

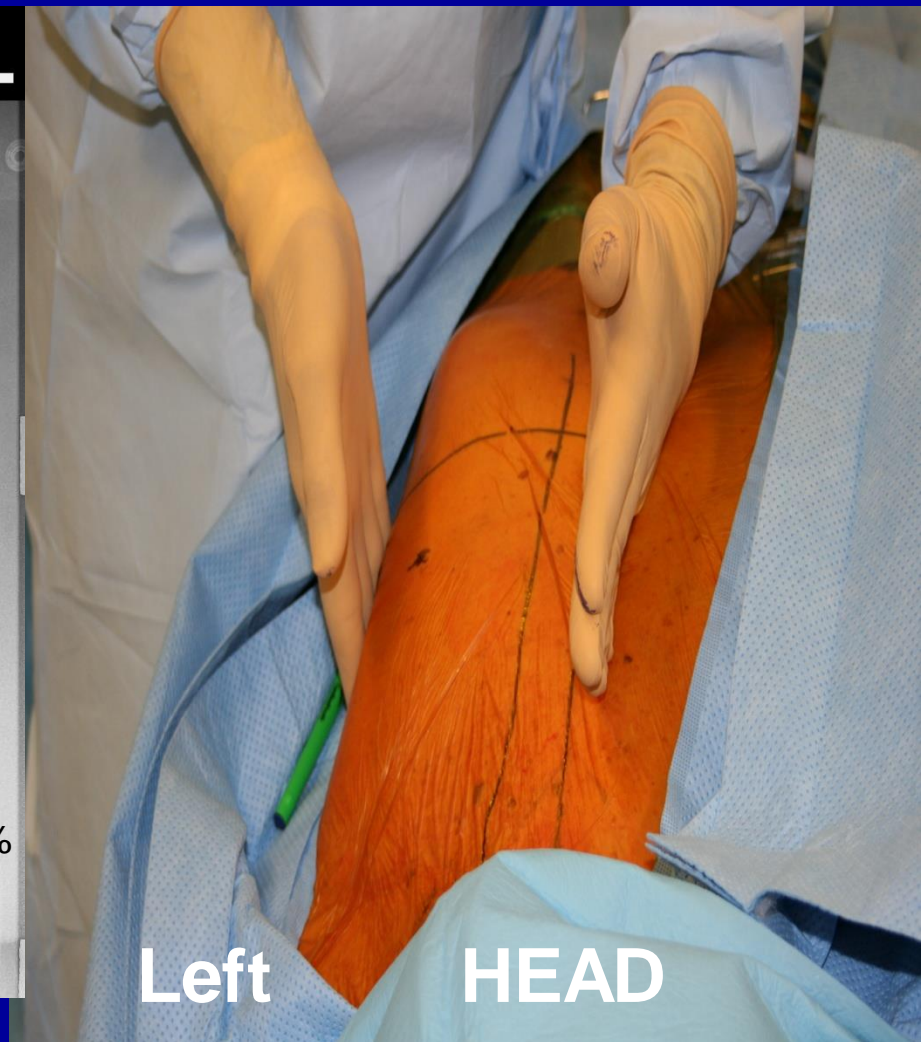
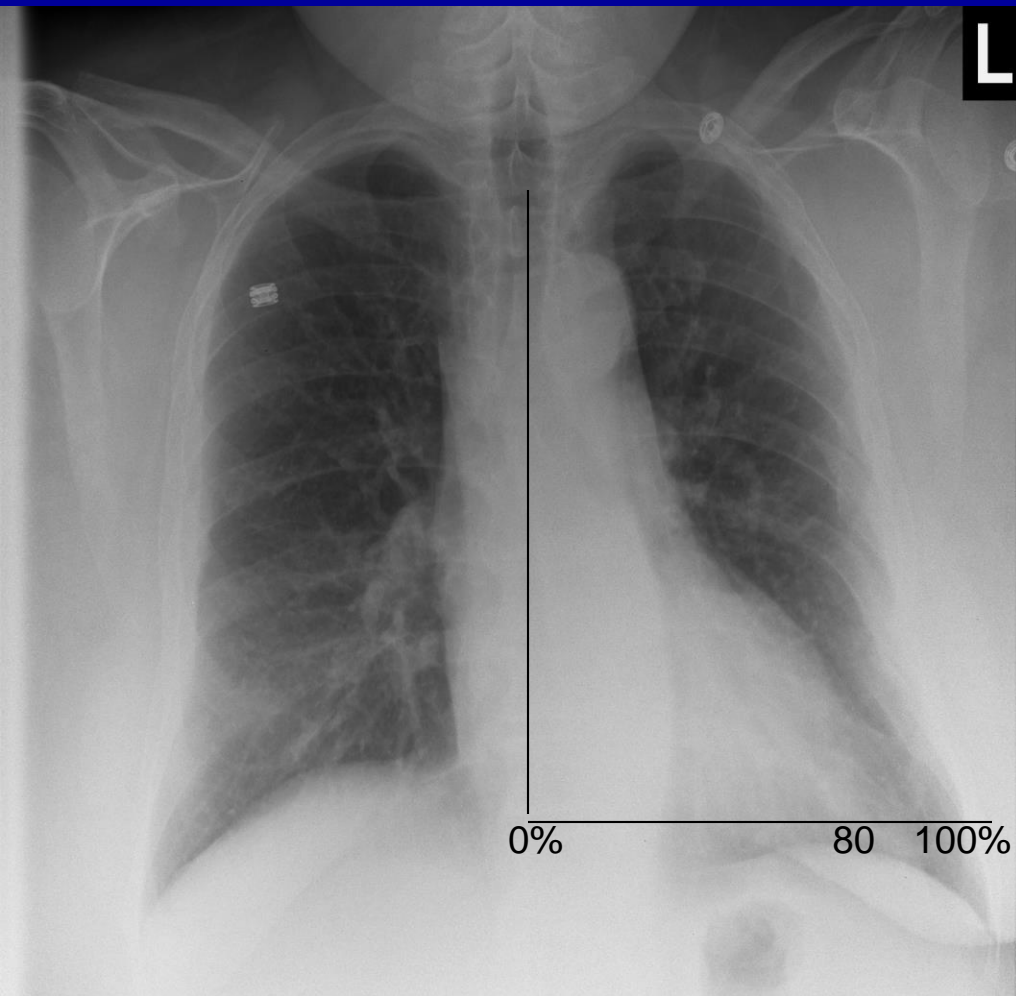
# Robotic Assisted Coronary Revascularization



**Francis P. Sutter, DO, FACS**  
*Clinical Professor of Surgery,  
Jefferson Medical College*  
**Chief, Cardiac Surgery**  
**Lankenau Heart Institute**

- **Robotic LIMA harvest**
- **Precision Incision**
- **Beating heart surgery**
- **Team Work**



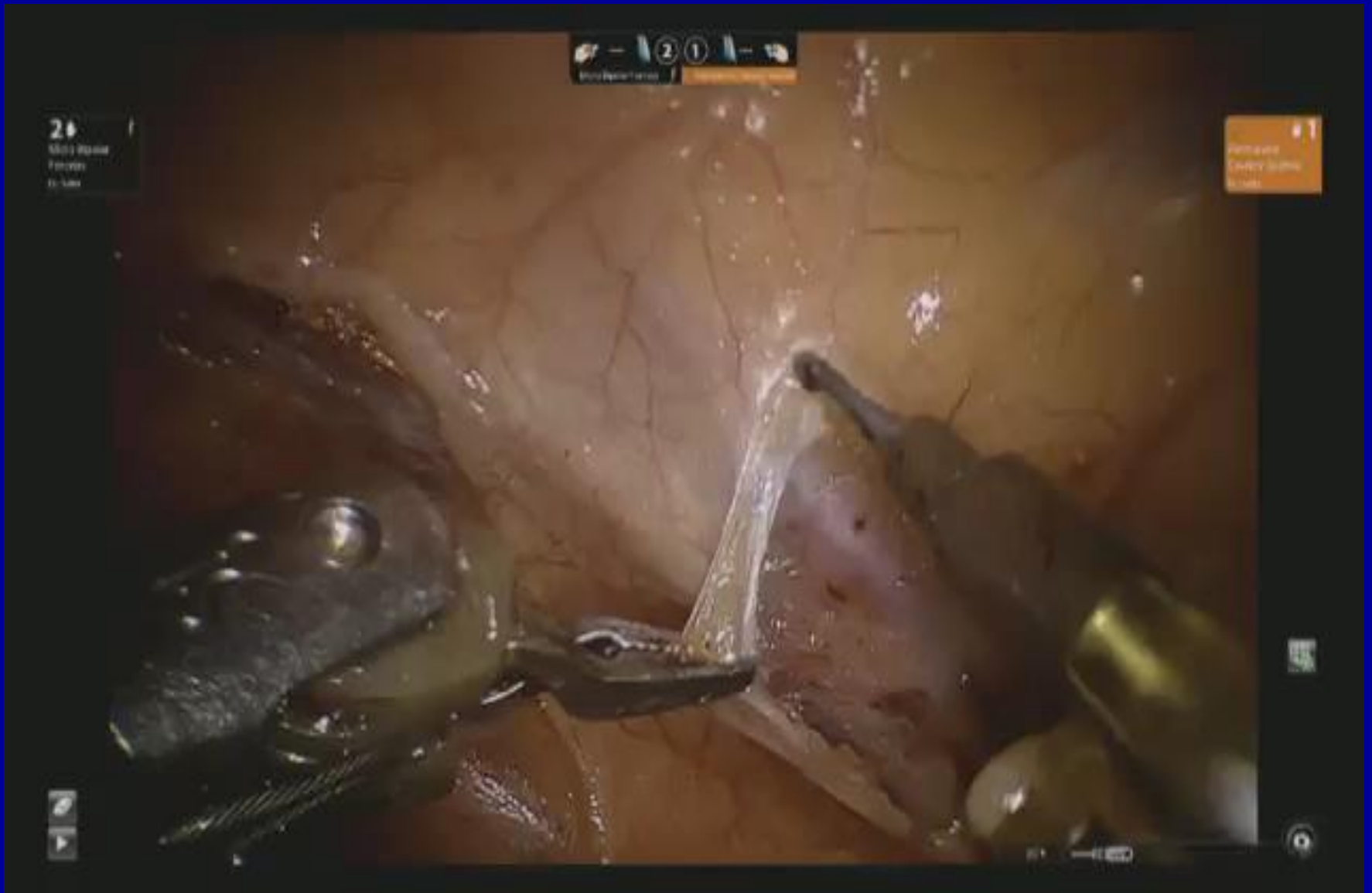


Marking

Ports in

Pericardium





LIMA Dissection 2:18 ADDED SLIDE FROM OTHER PRESENTION



Tacking to heart

Cutting IMA from chest wall

Enlarge incision and stabilizer

# Anastomosis

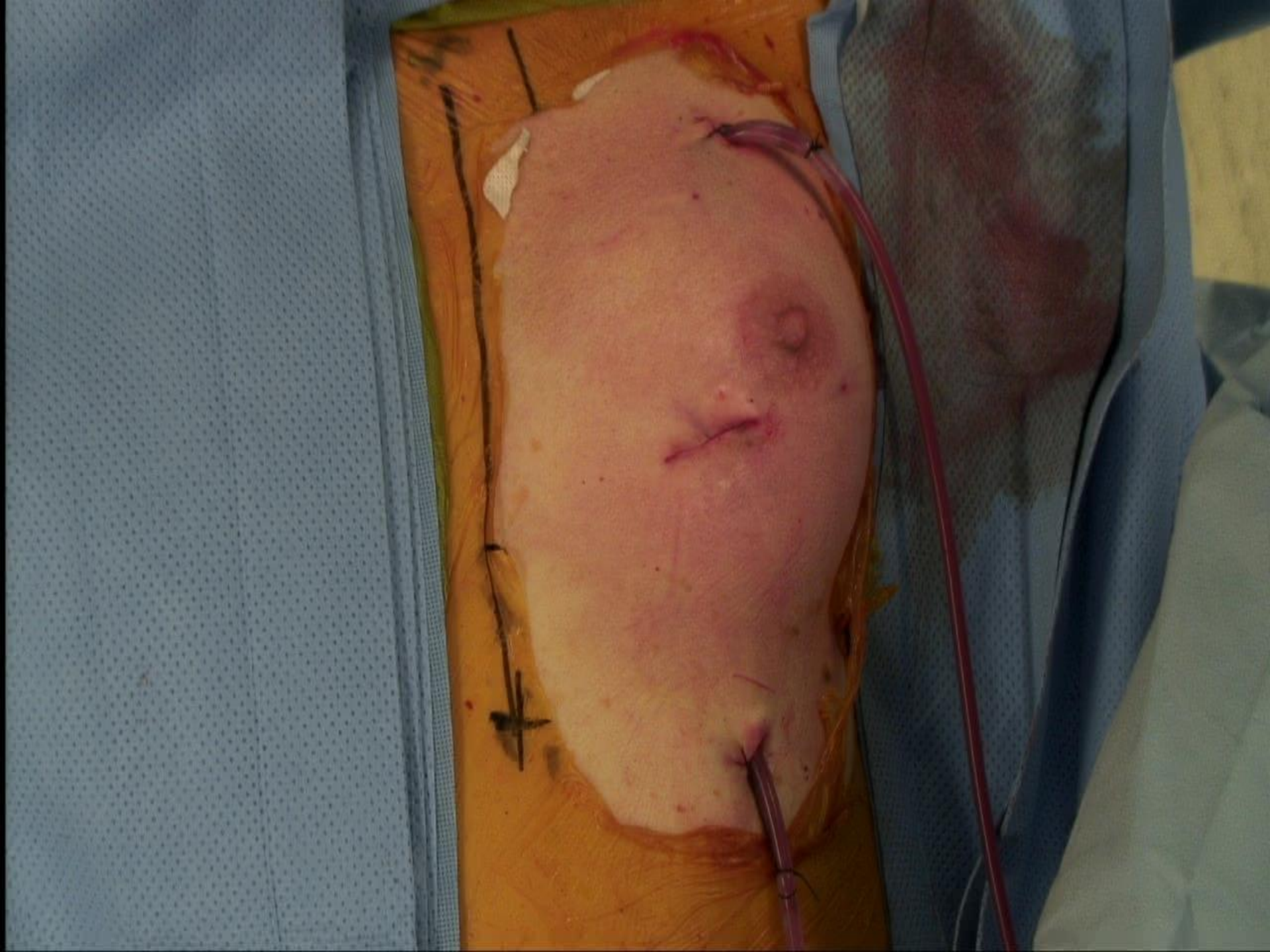
**Open Artery**

**Shunt**

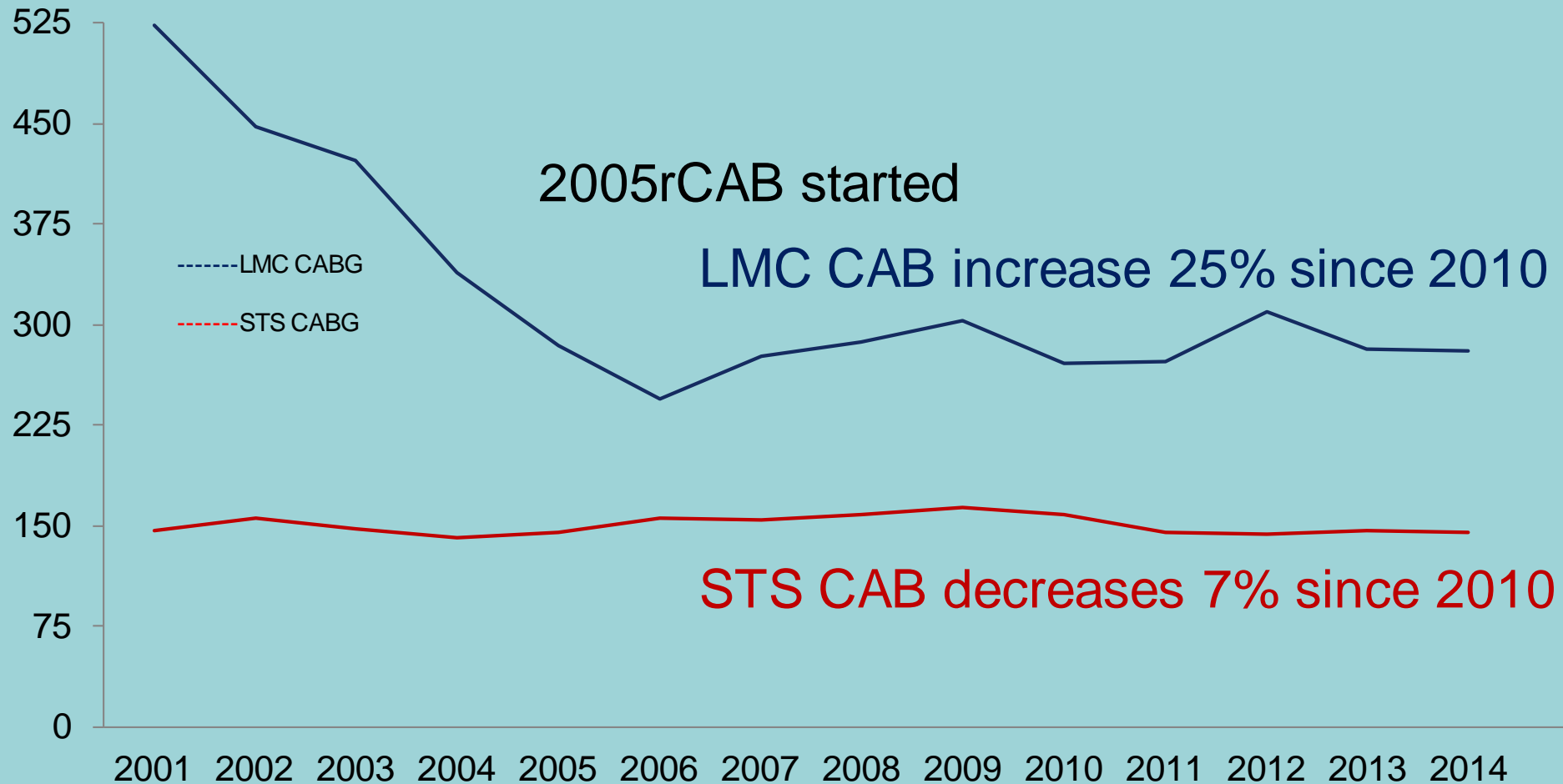
**Sew**

Sliding plasty

Sliding plasty

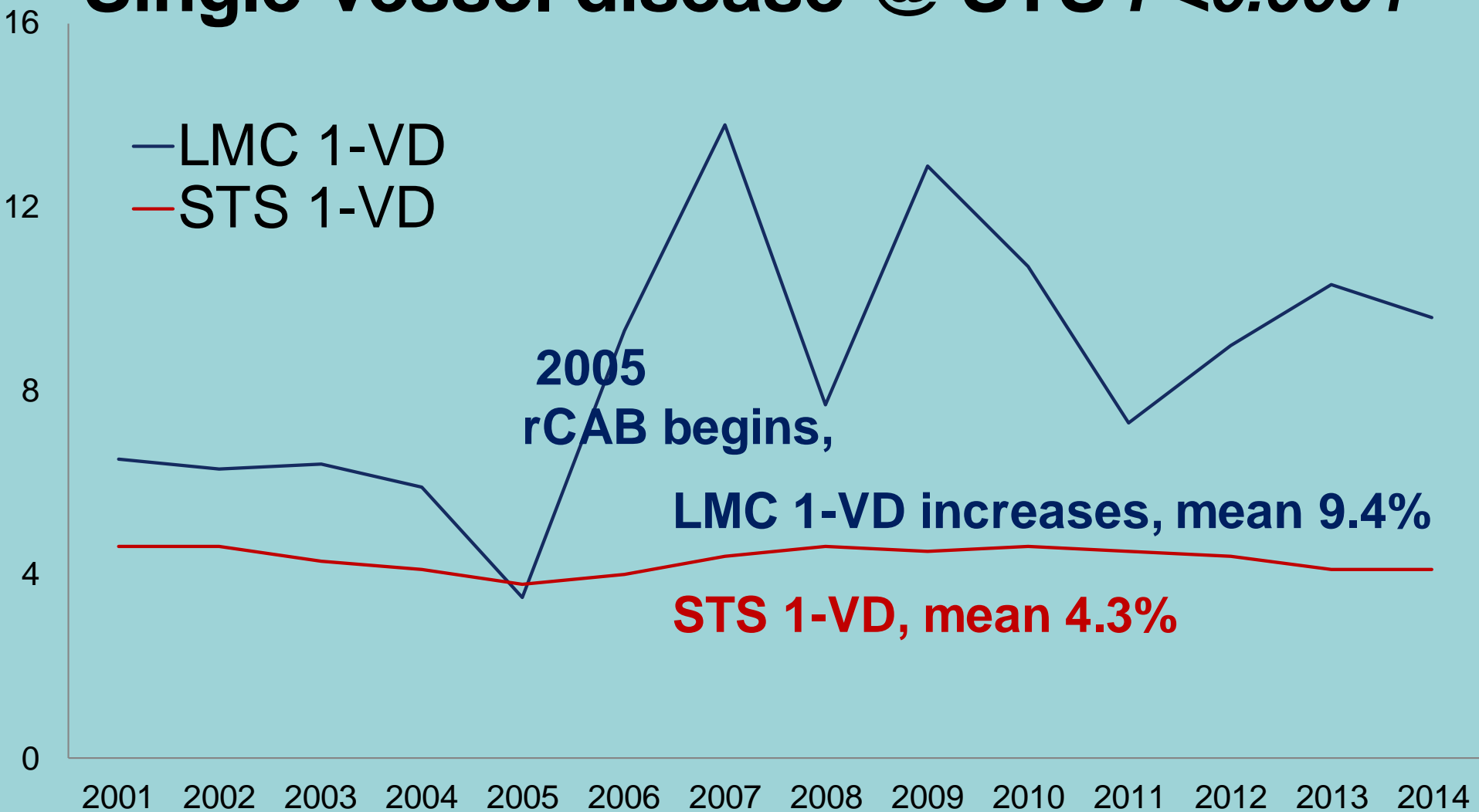


# Free falling CAB volume stabilized with rCAB

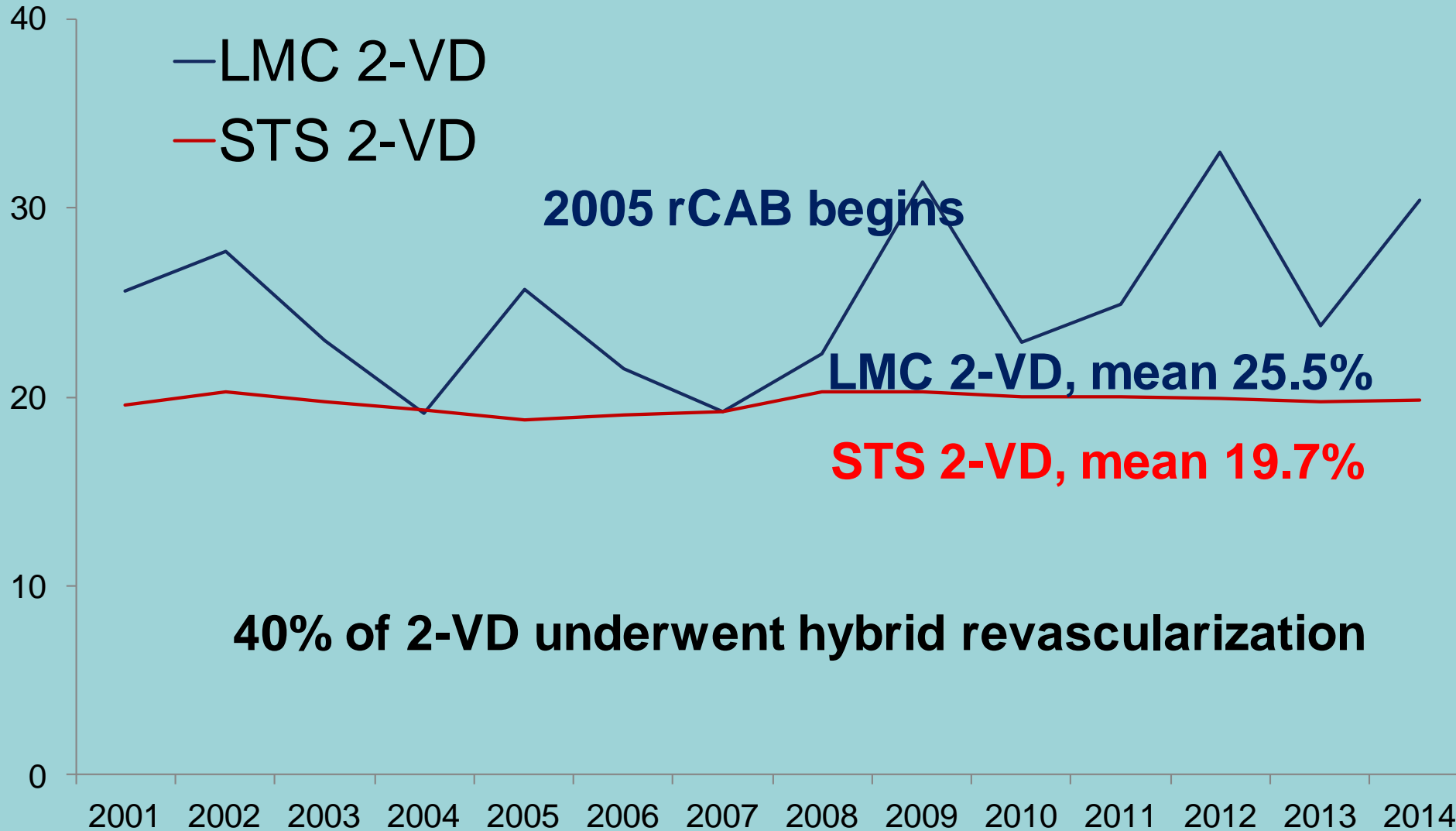


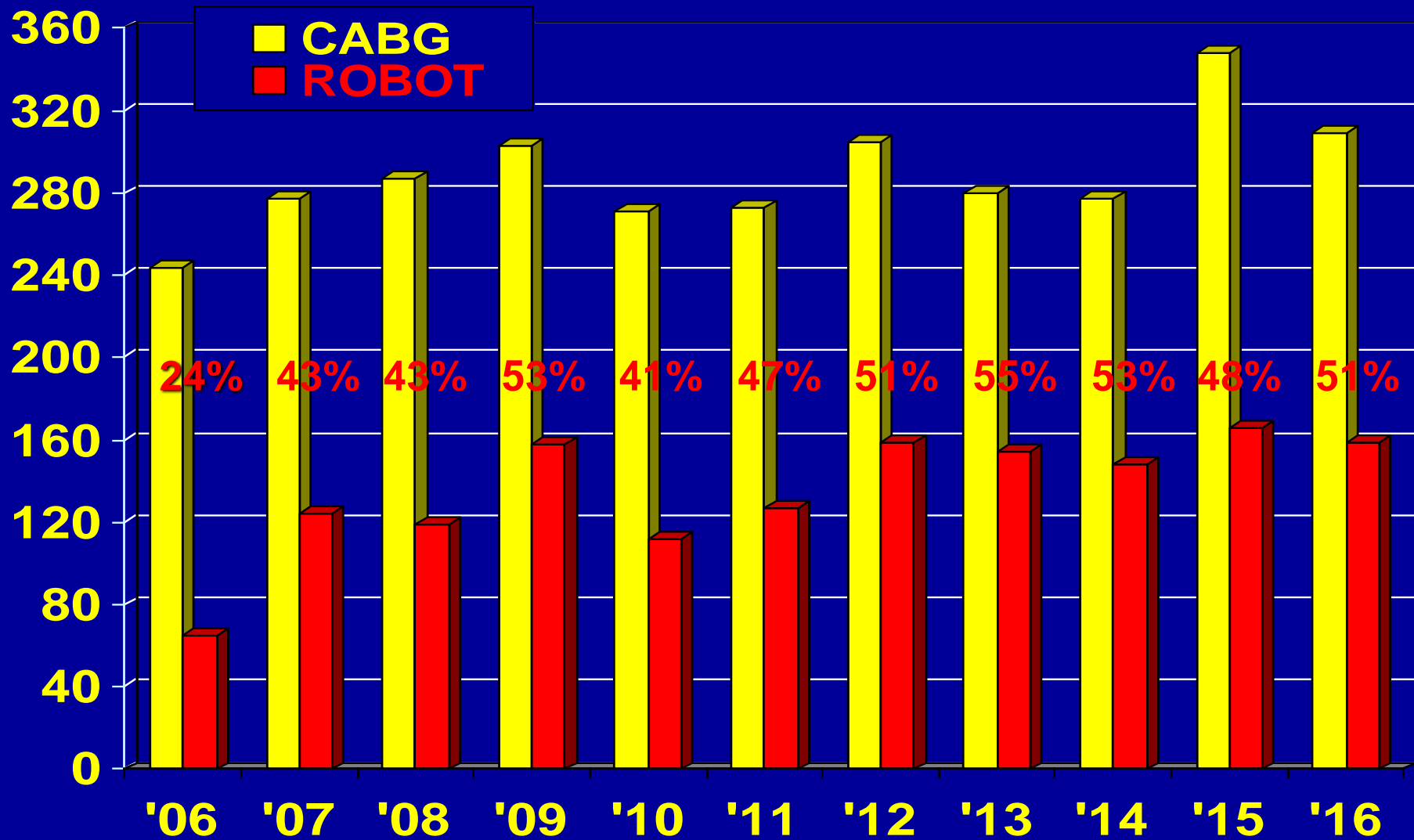


# Single vessel disease @ LMC versus Single vessel disease @ STS $P < 0.0001$



# Two vessel disease @ LMC versus Two vessel disease @ STS $P < 0.05$





# PARADIGM Shift

at Lankenau Medical Center

<b><i>INDICATORS</i></b>	<b>OP-CAB Robot May 05 – Feb 17 N = 1,535</b>	<b>Isolated CAB STS Database CY 2015 N = 151,474</b>
<b>Mean Age</b> <b>Age &gt; 75</b>	<b>66.1</b> <b>22.3%</b>	<b>65.2</b>
<b>Female</b>	<b>29.0%</b>	<b>24.8%</b>
<b>CHF</b>	<b>11.9%</b>	<b>19.7%</b>
<b>COPD</b>	<b>15.5%</b>	<b>24.8%</b>
<b>Diabetes</b>	<b>38.4%</b>	<b>48.3%</b>
<b>MI within 1-7 days</b>	<b>15.7%</b>	<b>29.1%</b>
<b>MI within 8-21 days</b>	<b>6.4%</b>	<b>5.0%</b>
<b>EF ≤ 40%</b>	<b>15.5%</b>	<b>16.1%</b>

<b><i>INDICATORS</i></b>	<b>OP-CAB Robot May 05 – Feb 17 N = 1,535</b>	<b>Isolated CAB STS Database CY 2015 N = 151,474</b>
<b>Left Main Disease</b>	<b>13.4%</b>	<b>31.9%</b>
<b>Vessel Disease</b>		
<b>Single</b>	<b>20.7%</b>	<b>4.1%</b>
<b>Double</b>	<b>38.2%</b>	<b>19.1%</b>
<b>Triple</b>	<b>41.2%</b>	<b>75.8%</b>
<b>Mean # of Distals</b>		
<b>CABG 1</b>	<b>76.0%</b>	<b>5.3%</b>
<b>CABG 2</b>	<b>21.4%</b>	<b>17.7%</b>
<b>CABG 3</b>	<b>2.2%</b>	<b>39.8%</b>
<b>CABG 4</b>	<b>0.4%</b>	<b>37.1%</b>

<b><i>RESULTS</i></b>	<b>OP-CAB Robot May 05 – Feb 17 N = 1,535</b>	<b>Isolated CAB STS Database CY 2015 N = 151,474</b>
<b>Extubated in OR</b>	<b>87.4%</b>	<b>2.5%</b>
<b>Ventilator &gt; 24 hr</b>	<b>2.3%</b>	<b>8.2%</b>
<b>Atrial Fibrillation</b>	<b>16.4%</b>	<b>24.0%</b>
<b>Permanent CVA</b>	<b>0.3% (4)</b>	<b>1.3%</b>
<b>Return to OR for bleeding</b>	<b>1.0%</b>	<b>1.6%</b>
<b>Total pts Transfused</b>	<b>18.6%</b>	<b>43.0%</b>
<b>Median Post-op LOS</b>	<b>4.0 days</b>	<b>8.0 days</b>
<b>Observed Mortality</b>	<b>1.1% (17)</b>	<b>2.2%</b>
<b>STS Predicted Risk</b>	<b>2.0%</b>	<b>2.2%</b>

**rCAB has markedly decreased institutional resource utilization as compared to STS national results**

<b><i>RESULTS</i></b> <b>INDICATORS</b>	<b>HYBRID</b> <b>Sep 05 – Feb '17</b> <b>N =588</b>	<b>Isolated CAB</b> <b>STS Database</b> <b>CY 2015</b> <b>N = 151,474</b>
<b>Extubated in OR</b>	<b>87.2%</b>	<b>2.5%</b>
<b>Ventilator &gt; 24 hr</b>	<b>1.7%</b>	<b>8.2%</b>
<b>Atrial Fibrillation</b>	<b>15.0%</b>	<b>24.0%</b>
<b>Permanent CVA</b>	<b>0.5% (3)</b>	<b>1.3%</b>
<b>Return to OR for bleeding</b>	<b>0.5%</b>	<b>1.6%</b>
<b>Total pts Transfused</b>	<b>18.0%</b>	<b>43.0%</b>
<b>Median Post-op LOS</b>	<b>4.0 days</b>	<b>8.0 days</b>
<b>Observed Mortality</b>	<b>0.9%</b>	<b>2.2%</b>
<b>STS Predicted Risk</b>	<b>2.17%</b>	<b>2.2%</b>

# ***“Precision Incision”***

**Vol 7, No 3, May/June 2012**

**Robotic Coronary Revascularization...Mini-thoracotomy  
FP Sutter, T Berry, MA Wertan**

- **Robotic LIMA harvest**
- **Precision Incision**
- **Beating heart surgery**
- **Team Work**

**\*\*\*HANDOUTS AVAILABLE IN WET LAB**



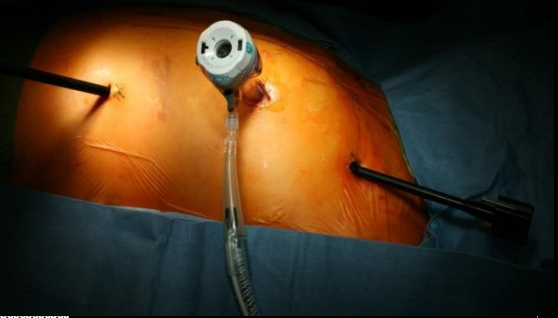
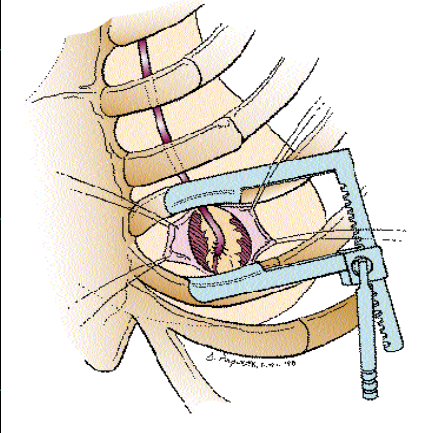


# CONCLUSION

1. Beating heart rCAB via small (4.2cm) non-rib spreading thoracotomy results in statistically significant increase in surgical treatment of 1 & 2-vessel CAD
2. rCAB likely results in more patients receiving the survival benefit of LIMA→LAD
3. Hybrid rCAB & collaborative heart team approach increases surgical treatment of 2-VD
4. rCAB has markedly decreased institutional resource utilization as compared to STS national results



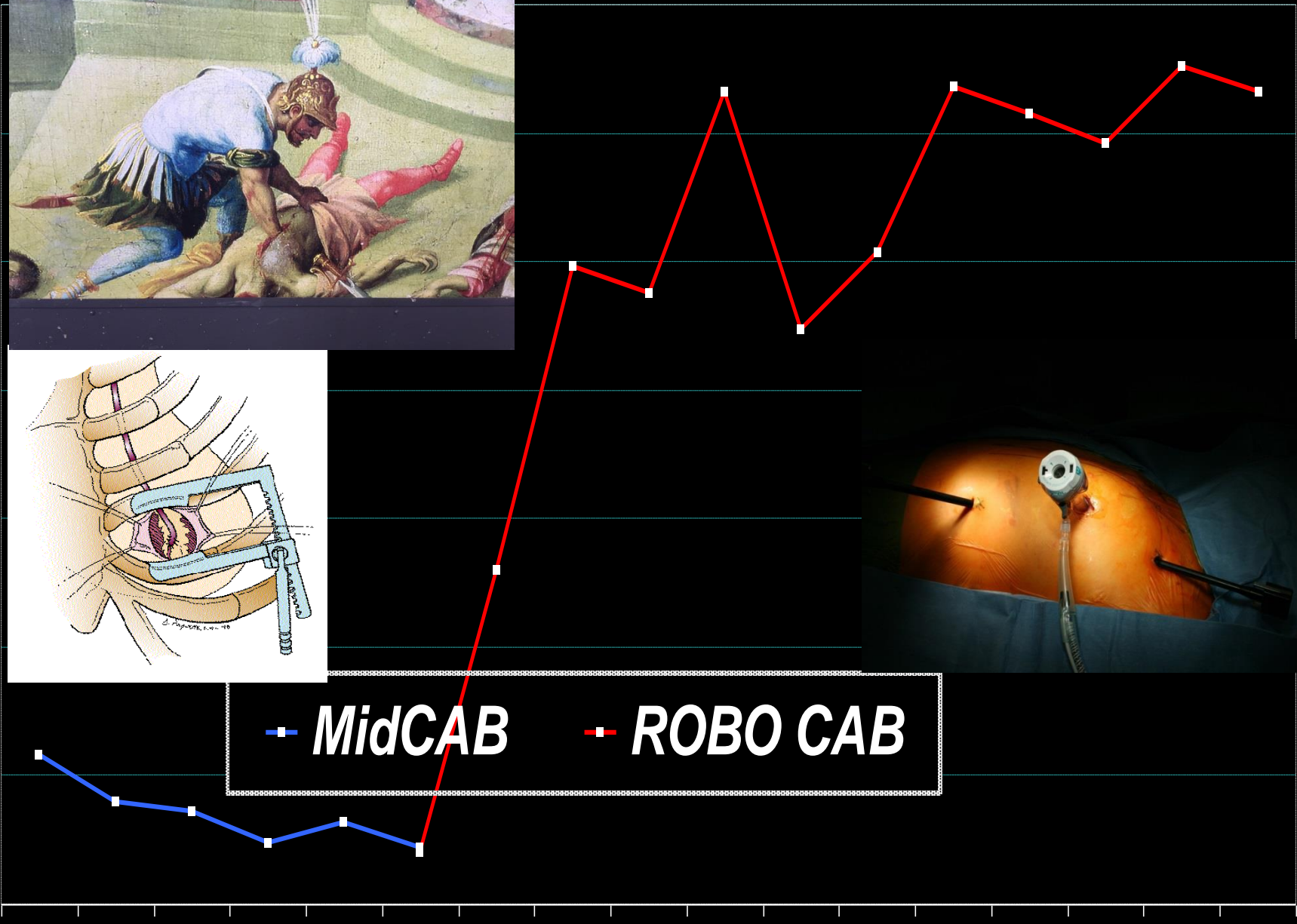
175  
150  
125  
100  
75  
50  
25  
0



—■ MidCAB      —■ ROBO CAB

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016

CABG 673 523 447 425 341 288 244 277 287 303 271 273 305 280 277 348 309







# Hybrid Coronary Revascularization

## Collaborative Heart Team Approach

### Treat the Culprit Vessel 1<sup>st</sup>

2<sup>nd</sup> Stage per patient status

64% (342) Robotic LIMA → LAD 1<sup>st</sup>

36% (193) PCI → culprit vessel 1<sup>st</sup>

**Same hospitalization Hybrid = 26% (139 of 535)**

59% (79/139) Robotic LIMA → LAD 1<sup>st</sup>

41% (55/139) PCI 1<sup>st</sup> followed by LIMA → LAD

No patient had simultaneous hybrid.

Ticagrelor & Prasugrel are transitioned to Clopidogrel  
for 10days preop

No ↑ in transfusion rates were seen in pts taking  
DAPT's