67.8 ± 12.5
  - SURG: 59.3 ± 14.1
  - ENDO: 60.7 ± 15.3
  - P Value: 0.02
- **Female (%)**
  - MED: 21 (47.7)
  - SURG: 8 (24.1)
  - ENDO: 5 (22.7)
  - P Value: 0.04
- **Marfan syndrome (%)**
  - MED: 0 (0.0)
  - SURG: 2 (6.1)
  - ENDO: 1 (4.5)
  - P Value: 0.24
- **Hypertension (%)**
  - MED: 34 (79.1)
  - SURG: 28 (84.8)
  - ENDO: 20 (90.9)
  - P Value: 0.46
- **Atherosclerosis (%)**
  - MED: 14 (32.6)
  - SURG: 8 (24.2)
  - ENDO: 8 (36.4)
  - P Value: 0.59
- **Prior aortic aneurysm (%)**
  - MED: 3 (7.0)
  - SURG: 8 (24.2)
  - ENDO: 0 (0.0)
  - P Value: 0.01
- **Prior aortic dissection (%)**
  - MED: 0 (0.0)
  - SURG: 2 (6.1)
  - ENDO: 1 (4.5)
  - P Value: 0.23
- **Diabetes mellitus (%)**
  - MED: 3 (6.8)
  - SURG: 4 (12.1)
  - ENDO: 1 (4.5)
  - P Value: 0.64
- **History of cocaine abuse (%)**
  - MED: 1 (2.3)
  - SURG: 2 (6.1)
  - ENDO: 3 (13.6)
  - P Value: 0.16
- **Family history of aortic disease (%)**
  - MED: 1 (4.0)
  - SURG: 0 (0.0)
  - ENDO: 2 (14.3)
  - P Value: 0.24
- **Prior cardiac surgery (valve surgery or CABG, %)**
  - MED: 2 (4.5)
  - SURG: 0 (0.0)
  - ENDO: 2 (9.1)
  - P Value: 0.20

*Prior aortic dissection that was managed medically. CABG, coronary artery bypass graft; MED, medical management group; SURG, surgical management group; ENDO, endovascular management group.
Acute Retrograde Dissection - IRAD

**Results – demographics**

<table>
<thead>
<tr>
<th>History</th>
<th>MED</th>
<th>SURG</th>
<th>ENDO</th>
<th>( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior aortic aneurysm (%)</td>
<td>34 (79.1)</td>
<td>28 (84.8)</td>
<td>20 (90.9)</td>
<td>0.46</td>
</tr>
<tr>
<td>Prior aortic dissection* (%)</td>
<td>14 (32.6)</td>
<td>8 (24.2)</td>
<td>8 (36.4)</td>
<td>0.59</td>
</tr>
<tr>
<td>Diabetes mellitus (%)</td>
<td>3 (6.8)</td>
<td>4 (12.1)</td>
<td>1 (4.5)</td>
<td>0.64</td>
</tr>
<tr>
<td>History of cocaine abuse (%)</td>
<td>1 (2.3)</td>
<td>2 (6.1)</td>
<td>3 (13.6)</td>
<td>0.16</td>
</tr>
<tr>
<td>Family history of aortic disease (%)</td>
<td>1 (4.0)</td>
<td>0 (0.0)</td>
<td>2 (14.3)</td>
<td>0.24</td>
</tr>
<tr>
<td>Prior cardiac surgery (valve surgery or CABG, %)</td>
<td>2 (4.5)</td>
<td>0 (0.0)</td>
<td>2 (9.1)</td>
<td>0.20</td>
</tr>
</tbody>
</table>

SURG patients showed widest ascending aortic diameters, \( P=0.04 \)

*Prior aortic dissection that was managed medically. CABG, coronary artery bypass graft; MED, medical management group; SURG, surgical management group; ENDO, endovascular management group.
Acute Retrograde Dissection - IRAD

Results – clinical presentation

<table>
<thead>
<tr>
<th>Table 2. Clinical Presentation, Signs, and Diagnostic Imaging Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>Clinical presentation and signs</td>
</tr>
<tr>
<td>Abrupt onset of pain (%)</td>
</tr>
<tr>
<td>Back pain (%)</td>
</tr>
<tr>
<td>Major neurologic deficit (coma, CVA, and SCI, %)</td>
</tr>
<tr>
<td>Limb ischemia (%)</td>
</tr>
<tr>
<td>Arch vessel involvement (%)</td>
</tr>
<tr>
<td>Pericardial effusion (%)</td>
</tr>
<tr>
<td>Cardiac tamponade (%)</td>
</tr>
</tbody>
</table>
Acute Retrograde Dissection - IRAD

Results – false lumen patency

<table>
<thead>
<tr>
<th>Table 2. Clinical Presentation, Signs, and Diagnostic Imaging Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Clinical presentation and signs</td>
</tr>
<tr>
<td>False lumen patency</td>
</tr>
<tr>
<td>Patent (%)</td>
</tr>
<tr>
<td>Partial thrombosis (%)</td>
</tr>
<tr>
<td>Complete thrombosis (%)</td>
</tr>
</tbody>
</table>
Results – early outcomes

<table>
<thead>
<tr>
<th>Variable</th>
<th>MED</th>
<th>SURG</th>
<th>ENDO</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall mortality rate (%)</td>
<td>4 (9.1)</td>
<td>6 (18.2)</td>
<td>3 (13.6)</td>
<td>0.51</td>
</tr>
</tbody>
</table>

No significant difference in mortality
Results – early outcomes

<table>
<thead>
<tr>
<th>Table 3. In-hospital Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>Overall mortality rate (%)</td>
</tr>
<tr>
<td>Major neurologic deficit (coma, CVA, or SCI, %)</td>
</tr>
<tr>
<td>Myocardial ischemia (%)</td>
</tr>
<tr>
<td>Mesenteric ischemia/infarction (%)</td>
</tr>
<tr>
<td>Acute renal failure (%)</td>
</tr>
<tr>
<td>Extension of dissection (%)</td>
</tr>
</tbody>
</table>

No significant difference in mortality or complications between treatment groups
Acute Retrograde Dissection - IRAD

Results – management per zone

\[ P < 0.001 \]

SURG 71.8%
Results – management per zone

MED 72.7%
ENDO 86.4%

P<0.01
Acute Retrograde Dissection - IRAD

**Results** – mortality per zone

Mortality 18.6%  
N=43
Acute Retrograde Dissection - IRAD

Results – mortality per zone

Mortality 18.6%  
N=43

Mortality 8.6%  
N=58

P=0.14
**Results** – mortality per zone

- **Mortality 18.6%**  
  - N=43
- **Mortality 8.6%**  
  - N=58

A trend of favorable mortality in patients with retrograde extension till zone 1

P=0.14
Acute Retrograde Dissection - IRAD

Results – outcomes compared to type B and A

<table>
<thead>
<tr>
<th></th>
<th>Retro AD</th>
<th>Type B AD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early mortality</td>
<td>12.9%</td>
<td>11.5%</td>
<td>P=0.72</td>
</tr>
</tbody>
</table>
### Acute Retrograde Dissection - IRAD

**Results** – outcomes compared to type B and A

<table>
<thead>
<tr>
<th></th>
<th>Retro AD</th>
<th>Type B AD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early mortality</td>
<td>12.9%</td>
<td>11.5%</td>
<td>P=0.72</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Retro AD</th>
<th>Type A AD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early mortality</td>
<td>12.9%</td>
<td>20.0%</td>
<td>P=0.001</td>
</tr>
</tbody>
</table>
Acute Retrograde Dissection - IRAD

Results – outcomes compared to type B and A

<table>
<thead>
<tr>
<th></th>
<th>Retro AD</th>
<th>Type B AD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early mortality</td>
<td>12.9%</td>
<td>11.5%</td>
<td>P=0.72</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Retro AD</th>
<th>Type A AD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early mortality</td>
<td>12.9%</td>
<td>20.0%</td>
<td>P=0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Retro AD</th>
<th>Type B AD</th>
<th>Type A AD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major neurological</td>
<td>7.1%</td>
<td>8.4%</td>
<td>19.1%</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>complications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Retrograde AD showed lower mortality and complication rates than Type A
Impact of Retrograde Arch Extension in Acute Type B Aortic Dissection on Management and Outcomes

Foeke J. H. Nauta, MD, Jip L. Tolenaar, MD, PhD, Himanshu J. Patel, MD, Jehangir J. Appoo, MDCM, Thomas T. Tsai, MD, Nimesh D. Desai, MD, PhD, Daniel G. Montgomery, BS, Firas F. Mussa, MD, Gilbert R. Upchurch, MD, Rosella Fattori, MD, G. Chad Hughes, MD, Christoph A. Nienaber, MD, PhD, Eric M. Isselbacher, MD, Kim A. Eagle, MD, and Santi Trimarchi, MD, PhD, on behalf of all International Registry of Acute Aortic Dissection (IRAD) Investigators

© 2016 by The Society of Thoracic Surgeons
Acute Retrograde Dissection - IRAD

Impact of Retrograde Arch Extension in Acute Type B Aortic Dissection on Management and Outcomes

Foeke J. H. Nauta, MD, Jip L. Tolenaar, MD, PhD, Himanshu J. Patel, MD, Jehangir J. Appoo, MDCM, Thomas T. Tsai, MD, Nimesh D. Desai, MD, PhD, Daniel G. Montgomery, BS, Firas F. Mussa, MD, Gilbert R. Upchurch, MD, Rosella Fattori, MD, G. Chad Hughes, MD, Christoph A. Nienaber, MD, PhD, Eric M. Isselbacher, MD, Kim A. Eagle, MD, and Santi Trimarchi, MD, PhD, on behalf of all International Registry of Acute Aortic Dissection (IRAD) Investigators


Type B: N = 337
Retrograde arch extension: N = 67
### Table 3. In-Hospital Management and Outcomes

<table>
<thead>
<tr>
<th>Variable</th>
<th>Patients Without RAE</th>
<th>Patients With RAE</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 337 (83.5%)</td>
<td>n = 67 (16.5%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No. (%)</td>
<td>No. (%)</td>
<td></td>
</tr>
<tr>
<td>Definitive management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>191 (56.5)</td>
<td>36 (53.7)</td>
<td>0.68</td>
</tr>
<tr>
<td>Surgery</td>
<td>32 (9.5)</td>
<td>8 (11.9)</td>
<td>0.54</td>
</tr>
<tr>
<td>Endovascular</td>
<td>105 (31.1)</td>
<td>22 (32.8)</td>
<td>0.78</td>
</tr>
<tr>
<td>Hybrid</td>
<td>10 (3.0)</td>
<td>1 (1.5)</td>
<td>0.70</td>
</tr>
</tbody>
</table>

No difference in management

---

Type B:  
N = 337

Retrograde arch extension:  
N = 67
**Acute Retrograde Dissection - IRAD**

**Table 3. In-Hospital Management and Outcomes**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Patients Without RAE</th>
<th>Patients With RAE</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 337 (83.5%)</td>
<td>n = 67 (16.5%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No. (%)</td>
<td>No. (%)</td>
<td></td>
</tr>
<tr>
<td>Definitive management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>191 (56.5)</td>
<td>36 (53.7)</td>
<td>0.68</td>
</tr>
<tr>
<td>Surgery</td>
<td>32 (9.5)</td>
<td>8 (11.9)</td>
<td>0.54</td>
</tr>
<tr>
<td><strong>Endovascular</strong></td>
<td>105 (31.1)</td>
<td>22 (32.8)</td>
<td>0.78</td>
</tr>
<tr>
<td>Hybrid</td>
<td>10 (3.0)</td>
<td>1 (1.5)</td>
<td>0.70</td>
</tr>
</tbody>
</table>

No difference in management: 1/3 endovascular approach

Type B: N = 337

Retrograde arch extension: N = 67
Acute Retrograde Dissection - IRAD

Table 3. In-Hospital Management and Outcomes

<table>
<thead>
<tr>
<th>Variable</th>
<th>Patients Without RAE</th>
<th>Patients With RAE</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 337 (83.5%)</td>
<td>n = 67 (16.5%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No. (%)</td>
<td>No. (%)</td>
<td></td>
</tr>
<tr>
<td>Mortality</td>
<td>36 (10.7)</td>
<td>7 (10.4)</td>
<td>0.96</td>
</tr>
</tbody>
</table>

No difference in mortality: ~ 10%

Type B: N = 337

Retrograde arch extension: N = 67
Conclusions

- Retrograde AD is not rare in dissection patients: 7%
Acute Retrograde Dissection - IRAD

Conclusions

• Retrograde AD is not rare in dissection patients: 7%

• Retrograde AD limited to the arch tends to do better than extension into the ascending. We suggest to define them as: Retro-Arch and Retro-Asc dissections
Conclusions

- Retrograde AD is not rare in dissection patients: 7%

- Retrograde AD limited to the arch tends to do better than extension into the ascending. We suggest to define them as: Retro-Arch and Retro-Asc dissections

- A subset of retrograde AD patients may be managed less invasively, particularly those with:
  - extension limited to the arch
  - no tamponade
  - no ascending aneurysm or aortic regurgitation
  - thrombosed false lumen
Acute Retrograde Dissection - IRAD

TEVAR case

Tear in descending, thrombosis in ascending
Acute Retrograde Dissection - IRAD

TEVAR case

Tear in descending, thrombosis in ascending

2 mo f/u: thrombosis in descending
Acute Retrograde Dissection - IRAD

Thank you
## Results – outcomes compared to type B and A AD

<table>
<thead>
<tr>
<th>Variable</th>
<th>Retro AD</th>
<th>Type A AD</th>
<th>Type B AD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>101 (7.0)</td>
<td>977 (68.2)</td>
<td>355 (24.8)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, y</td>
<td>63.2 ± 14.0</td>
<td>60.5 ± 14.1</td>
<td>62.0 ± 14.0</td>
<td>.07</td>
</tr>
<tr>
<td>Female (%)</td>
<td>34 (33.7)</td>
<td>300 (30.7)</td>
<td>119 (33.5)</td>
<td>.56</td>
</tr>
<tr>
<td>Marfan syndrome (%)</td>
<td>3 (3.0)</td>
<td>38 (4.0)</td>
<td>13 (3.7)</td>
<td>.97</td>
</tr>
<tr>
<td>Hypertension (%)</td>
<td>84 (84.0)</td>
<td>692 (72.2)</td>
<td>286 (80.6)</td>
<td>.001</td>
</tr>
<tr>
<td>History of cocaine abuse (%)</td>
<td>7 (6.9)</td>
<td>9 (1.0)</td>
<td>6 (1.8)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>
Acute Retrograde Dissection - IRAD

Results – predictors of death

Predictors of In-hospital Mortality

After adjustment for age, sex, and comorbid conditions, neither acute retrograde AD confined to the arch or extending into the ascending aorta were predictors of in-hospital death in patients with acute type B dissection (Hosmer-Lemeshow $P = 0.998$ and C-statistic = 0.643). Hypotension or shock at presentation (OR = 6.2; 95% CI: 2.4-15.9; $P < 0.001$), and murmur of aortic insufficiency at presentation (OR = 2.7; 95% CI: 1.1-6.3; $P = 0.03$), were both independent predictors of in-hospital death.
**Results** – outcomes compared to type B and A AD presentation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Retro AD</th>
<th>Type A AD</th>
<th>Type B AD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major neurologic deficit</td>
<td>5 (5.2)</td>
<td>73 (8.3)</td>
<td>13 (4.0)</td>
<td>.02</td>
</tr>
<tr>
<td>(coma, CVA, SCI, %)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limb ischemia (%)</td>
<td>8 (7.9)</td>
<td>98 (11.4)</td>
<td>25 (7.6)</td>
<td>.11</td>
</tr>
<tr>
<td>Syncope (%)</td>
<td>4 (4.2)</td>
<td>148 (16.5)</td>
<td>9 (2.6)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Shock (%)</td>
<td>4 (4.2)</td>
<td>124 (13.7)</td>
<td>5 (1.5)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>
Retrograde Extension of Type B Dissection in Arch

No difference in 5-year survival

![Graph showing cumulative survival with and without RAE](image)

Log rank $p = 0.59$
Retrograde Extension of Type B Dissection in Arch

No difference in 5-year survival

Table 4. Independent Predictors of Death at 5 Years in Patients With Type B Dissection: Effect of Multivariate Adjustment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hazard Ratio</th>
<th>95% CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute type B dissection with RAE</td>
<td>1.1</td>
<td>0.5–2.3</td>
<td>0.85</td>
</tr>
<tr>
<td>Age ≥70 years</td>
<td>2.6</td>
<td>1.4–4.7</td>
<td>0.002</td>
</tr>
<tr>
<td>Coma</td>
<td>3.8</td>
<td>1.6–9.0</td>
<td>0.003</td>
</tr>
<tr>
<td>Aortic rupture</td>
<td>3.4</td>
<td>1.8–6.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mesenteric ischemia</td>
<td>3.4</td>
<td>1.3–8.7</td>
<td>0.01</td>
</tr>
<tr>
<td>Acute renal failure</td>
<td>2.2</td>
<td>1.1–4.1</td>
<td>0.02</td>
</tr>
<tr>
<td>Shock</td>
<td>9.8</td>
<td>2.6–36.3</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Impact of Retrograde Arch Extension in Acute Type B Aortic Dissection on Management and Outcomes

Foeke J. H., Nauta, MD, Jip L. Toonen, MD, PhD, Himanshu J. Patel, MD, Johanne J. Appou, MD, CM, Thomas T. Tsai, MD, Milind D. Desai, MD, PhD, Daniel G. Montgomery, BS, Firas F. Musa, MD, Gilbert R. Echendu, MD, Rosella Fattori, MD, G. Chad Hughes, MD, Christoph A. Niemlabe, MD, PhD, Eric M. Jessen, MD, Kim A. Eagle, MD, and Santj Trimachi, MD, PhD, on behalf of all International Registry of Acute Aortic Dissection (IRAD) Investigators

No difference in 5-year survival

**Table 4. Independent Predictors of Death at 5 Years in Patients With Type B Dissection: Effect of Multivariate Adjustment**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hazard Ratio</th>
<th>95% CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute type B dissection with RAE</td>
<td>1.1</td>
<td>0.5–2.3</td>
<td>0.85</td>
</tr>
<tr>
<td>Age ≥70 years</td>
<td>2.6</td>
<td>1.4–4.7</td>
<td>0.002</td>
</tr>
<tr>
<td>Coma</td>
<td>3.8</td>
<td>1.6–9.0</td>
<td>0.003</td>
</tr>
<tr>
<td>Aortic rupture</td>
<td>3.4</td>
<td>1.8–6.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mesenteric ischemia</td>
<td>3.4</td>
<td>1.3–8.7</td>
<td>0.01</td>
</tr>
<tr>
<td>Acute renal failure</td>
<td>2.2</td>
<td>1.1–4.1</td>
<td>0.02</td>
</tr>
<tr>
<td>Shock</td>
<td>9.8</td>
<td>2.6–36.3</td>
<td>0.001</td>
</tr>
</tbody>
</table>
Acute Retrograde Type A Dissection

**Background**

Prognosis of Retrograde Dissection From the Descending to the Ascending Aorta

Shuichiro Kaji, MD; Takashi Akasaka, MD; Minako Katayama, MD; Atsushi Yamamuro, MD; Kenji Yamabe, MD; Koichi Tamita, MD; Maki Akiyama, MD; Nozomi Watanabe, MD; Kazuo Tanemoto, MD; Shigefumi Morioka, MD; Kiyoshi Yoshida, MD

Circulation 2003

- Retrograde AD with thrombosed false lumen
- Retrograde AD with non-thrombosed false lumen
- Type A AD

N = 27 patients

P=0.024
Acute Retrograde Type A Dissection

Background

Prognosis of Retrograde Dissection From the Descending to the Ascending Aorta

Shuichiro Kaji, MD; Takashi Akasaka, MD; Minako Katayama, MD; Atsushi Yamamuro, MD; Kenji Yamabe, MD; Koichi Tamita, MD; Maki Akiyama, MD; Nozomi Watanabe, MD; Kazuo Tanemoto, MD; Shigefumi Morioka, MD; Kiyoshi Yoshida, MD

Circulation 2003

→ Retrograde AD with thrombosed false lumen → Medically
→ Retrograde AD with non-thrombosed false lumen → Surgery
→ Type A AD

P=0.024

N = 27 patients
# Acute Retrograde Dissection - IRAD

## Results – management per zone

<table>
<thead>
<tr>
<th>Variable</th>
<th>Zone 0</th>
<th>Zone 1-2</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>43</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical (%)</td>
<td>12 (27.3)</td>
<td>32 (72.7)</td>
<td>0.006</td>
</tr>
<tr>
<td>Surgery (%)</td>
<td>27 (81.8)</td>
<td>6 (18.2)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Endovascular (%)</td>
<td>3 (13.6)</td>
<td>19 (86.4)</td>
<td>0.003</td>
</tr>
<tr>
<td>Hybrid (%)</td>
<td>1 (2.4)</td>
<td>1 (1.8)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

**SURG 71.8%**
Results – management per zone

Table 4. Comparison Between Retrograde AD into Zone 0 vs Zone 1-2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Zone 0</th>
<th>Zone 1-2</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>43</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical (%)</td>
<td>12 (27.3)</td>
<td>32 (72.7)</td>
<td>0.006</td>
</tr>
<tr>
<td>Surgery (%)</td>
<td>27 (81.8)</td>
<td>6 (18.2)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Endovascular (%)</td>
<td>3 (13.6)</td>
<td>19 (86.4)</td>
<td>0.003</td>
</tr>
<tr>
<td>Hybrid (%)</td>
<td>1 (2.4)</td>
<td>1 (1.8)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

MED 72.7%
ENDO 86.4%