

**CONTEMPORARY USE OF ARTERIAL
GRAFTS DURING CORONARY ARTERY
BYPASS SURGERY:
PARADIGM SHIFT ?
OR
A LITTLE (MORE) TALK
THAT NEEDS
A LOT MORE ACTION**

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I have no financial disclosures.

1897 Paget's *Surgery of the Chest*

Christian Billroth wrote:

“Surgery of the heart has probably reached the limits set by nature to all surgery: no new method and no new discovery can overcome the natural difficulties that attend a wound of the heart.”

Further,

“any surgeon who wishes to preserve the respect of his colleagues, would never attempt to suture the heart.”

CORONARY ARTERY BYPASS HISTORY

- 1910 Alexis Carrell
 - Vascular grafts between the descending aorta and left main coronary artery
- 1935 Claude Beck
 - Pedicle pectoralis graft directly to the myocardium
- 1945 Arthur Vineberg
 - Implanted the left internal mammary (LIMA) into the myocardium
- 1952 Vladimir Demikhov
 - Experimental use of the LIMA to bypass the coronaries
- 1959 F. Mason Sones
 - Performed first coronary arteriogram

CORONARY ARTERY BYPASS HISTORY

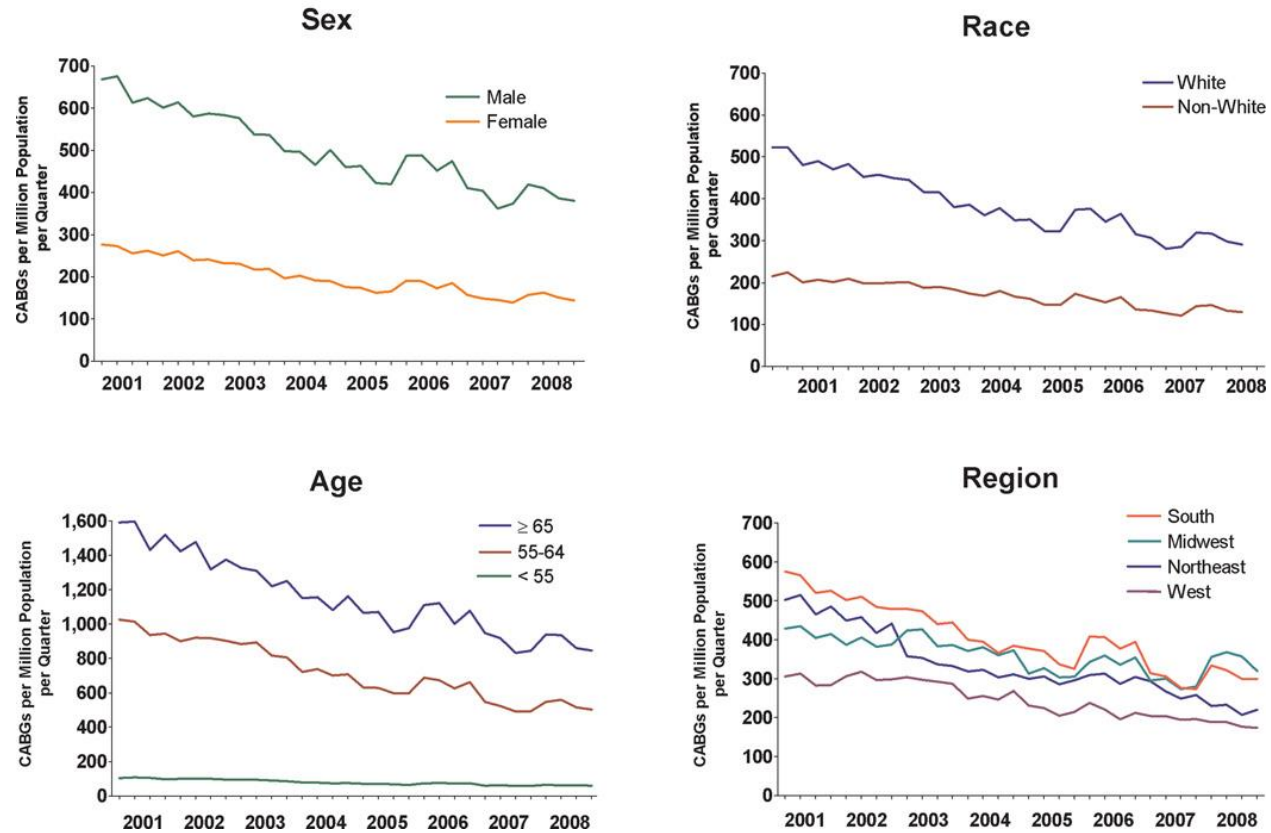
- 1962 David Sabiston
 - performed first aortocoronary saphenous vein bypass graft
- 1964 Edward Garrett
 - performed the first successful saphenocoronary bypass (Debaquey)
- 1964 Frank Spencer
 - performed the first successful LIMA to LAD anastomosis
- 1967 Kolessov
 - First direct anastomosis of the LIMA to an obstructed coronary
- 1968 Rene Favaloro and Dudley Johnson
 - Launched the widespread application of CABG in the treatment of coronary artery disease

Coronary Artery Bypass Grafting (CABG) Trends

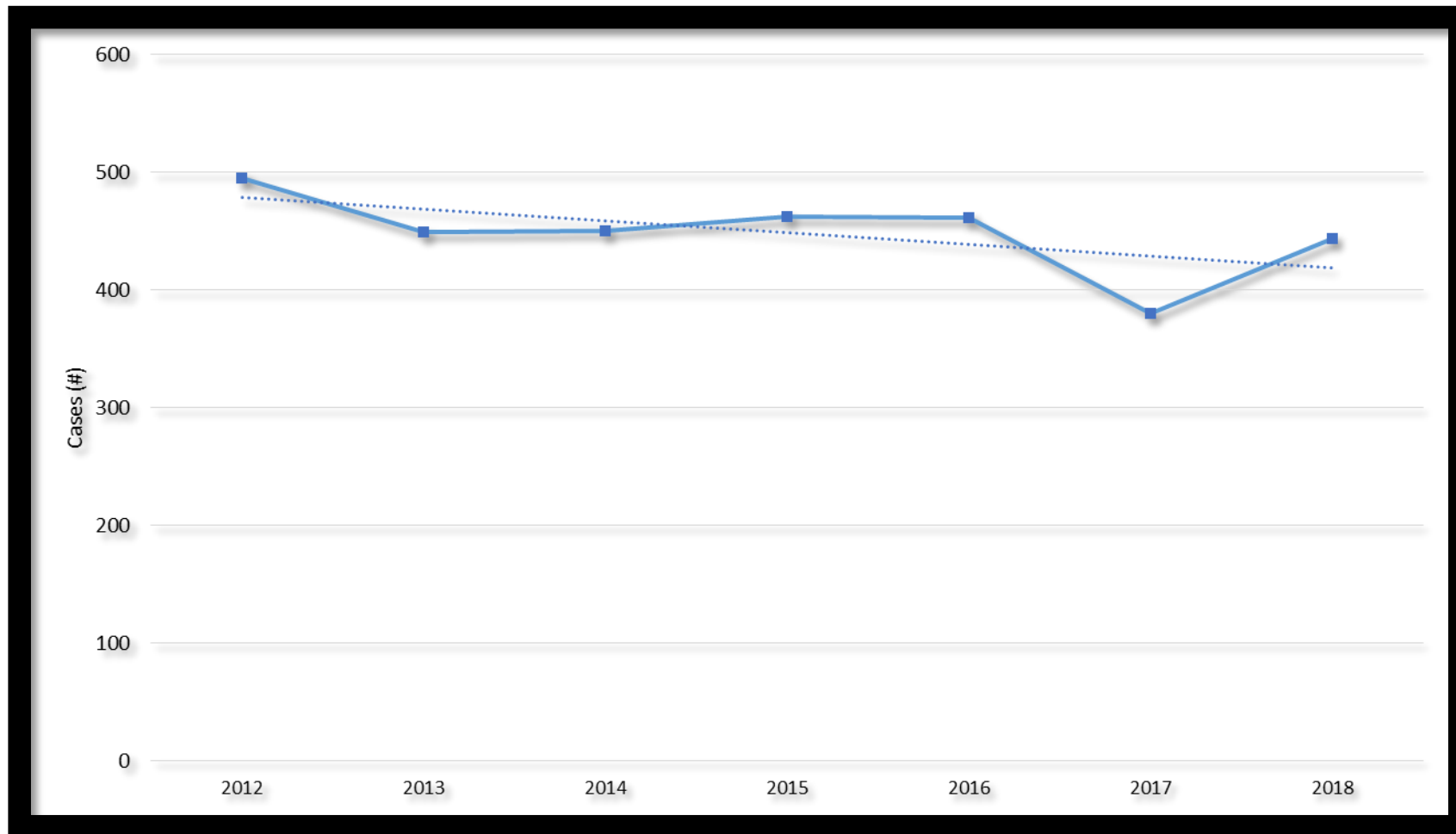
- Over last two decades rate of isolated CABG has declined 16%
 - 191,581 operations in 1997
 - 160,160 operations in 2017
- Reasons for decline
 - Improvements in medical therapy and secondary prevention
 - Improvements in stent technologies
 - Desire of patients to avoid invasive procedures

DOWNWARD TREND IN CABG NUMBERS

CABG Rates 2001-2008, by Patient Subgroups



Memorial Hospital Coronary Artery Bypass Grafting Volume (2012-2018)



Distributions of Cardiac Operations STS Database 2017

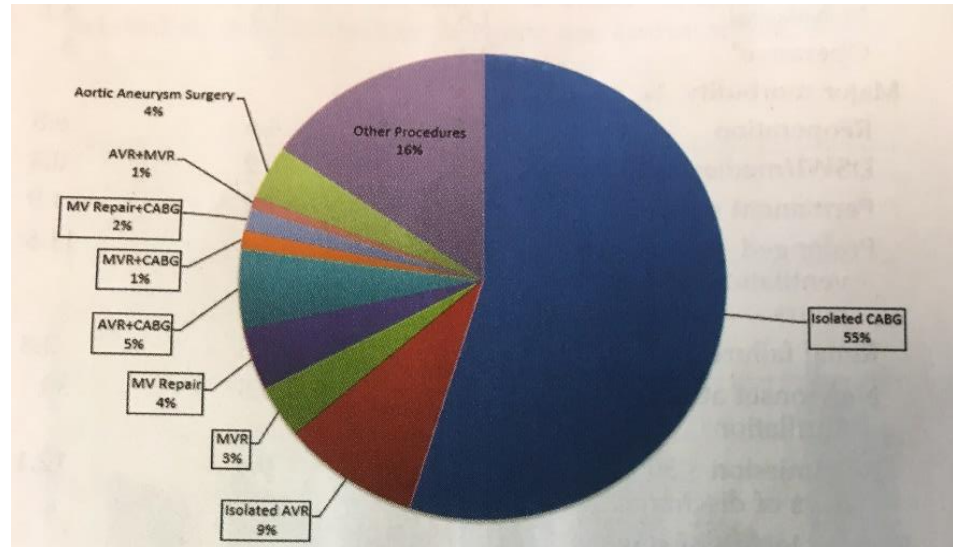


Fig 1. Relative distribution of cardiac operations by procedure type for calendar year 2017. "Other procedures" includes cardiac procedures not otherwise classified in the pie chart (ie, tricuspid valve replacement, ventricular assist device, cardiac transplant, etc). Procedures enclosed within a box are those for which The Society of Thoracic Surgeons Adult Cardiac Surgery Database has developed risk-adjustment models and composite quality ratings. (AVR = aortic valve replacement; CABG = coronary artery bypass grafting; MV = mitral valve; MVR = mitral valve replacement.)

CABG compared with PCI

- Large registries showed improved survival with CABG
- SYNTAX trial compared percutaneous coronary intervention(PCI) with CABG.
 - Lower rate for repeat revascularization
 - Lower rate of myocardial infarction (MI)
 - Lower rate of death
- WHY?:
 - More complete revascularization
 - Improved graft patency

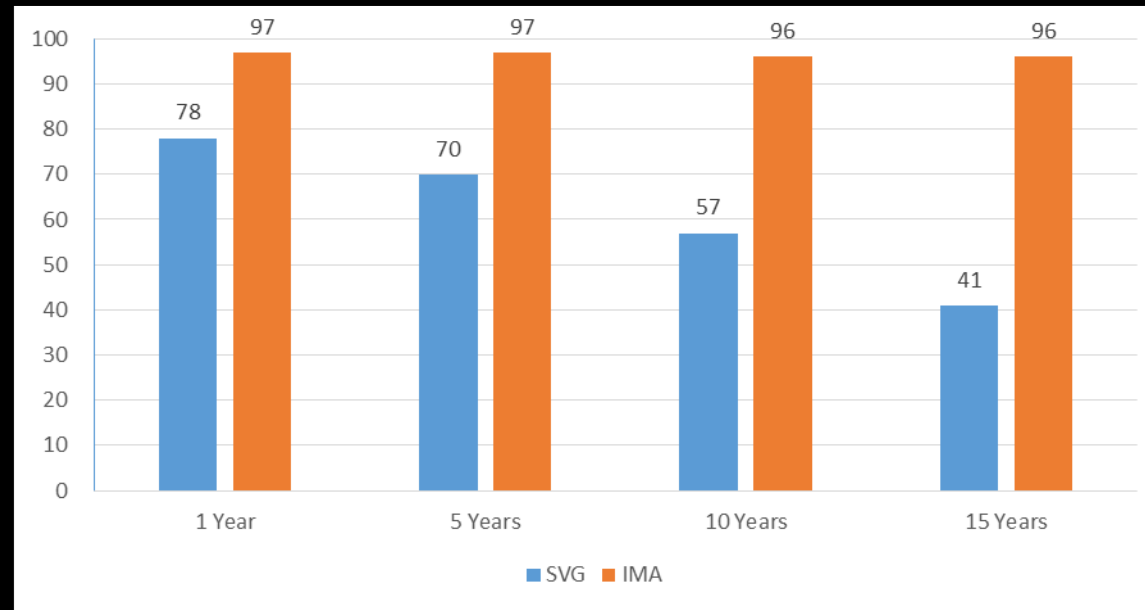
How To Improve CABG Results

- Operate on patients with fewer comorbidities
 - Diabetes
 - Hypertension
 - COPD
 - Peripheral vascular disease
 - Hyperlipidemia
 - Frailty
- Less coronary disease burden
- Increase the use of grafts with the best patency

Current Trends in CABG Techniques

- Fewer than 10% of patients undergoing CABG receive more than one arterial graft
- Why does this matter?
 - We know that failure rates for veins are higher than arterial grafts
 - SVG patency at 10 years 57%; 15 years 41%
 - LIMA patency at 10 years 96%; 15 years 96%

CABG Graft Patency



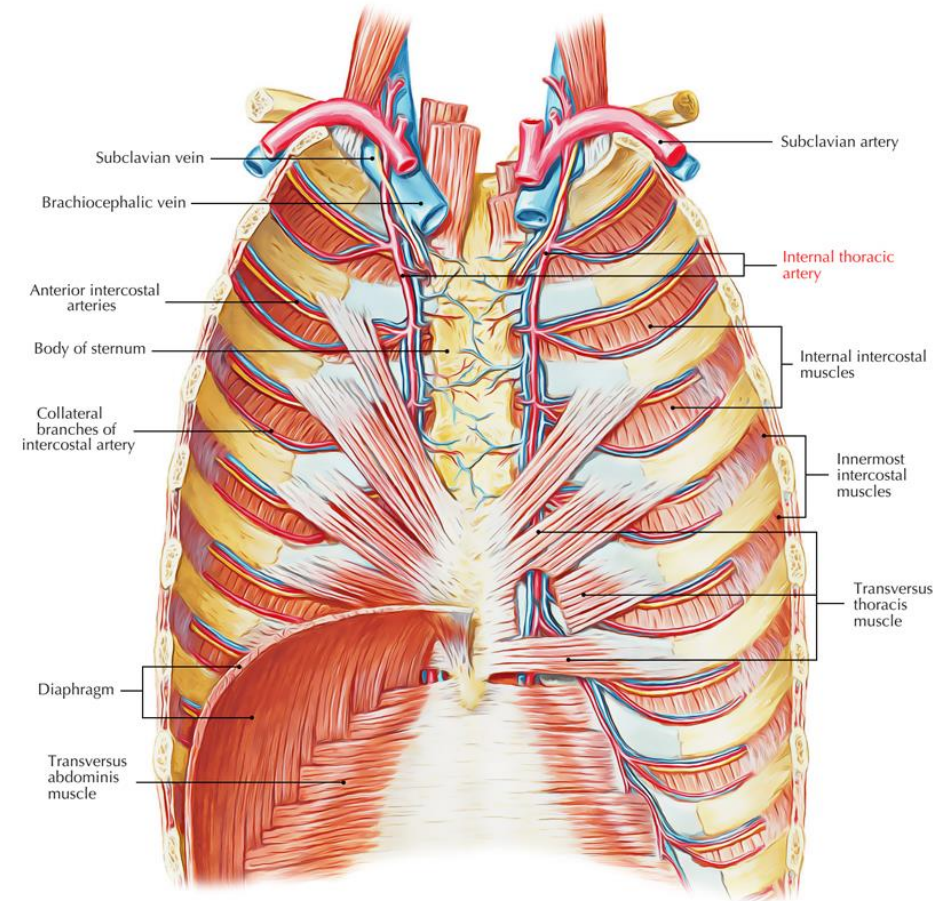
How To Improve Long Term Results of CABG

- Improve arterial graft rate

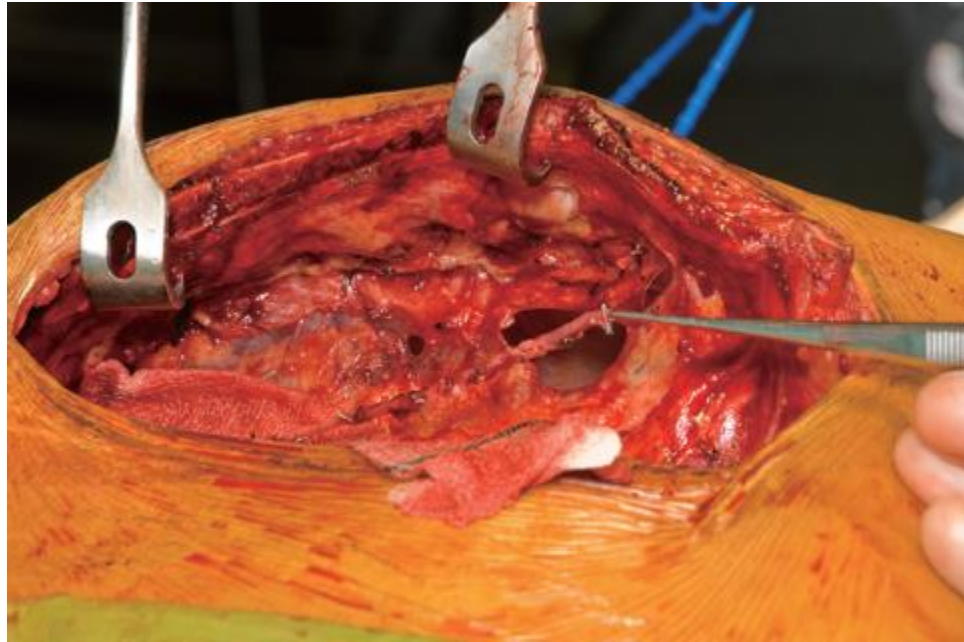
OBJECTIVES

- Discuss use of other arterial conduits (not LIMA)
- Discuss Society of Thoracic Surgeons practice guidelines
- Discuss collaboration of cardiologists and cardiac surgeons in the care of patients with coronary artery disease
- Future actions to improve patient outcomes

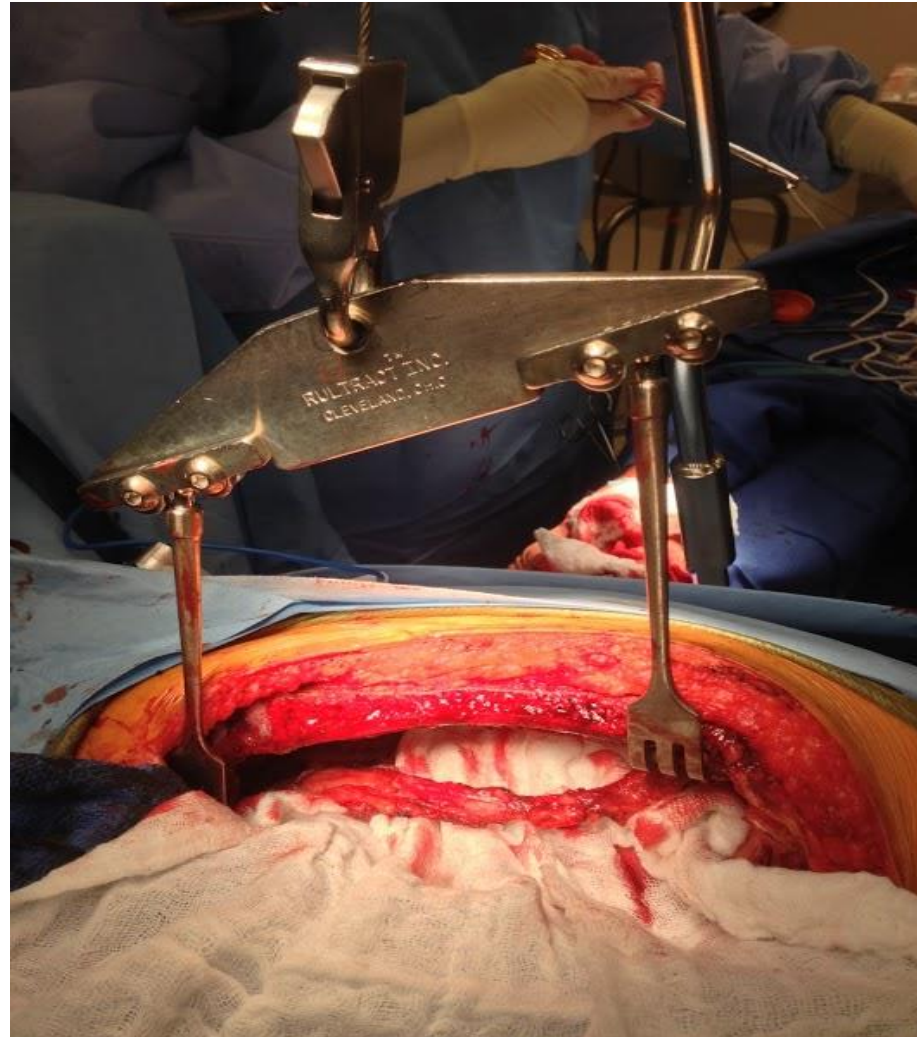
Internal Mammary Artery Anatomy



Internal Mammary Artery Harvest



IMA Harvest

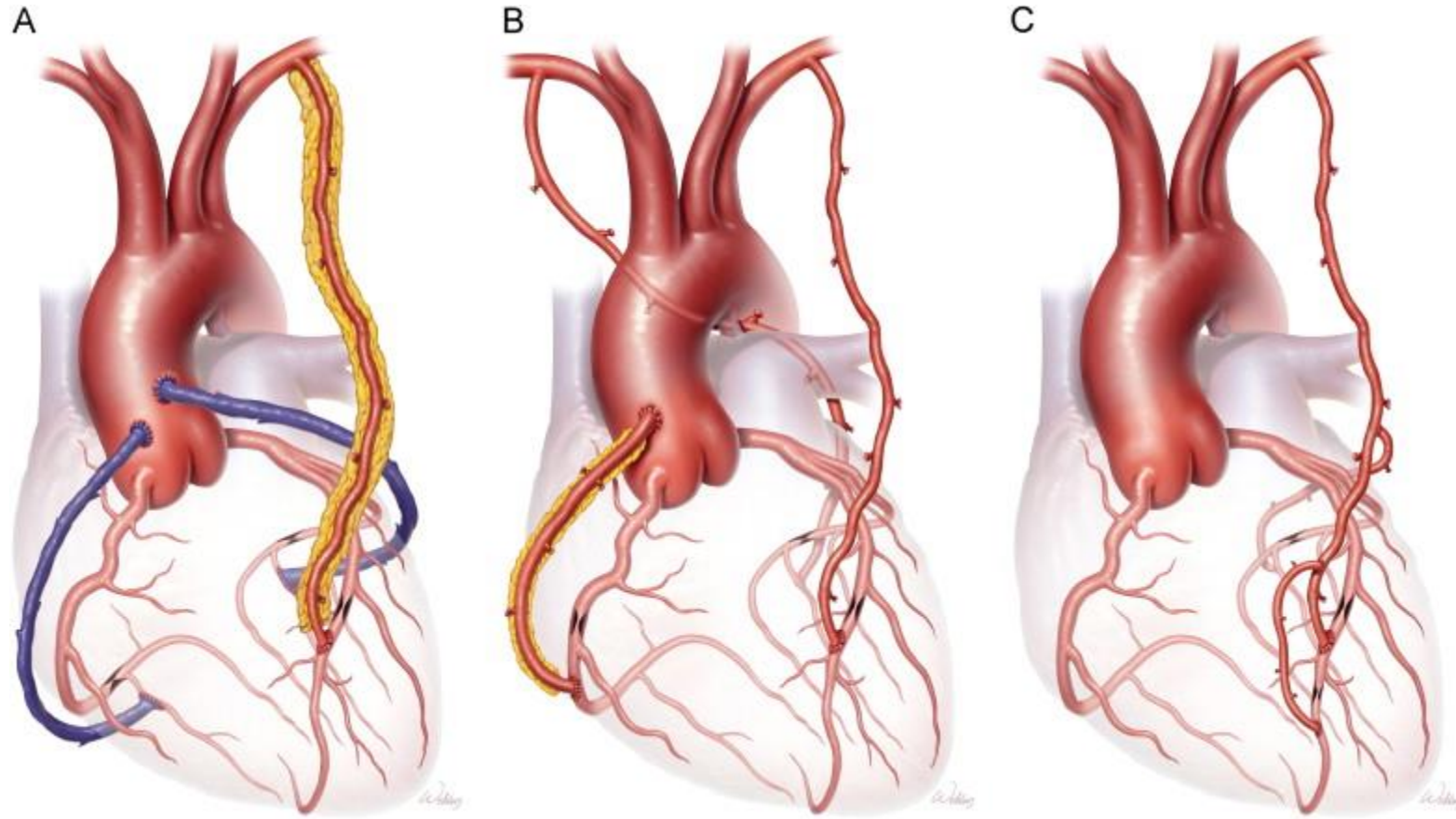


Bilateral Internal Mammary Artery (BIMA)

- The use of BIMA has been associated with:
 - Improved survival
 - Fewer adverse cardiac events
- Fewer reoperations and PCI

Large nonrandomized risk-adjusted data and meta-analysis studies

ARTERIAL REVASCULARIZATION STRATEGIES FOR CABG



Bilateral IMA Risks

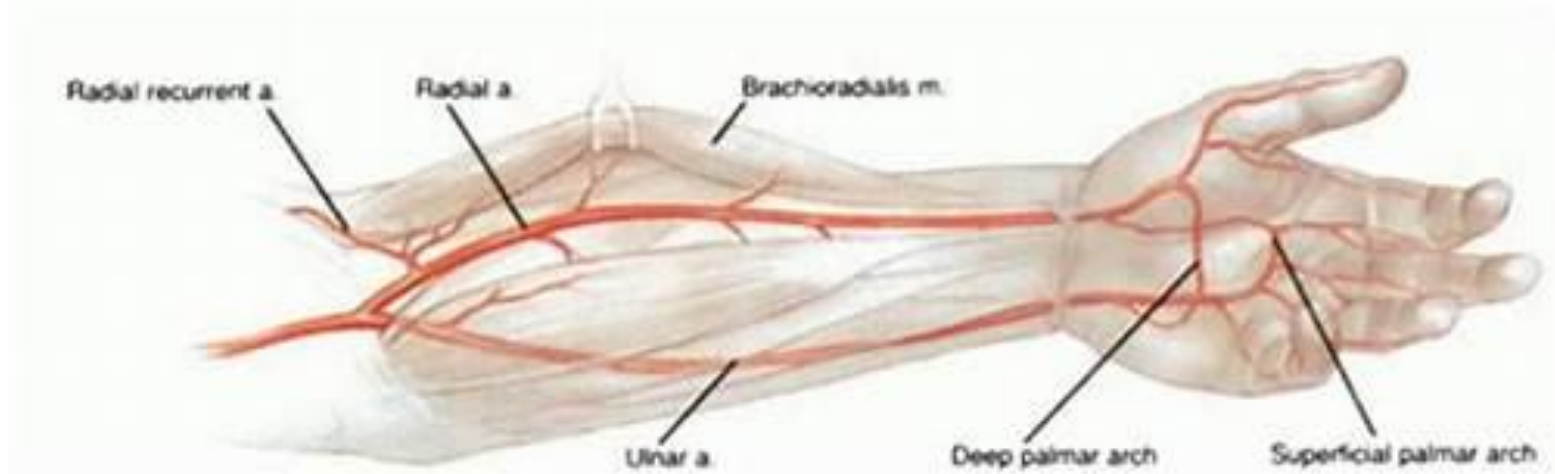
- Mediastinitis and Sternal Wound Infection
- Sternal Malunion
- Length of Graft

- Risks with single IMA are increased with:
 - Urgent cases
 - Obesity (body mass index over 40 kg/m²)
 - Female sex
 - Diabetes
 - COPD and smoking
 - Immunosuppression
 - Mediastinal Irradiation

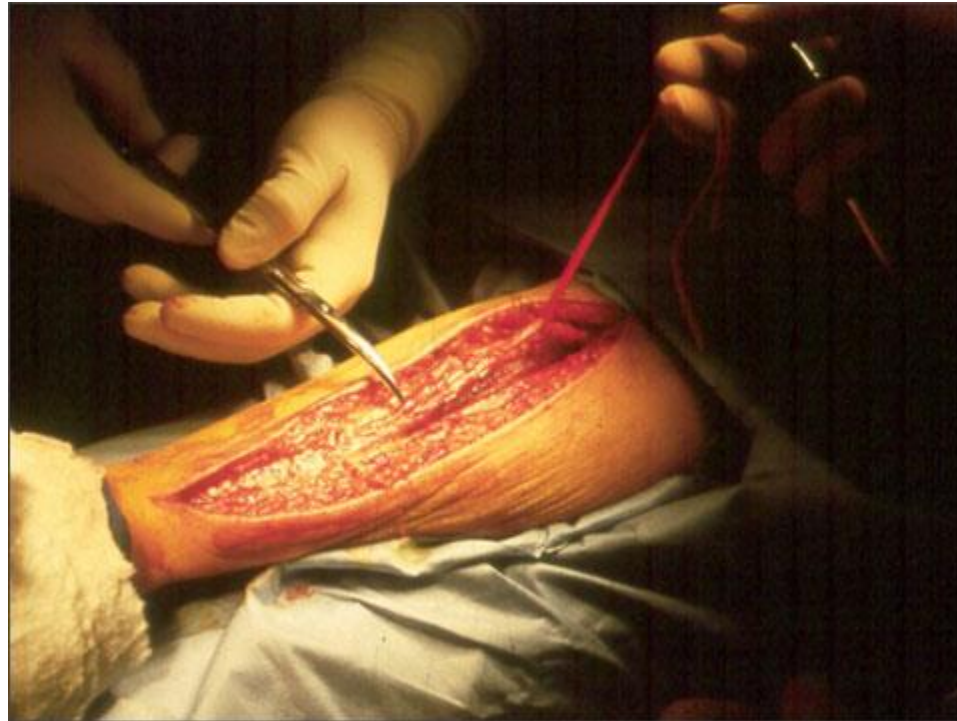
Bilateral versus Single Internal Mammary Artery Grafts at 10 Years

- Arterial Revascularization Trial (ART)
 - 3102 patients randomized prospectively to single or bilateral IMA
 - Intention to treat study
 - At 1 year, excellent results with similar operative and 1 year survival
 - At 5 years, no difference
 - At 10 years, no difference in
 - All cause mortality
 - Rate of composite outcome of death, MI or stroke
 - Rate of repeat revascularization
- Issues with study: 14% crossover between groups; 22% in the single IMA group had RA grafts; medical therapy effects

Radial Artery Anatomy



Radial Artery Harvest



Radial Artery (RA) In CABG

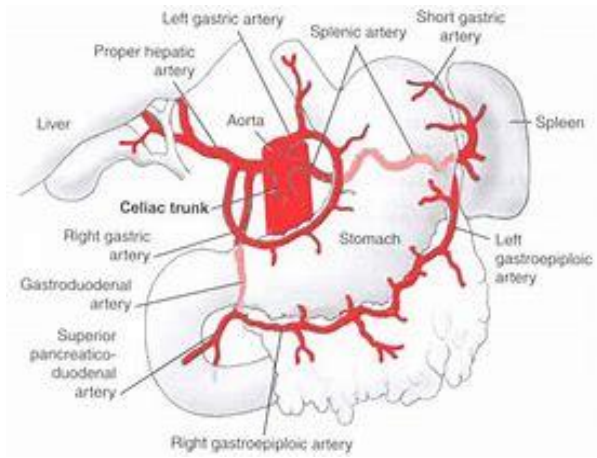
- RA conduits can provide more complete arterial revascularization
 - Relatively easy to harvest (even endoscopic)
 - Relatively low risk harvest
 - No impact on sternal healing
 - Able to reach all coronary territories
- Risks:
 - Hand ischemia
 - Paraesthesia and weakness of thumb and index finger
 - Vasospasm of RA
 - “string sign” (target vessel must have 70% or greater stenosis)

Radial Artery in CABG

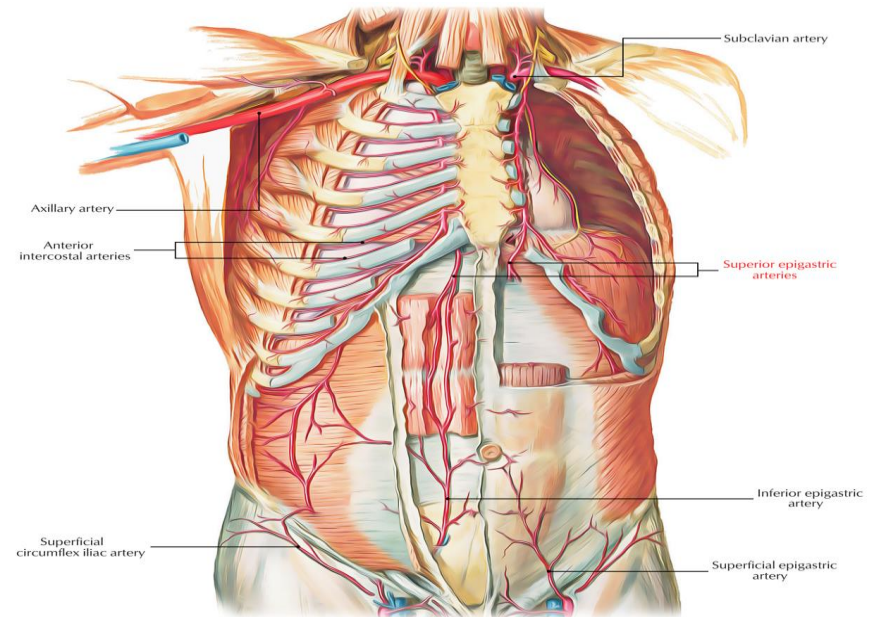
- Randomized trials comparing SV and RA grafts
 - RA has greater 5yr patency compared to SV grafts
 - Decreased angina recurrence with RA
 - RA associated with decreased major adverse cardiac events
 - Comparable patency to RIMA
 - No difference in mortality
- Caution:
 - If patient had RA as cathsite, need to delay harvest (3 month)

Other Arterial Conduits

- Right gastroepiploic artery (RGEA)



- Inferior epigastric artery



Society of Thoracic Surgeons Clinical Practice Guidelines on Arterial Conduits for CABG

- The LIMA should be used to bypass the LAD
- As an adjunct to LIMA, a second arterial graft (RIMA or RA) should be considered in appropriate patients
- Use of BIMA should be considered in patients without risk of sternal wound infection
- As an adjunct to LIMA, use of a RA graft is reasonable when grafting coronary targets with severe (80%) stenosis
- RGEA may be considered when poor conduits exist

Society of Thoracic Surgeons Clinical Practice Guidelines on Arterial Conduits for CABG

- Formal collaboration:
 - Non-interventional cardiologist
 - Interventional cardiologist
 - Cardiac surgeon
 - Other care providers

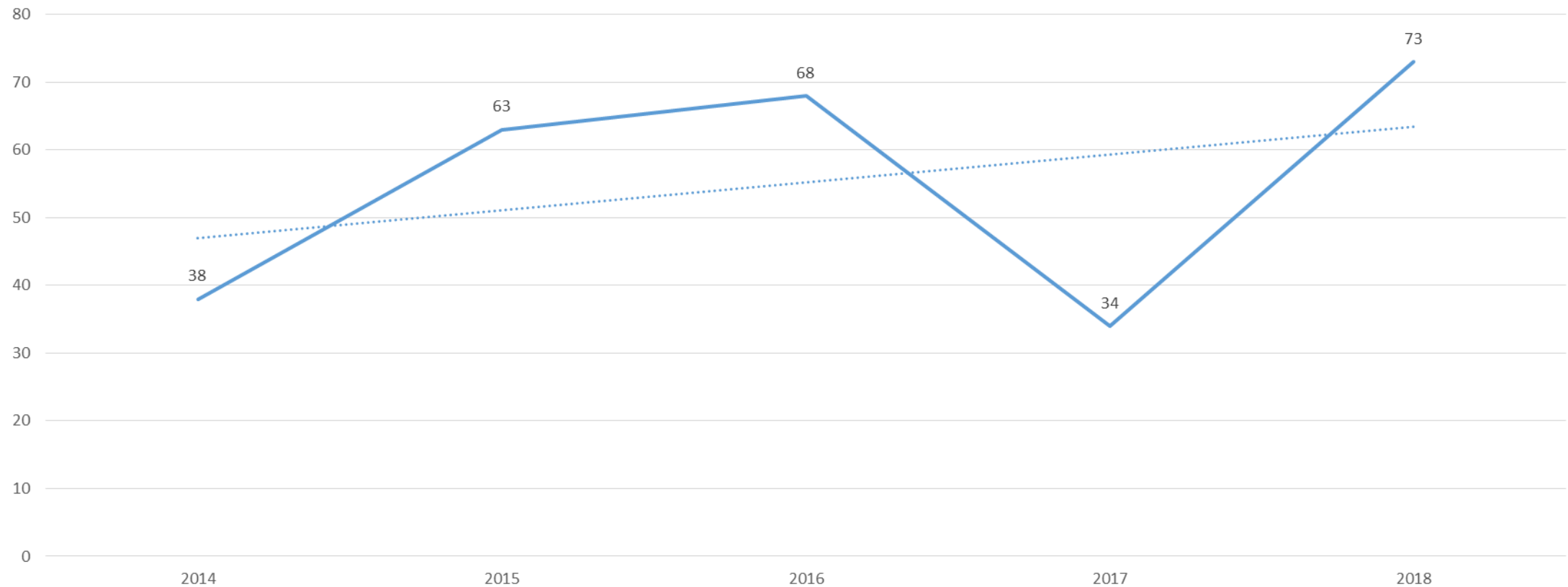
Society of Thoracic Surgeons Clinical Practice Guidelines on Arterial Conduits for CABG

- Patient Centered Care Based Upon:
 - Reviewing the patients coronary anatomy and disease burden (SYNTAX score)
 - Reviewing the patient's comorbidities
 - Integration of medical therapies to mitigate long term risks
 - Balancing patient goals and preferences to limit invasiveness of procedure with long term outcomes and survival benefit

CHI MEMORIAL HOSPITAL

- We have 12 conferences monthly to discuss cases and procedures
- Morbidity and mortality conferences
- Immediate access to heart catheterization images (even during surgery)
- Open dialogue between cardiologists and cardiothoracic surgeons in a noncompeting atmosphere to optimize patient care

Number of CABGs Cases with Multiple Arterial Grafts – Memorial Hospital (2014- 2018)



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