Association of Timing of Percutaneous Left Ventricular Assist Device Insertion with Outcomes in Patients Undergoing Cardiac Surgery

Objective: We explored the associations between timing of percutaneous ventricular assist devices (pVAD) insertion relative to cardiac surgery and postoperative outcomes.

Methods: The Nationwide Inpatient Sample was queried for patients undergoing isolated/combinations of coronary artery bypass grafting (CABG), cardiac valve, and aortic surgery. Patients who underwent pVAD insertion in the same admission were selected for the final cohort and stratified by timing of pVAD insertion relative to cardiac surgery (pre, intra, or postoperative). Preoperative characteristics and comorbidities as well as postoperative complications and mortality were compared between groups. Complications were stroke, non-gastrointestinal (GI) and GI bleeding, bleeding requiring transfusion, acute renal failure requiring dialysis, infection, sepsis, pneumonia, thromboembolism, prolonged ventilation, and tracheostomy.

Results: Overall, 3695 patients underwent cardiac surgery and pVAD insertion during the same hospitalization from 2016-2019. pVAD insertion occurred preoperatively in 1130, intraoperatively in 1690, and postoperatively in 875 patients. The distribution of cardiac surgery procedures was similar across the different groups, with isolated CABG being the most common procedure in each. Comorbidities including heart failure (p<0.01), valvular disease (p = 0.04), peripheral vascular disease (p = 0.05), fluid/electrolyte disorders (p=0.04), and complicated hypertension (p<0.01) were significantly higher in the postoperative pVAD group. Median Elixhauser Comorbidity Index was 13 for pre, 15 for intra, and 17 for postoperative pVAD patients (p = 0.02). Mortality occurred in 205 (18%) pre, 665 (39%) intra, and 470 (54%) postoperative pVAD patients (p<0.01). Mortality occurred in 205 (18%) pre, 665 (39%) intra, and 470 (54%) postoperative pVAD patients (p<0.01). Complications occurred in 690 (61%) pre, 930 (55%) intra, 660 (75%) postoperative pVAD patients. Significant differences were observed in rates of sepsis (pre: 205 (18%) vs intra: 165 (9.8%) vs post: 145 (17%); p=0.01), pneumonia (425 (38%) vs 390 (23%) vs 270 (31%); p<0.01), and prolonged ventilation (495 (44%) vs 690 (41%) vs 470 (54%); p=0.01) (Fig 1).

Conclusion: Postoperative pVAD insertion after cardiac surgery was associated with increased complication and mortality rates compared to insertion in the preoperative or intraoperative periods. Intraoperative pVAD insertion was associated with the lowest complication rates. Further studies are necessary to identify patients who may benefit from earlier pVAD insertion.

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Mortality and Complications by pVAD Insertion Timing

- Preoperative, N = 1,130
- Intraoperative, N = 1,690
- Postoperative, N = 875

*P < 0.05

pVAD – percutaneous ventricular assist device; GI – gastrointestinal; PE/DVT – pulmonary embolism/deep venous thrombosis.