Totally thoracoscopic repair of ventricular septal defect without robotic assistance: A single-center experience

Zengshan Ma

❖ Det.Cardiac Surgery, Qilu Hospital of Shandong University
❖ Det.Cardiac Surgery, Liaocheng Hospital

No disclosures
Conventional Cardiac Surgery

Operation is Golden Standard----The effect of operative therapy with Congenital and valvular heart diseases

Intervention Technique

Mini-incision
Thoracoscopic Technique

Thoracos -copes

Robotics
## Comparison of Thoracoscope and Robotics

<table>
<thead>
<tr>
<th>Robotics</th>
<th>Thoracoscope</th>
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<tbody>
<tr>
<td>Equipment expensive</td>
<td>Simple and cheap</td>
</tr>
<tr>
<td>3D visual fields</td>
<td>2D visual fields</td>
</tr>
<tr>
<td>Training complex and long</td>
<td>Training simple</td>
</tr>
<tr>
<td>Remote operations</td>
<td>No remote operations</td>
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<tr>
<td>No hand feel</td>
<td>Hand feel</td>
</tr>
<tr>
<td>Knot inconvenient</td>
<td>Knot convenient</td>
</tr>
<tr>
<td>4~5 ports</td>
<td>3 ports</td>
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<tr>
<td>Adult</td>
<td>Adult and children</td>
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<tr>
<td>High expenditure</td>
<td>Low expenditure</td>
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</table>

*Red is advantage*
Selecting exposed model in screen

near orthophoria
Selecting operative procedure
— near conventional operation

- Endoscope port
- Left hand
- Right hand
The Feature of Operative Model

Visual in screen is similar to conventional open-chest visual field

The model is similar to conventional open-chest heart operation

Simple、Safe、Easy to learn
From 07/2009 to 10/2012
256 patients with VSD in hospital
119 of 256 have underwent repairing VSD under totally thoracoscope

**Exclusion criteria are any one of the following:**
(1) Some supracristal or muscular VSD
(2) Pulmonary arterial systolic pressure ≥ 60mmHg
(3) History of lung disease, right-sided chest operation, or adhesions of the right pleural membrane
(4) Concurrent with other cardiovascular disease or chronic illnesses
(5) Femoral vessels abnormal
Standard--patients were selected

- Age ≥ 2 years old
- Weight ≥ 15kg
- Femoral artery and vein are normal
- Pulmonary arterial pressure ≤ 60mmHg
- No history of Pulmonary Diseases, pleurisy, serious thoracocyllosis and right chest operation
119 patients

66 male patients;

2–36 years old; average age (7.1±3.6 years).
Anesthesia

- Induction of general anesthesia
- Double-lumen endotracheal tube (Weight $\geq$ 50 kg)
- Single-lumen endotracheal tube (Weight $<$ 50 kg)
- Respiration rate was set between 18 to 30 breaths/min
- Arterial oxygen saturation $\geq$ 97%
Apparatus

- 1) Common Thoracoscope + two display screen
- 2) Workstation
- 3) Fixed thoracoscope instrument
- 4) Surgical instrument especially
 **Positioned**
  ---- 15° to 20° left lateral decubitus

 **Periphery CPB**
  ---- cannulate femoral artery and vein.
The Position of Port in Chest and Port Protecting
Ascending Aorta Cross-clamp and Perfusion Needle
The Repairing of VSD
## Comparison the Results between conventional and thoracoscope

<table>
<thead>
<tr>
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<th>Study (n=119)</th>
<th>Control (n=35)</th>
<th>p</th>
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</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>7.1 ± 3.6</td>
<td>7.8 ± 4.3</td>
<td>0.106</td>
</tr>
<tr>
<td>Male</td>
<td>66 (55.4%)</td>
<td>18 (51.4%)</td>
<td>0.223</td>
</tr>
<tr>
<td>Body weight (kg)</td>
<td>32.4 ± 7.8</td>
<td>34.5 ± 9.2</td>
<td>0.189</td>
</tr>
<tr>
<td>Perimembranous VSD</td>
<td>55 (46.2%)</td>
<td>16 (45.7%)</td>
<td>0.289</td>
</tr>
<tr>
<td>Membranous VSD</td>
<td>64 (53.8%)</td>
<td>19 (55.3%)</td>
<td>0.371</td>
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<tr>
<td>Total operation time (min)</td>
<td>86 ± 15</td>
<td>124 ± 18</td>
<td>0.002</td>
</tr>
<tr>
<td>CPB (min)</td>
<td>42.2 ± 9.8</td>
<td>40 ± 4</td>
<td>0.177</td>
</tr>
<tr>
<td>Aortic crossclamp time (min)</td>
<td>32.5 ± 7.3</td>
<td>29.9 ± 3.4</td>
<td>0.095</td>
</tr>
<tr>
<td>Mechanical ventilation time (h)</td>
<td>0.3 ± 0.4</td>
<td>4.9 ± 3.2</td>
<td>0.006</td>
</tr>
<tr>
<td>Intensive care stay (h)</td>
<td>11.0 ± 2.6</td>
<td>22.9 ± 4.7</td>
<td>0.009</td>
</tr>
<tr>
<td>Postoperation hospital stays (day)</td>
<td>4.2 ± 1.1</td>
<td>6.6 ± 2.1</td>
<td>0.036</td>
</tr>
<tr>
<td>Volume of chest drainage (ml)</td>
<td>55 ± 12</td>
<td>237 ± 66</td>
<td>0.001</td>
</tr>
<tr>
<td>Rate of blood transfusion</td>
<td>16%</td>
<td>67%</td>
<td>0.001</td>
</tr>
<tr>
<td>Patients who put UFTA</td>
<td>82%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>The percentage analgesics</td>
<td>31.9%</td>
<td>74.2%</td>
<td>0.003</td>
</tr>
</tbody>
</table>
Clinical Outcome

- Patients who put UFTA 82%
- No operative mortality
- Complications: one patient with residue shunt
- one patient with III A-V block
- Postoperative follow up 3-36 month, patients recover well. Especially the quality of life was better in the thoracoscope group
Comparison of Incision

Thoracoscope

Robotics

Conventional
Conclusions

- In patients with membranous, perimembranous and some supracristal VSDs, totally thoracoscopic repair without a robotically assisted surgical system appears feasible, safe and easy to learn.

- This novel technique is associated with perfect recovery and high quality of life compare with conventional surgical VSD repair.
Generalization

- Cardiosurgery by thoracoscope = Open chest Cardiosurgery on telescreen

Simplest equipment
Immediate approach
Best effect of mini-invasive

Simple and safe
Outlook of thoracoscopic technique in cardiac surgery

More and more widespread!
Thanks!