Extra Anatomic Bypass For Congenital And Acquired Disorders Of The Thoracic Aorta

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I have the following potential conflicts of interest to report:

- Receipt of grants/research support
- Receipt of honoraria and travel support
- Participation in a company sponsored speakers’ bureau
- Employment in industry
- Shareholder in a healthcare company
- Owner of a healthcare company

I do not have any potential conflict of interest
Objective:

✓ To draw the attention of surgeons to Ascending-to-Descending aortic bypass as a method of adequate restoration of hemodynamics in patients with Thoracic Aortic Disorders.

✓ Popularization of this method, which is more safe and less traumatic as compared to the existing types of direct and bypass surgery for repeated reconstruction of thoracic aorta.
Proportion of surgery for Congenital Aortic Diseases (CongenAoD)

<table>
<thead>
<tr>
<th>Year</th>
<th>Other Ao Surg</th>
<th>Cong Ao D</th>
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<tbody>
<tr>
<td>2014</td>
<td>436</td>
<td>57</td>
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<tr>
<td>2013</td>
<td>365</td>
<td>41</td>
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<tr>
<td>2012</td>
<td>341</td>
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<td>2010</td>
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<td>2005</td>
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<td>2004</td>
<td>127</td>
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<td>2001</td>
<td>296</td>
<td>71</td>
</tr>
<tr>
<td>2000</td>
<td>252</td>
<td>75</td>
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10-40%
DIRECT ANATOMIC REPAIR FOR COMPLEX (RE-) COARCTATION AND HYPOPLASTIC AORTIC ARCH (...more than 200 cases)
Indications for Extra-Anatomic Aortic Bypass Grafting

- Complex coarctation or recoarctation, for which extra-anatomic bypass grafting was chosen because of the anticipated difficulties with direct anatomic repair (87 patients)
- Coarctation or recoarctation and associated cardiac problems that required surgical repair (10 patients):
  - Coronary artery disease (n=1)
  - Aortic and mitral valve regurgitation (n=9)
- Complex coarctation with congenital anomalies of aortic arch (12 patients)
- Infected endograft of descending thoracic aorta (5 patients)
The surgical approach (patient G., 16 y.o.)

- Front view
- Skin incision
- Descending Aorta
Distal and proximal anastomosis

- Distal anastomosis
- Proximal anastomosis
- Pericardial cavity drainage
We reviewed the clinical, surgical, and follow-up records of 114 patients who underwent Ascending-to-Descending Aortic Bypass.

- The ages ranged from 10 to 51 (mean 29.34±13.13) years
- Males:Females = 69:45 (1.5:1)
- Bypass graft sizes 14-20 mm (in 80% cases – 18 mm)
Indications

1. Complex Coarctation or Recoarctation (anticipated difficulties with direct anatomic repair (87 patients):
Complex coarctation was defined as a long coarctation or recoarctation segment, concomitant hypoplasia of the aortic arch, or a pseudoaneurysm at a previous aortic isthmus suture line (87 patients)
Results in 87 patients with Complex Co or ReCo

<table>
<thead>
<tr>
<th>Blood pressure</th>
<th>Preoperative</th>
<th>Postoperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP sist.</td>
<td>182±24 mm Hg</td>
<td>131±21 mm Hg</td>
</tr>
<tr>
<td>AP diast.</td>
<td>108±33 mm Hg</td>
<td>86±14 mm Hg</td>
</tr>
<tr>
<td>AP gradient</td>
<td>54±12 mm Hg</td>
<td>3±2 mm Hg</td>
</tr>
</tbody>
</table>

- There were no instances of postoperative paraplegia
- Early postoperative morbidity included reexploration for lymphorrhea in 8 patients (in 3-5 days after operation)
- The mean hospital stay was 11±4 (range 8 to 18) days.

The mortality rate was 1.1% (1/87)
Indications

1. Complex Coarctation or Recoarctation (87 patients)
2. Infectious Aneurysms of Aortic Arch and Descending Thoracic Aorta (5 patients)
Patients
(infectious aneurysms)

Patients with mycotic aneurysms and extra-anatomic bypass from the ascending to the descending thoracic aorta.

<table>
<thead>
<tr>
<th></th>
<th>Sex</th>
<th>Age</th>
<th>Symptomatic</th>
<th>Culture</th>
<th>Death</th>
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<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>35</td>
<td>Yes</td>
<td>Staph.</td>
<td>in 11 day</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>42</td>
<td>Yes</td>
<td>Strep.</td>
<td>No</td>
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<tr>
<td>3</td>
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<td>Yes</td>
<td>Staph.</td>
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<tr>
<td>4</td>
<td>M</td>
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<td>Staph.</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>42</td>
<td>Yes</td>
<td>Strep.</td>
<td>In 1 month</td>
</tr>
</tbody>
</table>
Incidence of mycotic aneurism of Thoracic aorta

- 5 Patients
  - 3 Patients
    - Aorto-bronchial fistula in 2 cases
  - 1 Patient
    - Idiopathic mycotic aortic arch aneurysm
Ascending-to-descending aortic bypass via right thoracotomy in patient with infected aortic endograft
Ascending-to-descending aortic bypass via right thoracotomy in patient with infected aortic endograft
Aorto-bronchial fistula  (in 2 cases)
Idiopathic mycotic aortic arch aneurysm
Outcomes
(infectious aneurysms)

- In hosp mortality - 20% (1 of 5)
- 2 month mortality – 25% (1 of 4)
- Known reinfection – 0

- In 3 patients during the follow up period from 6 months to 5 years good results were obtained.
Indications

1. Complex Coarctation or Recoarctation (87 patients)
2. Infectious Aneurysms of Aortic Arch and Descending Thoracic Aorta (5 patients)
3. Coarctation or recoarctation and associated cardiac problems that required surgical repair (10 patients):
**SIMULTANEOUS INTRACARDIAC REPAIR (10 patients)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>№ of Patients</th>
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<tr>
<td>Mean age (range)</td>
<td>44 (28-53)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>4</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
</tr>
<tr>
<td>Hypertension</td>
<td>10</td>
</tr>
<tr>
<td>CAD</td>
<td>1</td>
</tr>
<tr>
<td>NYHA class</td>
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<tr>
<td>I</td>
<td>-</td>
</tr>
<tr>
<td>II</td>
<td>3</td>
</tr>
<tr>
<td>III</td>
<td>5</td>
</tr>
<tr>
<td>IV</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Concomitant Procedure</th>
<th>№ of Patients</th>
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</thead>
<tbody>
<tr>
<td>CoAo+CAD</td>
<td>CABG</td>
<td>1</td>
</tr>
<tr>
<td>ReCoAo + AoStenosis</td>
<td>AVR</td>
<td>2</td>
</tr>
<tr>
<td>ReCoAo + AoRegurg</td>
<td>AVR</td>
<td>1</td>
</tr>
<tr>
<td>CoAo + AoStenosis + Mitr Regurg</td>
<td>AVR, MVR</td>
<td>1</td>
</tr>
<tr>
<td>(Re)CoAo + Asc Aneur + Ao Regurg</td>
<td>Modified Bentall</td>
<td>5</td>
</tr>
</tbody>
</table>
Operative Technique

1. Thoracotomy in the 5th right intercostal space
2. The end-to-side Dacron graft-to-aorta anastomosis

3. Median sternotomy
4. CPB technique
Operative Technique

5. Concomitant intracardiac procedures

- Bentall Procedure
- Aortic Valve Replacement
- Mitral Valve Replacement

6. Proximal anastomosis with ascending aorta
Results in 10 patients with associated cardiac pathology

• No early deaths occurred
• Syst. BP decreased after surgery (168 mm Hg Vs 125 mm Hg).
• Overall, left ventricular ejection fraction did not change after surgery but did improve substantially in 1 patient who had severe left ventricular dysfunction before surgery (from 41% to 59%).
• Early postoperative morbidity:
  ✓ reexploration for control of bleeding – in 1 patient
  ✓ transient atrial fibrillation in 2 patients,
• No instances of postoperative paraplegia
• No permanent abnormalities in the neurological examination
• The mean hospital stay was 10 (range 7 to 17) days.
1. Complex Coarctation or Recoarctation (87 patients)
2. Infectious Aneurysms of Aortic Arch and Descending Thoracic Aorta (5 patients)
3. Coarctation or recoarctation and associated cardiac problems that required repair (10 patients)
4. Complex coarctation with congenital anomalies of aortic arch:
   • Aortic Arch Anomalies (10 patients):
This procedure allowed to obviate coarctation, hypertensive and compressive syndromes.
8 month after surgery

front view

back view
Indications

1. Complex Coarctation or Recoarctation (87 patients)
2. Infectious Aneurysms of Aortic Arch and Descending Thoracic Aorta (5 patients)
3. Coarctation or recoarctation and associated cardiac problems that required repair (16 patients)
4. Complex coarctation with congenital anomalies of aortic arch:
   • Aortic Arch Anomalies (10 patients)
   • Interrupted Aortic Arch (2 patients):
Удвоение левой ОСА
Правая ОСА
НСА
ВС
А
3 years after surgery

front view

back view

right side view
Immediate Results in 114 patients

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</tbody>
</table>

• There were no instances of postoperative paraplegia

• Early postoperative morbidity:
  ✓ reexploration for lymphorrhea in 5 patients
  ✓ reexploration for control of bleeding – in 1 patient

• The mean hospital stay was 14±4 (range 8 to 22) days.

The mortality rate was 0.8% (1/114)
Late Results

Follow-up extended to a maximum of 15 years (mean 79±54 months)

- No late graft-related complications or reoperations occurred
- Echocardiography demonstrated patency of all grafts
- In most cases patients are normotensive
- With no measurable arm-leg gradient
Conclusions:

• *The Ascending-to-Descending Aortic Bypass Graft* through a right thoracotomy approach appears to be effective in relieving aortic gradient and improving systemic blood pressure.

• It represents a safer solution to complex coarctation and permits a single-stage approach to coarctation associated with other cardiac pathology that requires