Early complications after cardiac surgery – the cardiologist’s perspective

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Partial list of complications after cardiac surgery

- Perioperative acute myocardial infarction (mostly post CABG)
- Arrhythmias
  - Postoperative atrial fibrillation
  - Bradyarrhythmias and AV block
  - Ventricular tachyarrhythmias, polymorphic VT/VF
- Pericarditis, pericardial effusion and tamponade
- LV dysfunction, left heart failure
- RV dysfunction, right heart failure
- Low cardiac output state, cardiogenic shock
- Dynamic LVOT obstruction (mostly related to MVR/MV repair
- Mediastinitis, Hemothorax, Pneumothorax – surgical issues
- Endocarditis (mostly related to valve repair/replacement)
Early cardiac complications after coronary artery bypass graft surgery

- Perioperative MI – occurs in 4%-5% of CABG pts
  - Diagnosis is difficult: symptoms relate to hemodynamic instability
    - Cardiac enzymes often elevated post surgery
    - ECG changes may reflect pericardial inflammation
  - 3rd universal definition of myocardial infarction (type 5)
    - “MI associated with CABG is arbitrarily defined by elevation of cTn values >10 x 99th percentile URF in pts with normal baseline cTn values (<99th percentile)
    - In addition, either (i) new Q-waves or new LBBB, or (ii) angiographic documented new graft or new native coronary artery occlusion, or (iii) imaging evidence of new loss of viable myocardium or new regional WMA”

Thygesen K. Third ESC/ACCF/AHA/WHF Universal Definition of MI. European Heart Journal 2012
Early cardiac complications after coronary artery bypass graft surgery

- Perioperative MI – patophysiology:
  - Usually attributed to poor distal perfusion after grafting of more proximal arteries has been performed
  - Early graft failure, poor myocardial protection, plaque debris
  - Increased risk in re-CABG, long CPB time, cardiomegaly

- Perioperative MI – related to worst prognosis:
  - CASS in-hospital mortality
    - 9.7% with Q-wave MI vs 1.0% without MI
  - BARI 5 year mortality
    - 8.2% with Q-wave MI vs 3.7% without MI
  - Meta-analysis of 7 studies (19,000 pts)
    - Direct relationship between 30-day mortality and 8-24h increase in CKMB or cTn (i.e. related to extent of myocardial necrosis)
Early cardiac complications after coronary artery bypass graft surgery

- Perioperative MI – early graft occlusion
  - 5%-10% of SVG, usually thrombotic
  - Mostly related to technical problems at the anastomosis
  - Risk is reduced with aspirin (given within 6h after CABG)

- Perioperative MI – clinical manifestations
  - Occur early after CABG (usually within 2 days, median 12h)
  - Ischemic symptoms
  - Significant ischemic ECG changes
  - Hemodynamic instability
  - Ventricular arrhythmias
  - Management: urgent diagnostic cath and prompt revascularization (repeat CABG ~ 20%, PCI ~ 80%)
  - Increased procedural complications (bleeding, renal failure, perforation)
  - Increased early stent thrombosis (no DAPT) and 30-day mortality

References
Post-operative arrhythmias

- Mostly tachyarrhythmias
- Relate to preoperative hypokalemia
  - If $K < 3.5$ mEq/l than OR 2.2 for serious ventricular arrhythmia, need for resuscitation, incidence of AF/Aflutter
- Post-operative atrial fibrillation
  - Occurs in 15-40% of CABG pts
  - Up to 60% post combined CABG with valve replacement
  - Beta blockers, sotalol and amiodarone reduce the frequency of post-operative AF by 52-65% (beta-blockers should be given before or ASAP after surgery)
  - In practice, amiodarone is continued for 30 days or until 1st postoperative visit
Randomized Trial of Atorvastatin for Reduction of Postoperative Atrial Fibrillation in Patients Undergoing Cardiac Surgery

Results of the ARMYDA-3 (Atorvastatin for Reduction of MYocardial Dysrhythmia After cardiac surgery) Study

Giuseppe Patti, MD; Massimo Chello, MD; Dario Candura, MD; Vincenzo Pasceri, MD; Andrea D’Ambrosio, MD; Elvio Covino, MD; Germano Di Sciascio, MD

- 200 consecutive patients undergoing CPB operation
- Randomized to 40 mg atorvastatin vs. placebo for 1 week before surgery and following surgery to discharge (~1 week)
- Open-label atorvastatin continued for 3 more weeks in all pts
- Primary endpoint: in-hospital atrial fibrillation (> 5 min)
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Multivariate analysis:
ARR 22% of AF
RRR 61%
P=0.017

Treatment benefit seen in CABG pts; less evident in pts with LA dilation and non-CABG op

Figure 2. Actuarial curves of 30-day atrial fibrillation–free survival in the 2 arms.

(Circulation. 2006;114:1455-1461.)
Randomized Trial of Atorvastatin for Reduction of Postoperative Atrial Fibrillation in Patients Undergoing Cardiac Surgery

Figure 4. Multivariable analysis indicating predictors of outcome. CHF indicates congestive heart failure; Rx, prescription; and Atorv, atorvastatin.
The cardiologist’s perspective – think physiology:

- Rhythm, heart rate
- Preload
- Afterload
- LV systolic dysfunction
- LV diastolic dysfunction

(leave the mechanical problems to the surgeons)
Low Cardiac Output

- Base assessment on monitoring and imaging:
  - Heart rate, O2 sat., Blood pressure, Blood gases
  - LA line or SG catheter (SVR, PVR)
  - ECG
  - Echocardiography is essential
    - LV function, valves, tamponade (often localized)
    - Don’t forget LVOT obstruction (post MVR or AVR)
    - To TEE or not to TEE → to TEE
    - Why is it always in the middle of the night???
    - We need data on performance…
Post surgical vasodilator response

- In ~ 6% of patients
- More frequent with ACE-I pre-treatment
- Low SVR
- Relates to non-specific inflammatory response to CPB
- Relates to long bypass time
- Relates to reduced systolic function
- Usually responds to low-dose norepinephrine