Techniques of conventional and off-pump CABG

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Introduction

- **Conventional CABG**
- **On-pump beating CABG**
- **Off-pump CABG**

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Conventional CABG

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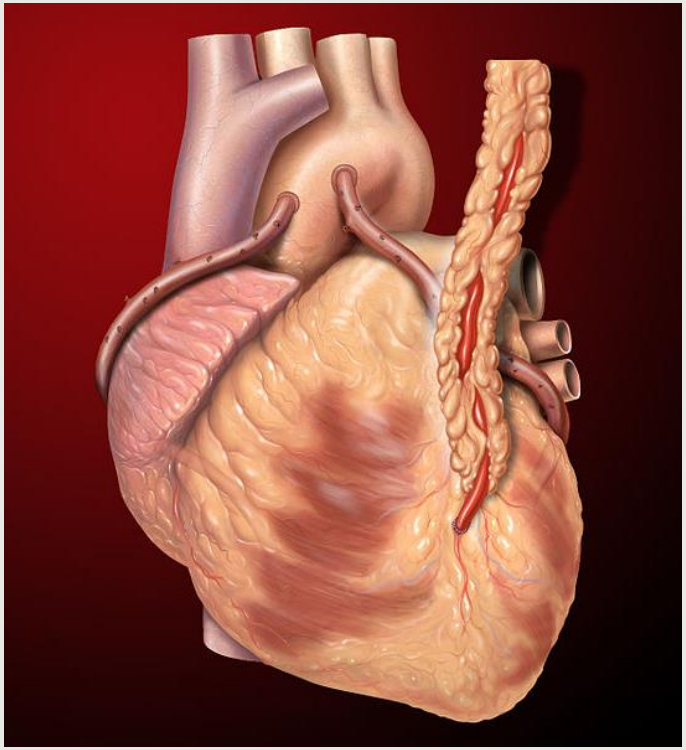
Conventional CABG

- Use of cardiopulmonary bypass
- Use of cardioplegia
  - Arrested heart
- Hypothermia
  - Fibrillated heart



- Free graft >> composite graft or in-situ graft

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Conventional CABG

- **Optimal operative conditions**
  - ***Bloodless, motionless…***

- **CPB related complications**
  - **Systemic inflammatory response**
  - **Increased bleeding risk**
  - **Increased neurologic deficit**
  - **…….**

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Prevention of neurologic Cx

- **Mechanisms of cerebral injury**
  - **Hypoperfusion**
  - **Micro- and macroemboli**
  - **Inflammatory response**

- **Risk factors**
  - **Old age, previous CVA..**
  - **Calcified ascending aorta**
  - **Carotid stenosis**

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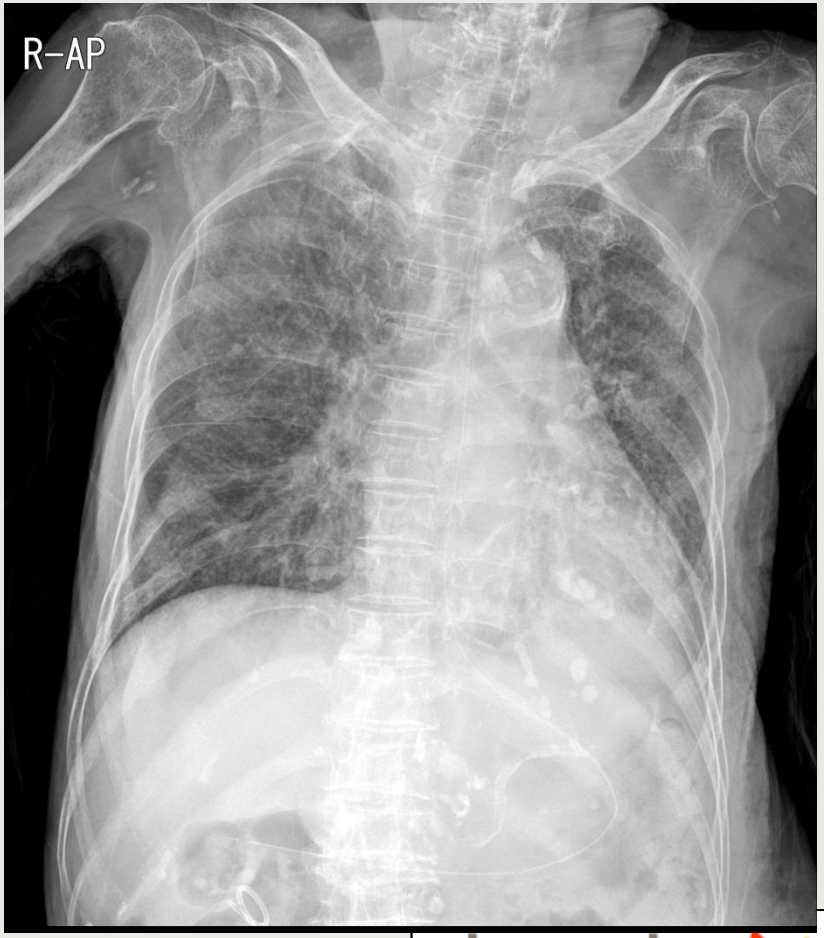
Evaluation of ascending aorta

- Chest X-ray
- CAG

- Chest CT or CT angiography

- Epiaortic scan



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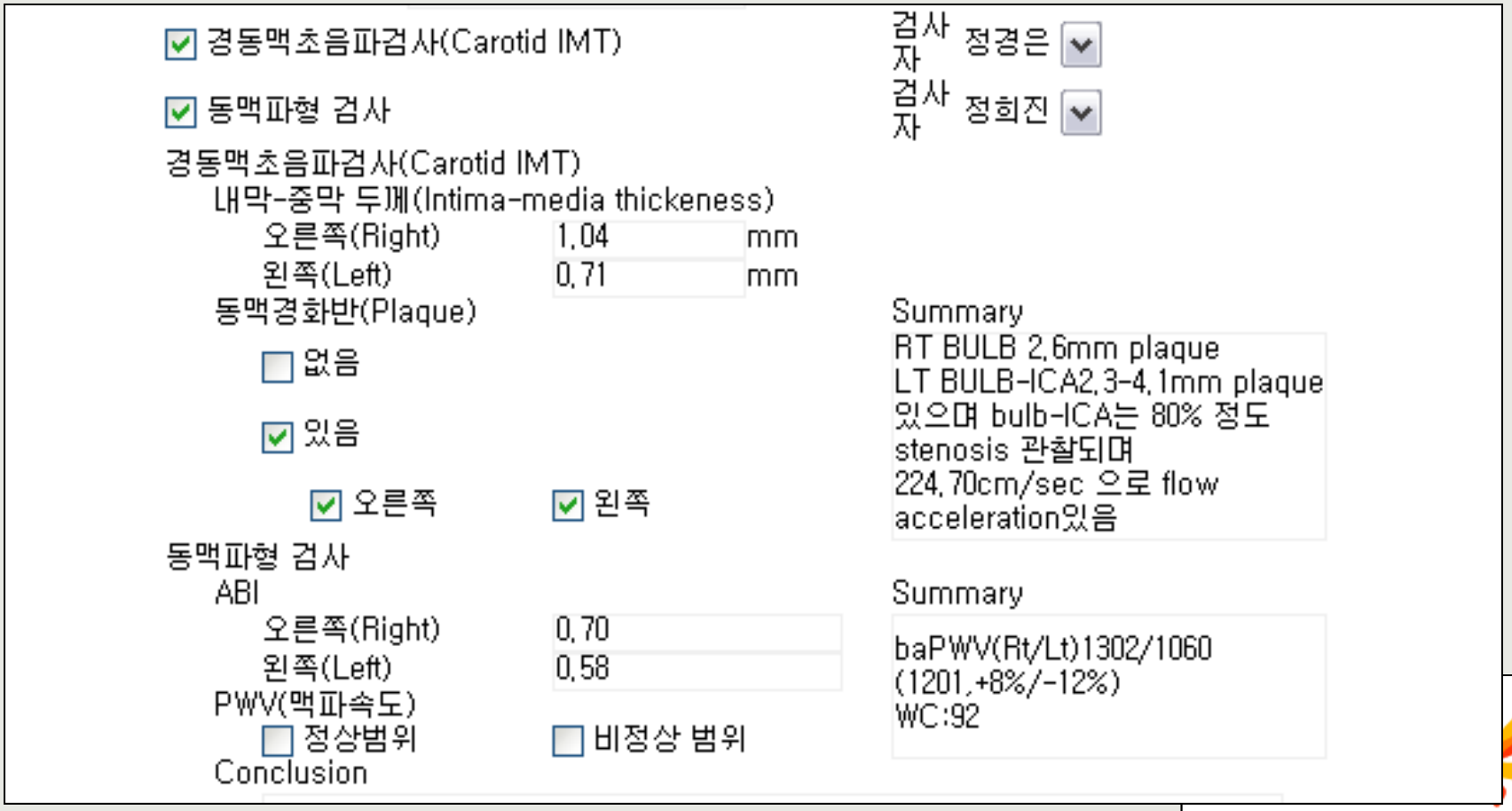
Evaluation of carotid artery

- **Carotid US**



Ascending aorta manipulation

- **Meticulous palpation of aortic wall**
  - **SBP < 50~60mmHg**
- ***If) no bleeding after aortotomy..??***

  → presence of soft atheroma
- **Epiaortic scan**

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Ascending aorta manipulation

- **Hostile ascending aorta**
  - **Off-pump technique**
  - **On-pump beating technique**
  - **Fibrillating heart**
  - **Femoral or axillary or innominate cannulation**
  - **Avoid partial clamping for graft anastomosis**
    - **In-situ graft >> free graft**
    - **Proximal sealing system (Heartstring® device)**

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Proximal sealing system (Heartstring® device)

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Cannulation

- **Arterial cannulation**
  - **Ascending aorta**
  - **Femoral or axillary or innominate cannulation**
- **Venous cannulation**
  - **Single cannula (two-stage cannula)**
  - **Bicaval cannulation (combined procedure, ex. Ischemic MR)**
- **LV vent catheter insertion**

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Cardioplegia (1)

- **Antegrade infusion**
  - ***via root cannula***
  - **Caution of AR, heart elevation**
    - **LV dilatation & perfusion pr.↓↓**

- **Retrograde infusion**
  - ***via coronary sinus (retrograde CPS cannula)***
  - **150~200cc/min, < 40mmHg**
  - **Back-flushing**

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Cardioplegia (2)

- **Blood cardioplegia**

- **Crysalloid cardioplegia**
  - **HTK solution (Custodiol®)**

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Main procedure – anastomosis (1)

- **Coronary exposure**
  - **Hand, gauze, spongy stick.. : 2nd assistant**
  - **Use of stabilizer**

- **Decision of graft configuration & length**
  - **After blood filling inside heart**

  → Prevention of graft kinking or stretching

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Main procedure – anastomosis (2)

- **Prevention of air embolism**
  - **Avoid of excessive venting**
  - **Avoid of high CO2 blowing**
  - **Deairing before graft anastomosis**

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On-pump beating CABG

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On-pump beating CABG

- **Conventional CABG → off-pump CABG**

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On-pump beating CABG

- **Controlled CPB drainage**
  - **Avoid of flattened heart**
  - **Avoid of LV dilatation**

- **Controlled body temperature**
  - **Prevention of ventricular fibrillation**
  - **Shorten the duration of CPB**

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Off-pump CABG (OPCAB)

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OPCAB vs ONCAB

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Off-pump CABG

- **Prevent complication caused by CPB**
  - **Avoid inflammatory response**
  - **Reduce myocardial injury**
  - **Reduce cerebral injury**
  - **Reduce renal injury**
  - **Reduce atrial fibrillation**
  - **Reduce transfusion, hospitalization time, cost**

……

  - **But technically more demanding**

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General consideration

- **Heparinization**
  - **1.5~2.0mg /kg**
  - **ACT > 300sec**
- **Maintain body temperature**
  - **Prevention of ventricular arrhythmia**
  - **blanket, warm saline, OR temperature ↑….**
- ***Co-operation with anesthesiologist..!!!!***

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Monitoring

- ECG, ABP, CVP, PAP, SaO2
  - Swan-Ganz cath
  - 5-lead ECG
- TEE
  - RWMA, contractility, MR grade
- Cerebral oxymeter

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V/S maintenance during OPCAB

- **BP ↓ & PAP ↓**
  - **Trendelenbrg position**
  - **Volume loading, vasoconstrictor..**

- **BP ↓ & PAP ↑**
  - **Heart reposition & rest**
  - **Intracoronary shunt**
  - **Avoid repeated positive inotropes**
  - **Consider CPB**

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Conversion to ONCAB

- **Unstable V/S**
- **Myocardial ischemia**
- **Cardiac arrest**
- **Inadequated anastomosis**

- **Diffuse calcified arteries & Intramyocardial vessels**

- ***surgical failure (X), modification (O)***

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Exposure of coronary arteries

- LAD
  - Gauze or glove ball at posterior pericardium
  - Stabilizer only
- OM & PLb
  - Apical suction device
  - Deep pericardial suture
- PDA
  - Suction device at apex or acute margin

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Coronary anastomosis – end to side

- **Parallel anastomosis**
  - **“cobra head”**
  - **12-14 stitch**
- **Perpendicular anastomosis**
  - **Small arteriotomy (< 3 - 4mm)**
  - **8-10 stitch**

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Coronary anastomosis – side to side

- **Parallel anastomosis**
  - **Ex) LITA – D- LAD**
- **Perpendicular anastomosis**
  - **Ex) composite graft – OM – PDA**
  - **Short arteriotomy..!!!!**
    - **Prevent sea-gull effect**
  - **Diamond shape & transverse shape**

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ONCAB vs OPCAB..????

No shame in using CPB

We are CARDIAC SURGEONS

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Thank you for your attention~!

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