CORONARY ARTERY DISEASE SURGICAL ASPECTS

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INTRODUCTION

HISTORY OF CARDIAC SURGERY

CORONARY ARTERY ANATOMY

ATHEROSCLEROSIS CAD

DIAGNOSIS

MANAGEMENT

SURGICAL INDICATIONS /TECHNIQUES

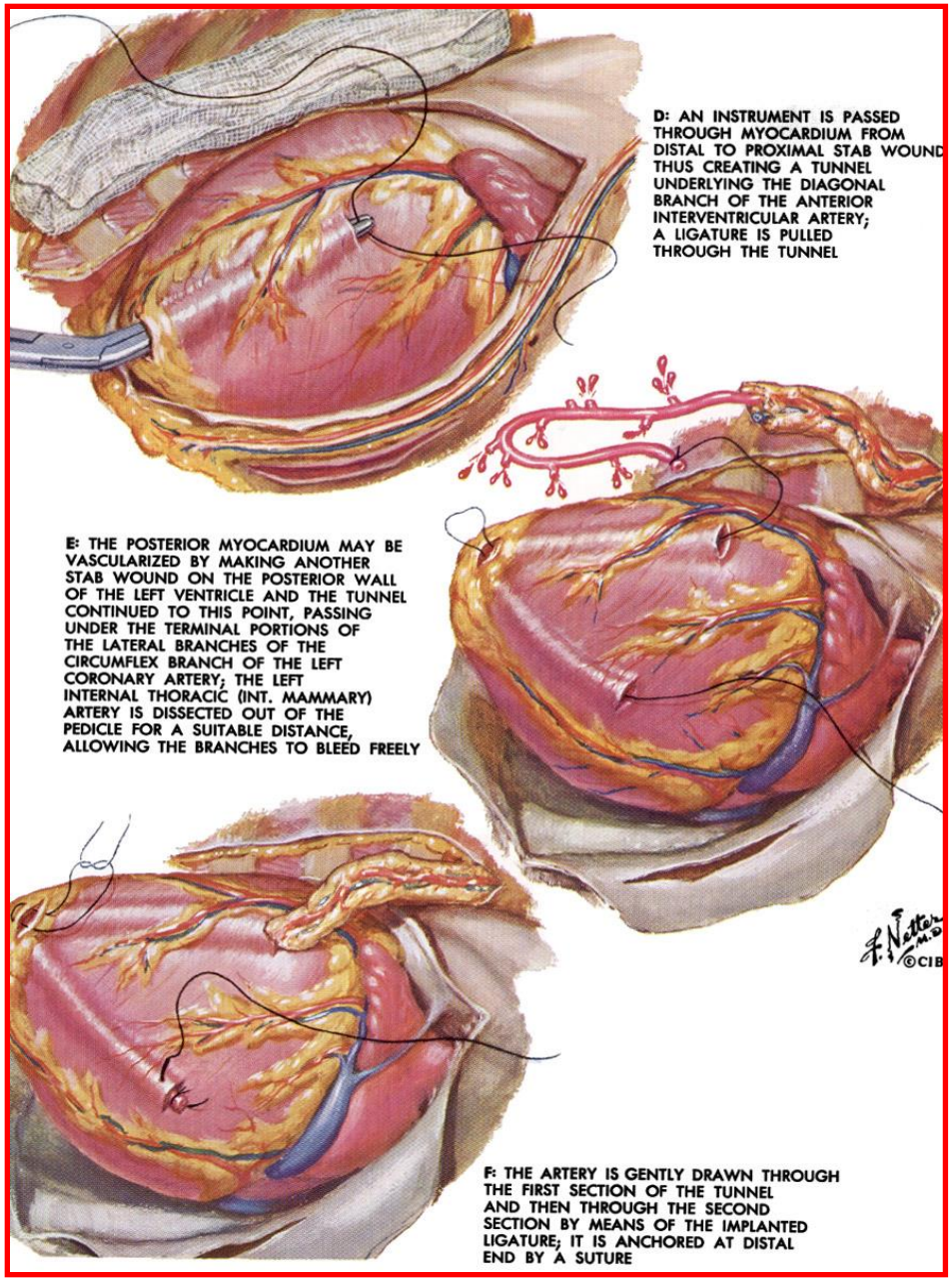
COMPLICATIONS

Adult Cardiac Surgery: Ischemic Heart Disease (History)

- **Claude Beck**
  - **1930's**- sought to increase myocardial blood flow indirectly with pericardial fat and omentum.
- **Arthur Vineberg**
  - **1940's**- Mobilization of left internal mammary artery with implantation of bleeding end into the left ventricle.
  - **1964**- follow-up study on 140 patients

    33% mortality

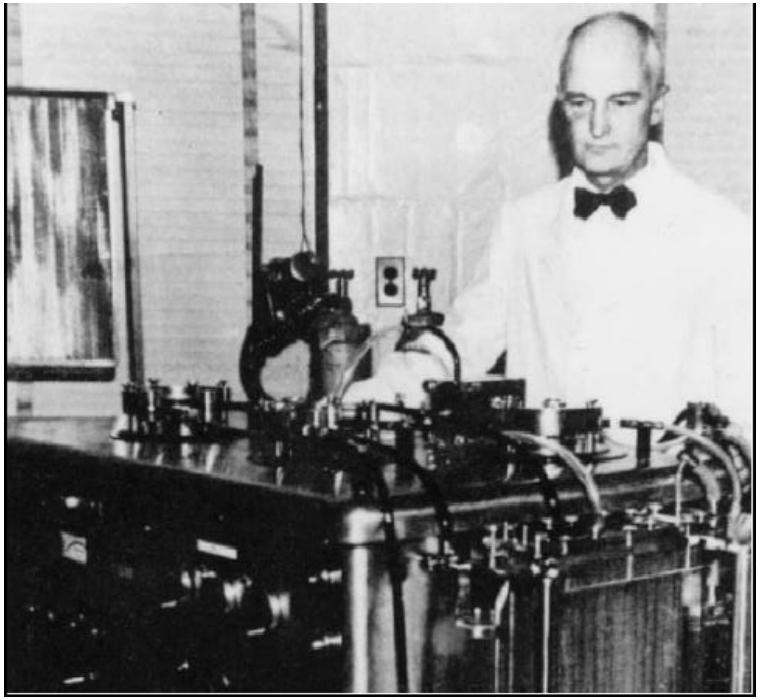
    85% relief from angina


D: AN INSTRUMENT IS PASSED THROUGH MYOCARDIUM FROM DISTAL TO PROXIMAL STAB WOUND THUS CREATING A TUNNEL UNDERLYING THE DIAGONAL BRANCH OF THE ANTERIOR INTERVENTRICULAR ARTERY; A LIGATURE IS PULLED THROUGH THE TUNNEL
E: THE POSTERIOR MYOCARDIUM MAY BE VASCULARIZED BY MAKING ANOTHER STAB WOUND ON THE POSTERIOR WALL OF THE LEFT VENTRICLE AND THE TUNNEL CONTINUED TO THIS POINT, PASSING UNDER THE TERMINAL PORTIONS OF THE LATERAL BRANCHES OF THE CIRCUMFLEX BRANCH OF THE LEFT CORONARY ARTERY; THE LEFT INTERNAL THORACIC (INT. MAMMARY) ARTERY IS DISSECTED OUT OF THE PEDICLE FOR A SUITABLE DISTANCE, ALLOWING THE BRANCHES TO BLEED FREELY
F. Netter M.D.
©CIB
F: THE ARTERY IS GENTLY DRAWN THROUGH THE FIRST SECTION OF THE TUNNEL AND THEN THROUGH THE SECOND SECTION BY MEANS OF THE IMPLANTED LIGATURE; IT IS ANCHORED AT DISTAL END BY A SUTURE

Adult Cardiac Surgery: Ischemic Heart Disease (History)

John H. Gibbon, Jr.

"During the long night, helplessly watching the patient struggle for life as her blood became darker and her veins more distended, the idea naturally occurred to me that if it were possible to remove some of the blue blood…put oxygen into that blood and allow carbon dioxide to escape from it, and then to inject continuously the now-red blood back into the patient's arteries, we might have saved her life."



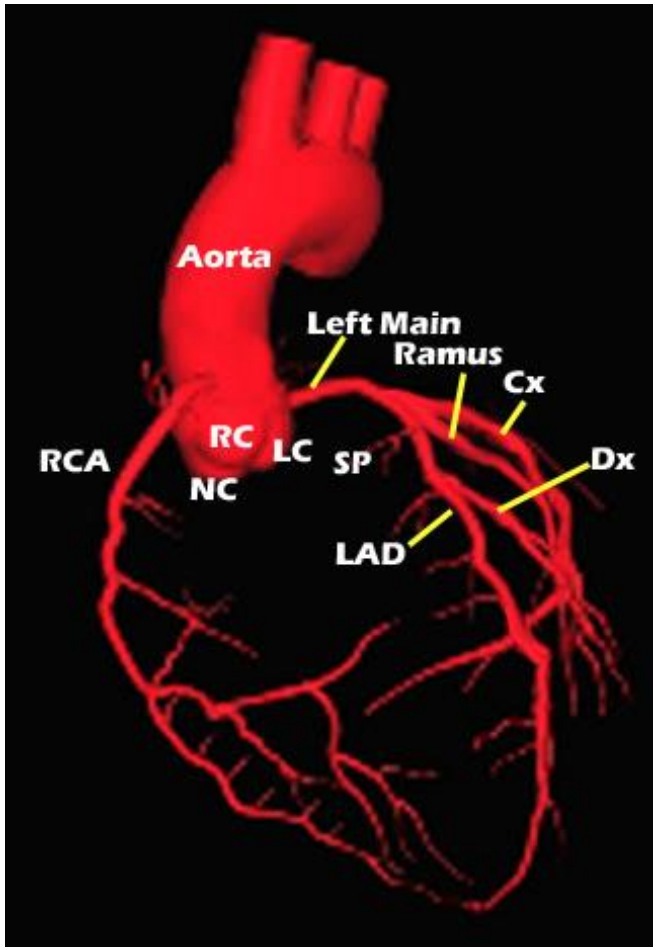
- Heart-lung machine
- May 6, 1953- ASD closure

Heart Lung Machine

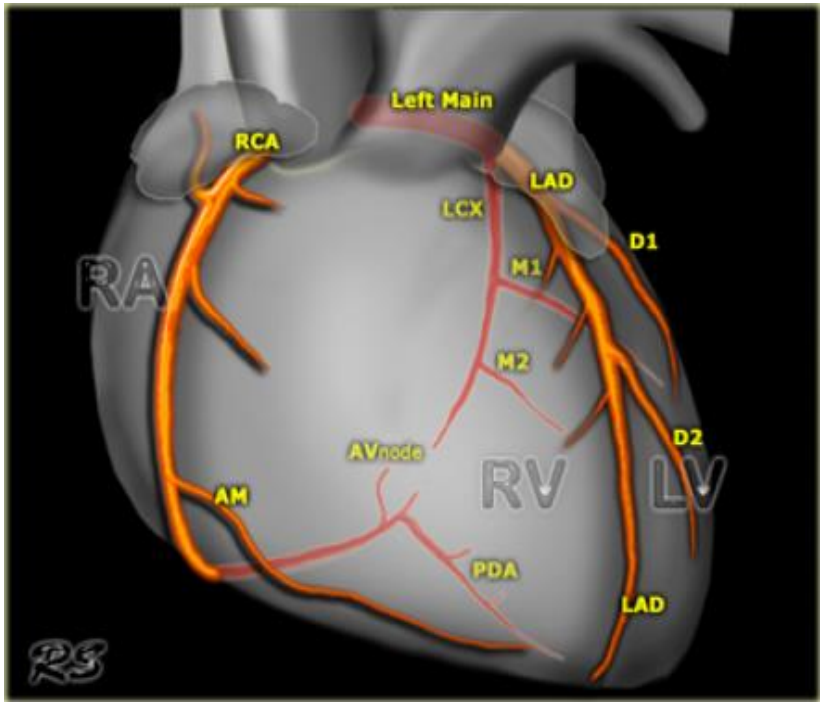
Adult Cardiac Surgery: Ischemic Heart Disease (History)

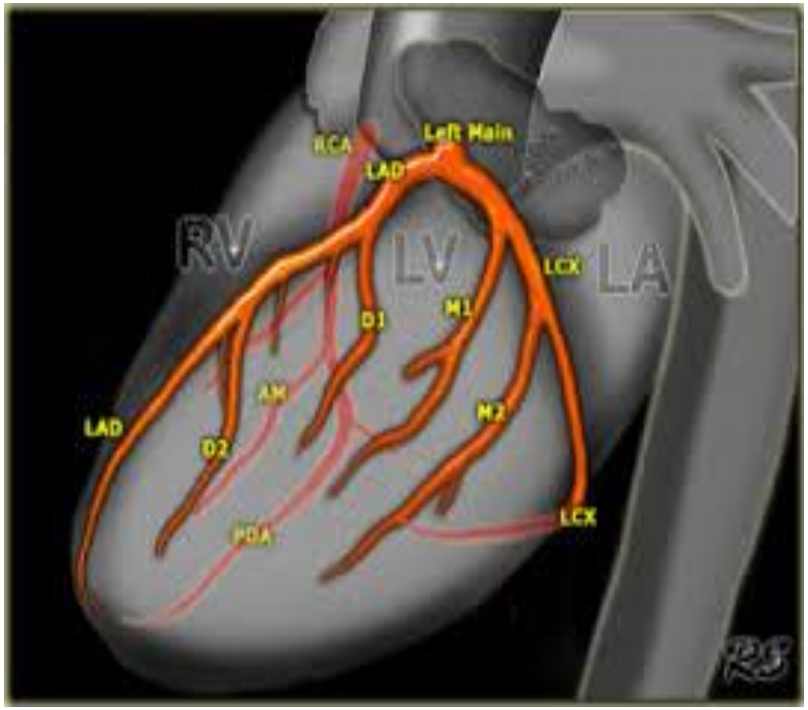
- 1962- **David C. Sabiston, Jr.-**
  - Aortocoronary saphenous vein bypass
- **KOLOSOV** LIMA -LAD 1964 IN Russia
- **Frank Spencer/George Green**
  - Internal mammary artery

The Normal Heart - Coronary Artery Anatomy



The Normal Heart - Coronary Artery Anatomy



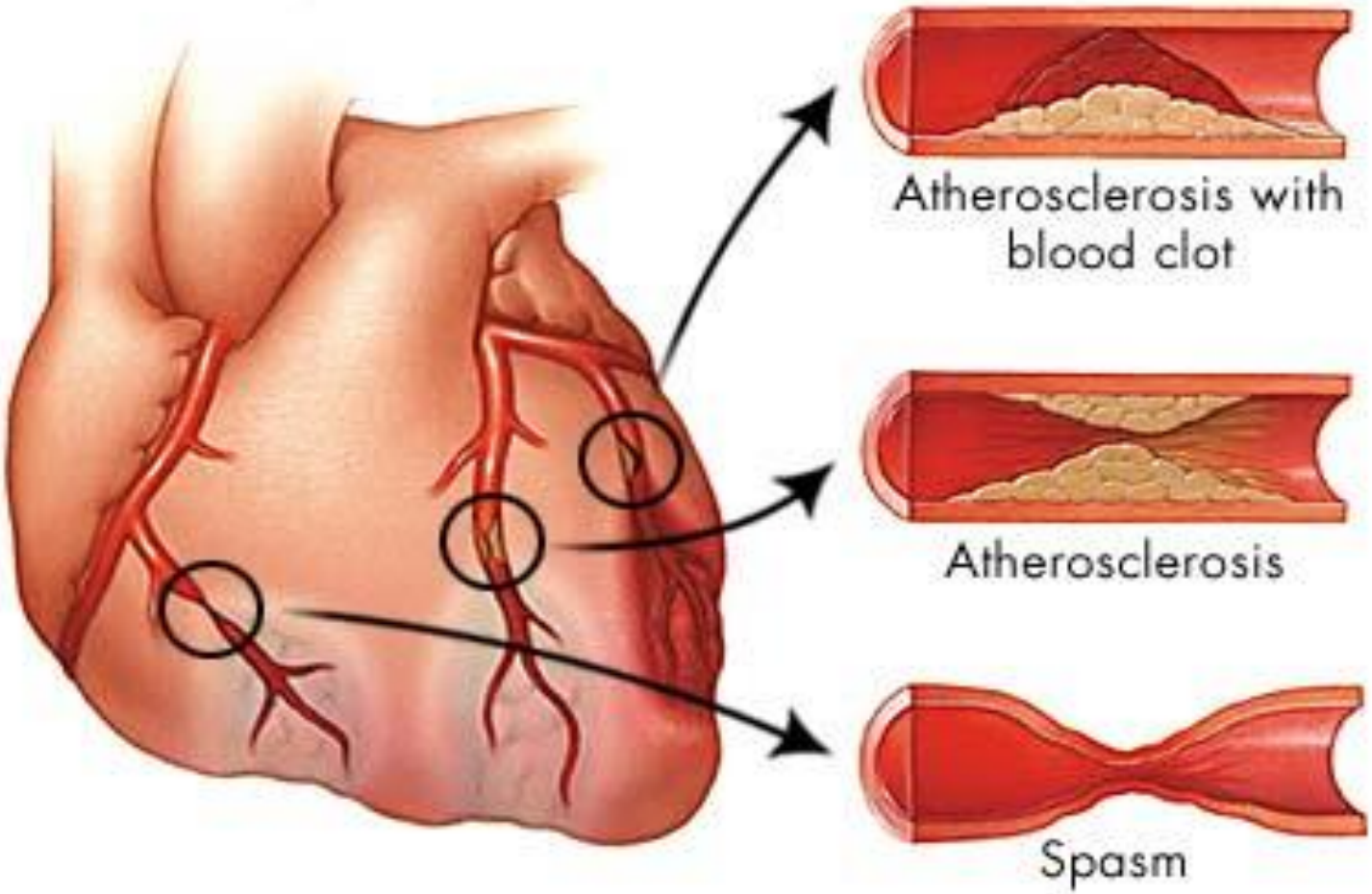


Ischaemic Heart Disease

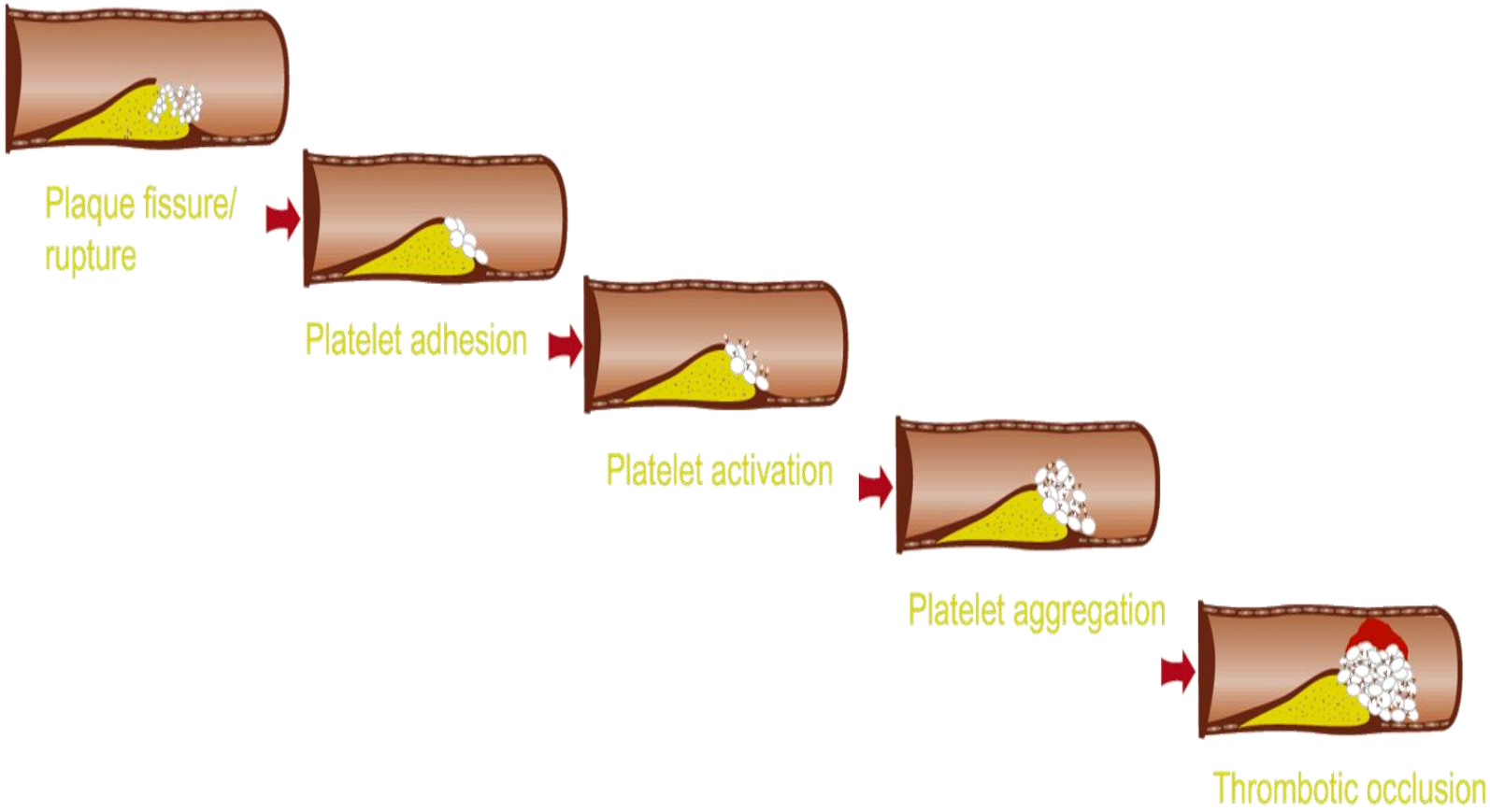
- It results from imbalance between oxygen demand and supply

Aetiology

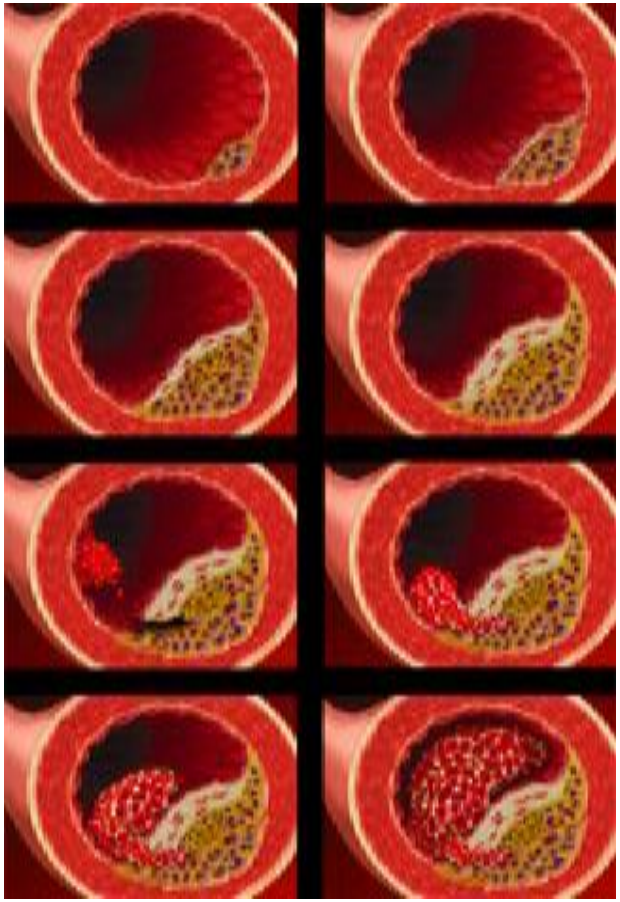
- Atherosclerosis (>90%)
- Embolisation
- Coronary spasm
- Vasculitis
- Ostial stenosis
- Severe LVH
- Congenital anomalies of the coronary artereis (e.g anomalous origin of LAD artery from pulmonary artery)

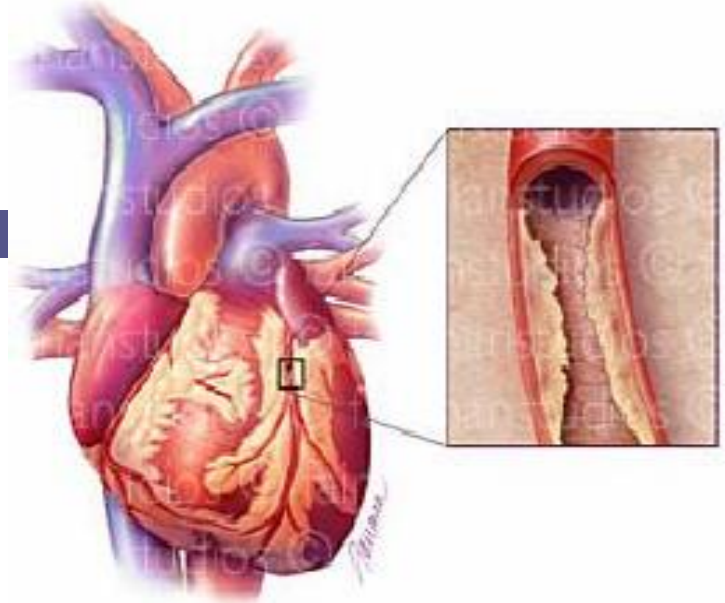

Atherosclerosis with blood clot
Atherosclerosis
Spasm

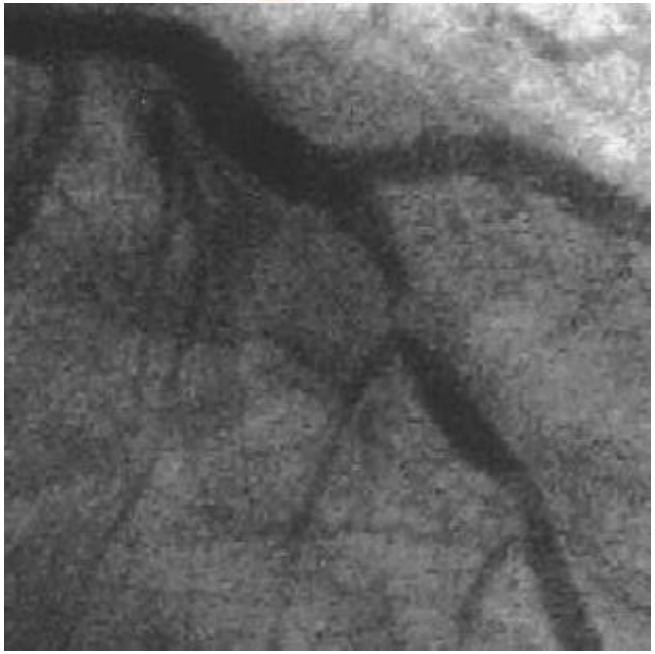
Pathogenesis of ACS



ATHEROSCLEROSIS







CAD

- <u>Diagnosis</u>

1. History
2. Physical examination
3. ECG findings
4. cardiac enzymes

Investigations

- ECG
- Cardiac enzymes
- Chest x-ray
- FBS
- Serum lipids
- TMT
- Stress or pharmacologic stress myocardial perfusion studies
- Cardiac CT-Scan
- Coronary angiography

Treatment of CAD

- Nitrates
- Beta blockers
- Aspirin/PLAVIX DUAL ANTIPLATELT THERAPY
- Ca-channel blockers(in coronary spasm)
- Treating the associated risk factors
- Treating the precipitating factor
- Revascularization (if indicated)

  SURGICAL VS INTERVENTIONAL

Indications for open-heart surgery

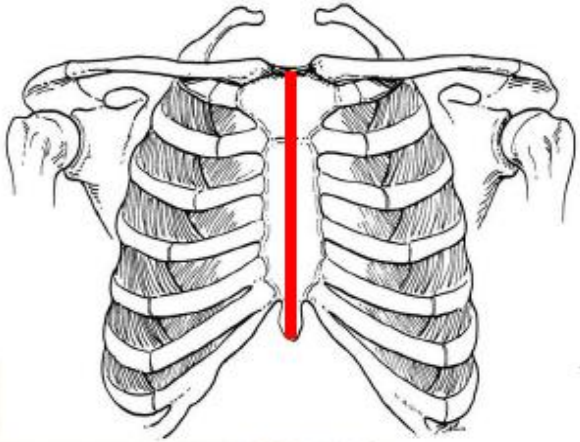
- Coronary Artery Bypass Grafting: (CABG)
  - Triple vessel disease
  - Lf main coronary artery disease
  - Unstable angina ,failed Mx therapy
  - Complications of PTCA
  - Life threatening complications of MI
  - Anomalies of Coronary arteries.

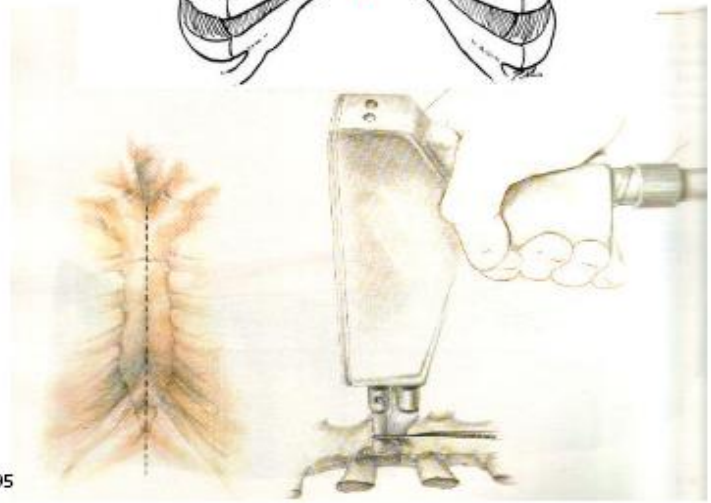
Adult Cardiac Surgery: CABG Techniques

- Median sternotomy
- Cardiopulmonary bypass
- Cardioplegic arrest
- Mammary artery, reversed saphenous vein, radial artery.

Sternotomy

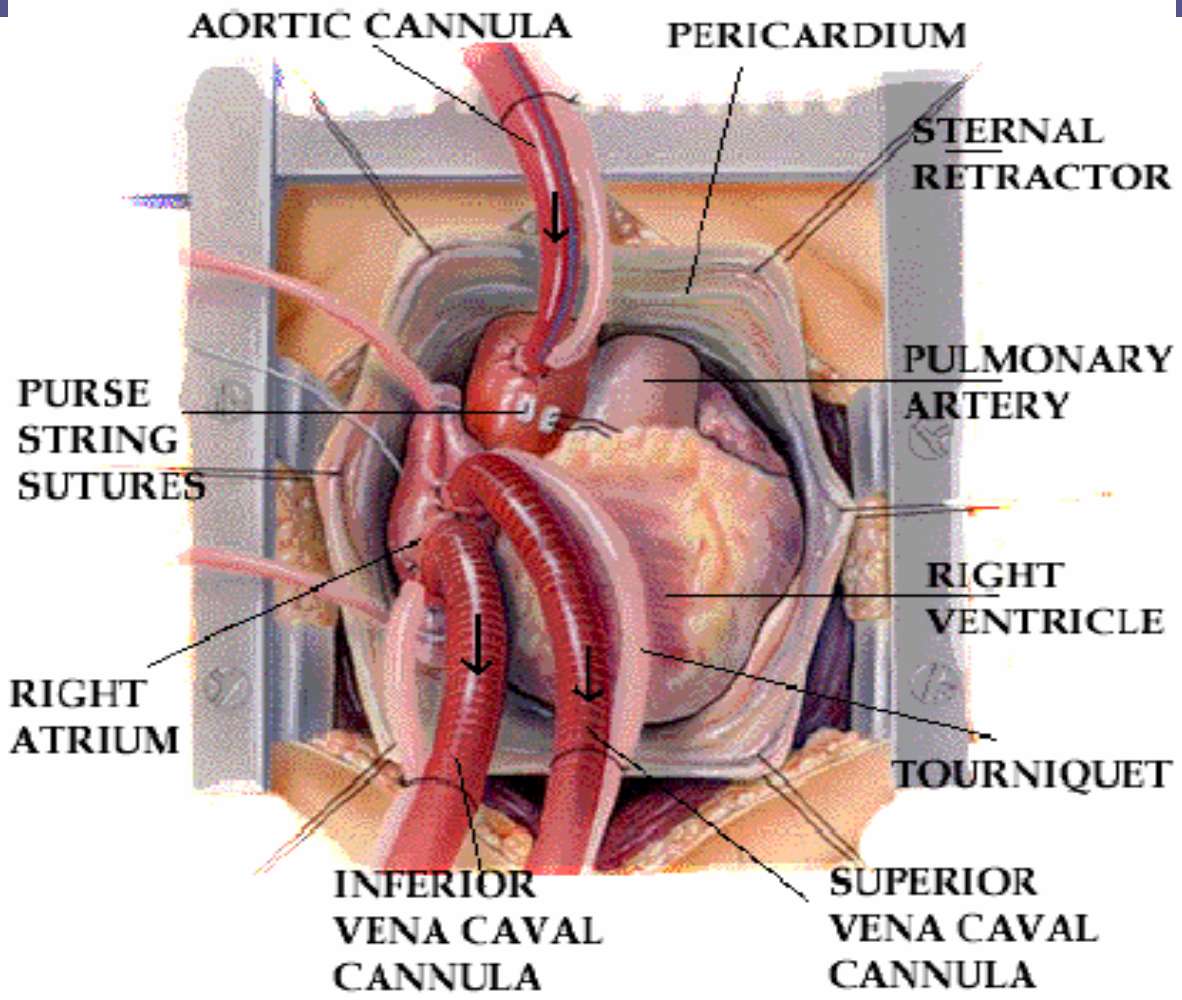
- Sternotomy approach
  - allows almost all cardiac procedures
  - best overall access to the heart
- The sternum is divided with a saw

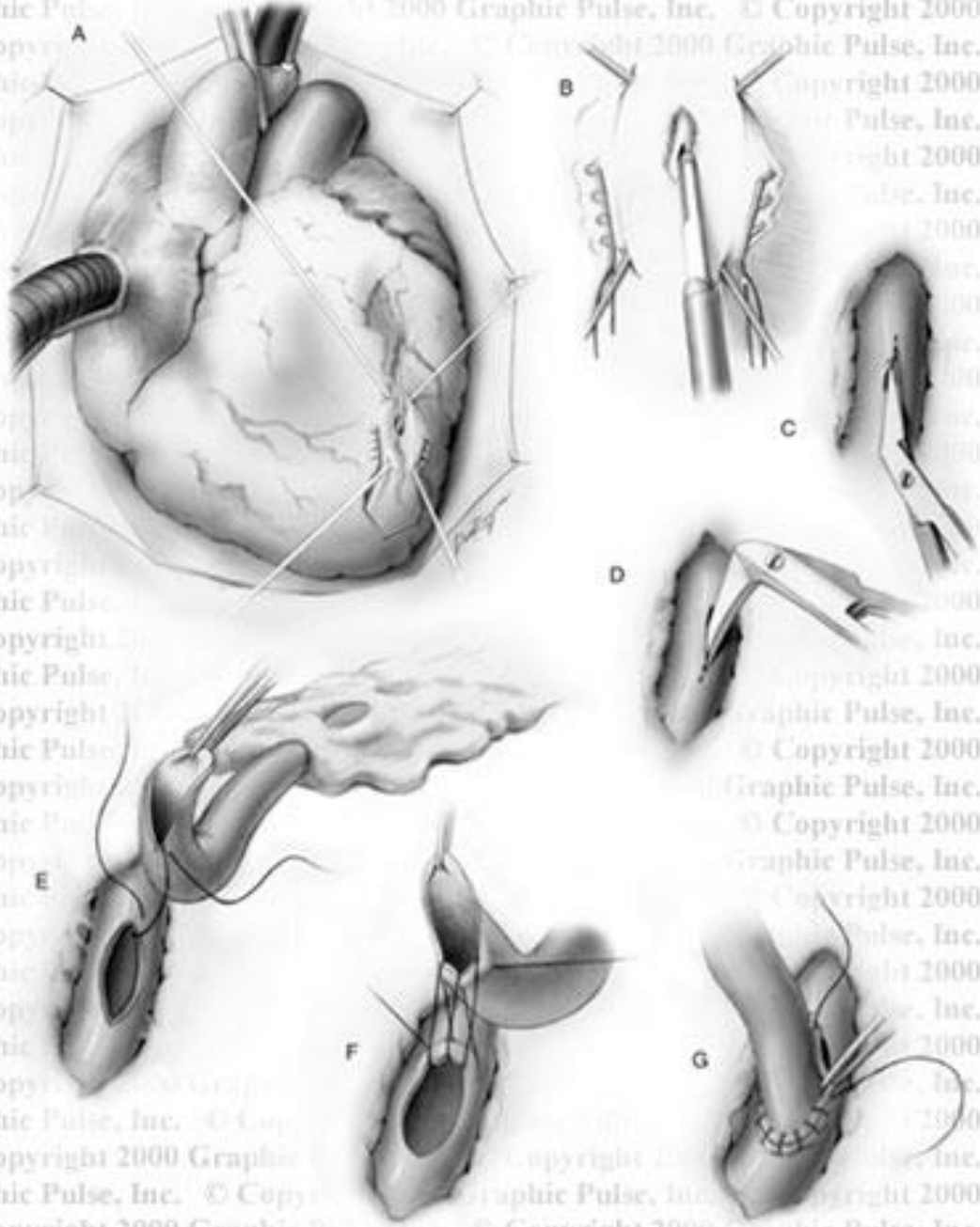


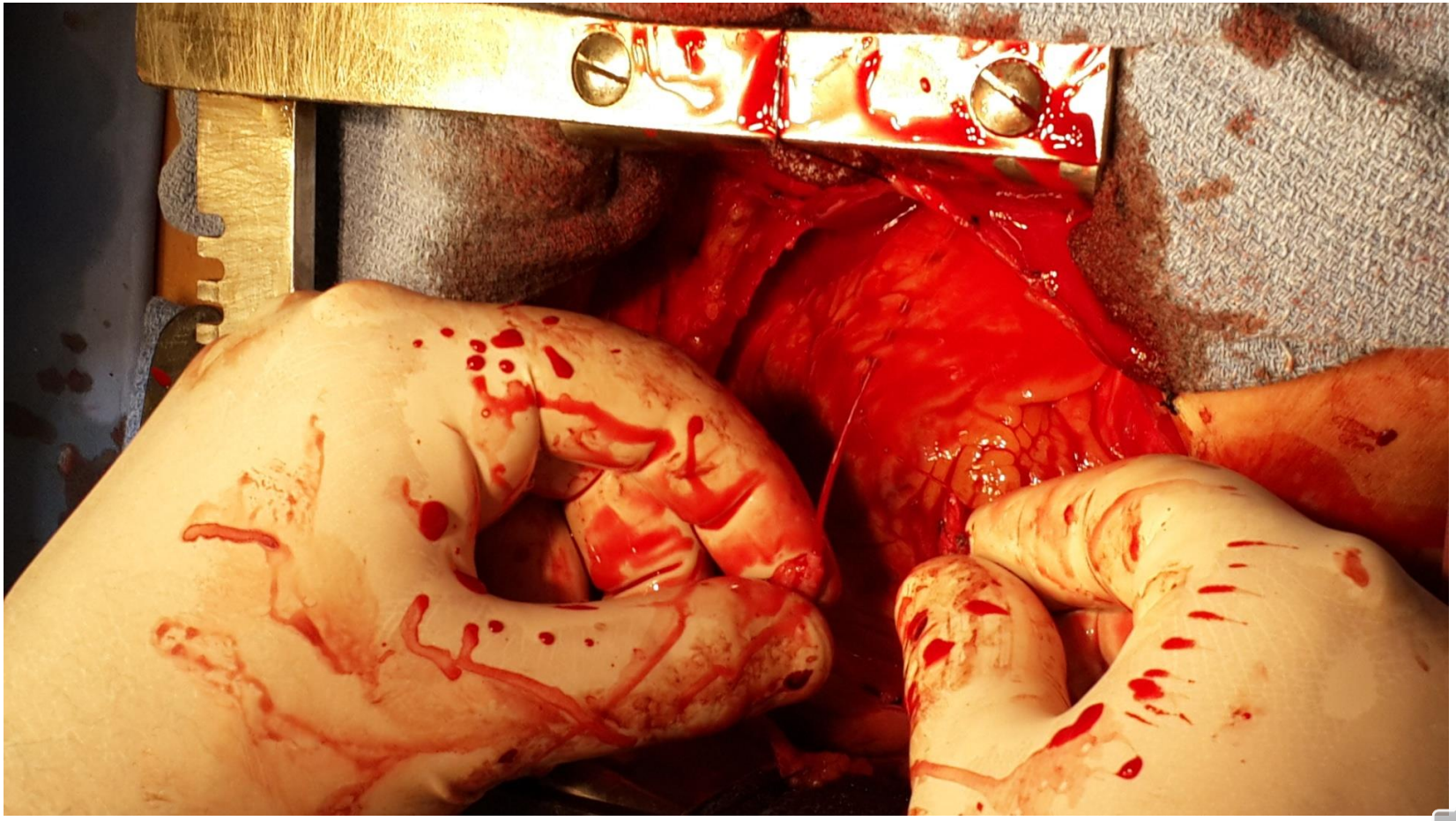


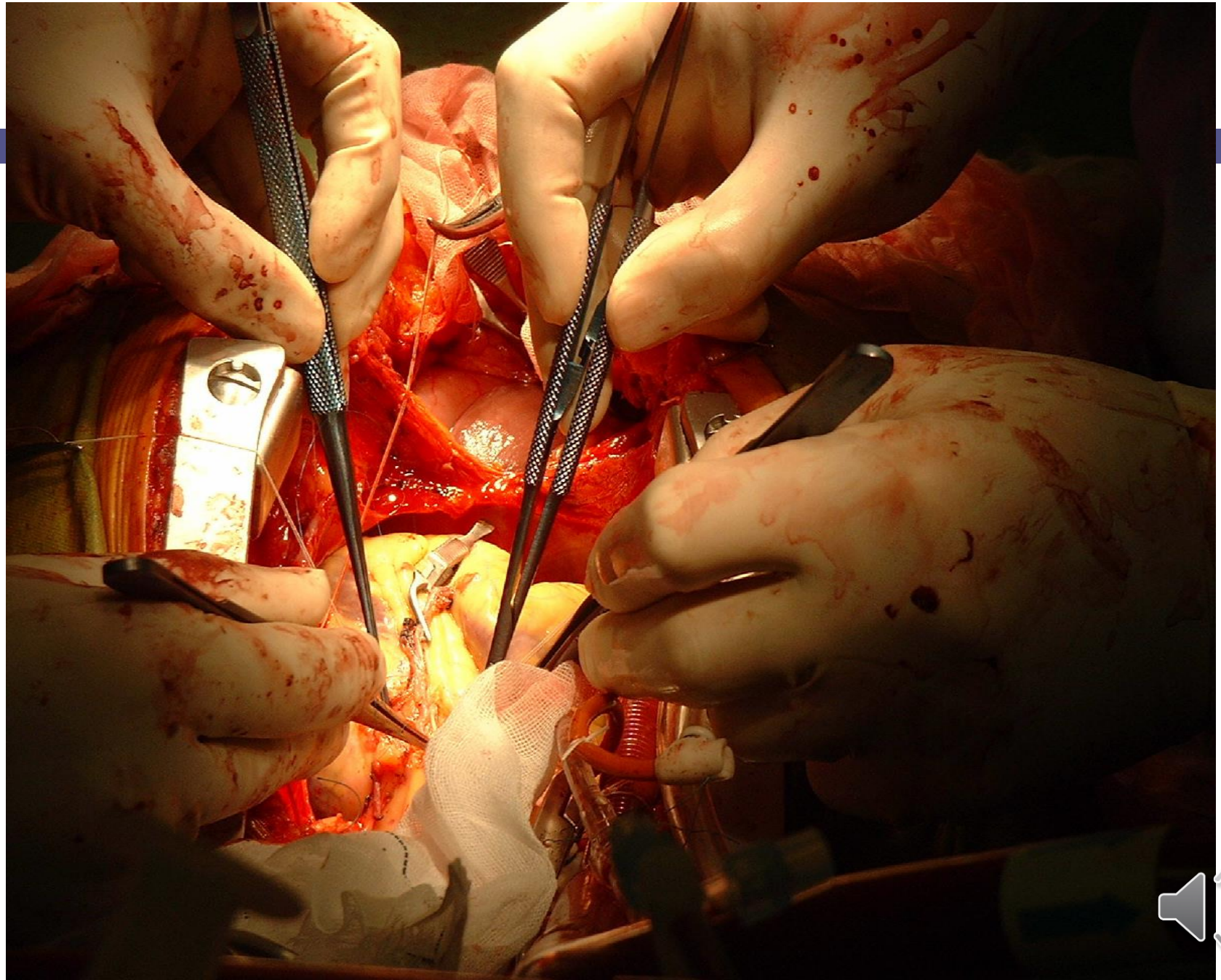
From : Manual of Cardiac Surgery, Harlan & Starr, Springer-Verlag, New York , 1995

HEART ON CARDIOPULMONARY BYPASS

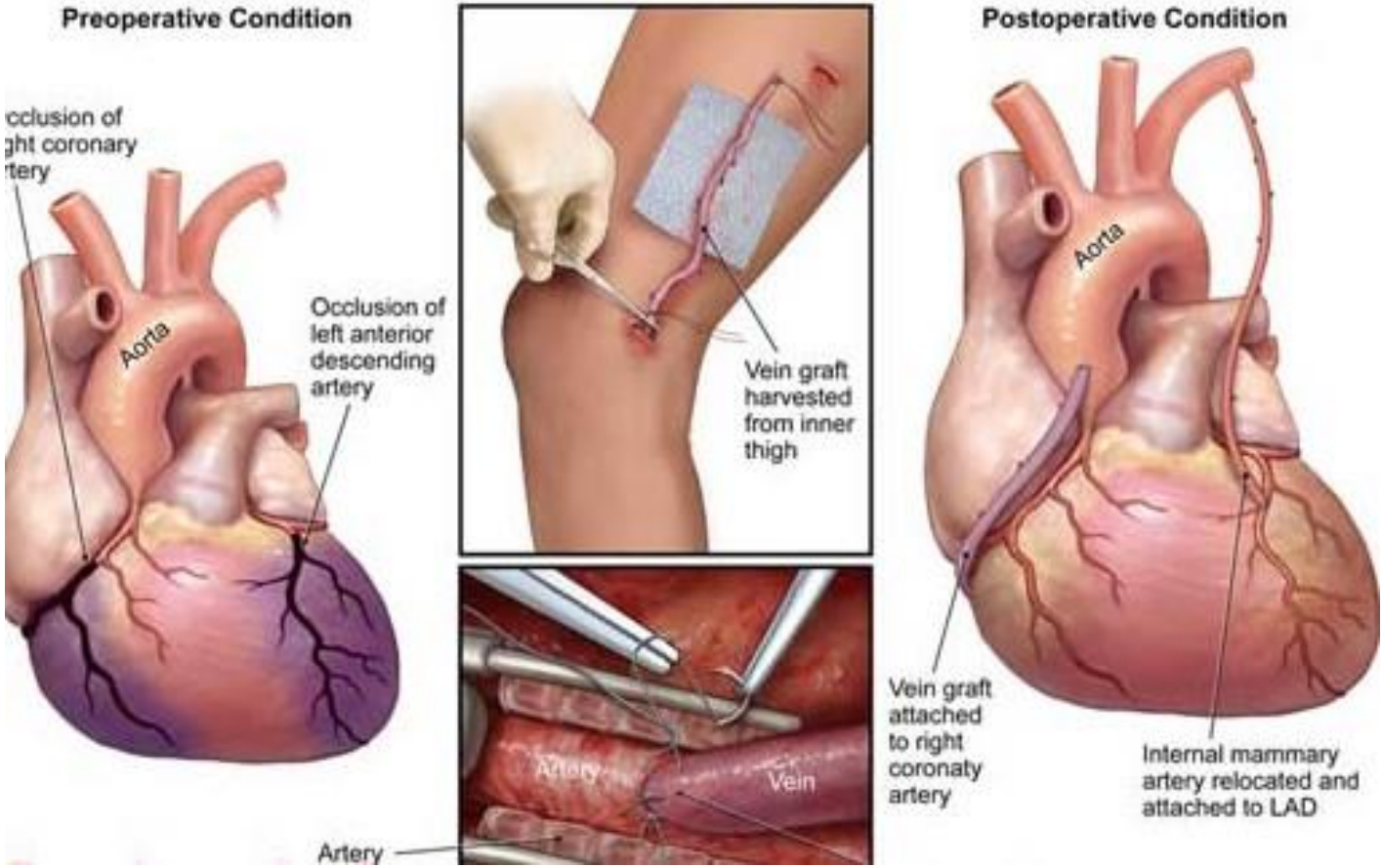




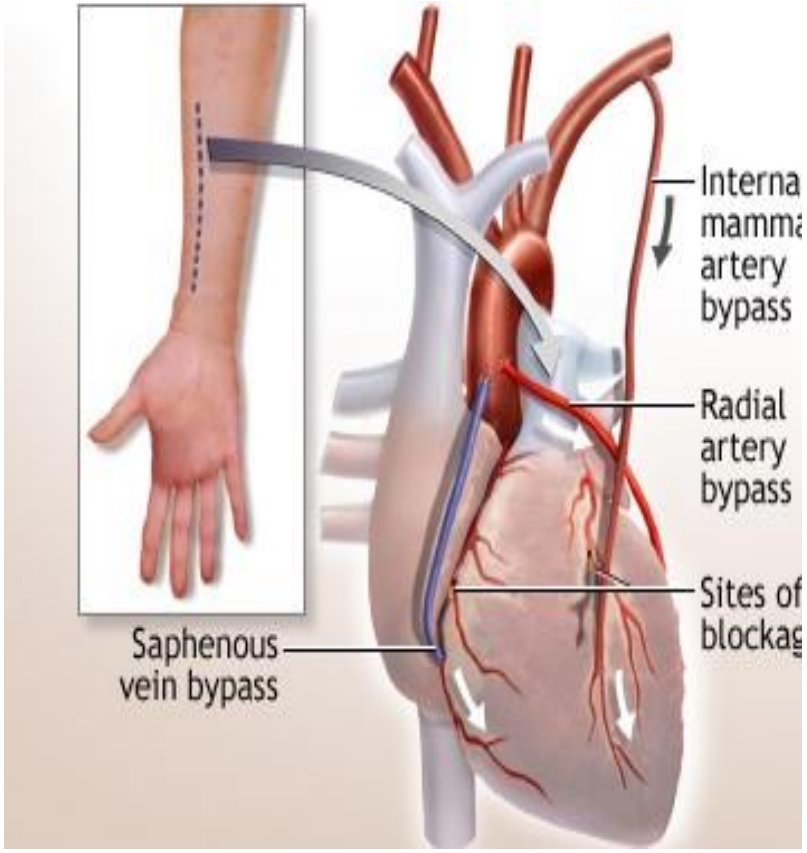


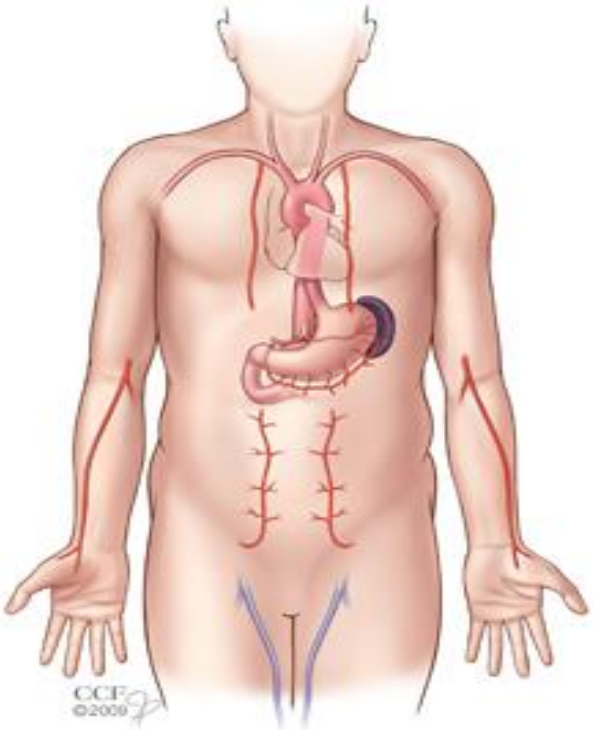


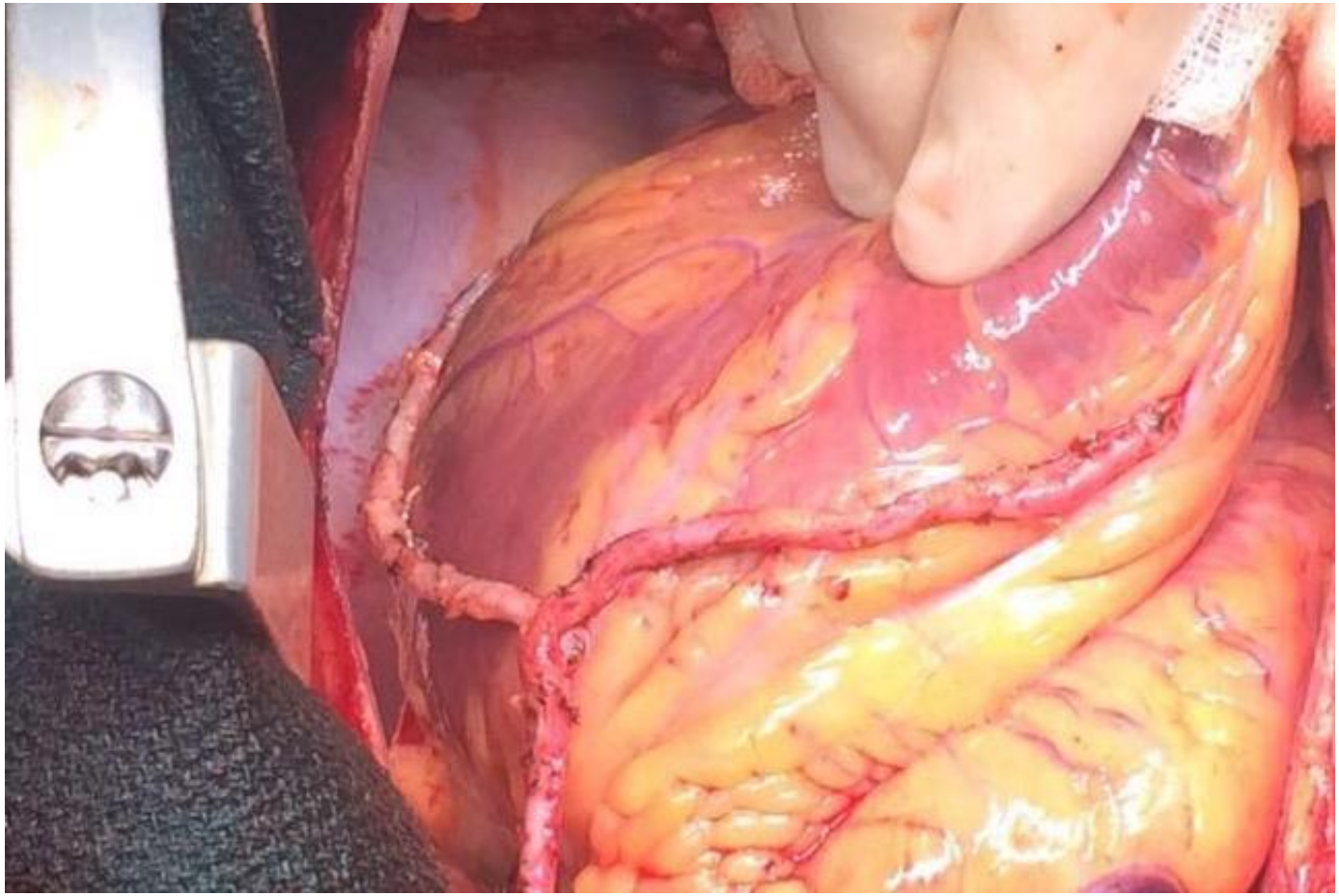
Coronary Artery Bypass Grafts



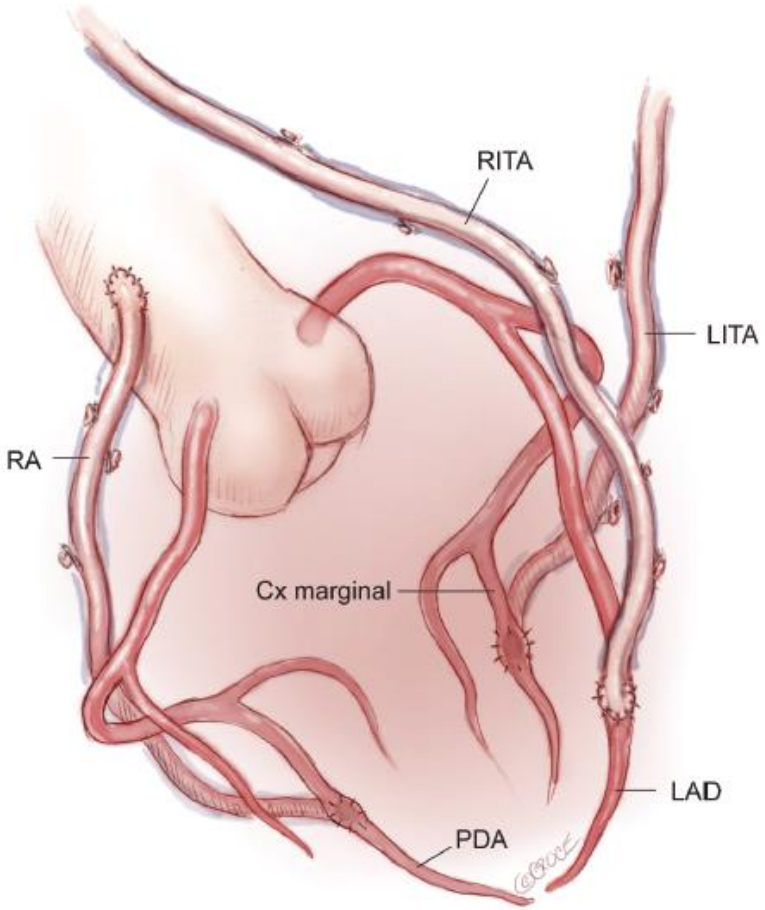
Arterial vs Venous conduits

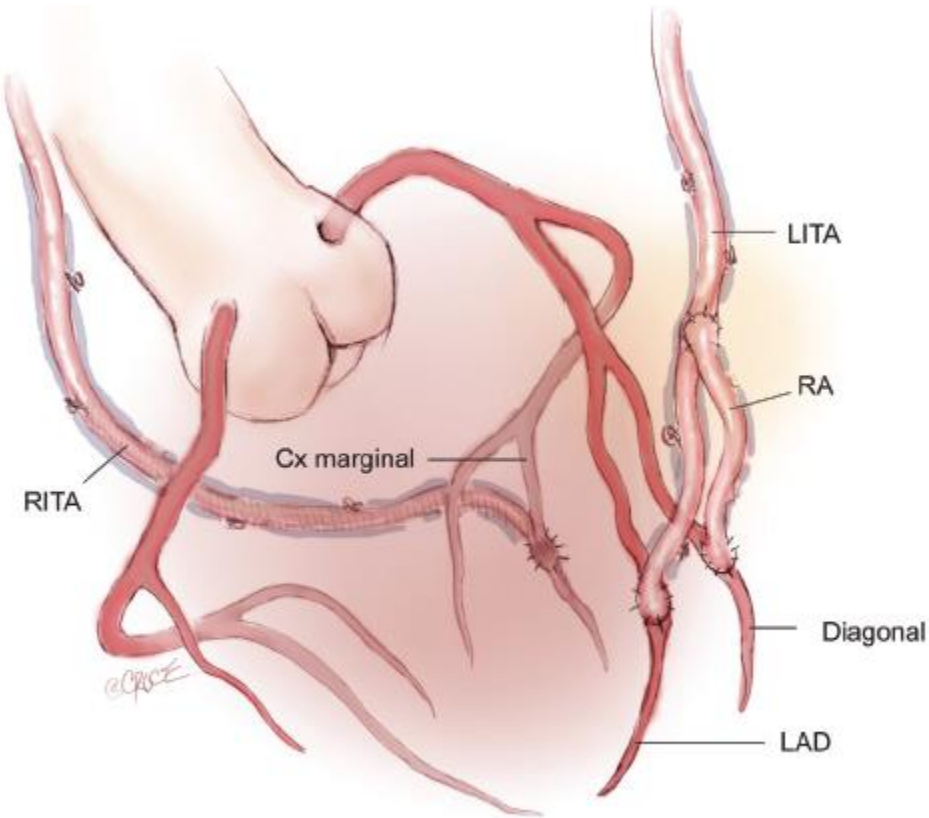


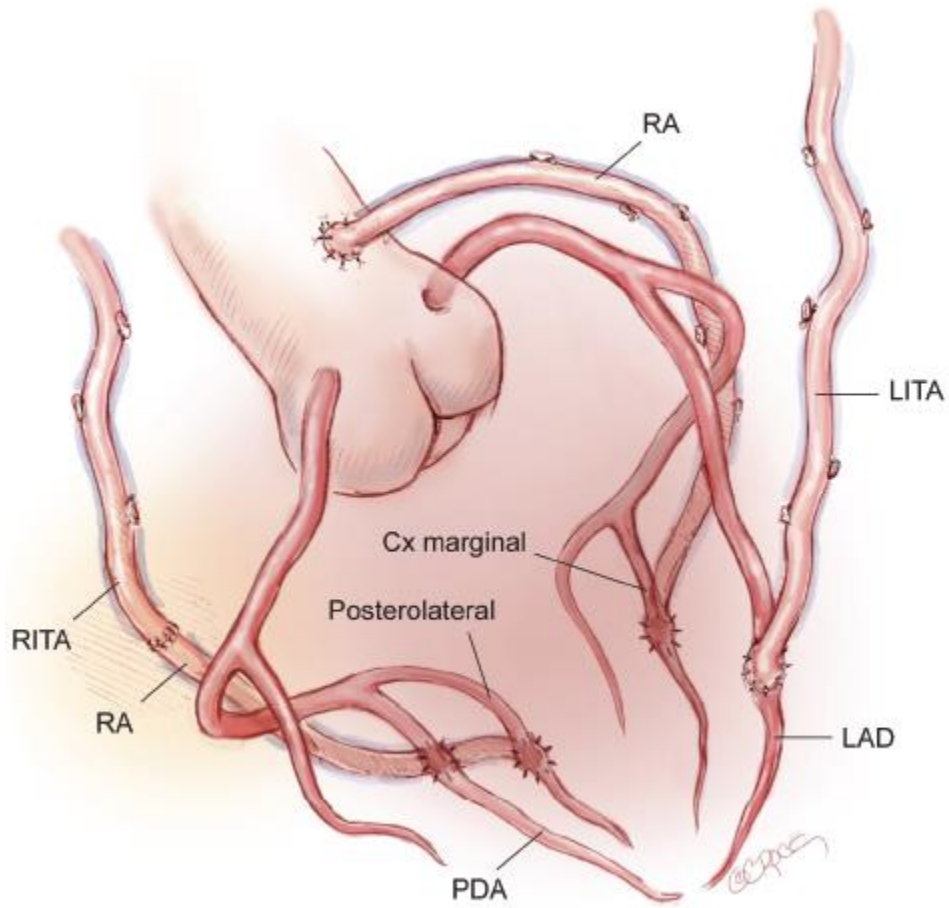


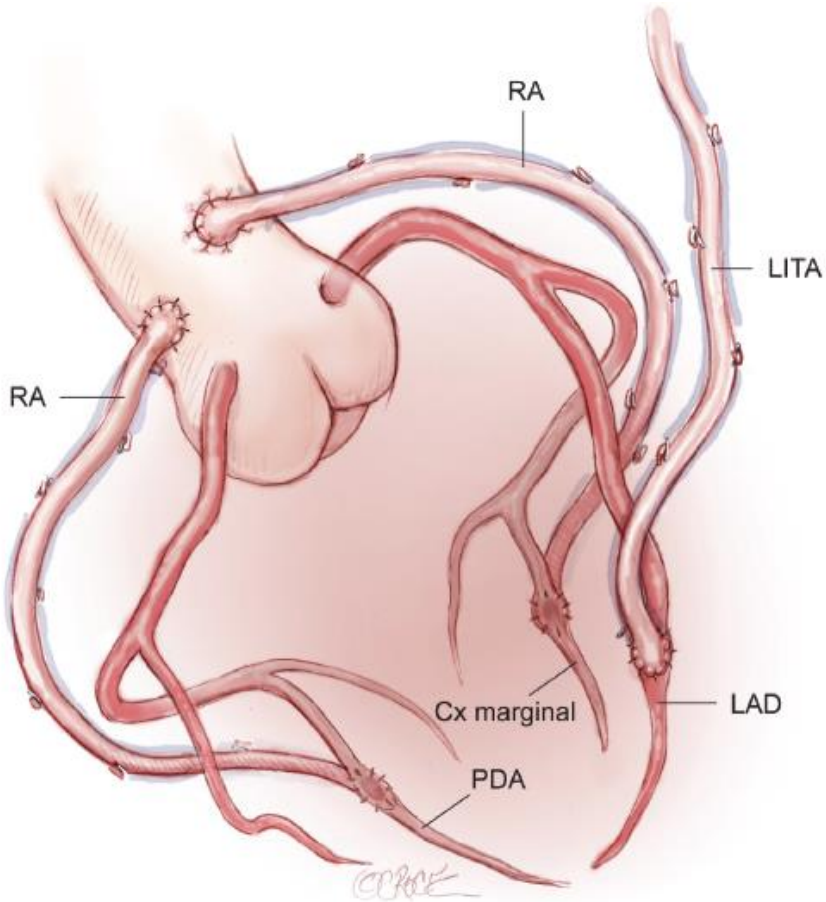


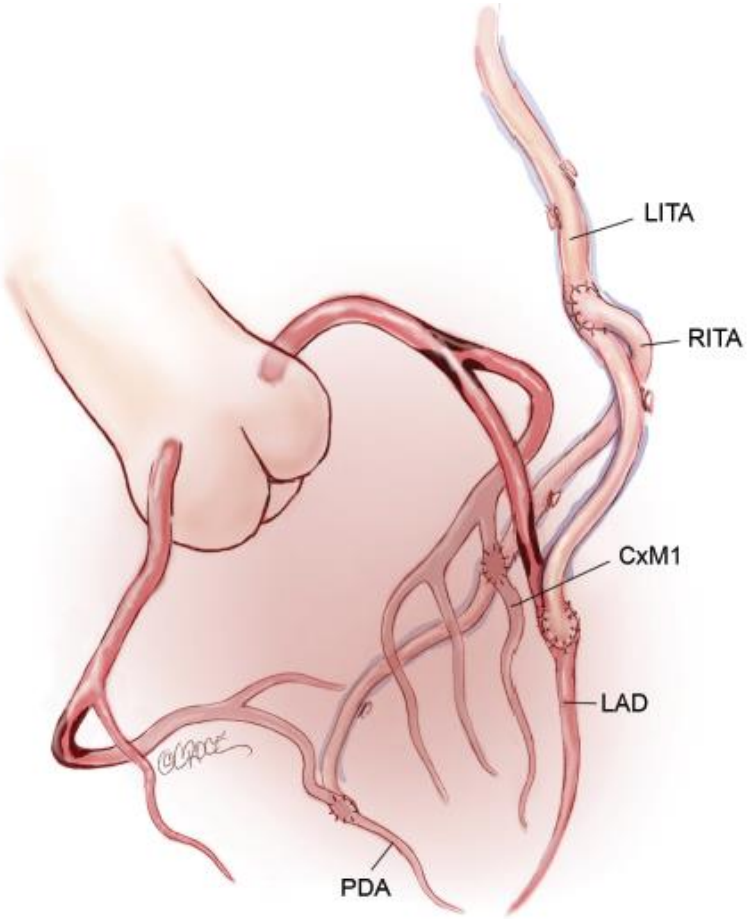
Total arterial revascularization

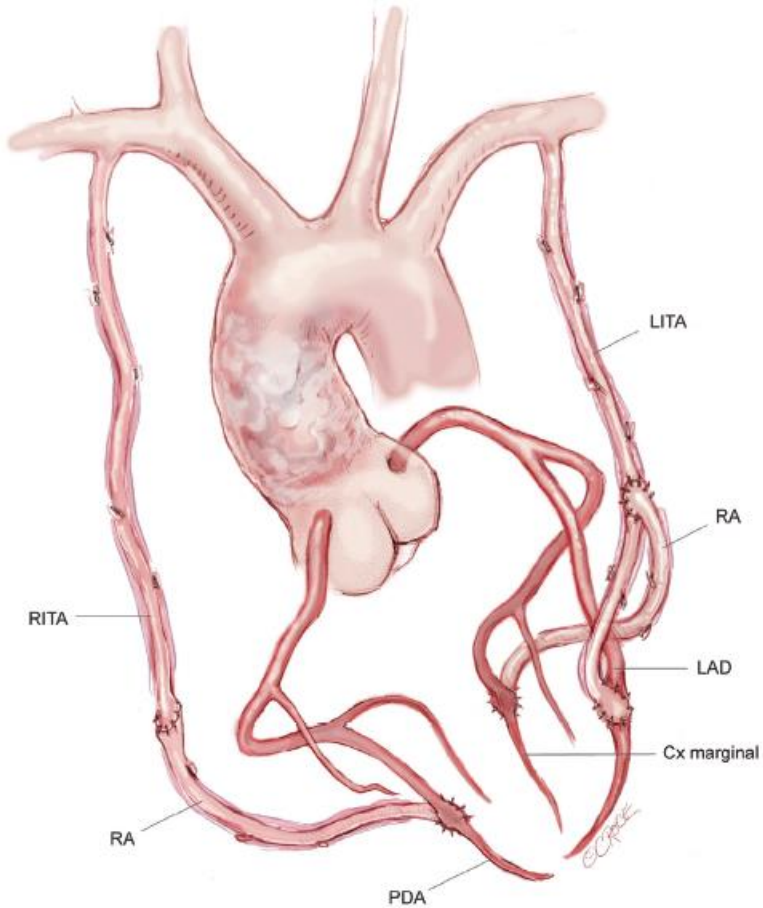



LITA
RA
Cx marginal
RITA
Diagonal
LAD


RA
LITA
Cx marginal
Posterolateral
RITA
RA
LAD
PDA


RA
LITA
RA
Cx marginal
LAD
PDA


LITA
RITA
CxM1
LAD
PDA


LITA
RA
RITA
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Cx marginal
RA
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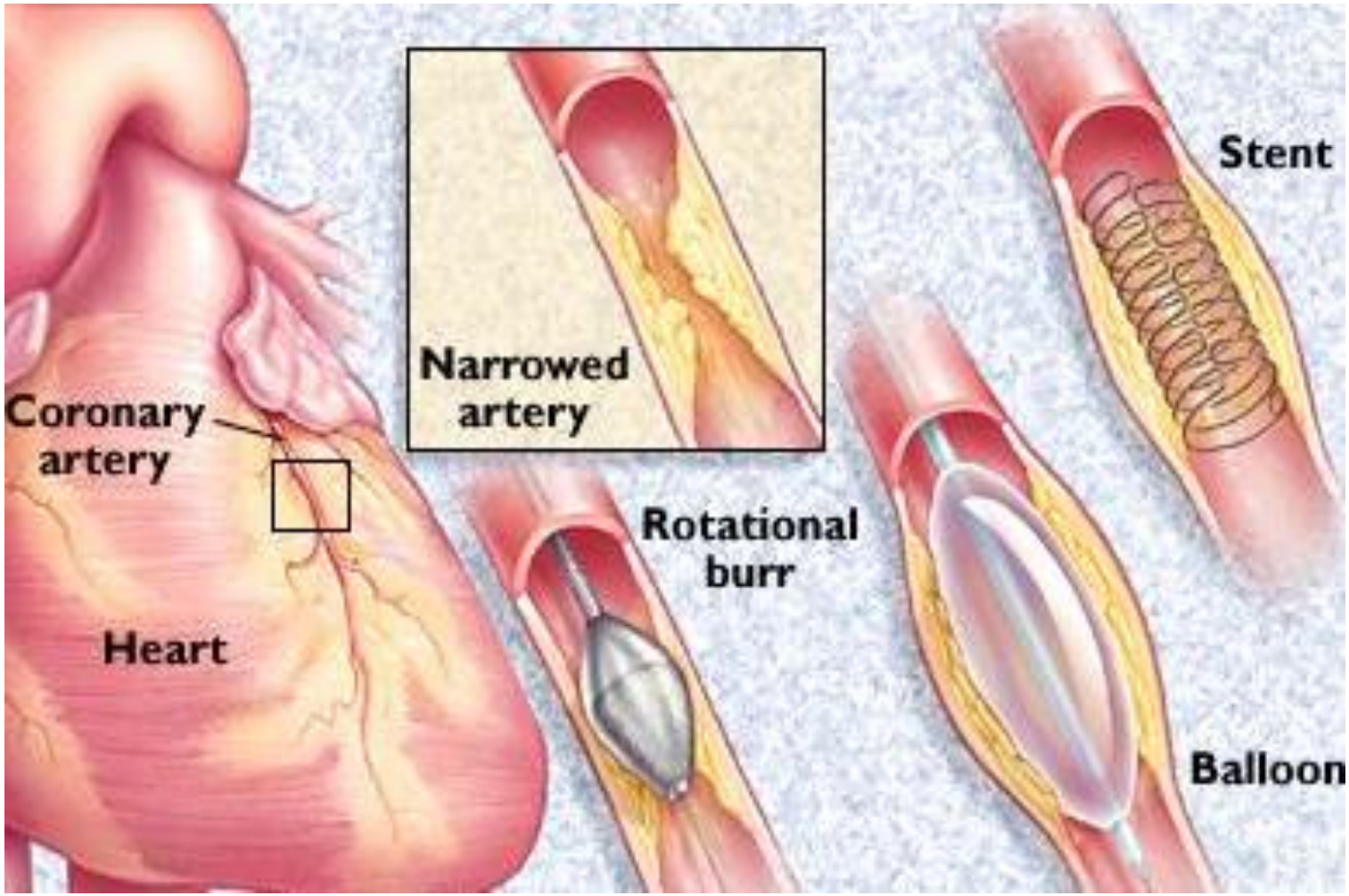

Stent
Narrowed artery
Coronary artery
Rotational burr
Heart
Balloon

Off-Pump Coronary Artery Bypass (OPCAB)

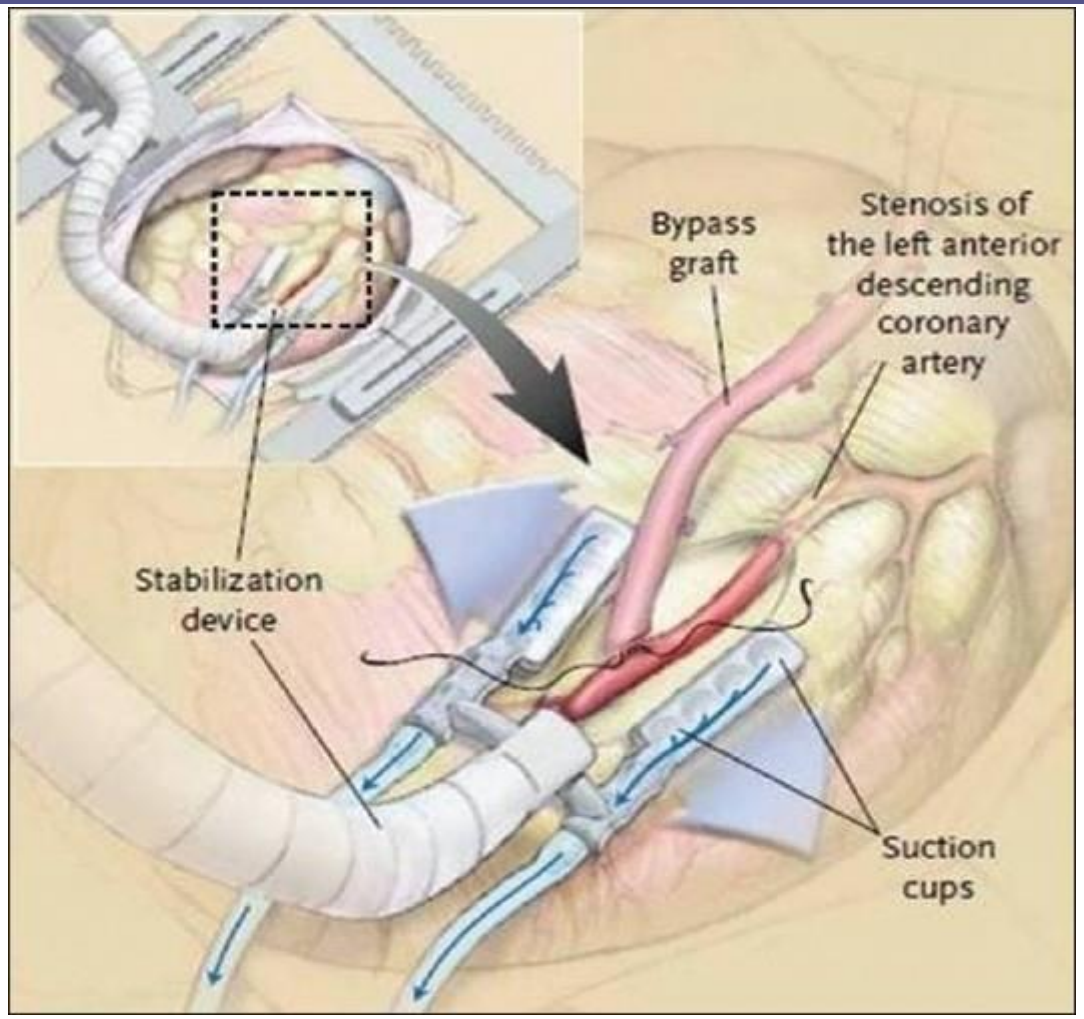
Procedure

- Median sternotomy of varying sizes.
- Depending on the physiology of the patient, the smallest incision will be made.
- Arteries or veins can be harvested from the patients chest wall, arm, and or leg.
- Adenosine and Esmolol are used to slow the heart rate.
- Deep pericardial sutures and the use of specialized instruments to prop the heart in a position that will allow the surgeon to access occluded arteries.

Instrumentation

- **Octopus Device**
  - Has multiple small suction cups that are applied to the heart surface.
  - When suction is turned on, the cups stick to the surface, and hold the heart steady, with movement being less than 1 mm.

- **Drug Therapy**
  - Esmolol and Adenosine have been found effective in slowing, and even temporarily stopping the heart beat for short periods (around 20 seconds).


Bypass graft
Stenosis of the left anterior descending coronary artery
Stabilization device
Suction cups

OPCAB vs. CABG

- The comparison of OPCAB to CABG patients showed that OPCAB had **similar or better results**.

- In another study that was presented at an Annual Meeting of the Society of Thoracic Surgeons, the following information was found:
  - The hypothesis for the study was that OPCAB surgery would reduce some of the **side effects** of conventional **cardiopulmonary bypass**.
  - There were no **hospital deaths** in the OPCAB group compared to nine deaths in the CABG group.
  - OPCAB surgery also reduced the average postoperative **hospital stay** from 5.5 days to 3.3 days.
  - The most significant statistic was the reduction in the need for **transfusion** after the operation.
  - Less than a third of the OPCAB patients (29.6 %) needed transfusions compared to more than half (56.5 %) of the CABG group.

COMPLICATIONS

- Mortality STS PROM EURO SCORE II
- STROKE
- LOW CARDIAC OUTPUT
- ARRYTHMIAS
- SSI/STERNAL DEHISCENCE
- PERIOPERATIVE MI
- BLEEDING /TAMPONADE

- Any Questions

SUMMARY