Renal Risk Stratification in on-pump and off-pump Coronary Artery Bypass Surgery

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OBJECTIVES

Renal complications, particularly acute kidney injury (AKI), remain clinically relevant following coronary artery bypass grafting (CABG). Surgical technique may influence perioperative renal risk, yet comparative data remain heterogeneous.

To compare baseline renal function and demographic characteristics between patients undergoing on-pump versus off-pump CABG, to stratify patients into AKI risk categories, and to estimate the relative likelihood of postoperative AKI based on preoperative risk profiles.

METHODS

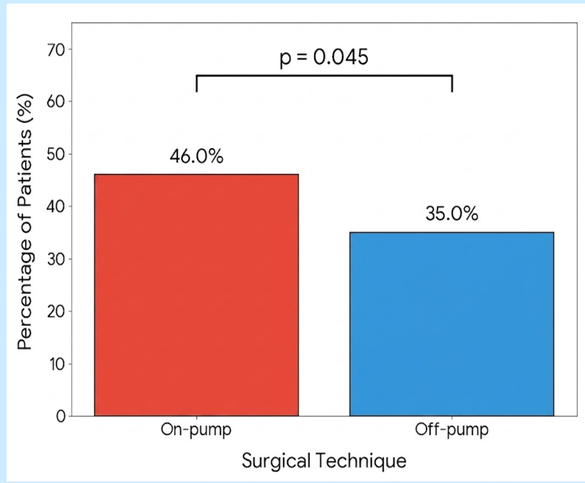
A retrospective cohort study of 350 patients — two groups into on-pump (n = 287) and off-pump (n = 63) groups — undergoing CABG and mixed cardiac surgical procedures in the hear center of the medical school at the University of Pécs from Dec 1. 2023 to Sep 1.2025. Demographic characteristics, comorbidities, and renal function parameters were compared between groups. A composite AKI risk profile was constructed using established predictors, including age >75 years, diabetes mellitus, and baseline estimated glomerular filtration rate (eGFR) <60 mL/min/1.73 m² — Patients meeting at least two criteria were classified as high risk for postoperative AKI.

RESULTS

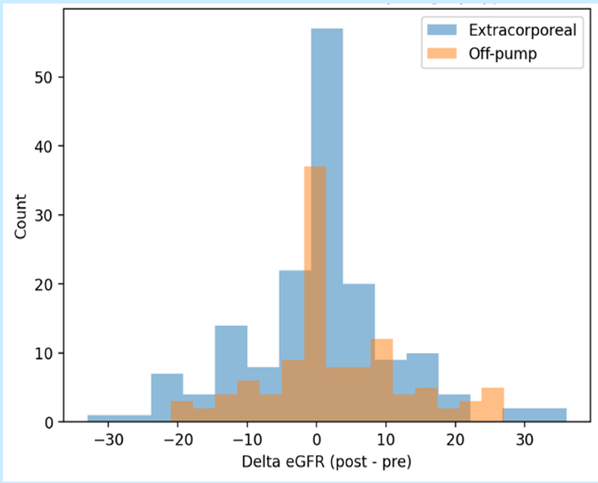
Baseline demographics were largely comparable between the two groups. Pre-existing kidney disease and emergent surgery were significantly more frequent in the on-pump group (p = 0.040 and p = 0.002, respectively). Baseline renal function parameters, including serum creatinine, eGFR, and urea, did not differ significantly; however, a consistent trend toward more favorable renal markers was observed in the off-pump group. Further, significantly higher proportion of patients were classified as high risk of postoperative AKI in the on-pump group compared with the off-pump group (46.0% vs. 35.0%, p = 0.045), with a higher estimated AKI incidence.

CONCLUSIONS

Patients undergoing off-pump CABG demonstrated a more favorable baseline renal risk profile and a lower estimated risk of postoperative AKI. These findings should be interpreted cautiously and prospective studies are warranted to clarify the independent effect of surgical technique on postoperative renal outcomes.



Figer 1.
Comparison of high-risk profile between the on-pump and off-pump surgeries groups.



Figer 2
Distribution of delta eGFR by surgery type

Parameter	On-Pump	Off-Pump	p-value
Pre-existing Kidney Disease	Higher Frequency	Lower Frequency	0.040
Emergent Surgery	Higher Frequency	Lower Frequency	0.002
High-Risk AKI Profile	46.0%	35.0%	0.045
Baseline eGFR/Creatinine	Comparable	Comparable	NS (>0.05)

Table 1.
Summary table of the two groups comparison and outcomes

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