Technical Complications in Aortic Root Replacement: Can Surgical Expertise Prevent Nightmare?

Objective: Although technical complications during aortic root replacement (ARR), such as massive bleeding and coronary events, are nightmares for surgeons, there is little literature to help surgeons prepare for such situations. We describe our experience of outstanding technical complications during ARR.

Methods: This is a retrospective study of 830 consecutive patients who underwent ARR at a single center from 2012-2022. Outstanding intraoperative technical complications were defined as intraoperative events that led to an unplanned cardiac procedure, mechanical circulatory support (MCS), or multiple aortic cross clamping (MCC). Multivariable logistic regression was performed to identify factors associated with operative mortality and technical complications.

Results: In the overall cohort, median age was 60 [49-67] years. The most common indications for ARR were aneurysm (82.2%), endocarditis (7.5%), and dissection (5.4%). An aortic valve-sparing operation was performed in 38.4%. Intraoperative technical complications occurred in 90 (10.8%), and in order of frequency, were bleeding (n=28, 3.4%), ventricular dysfunction (n=25, 3.0%), residual valve disease (n=21, 2.5%), myocardial ischemia (n=14, 1.7%), and iatrogenic aortic dissection (n=2, 0.2%). These complications were managed with MCC (n=57, 6.9%), unplanned procedures (n=28, 3.4%), and MCS (n=28, 3.4%), with some overlap (Figure). Patients with technical complications had a higher incidence of prior sternotomy (51.1% vs 22.4%, p<0.001), urgent or emergent cases (44.4% vs 30.7%, p=0.01), and surgical indications of aortic valve disease (11.1% vs 3.5%) and endocarditis (17.8% vs 6.2%, p<0.001), and they had higher rates of operative mortality (6.7% vs 2.3%, p=0.03), reexploration for bleeding (p=0.01), stroke (p=0.04), prolonged ventilation (p<0.001), and AKI (p<0.001). On multivariable analysis, surgeon volume <10 ARR/year (OR 5.9 [95% CI: 2.24-15.6], p<0.001) and dissection (OR 10.5 [3.6-30.5], p<0.001) but not technical complications (OR 1.2 [0.3-4.4], p=0.8) were associated with operative mortality. Surgeon volume <10 ARR/year (OR 1.8 [1.01-3.09], p=0.04) was also associated with technical complications together with prior sternotomy (OR 2.6 [1.5-4.3], p<0.001).

Conclusions: Technical complications occur in 10.8% of ARR. Our observation that surgeon volume is associated with technical complications and operative mortality suggest utility of expertise in this complex procedure.

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Aortic Root Replacements from 01/2012-09/2022
n=830

Technical Complications
n=90 (10.8%)

Bleeding
n=28
- MCC n=28
- ECMO n=1

Ventricular Dysfunction
n=25
- ECMO n=16
- IABP n=8
- Impella n=1
- Urgent bypass n=3

Residual Valve Disease
n=21
- MCC n=18
- VS converted to Bentall n=8
- Re-replacement of AVR n=2
- AVR n=5
- Mitral procedure n=5

Myocardial Ischemia
n=14
- MCC n=10
- ECMO n=1
- Urgent bypass n=13

Iatrogenic Dissection
n=2
- MCC n=1
- Arch replacement n=2