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ORIGINAL ARTICLE

Early outcomes of repeat cardiac surgery at a newly established cardiac center in a developing country.

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ABSTRACT… Objective: To evaluate the early clinical outcomes of repeat cardiac surgery performed at a newly established cardiac center in a developing country. **Study Design:** Prospective Observational Cohort study. **Setting:** Department of Cardiac Surgery, Peshawar Institute of Cardiology. **Period:** January 2021 and July 2024. **Methods:** A total of 25 consecutive patients aged 18 years or older who had any previous cardiac surgery with and without the use of cardiopulmonary bypass were included. Elective, urgent, emergent, and salvage cases were all there. Patients who had incomplete records were excluded. Our study utilized SPSS (Statistical Program of Social Science) version 20 for analysis of our dataset. **Results:** The average cardiopulmonary bypass (CPB) time was 193.48 minutes (±72.8), while the average duration of aortic clamp time was 136.20 minutes (±73.6). Regarding complications, 16% of patients (n=4) required re-intubation, 12% (n=3) needed re-exploration, 16% (n=4) experienced renal failure, and 4% (n=1) suffered a stroke. Additionally, 16% of patients (n=4) were readmitted, and 4% (n=1) died within 30 days following surgery. **Conclusion:** This study showed that new cardiac centers are safe for commencing complex cases like repeat cardiac surgeries with comparable results to other established centers.

Key words: Mitral Valve Replacement, Repeat Cardiac Surgery, Redo CABG, Redo AVR.

INTRODUCTION

Cardiovascular disease (CVD) remains one of the leading causes of morbidity and mortality worldwide, and its burden is particularly severe in developing countries, where healthcare infrastructure and resources often struggle to meet the increasing demand for cardiac care. Among the more complex and high-risk procedures in cardiovascular medicine is repeat cardiac surgery the surgical intervention performed on patients who have previously undergone heart surgery.[1] Repeat surgeries are typically required due to complications such as graft failure, valve dysfunction, or disease recurrence, and are associated with higher risk profiles compared to first-time surgeries.[2] Despite these challenges, the availability of repeat cardiac surgery is critical for patients who experience such complications, as it offers the potential for improved quality of life and survival.[3]

In many low- and middle-income countries (LMICs), the capacity to perform repeat cardiac surgery is often limited by a range of factors, including a shortage of specialized medical professionals, inadequate diagnostic tools, and constrained surgical infrastructure.[4] The establishment of a new cardiac center in such a setting provides a unique opportunity to explore and understand the early outcomes of these high-risk procedures in a resource-constrained environment. The early mortality associated with redo cardiac surgery at various centers in developing countries ranges from 7.2% to 9.5%.[1,5] Many studies have demonstrated that redo cardiac surgery can be performed with risks comparable to those of primary cardiac surgery.[6,7] But there is a paucity of data on repeat cardiac surgery in newly established centers in the developing world, where healthcare delivery is often shaped by local challenges, including economic constraints, healthcare access issues,

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and differences in patient demographics.

In this context, the early outcomes of repeat cardiac surgery including postoperative complications, mortality, and recovery patterns—are essential indicators of the surgical team's skill, the center's operational capacity, and the broader healthcare environment's ability to manage such complex procedures. These outcomes not only reflect the immediate success of the surgery but also provide valuable insight into the effectiveness of the center's resources, protocols, and patient management strategies.[8] Understanding these early outcomes is critical for improving clinical practice, shaping healthcare policy, and guiding future research to address the specific needs of cardiac patients in developing countries.

This research aims to fill a critical gap in the literature by assessing the early clinical outcomes of patients undergoing repeat cardiac surgery at a newly established cardiac center in a developing country. The study will evaluate postoperative morbidity, mortality, complications, and recovery. By focusing on this particular setting, the study seeks to generate actionable insights that could enhance the safety, efficiency, and accessibility of cardiac care in similar environments, ultimately improving patient outcomes and contributing to the overall strengthening of cardiovascular healthcare in the region.

METHODS

This study was performed between January 2021 and July 2024 at cardiac surgery department of Peshawar Institute of Cardiology. A total of 25 consecutive patients aged 18 years or older who had any previous cardiac surgery with and without the use of cardiopulmonary bypass were included. Elective, urgent, emergent, and salvage cases were all there. Patients who had incomplete records were excluded.

Baseline patient characteristics, data from previous cardiac surgery, peri-operative data, and postoperative outcome data were retrospectively collected from the hospital management information system (HMIS) and electronic medical record (EMR). The Institutional Review Board (IRB) committee of Peshawar Institute of Cardiology approved the study (IRC/24/120).

The indications of repeat cardiac surgery were different depending on the case. The primary end point was postoperative complications and 30-day mortality. The sternal wires were cut interiorly and bent back, but they were not removed in order to protect the underlying structures. An oscillating saw is used to divide the sternum. Once the posterior table of the sternum was divided with the saw, the wires were removed, and a sharp dissection was done with scissors to separate each side of the sternum from the underlying structures. The dissection plane was close to the sternum and developed along the diaphragmatic surface, then up around the right atrium towards the aorta. Dissection on the aorta was performed slowly and carefully to avoid penetration and extension beneath the adventitia. Dissection of the left heart was completed on cardiopulmonary bypass (CPB). The cardiopulmonary bypass was initiated and mild systemic hypothermia (30-32 °C) was achieved. Antegrade blood cardioplegia in induction and continuous retrograde blood cardioplegia in maintenance were used for myocardial protection.

Our study utilized SPSS (Statistical Program of Social Science) version 20 for analysis of our dataset. Continuous variables are described as mean ± Standard deviation while categorical variables are described in terms of frequency and percentages.

RESULTS

Redo cardiac surgeries are performed in patients presenting with recurrent or progressive heart disease following surgery. These operations are very challenging due to the presence of scar tissue, deformed structures, and high rates of complications compared with the first interventions. In this study, we evaluated the outcomes of 25 patients, who underwent a range of cardiac redo operations from single valve replacements to multi-valve replacement.

Parameters	Frequency = n	Percentage %
Male	7	28.0
Female	18	72.0
Age (Mean SD)	38.12 ± 12.9	--
BMI Mean SD	24.0± 4.9	--
Hypertension	8	32.0
CCS I	2	8.0
CCS II	9	36.0
CCS III	14	56.0
NYHA II	2	8.0
NYHA III	18	72.0
NYHA IV	5	20.0

Table-I. Preoperative and demographic Analysis of Redo Cases n=25

The group was mainly female (72%, n = 18) with an average age of 38.12 years (± 12.9) and a mean body mass index (BMI) of 24.0 (± 4.9). Hypertension was found in 32% (n=8) of the population. Angina severity based on Canadian Cardiovascular Society (CCS) classification showed patients were predominantly CCS III (56%), followed by CCS I (8%) and CCS II (36%),. While, In New York Heart Association (NYHA) classes, the greater part (72%) was in NYHA class III, 20% in class IV, and 8% in class II, indicating a high grade of functional impairment in this patient group.

Procedures	Frequency	Percentage
Pseudoaneurysm repair	4	16.0
Re-do AVR+aortic root enlargement TV repair	1	4.0
Re-do TVR	1	4.0
Redo AVR	1	4.0
Redo AVR,TVR	1	4.0
Redo AVR+MVR	4	16.0
Redo CABG	1	4.0
Redo MVR	2	8.0
Redo MVR, TVR	2	8.0
Redo MVR+Aortic valve repair	2	8.0
Redo MVR+AVR+TV repair	2	8.0
Redo Pulmonary valve replacement	1	4.0
Redo ruptured sinus of Valsalva repair	1	4.0
Redo TVR	1	4.0
Salvage AVR	1	4.0

Table-II. List of Redo Cardiac surgeries

The pseudoaneurysm repair emerged as the most prevalent procedure, carried out in 16% of the cases. Some patients had indication for redo surgery on several valves: 16% of patients underwent a simultaneous aortic and mitral valve replacement (AVR + MVR) whereas 8% had a repeat surgery for mitral valve replacement (MVR) with tricuspid valve replacement (TVR) or aortic valve repair.

Outcomes from single redo surgeries were also observed, with aortic valve replacement (AVR), tricuspid valve replacement (TVR), and coronary artery bypass grafting (CABG) done in 4% of patients each, while in a few cases pulmonary valve replacement, salvage AVR as well as repair of ruptured sinus of valsalva were also performed.

Parameters	Frequency = n	Percentage %
CPB time in min (Mean SD)	193.48±72.8	
Clamp time in min (Mean SD)	136.20±73.6	
Re intubation	4	16.0
Re Exploration	3	12.0
Renal Failure	4	16.0
Stroke	1	4.0
Re admission	4	16.0
30 days Mortality	1	4.0

Table-III. Early comorbidities

The analysis of these patients (Table-III) after surgery showed the average cardiopulmonary bypass (CPB) time was 193.48 minutes (±72.8) whereas, the average duration spent on aortic clamp was 136.20 minutes (±73.6). Among complications, 16% of patients (n=4) were re-intubated, 12% (n=3) underwent re-exploration, 16% (n=4) encountered renal failure; and 4% (n=1) had a stroke. Furthermore, readmission was necessary for 16% of the patients (n=4), while mortality within 30 days was recorded in 4% (n=1) of the patients. This underlines the great degree of perioperative care which should be provided to this subgroup of patients and the extent of postoperative care that is required.

DISCUSSION

Patients requiring cardiac surgery have become more complex and an increasing number of them require repeat surgery.[9] Repeat cardiac

surgery is historically been associated with increased morbidity and mortality. Although with recent advances in technical and post-operative care, this risk is deceased, it is still considered a challenging surgery with increased operative risk.[10,11] Repeat cardiac surgery poses many challenges especially for new setups and in developing countries like ours where resources are scarce.

Our study included 25 repeat cardiac surgery cases in which 7 (28%) were males while 18 (72%) were females. Mean age of the participants was 38.12 ± 12.9 years. Most of the cases were presented with angina CCS III and shortness of breath NYHA III. The majority of the cases were valvular (76%) while few were Redo CABG, pseudo aneurysm repair, and sinus of Valsalva repair (24%). The higher number of valvular operations in our study may be attributed to the higher incidence of rheumatic valvular heart disease in our population and the mostly conservative management of symptoms in surgically revascularized patients. Other noteworthy complications were prolonged bypass (193.48±72.8 minutes) and cross-clamp time (136.20±73.6), re-intubation (16%), re-exploration (12%), renal failure (16%), and re-admission (16%). 30-day mortality was 4%.

A similar study was conducted by Tekumit et al which comprised 127 redo surgeries.[12] It included 35 isolated coronary artery bypass grafting surgery (27.5%), 70 isolated valve surgeries (55.1%), 10 combined valvular plus coronary artery bypass grafting surgeries, and 12 other types of cardiac reoperation. In-hospital mortality rate was 5.5%. The mean cross-clamp time was 76.9±35.4 minutes while mean bypass time was 103.9±48.9 minutes. Prolonged ICU stay was present in 19 % of cases, readmission in 19.8%, re-exploration in 6.5%, and re-intubation in 9.8%.[4] These results are nearly comparable to our study except for the large difference between bypass, cross-clamp time, and prolonged ICU stay. However, their sample size was large.

Another comparatively recent study conducted by Hamid et al[1], included 544 patients, comprising 60% males and 40 % females. Mean age was higher compared to ours (61±14 years). Isolated valvular surgeries were 48 %, CABG was 15 %, CABG+ valvular surgeries were 14% while the rest were other cases. Mean bypass time was 146 minutes while mean cross-clamp time was 91 minutes. Similar to the previous study mentioned, this time is significantly less than our study, which may be attributed to the fact that our institute was new. In-hospital mortality was 9.5%.

The findings of this study are based on a single-center study, the sample size is small and the study was retrospective. Large sample size and prospective study is needed to compare our results with other centers.

CONCLUSION

This study showed that new cardiac centers are safe for commencing complex cases like repeat cardiac surgeries with comparable results to other established centers.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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