The Aortic Valve and The Aortic Root in Type A Aortic Dissections

Optimal Surgical Technique
Type A aortic dissection
Objectives of surgical repair

- Replace the segment of ascending aorta where the **intimal tear** occurred
- Treat **aortic regurgitation**
- Eliminate any **antegrade flow** in the false lumen

- Keep the patient **ALIVE**
Type A aortic dissection
Surgical Technique

- Emergency surgery
- « Open » distal anastomosis
  - Avoid aortic Xclamp
  - Inspect the Transverse Ao Arch (30% intimal tear)
- Antegrade flow
- AORTIC ROOT & VALVE?

..... Canulation of the Axillary Artery
Type A dissection
Disease of the aortic valve

- « de novo » aortic regurgitation due to detachment of one or more commissures and prolapse of the valve

- Preexisting disease of the aortic valve and/or root prior to the dissection
How was the aortic valve PRIOR TO dissection?

- Past cardiac history
- Prior echo studies
- Preoperative echo
- Operative findings
<table>
<thead>
<tr>
<th><strong>Aortic Valve</strong></th>
<th><strong>Aortic Root</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Normal</td>
<td>- Normal</td>
</tr>
<tr>
<td>- Bicuspid</td>
<td>- Dilated</td>
</tr>
<tr>
<td>- Calcified</td>
<td></td>
</tr>
<tr>
<td>- Aortic</td>
<td></td>
</tr>
<tr>
<td>- Regurgitation</td>
<td></td>
</tr>
</tbody>
</table>
Bicuspid aortic Valve
Normal aortic Root

Commissure

Cusp
DILATED Aortic Root

Aortic Regurgitation
commissures

Normal Aortic Valve
Aortic Regurgitation In Aortic Dissection

- False lumen
- Intimal flap

The commissure is detached and the cusp prolapse in the LV
Surgical Techniques
Aortic Root & Aortic Valve

- Replace the ascending aorta (GRAFT)
- Nothing on the valve and root
- Resuspend the valve
- Replace the valve
- Replace the valve and root (Bental)
- Replace the root (valve sparing)
Surgical Techniques
Aortic Root & Aortic Valve

- Replace the ascending aorta
- Nothing on the valve and root
- Resuspend the valve
- Replace the valve
- Replace the valve and root (Bentall)
- Replace the root (valve sparing)
Reconstruction of the distal aortic segment

(Obliterate the false lumen)

(Resection of the segment that carries the intimal tear)
Replacement of the ascending aorta (supra coronary)

Nothing on the valve and the root
Surgical Techniques
Aortic Root & Aortic Valve

- Replace the ascending aorta
- Nothing on the valve and root
- Resuspend the valve and reconstruct the sinus
- Replace the valve
- Replace the valve and root (Bentall)
- Replace the root (valve sparing)
Dissection of the Aortic Root
Non-coronary sinus

The intimal flap
False lumen
The commissure is detached
Dissection of the Aortic Root
Non-coronary sinus

Intimal flap
Detached commissure
False lumen
Commissure reattached
Reconstruction of the aortic root

Occlusion of the false lumen

Resuspension of the comissures
Reconstruction of the aortic root
Surgical Techniques
Aortic Root & Aortic Valve

- Replace the ascending aorta
- Nothing on the valve and root
- Resuspend the valve
- Replace the valve
- Replace the valve and root (Bental)
- Replace the root (valve sparing)
Surgical Techniques
Aortic Root & Aortic Valve

- Replace the ascending aorta
- Nothing on the valve and root
- Resuspend the valve
- Replace the valve
- Replace the valve and root (Bental)
- Replace the root (valve sparing)
Root Replacement (Bental)
Surgical Techniques
Aortic Root & Aortic Valve

- Replace the ascending aorta
- Nothing on the valve and root
- Resuspend the valve
- Replace the valve
- Replace the valve and root (Bental)
- Replace the root (valve sparing)
Valve sparing operation remodelling (Yacoub)
Valve sparing operation reimplantation (David)
Surgery for Type A dissections

Operative Mortality
10 – 26 %
Long-term effectiveness

SURGERY FOR ACQUIRED CARDIOVASCULAR DISEASE

LONG-TERM EFFECTIVENESS OF OPERATIONS FOR ASCENDING AORTIC DISSECTIONS

Joseph F. Sabik, MD
Bruce W. Lytle, MD
Eugene H. Blackstone, MD
Patrick M. McCarthy, MD
Floyd D. Loop, MD
Delos M. Cosgrove, MD

Objective: To evaluate long-term effectiveness of a strategy for aortic root and distal aorta according to the pathology in ascending aortic dissection.

Methods: From 1978 to 1995, 208 patients underwent operations (n = 135) and chronic (n = 73) ascending aortic dissection. Strategies included valve resuspension with supravalvular aortic resection and reimplantation.}

Long-term study (Cleveland Clinic)

- n = 208 patients
- 1978-1995
- Operative mortality
- Long-term survival
- Impact of different surgical techniques

Actuarial Survival

Actuarial Survival
Bental vs Resuspension vs AVR

Resuspension + graft (n=135)

AVR + graft (n=26)

Composite graft (n = 47)

Freedom from Reoperations
Composite graft vs Resuspension

![Graph showing Freedom from Reoperation over Years After Surgery with comparison between No and Yes options.]  
- Preservation of native aortic valve
- Proximal Aortic Problems

**P = .8**

*Sabik et al. JTCS 2002*
Durability of the native aortic valve after resuspension

Durability of Aortic Valve Preservation and Root Reconstruction in Acute Type A Aortic Dissection

Filip P. Casselman, MD, M. Erwin S. H. Tan, MD, Freddy E. E. Vermeulen, MD, Johannes C. Kelder, MD, Wim J. Morshuis, MD, PhD, and Marc A. A. M. Schepens, MD, PhD

Departments of Cardio-Thoracic Surgery and Cardiological Epidemiology, St. Antoniusziekenhuis, Nieuwegein, The Netherlands

Casselman et al Ann Thorac Surg 2000
Durability of the native aortic valve after resuspension

- n = 246 patients (1976-1999)
- Operative mortality
- Long-term survival
- Impact of different surgical techniques
- Fate of the root & valve

Casselman et al Ann Thorac Surg 2000
Actuarial Survival

Casselman et al Ann Thorac Surg 2000
Actuarial Freedom from Reoperation

Casselman et al Ann Thorac Surg 2000
Echocardiographic follow-up of the aortic root after conservative surgery for Type A dissections

<table>
<thead>
<tr>
<th>Diametre (mm)</th>
<th>N pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 35</td>
<td>37</td>
</tr>
<tr>
<td>36-40</td>
<td>9</td>
</tr>
<tr>
<td>41-45</td>
<td>7</td>
</tr>
<tr>
<td>46-50</td>
<td>1</td>
</tr>
<tr>
<td>&gt;50</td>
<td>2</td>
</tr>
</tbody>
</table>

Casselman et al Ann Thorac Surg 2000
Aortic valve preservation in acute type a dissection: Is it sound?

Ludwig K. von Segesser, MD (by invitation) [MEDLINE LOOKUP]
Enrico Lorenzetti, (by invitation) [MEDLINE LOOKUP]
Mario Lachat, MD (by invitation) [MEDLINE LOOKUP]
Urs Niederhäuser, MD (by invitation) [MEDLINE LOOKUP]
Mariette Schönbeck, MD (by invitation) [MEDLINE LOOKUP]
Paul R. Vogt, MD (by invitation) [MEDLINE LOOKUP]
Marko I. Turina, MD [MEDLINE LOOKUP]

Zurich, Switzerland
Long-term results

- n = 200 patients
- Operative mortality
- Long-term survival
- Impact of different surgical techniques

Actuarial Survival
Bental vs Graft & Resuspension

Freedom from Reoperation
Bental vs Graft & Resuspension

Advances in the Treatment of Acute Type A Dissection: An Integrated Approach

Joseph E. Bavaria, MD, Derek R. Brinster, MD, Robert C. Gorman, MD, Y. Joseph Woo, MD, Thomas Gleason, MD, and Alberto Pochettino, MD

Division of Cardiothoracic Surgery, University of Pennsylvania Medical Center, Philadelphia, Pennsylvania
Analysis of the Results of the « integrated approach »

- n = 163 patients
- 1994-2002
- Operative mortality
- Long-term survival
- Impact of different surgical techniques
When to replace the Aortic Valve?

- Conclusion
  - Marfan
  - Dilation of the Valsalva sinuses
  - Bicuspid or calcified
Composite aortic root replacement in acute type A dissection: time to rethink the indications?  

James C. Halstead\textsuperscript{a,}* , David Spielvogel\textsuperscript{a}, Dieter M. Meier\textsuperscript{a}, Sindy Rinke\textsuperscript{a}, Carol Bodian\textsuperscript{b}, Ramin Malekan\textsuperscript{a}, M. Arisan Ergin\textsuperscript{a}, Randall B. Griep\textsuperscript{a}  

\textsuperscript{a}Department of Cardiothoracic Surgery, Mount Sinai School of Medicine, One Gustave L. Levy Place, New York, NY 10029, USA  
\textsuperscript{b}Department of Biomathematics, Mount Sinai School of Medicine, New York, NY 10029, USA  

Received 21 September 2004; received in revised form 2 December 2004; accepted 20 December 2004
Patients & Methods

- 162 patients
- Group A (n=89, 54.9%) had interposition graft replacement of the ascending aorta with resuspension, repair or separate replacement of the aortic valve
- Group B (n=73, 45.1%) underwent composite graft replacement of the aortic root and ascending aorta.
Evolving Strategies for Treatment of Acute Aortic Dissection Type A

Klaus Kallenbach, MD; Timm Oelze, MS; Rolf Salcher, MS; Christian Hagl, MD; Matthias Karck, MD, PhD; Rainer G. Leyh, MD, PhD; Axel Haverich, MD, PhD

(Circulation. 2004;110[suppl II]:II-243–II-249.)
Patients & Methods

- 1990 - 2003
- 257 pts. were divided into 3 subgroups by surgical treatment:
  - 145 patients operated with SCR of the ascending aorta,
  - 64 patients were treated with a composite graft (comp),
  - 48 patients the native aortic valve was reimplanted into a Dacron tube replacing the ascending aorta (AVS)
Early mortality
Cumulative freedom from death

Patients at risk

<table>
<thead>
<tr>
<th>Patients at risk</th>
<th>AVS</th>
<th>Comp</th>
<th>SCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>25</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
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Years after operation

actuarial survival at

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<tr>
<th>Years</th>
<th>AVS</th>
<th>Comp</th>
<th>SCR</th>
</tr>
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<tbody>
<tr>
<td>3 years</td>
<td>89 ± 5 %</td>
<td>90 ± 5 %</td>
<td>83 ± 4 %</td>
</tr>
<tr>
<td>5 years</td>
<td>89 ± 5 %</td>
<td>85 ± 6 %</td>
<td>80 ± 4 %</td>
</tr>
<tr>
<td>10 years</td>
<td>-</td>
<td>81 ± 7 %</td>
<td>73 ± 5 %</td>
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log rank = 0.61
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Type A Dissection: Disease of the aortic root

Root Normal
Valve Normal

Valve resuspension

Graft replacement of the ascending aorta
Type A Dissection: Disease of the aortic root

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Type A Dissection: Disease of the aortic root

- Valve replacement
- Root Normal Valve Abnormal
- Graft replacement of the ascending aorta
Type A Dissection: Disease of the aortic root

- Root Normal
  - Valve Normal
- Root Abnormal
  - Valve Normal
- Root Normal
  - Valve Abnormal
- Root Abnormal
  - Valve Abnormal
Type A Dissection: Disease of the aortic root

Root replacement
Composite Graft
Bental

Root Abnormal
Valve Abnormal
Type A Dissection: Disease of the aortic root

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Type A Dissection: Disease of the aortic root

Root Abnormal
Valve Normal

Total Replacement of the aorta

Valve sparing
Conclusion

- The surgical technique should be **adapted** to operative findings
- Graft replacement of the ascending aorta and valve **resuspension** offer excellent results
- More extensive operations are associated to a **higher operative mortality. BUT .....**
Type A Dissection

- 1993 – 2005
- N = 44
- M/F 32/12
- Age = 61 (39-84)
- Marfan = 0
Surgical Technique

- Arterial canulation
  - < June 1994 femoral artery 8/44
  - 1994 – 2002 axillary artery 36/44

- Open distal anastomosis 42/44
  - Hemiarch 39/42
  - Total arch 3/42

- Aortic root
  - Ao valve resuspension 41/44
  - Ao valve replacement 2/44
  - Composite graft Bental 1/44
Cerebral Protection

- DHCA \( t < 16 ^\circ C \)  
  41/42
- Retrograde perfusion (1994)  
  8/42
- Antegrade perfusion  
  34/42

- Circulatory arrest time
  - < 30 minutes (19-30)  
    30/42
  - 30 – 45 minutes  
    7/42
  - > 45 minutes  
    4/42
  - > 60 minutes  
    1/42
Results

- 30-day mortality: 4/44 (9%)
  - Causes of death:
    - Neurological: 1/4
    - Respiratory: 1/4
    - MOF: 2/4

- Morbidity:
  - Neurological: 4 (3 transient)
  - Renal: 1 (dialysis 1mo)
  - Respiratory: 6
Echo follow-up (1-5 years)

- **Aortic valve**
  - AR = 0 21/29
  - AR = 1+ 7/29
  - AR = 2+ 1/29

- **Diameter of the aortic root**
  - < 40 mm 27/29
  - 43,45 mm 2/29
Conclusion

- **Open** distal anastomosis
- **Adapted** surgical technique to operative findings at the level of the aortic root
- Graft replacement of the ascending aorta and valve resuspension offer excellent results