Preoperative intraaortic balloon counterpulsation in high-risk CABG

Stefan Klotz, M.D.
Preoperative IABP in high-risk CABG – Questions?? –

❤ Useful?
❤ Definition of “High-risk”?
❤ Pre-OP/Intra-OP/Post-OP?
❤ Complication vs Benefit?
❤ Mortality?
❤ Morbidity?
Effects of IABC

- Increase cardiac output
- Increase coronary perfusion
- Increase myocardial oxygen supply
- Decrease afterload
- Decrease cardiac work
- Decrease myocardial oxygen consumption
Indications

- Cardiac failure after a cardiac surgical procedure
- Refractory angina despite maximal medical management
- Cardiogenic shock/Acute MI
- Mitral regurgitation
- Perioperative treatment of complications due to myocardial infarction
- Failed PTCA
- As a bridge to cardiac transplantation
- Elective: Prior to high-risk CABG
Contraindications

- Severe aortic insufficiency
- Aortic aneurysm (thoracic or abdominal)
- Aortic dissection
- Severe calcific aorta-iliac disease or peripheral vascular disease
- Thromboembolism
IABP Insertion

- Percutaneous
  - Sheath less
- Surgical insertion
  - Femoral cut down
  - Trans-thoracic
IABP Complications

- Limb ischemia
- Thrombosis
- Emboli
- Bleeding at the insertion site
- Groin hematomas
- Aortic perforation and/or dissection
- Renal failure and bowel ischemia
- Neurologic complications including paraplegia
- Infection
IABC Clinical Indications

- High-risk CABG Surgery: 16%
- Cardiogenic Shock: 20%
- Weaning from CPB: 15%
- AMI Complications: 12%
- Cath Lab Support: 21%
- Refractory Angina: 6%
- Ventricular Failure: 6%
- Other: 4%

Benchmark 2005
IABC in High-Risk CABG

- ~700,000 CABG procedures/year
- ~10% high-risk (?)
- No consensus on the definition of high-risk CABG pts.
- Low cardiac output post-CABG: ~2-9%
- No real consensus who may benefit from IABC

- Low ejection fraction... *(how low?)*
- Advanced age... *(how old?)*
- Left main stenosis... *(grade?)*
- Redo operation
- Unstable angina
- Recent myocardial infarction
- New York Heart Association III-IV class
2011 ACCF/AHA Guideline for Coronary Artery Bypass Graft Surgery

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

JACC Vol. 58, No. 24, 2011

CLASS IIa
1. In the absence of severe, symptomatic aorto-iliac or PAD, the insertion of an intraaortic balloon reduce mortality rate in CABG patients who are c high risk (e.g., those who are undergoing reoperation <30% or left main CAD) (1021–1026). (Level of


Prophylactic IABP Placement – META-ANALYSIS –

- Pre-Op IABP placement vs intra-, post- or no IABP placement
- Outcome
  - Hospital mortality (primary)
  - IABC-related complications (secondary)

IABC-related complications: 3.7%
IABC related Mortality: 0%

Figure 1. Meta-analysis of randomized controlled trials and cohort studies, and effect on hospital mortality.

IABP Placement in high-risk CABG pts. directed by EuroSCORE — SINGLE-CENTER —

- EuroSCORE developed for prediction of early mortality after cardiac surgery
- 267 high-risk pts. (EF<40%, unstable angina, left main stenosis + RCA >70%)
  - No preoperative IABC (92pts)
  - Preoperative IABC (62 pts)
  - Intra- or postoperative IABC (113 pts)

Preoperative IABC placement reduces mortality

Prophylactic IABP Placement in high-risk CABG pts. – SINGLE-CENTER –

- 141 high-risk CABG pts.
  - unstable angina
  - EF ≤ 40%
  - left main stenosis ≥ 70%
  - previous CABG
  - 4 or more planned distal anastomosis

- 38 (27%) prophylactic IABC
- 103 (73%) no pre-OP IABC ➞ 27 (26%) IABC intra-OP
  ➞ 10 (10%) IABC post-OP

Prophylactic IABP Placement in high-risk CABG pts. — SINGLE-CENTER —

Preoperative IABC in high-risk pts. reduces low cardiac output syndrom and renal failure

Prophylactic IABP Placement in high-risk CABG pts. – SINGLE-CENTER –

- 111 high-risk CABG pts. with IABC pre-OP
  - EuroScore >12

- 130 low-risk CABG pts. without IABC
  - EuroScore <5

Prophylactic IABP Placement in High-risk CABG pts. – SINGLE-CENTER –

- High-risk (IA)
- Low-risk (no IABC)

Mortality (%)

Predicted mortality: 17.1% (EuroScore)
17.5% (STS Score)

→ Preoperative IABC reduces mortality in high-risk pts.

Prophylactic IABP Placement in high-risk CABG pts. — PROPENSITY-SCORE-ANALYSIS —

- **6121 high-risk CABG pts.** (EuroScore ≥ 8)
  - 1207 (19.7%) pre-OP IABC placement (left main >75%, unstable angina, EF <35%, recent MI, heart failure)
  - 4914 (80.3%) no IABC

- **478 pts in propensity-score analysis in IABC and no IABC group**
Prophylactic IABP Placement in high-risk CABG pts. – PROPENSITY-SCORE-ANALYSIS –

Preoperative IABC is of benefit in high-risk CABG pts.

No. P.

In-Hospital mortality 30-day mortality Peri-op MI Post-op LCOS Hospital length of stay

6 12 9 34 10

P=0.001 P=0.003 P=0.01 P=0.003 P=0.001

Lorusso et al. EJCTS 2010;38:585-91
IABP Placement in high-risk pts.  

- TIMING -

- 7440 consecutive pts.
  - 218 (2.9%) pre-OP IABP placement
  - 184 (2.5%) intra-OP IABP placement
  - 42 (0.6%) post-OP IABP placement
  - 6997 (94%) no IABP

IABP Placement in high-risk pts. – TIMING –

Preoperative IABC is associated with low risk-adjusted mortality

Model properties
Hosmer-Lemeshow goodness-of-fit

P = .01

IABC Placement

- COMPLICATIONS -

- 423 CABG pts. receiving IABC pre or intra-OP
  - EF < 35%
  - Left main stenosis
  - unstable hemodynamics
  - failure to wean from CBP

Severi et al. J Cardiothorac Vasc Anesthesia 2012; in print
IABC Placement

- COMPLICATIONS -

IABC Insertion

- 99.29% percutaneous femoral puncture (sheath-less)
- 0.47% femoral cut down
- 0.24% ascending aorta

Elective preoperative IABC has a low complication rate compared to intra-OP IABC.

Severi et al. J Cardiothorac Vasc Anesthesia 2012; in print

Department of Cardiac and Thoracic Vascular Surgery
Summary

❤️ Increase in CO and perfusion

❤️ Decrease in afterload and cardiac work

❤️ Class IIa (LOE B) in high-risk CABG pts. (ACCF/AHA Guidelines 2011)

❤️ Definition of high-risk pts?

❤️ Newer studies (EuroScore) confirmed the positive effect of prophylactic IABC

❤️ Low risk of complications in elective placement
Conclusion

In hemodynamically stable high-risk CABG pts. prophylactic IABP insertion is safe and effective in reducing postcardiotomy syndrome, perioperative myocardial infarction, length of stay and mortality.
Remaining questions....

• Clear definition of high-risk CABG pts.
• Ideal timing preoperatively
Thank You!

(c) Bastian Wehler