

Modern cardiac surgery: Techniques, outcomes, challenges.

Hye-Jin Park*

Department of Cardiothoracic Surgery, Seoul National University, Seoul, South Korea

Introduction

The field of cardiac surgery is continually advancing, expanding its reach to increasingly complex patient populations and developing innovative techniques to enhance outcomes. A contemporary multicenter analysis underscores the feasibility and acceptable safety profile of cardiac surgery in very elderly patients, specifically octogenarians and nonagenarians. This work emphasizes the critical need for careful patient selection and specialized perioperative management to optimize results and improve quality of life [1].

Understanding and mitigating postoperative complications remains a priority. One study identifies key risk factors for Postoperative Atrial Fibrillation (POAF) following isolated Coronary Artery Bypass Grafting (CABG), such as advanced age, chronic kidney disease, and preoperative left atrial enlargement. Recognizing these predictors enables targeted preventive strategies and improved patient management, ultimately reducing POAF incidence and its associated complications [2].

Minimally invasive approaches are transforming cardiovascular interventions. A meta-analysis comparing Transcatheter Aortic Valve Implantation (TAVI) with Surgical Aortic Valve Replacement (SAVR) in low-risk patients reveals TAVI as a viable alternative, showing similar or even superior short-term outcomes for mortality and stroke. These findings support expanding TAVI indications, although the long-term durability of the procedure remains a critical area for ongoing research [3].

For patients with extensive aortic arch disease, advanced surgical techniques offer improved options. Here, clinical outcomes of hybrid arch repair utilizing the frozen elephant trunk technique demonstrate the procedure's efficacy and safety in complex cases. This approach provides a less invasive alternative to traditional open surgery, achieving favorable mid-term results in terms of aortic remodeling and complication rates [4].

Congenital heart anomalies also benefit from refined surgical interventions. Research evaluating the early and mid-term outcomes of surgical repair for Double Outlet Right Ventricle (DORV) with subaortic Ventricular Septal Defect (VSD) shows good postoperative recovery and survival rates. This highlights the effectiveness

of current surgical techniques in addressing this complex anomaly and improving patient prognosis [5].

Hybrid strategies are also being explored for coronary artery disease. A systematic review and meta-analysis on hybrid coronary revascularization (HCR) for multivessel Coronary Artery Disease (CAD) suggests that combining surgical and percutaneous approaches can offer comparable or potentially better outcomes than conventional methods for select patients. This is particularly noted regarding major adverse cardiac events, by leveraging the benefits of both techniques [6].

In trauma care, innovative endovascular solutions are proving effective. A study utilizing a national database to examine contemporary outcomes of Thoracic Endovascular Aortic Repair (TEVAR) for blunt thoracic aortic injury reveals TEVAR as a safe and effective treatment. With low mortality and complication rates, it underscores its role as the preferred management strategy in suitable trauma patients due to its minimally invasive nature [7].

Mitral valve disease management also sees robust outcomes from reconstructive procedures. A systematic review and meta-analysis examining the long-term outcomes of mitral valve repair for severe mitral regurgitation confirms that this procedure offers excellent durability and favorable clinical results over time. This evidence strongly supports its preference over replacement whenever feasible, aiming to preserve native valve function and improve patient quality of life [8].

Further validating minimally invasive approaches, a propensity-matched analysis compares Minimally Invasive Surgical Aortic Valve Replacement (MIS-AVR) with conventional SAVR. The analysis demonstrates that MIS-AVR offers similar or improved short-term outcomes, including reduced hospital stay and lower rates of complications, while maintaining equivalent survival. This robustly supports MIS-AVR as a safe and effective option for suitable patients [9].

Despite surgical and interventional advancements, managing critical postoperative complications remains a significant challenge. A retrospective analysis investigates the early outcomes of Extracorporeal Membrane Oxygenation (ECMO) support for cardiogenic

*Correspondence to: Hye-Jin Park, Department of Cardiothoracic Surgery, Seoul National University, Seoul, South Korea. E-mail: hyejin.park@snu.ac.kr

Received: 04-Sep-2025, Manuscript No. AABMCR-221; Editor assigned: 08-Sep-2025, Pre QC No. AABMCR-221 (PQ); Reviewed: 26-Sep-2025, QC No. AABMCR-221; Revised: 07-Oct-2025, Manuscript No. AABMCR-221 (R); Published: 16-Oct-2025, DOI: 10.35841/bmcr-9.4.221

shock following cardiac surgery. While ECMO provides crucial circulatory support, mortality rates remain high. This underscores the severity of the condition and the ongoing need for careful patient selection and aggressive management to improve survival in this critically ill population [10].

Conclusion

Contemporary cardiac surgery addresses a broad spectrum of conditions, continuously evolving to improve patient outcomes. Recent research highlights the feasibility of complex procedures in vulnerable populations, such as cardiac surgery in octogenarians and nonagenarians, demonstrating acceptable safety with meticulous patient selection and specialized perioperative care. Understanding risk factors for common postoperative complications, like Postoperative Atrial Fibrillation (POAF) after isolated Coronary Artery Bypass Grafting (CABG), allows for targeted preventive strategies, improving patient management. Advances in minimally invasive techniques are reshaping treatment paradigms. Transcatheter Aortic Valve Implantation (TAVI) emerges as a viable alternative to Surgical Aortic Valve Replacement (SAVR) for low-risk patients, showing comparable or superior short-term results, although long-term durability is still under investigation. Similarly, Minimally Invasive Surgical Aortic Valve Replacement (MIS-AVR) offers benefits over conventional SAVR, including shorter hospital stays and fewer complications. For complex aortic pathologies, hybrid approaches such as hybrid arch repair with the frozen elephant trunk technique, and Thoracic Endovascular Aortic Repair (TEVAR) for blunt thoracic aortic injury, provide effective and less invasive solutions with favorable mid-term outcomes. Addressing congenital anomalies, surgical repair for Double Outlet Right Ventricle (DORV) with subaortic Ventricular Septal Defect (VSD) shows promising early and mid-term recovery rates. Furthermore, hybrid coronary revascularization for multivessel Coronary Artery Disease (CAD) combines surgical and percutaneous techniques, aiming for optimized results. Mitral valve repair consistently demonstrates excellent long-term durability for severe mitral regurgitation, reinforcing its preference over replacement. Despite these advancements, challenges persist, notably in managing severe complications like car-

diogenic shock post-cardiac surgery, where Extracorporeal Membrane Oxygenation (ECMO) provides crucial support, though mortality remains significant, emphasizing the need for continued research in critical care.

References

1. Francesco MM, Nicola C, Giovanni DA. Outcomes of Cardiac Surgery in Octogenarians and Nonagenarians: A Contemporary Multicenter Analysis. *J Clin Med.* 2023;12:4409.
2. Xiaohui D, Yibin H, Qiang Y. Risk Factors for Postoperative Atrial Fibrillation in Patients Undergoing Isolated Coronary Artery Bypass Grafting. *J Cardiothorac Surg.* 2023;18:161.
3. Jia-Ning C, Yi-Xuan Z, Jing-Han C. Transcatheter Aortic Valve Implantation vs Surgical Aortic Valve Replacement for Low-Risk Patients: A Meta-Analysis of Randomized Controlled Trials. *Front Cardiovasc Med.* 2023;10:1198547.
4. Yu W, Xiangcheng Z, Qiang W. Clinical outcomes of hybrid arch repair using the frozen elephant trunk technique for extensive aortic arch disease. *Front Surg.* 2022;9:994082.
5. Zhiheng C, Liang Y, Hongyu L. Early and Mid-term Outcomes of Surgical Repair of Double Outlet Right Ventricle with Subaortic Ventricular Septal Defect. *J Clin Med.* 2023;12:2977.
6. Xiaoyu S, Fan H, Chao L. Hybrid Coronary Revascularization for Multivessel Coronary Artery Disease: A Systematic Review and Meta-Analysis. *J Clin Med.* 2021;10:3374.
7. Michael WS, David KJ, Daniel EH. Contemporary Outcomes of Thoracic Endovascular Aortic Repair for Blunt Thoracic Aortic Injury: An Analysis of the American College of Surgeons National Surgical Quality Improvement Program Database. *Ann Vasc Surg.* 2022;80:111-119.
8. Xiaoxiao L, Ziliang L, Xiaohui M. Long-term outcomes of mitral valve repair in patients with severe mitral regurgitation: a systematic review and meta-analysis. *J Cardiothorac Surg.* 2023;18:201.
9. Stefano C, Enrico F, Alessandro P. Minimally invasive versus conventional surgical aortic valve replacement: a propensity-matched analysis. *J Cardiovasc Surg (Torino).* 2022;63:569-577.
10. Ming-Ju H, Chih-Hsien L, Che-Chi K. Early Outcomes of Extracorporeal Membrane Oxygenation Support for Cardiogenic Shock After Cardiac Surgery: A Retrospective Analysis. *J Clin Med.* 2023;12:2269.

Citation: Park H. Modern cardiac surgery: Techniques, outcomes, challenges. *aabmcr.* 2025;09(04):221.