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TRENDS IN PERI-OPERATIVE PARAMETERS AND POSTOPERATIVE COMPLICATIONS ASSOCIATED WITH COARCTATION OF THE AORTA REPAIR IN A TERTIARY CARE HOSPITAL

Dr. Haseeb Ahmed[1], Muhammad Sanaan Noor[*2], Dr. Muhammad Salman Farsi[3], Muhammad Maaz Bin Zahid[4], Dr. Azam Jan[5]

[1]*Consultant Cardiac Surgeon, Bahria International Hospital, Orchad, Lahore*
[*2]*Department of Medicine, Khyber Medical College, , Peshawar*
[3]*Registrar Pediatric Cardiac Surgery, Bahria International Hospital, Orchad, Lahore*
[4]*Department of Medicine, Khyber Medical College, Peshawar*
[5]*Head of Department, Department of Cardiovascular and Cardiothoracic Surgery, RMI, Peshawar*

[1]haseeb.dik16@gmail.com, [*2]muhammadsanaannoor@gmail.com, [3]salman.farsi75@gmail.com, [4]maazk1505@gmail.com, [5]azam.jan@rmi.edu

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Corresponding Author: *
Muhammad Sanaan Noor

Abstract

Introduction: *Coarctation of the aorta (CoA) is usually diagnosed in neonatal and infant patients, and congenital heart surgery for CoA is well established in infants. CoA accounts for 6-8% of all congenital cardiac diseases worldwide, and the estimated average incidence of this disease is 4 per 1000 live births worldwide. Coarctation of the aorta (CoA) in adolescents and adults is relatively rare. Several operative and interventional techniques have been reported, but there is no consensus.*

Objectives: *The objective of this study was to see the trends in perioperative parameters and post-operative complications associated with the surgical repair of CoA at Rehman Medical Institute (RMI).*

Methods: *This is a cross-sectional study starting from July 2017 to December 2021. A total of 24 patients underwent CoA repair and were included in the study.*

Results: *Out of the 24 patients, only 2 had diabetes, which was controlled with oral medications. The mean initial ICU stay was 35.75±12.5 hours, and there were no readmissions to the ICU. The mean initial hours of intubation were 3.88±3.34 hours. None of the patients was re-intubated during the postoperative period. 4 (16.6%) patients were reopened and shifted back to the operating room for bleeding/tamponade. The in-hospital mortality was 0%.*

Conclusions: *Surgical repair for CoA in adolescents and adults is a good option with improved outcomes. The morbidity rates are minimal, and no mortality was observed in our study with surgical repair.*

INTRODUCTION

Coarctation of the aorta is a congenital cardiac abnormality that results in the obstruction of blood flow from the aorta to the body, It can occur in either the thoracic or abdominal aorta. The most common location for CoA is just distal to the origin of the left subclavian artery at the point where the ductus arteriosus connects to the aorta.[1] CoA accounts for 6-8% of all congenital cardiac diseases worldwide, and the estimated average incidence of this disease is 4 per 1000 live births worldwide [2,3]. Coarctation of the aorta is usually diagnosed in infants; it can also present in adolescence and adults as an incidental finding of hypertension, heart murmur, and decreased femoral pulses. Long-term sequelae of CoA include systemic arterial hypertension, heart failure, aortic aneurysm, aortic dissection, and early mortality, commonly in the third or fourth decade.[1]

CoA is more frequently present in males compared to females and is usually associated with some other cardiac abnormality. Bicuspid aortic valve, ventricular septal defect, and patent ductus arteriosus are most commonly associated with it. The incidence of bicuspid aortic valve ranges from 45-62% (4–6). CoA is sometimes also a part of genetic syndromes such as Turner syndrome and Williams syndrome, with an 18% incidence reported in Turner syndrome. [7]

The treatment options available for the management of CoA include surgical correction, transcatheter balloon angioplasty, and transcatheter stenting. The preferred treatment is usually personalized based on age and size of the patient, associated cardiac defects, and availability of the treatment options [8,9]. Surgery is usually the preferred treatment option for children, and endovascular procedures are increasingly used in adults nowadays. Surgical repair still has a crucial role in patients with anatomies unsuitable for endovascular grafts.

Surgical options are based on age and arch anatomy of the patient and include end-to-end anastomosis, subclavian flap repair, and coarctation segment resection with prosthetic patch augmentation [10]. Postop complications include paradoxical hypertension, recurrent laryngeal nerve injury, and bleeding, while long-term complications are recurrent CoA, aneurysm formation and spinal cord ischemia. [11]

The rationale of this study is to find early outcomes and perioperative parameters of patients that underwent CoA surgical repair at RMI to help guide clinical decision-making, improve surgical practices, and contribute to regional data on this condition. The objective of this study is to evaluate the early outcomes and perioperative parameters of patients undergoing surgical repair for CoA at RMI.

MATERIALS AND METHODS

Data was retrieved from the cardiothoracic archives, exported to Microsoft Excel, and analyzed in SPSS 23. Results were represented in the form of tables

Methodology:

Study design and setting:

This is a cross-sectional study conducted in a tertiary care hospital in Peshawar, on patients who underwent CoA surgical repair from July 2017 to December 2021. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist was followed while conducting the study.

Study population and sampling:

Our study participants were patients undergoing CoA repair. Participants who fulfilled the criteria for surgery were included. Pre-op patients were assessed according to AHA/ACC guidelines, and a decision for surgery was made after involving multidisciplinary teams. Participants with any neurologic (such as insomnia, narcolepsy, restless leg syndrome, and sleep apnea) or psychiatric issues were excluded. Patients with a heart disease that needed a surgery other than CoA repair were also excluded.

For the selection of participants, the non-probability convenience sampling method was used. The sample size was calculated using the formula for a single proportion. The confidence interval was taken as 95%, and a 5% margin of error. By putting values in the formula and then adding 10% attrition, our minimum sample size was calculated to be 24.

Data collection tools:

Patient Characteristics:

The participant characteristics included age, gender, history of diabetes, and systolic and diastolic blood pressure (BP) measurement.

ICU Characteristics:
The ICU parameters included duration of ICU stay, duration of intubation, and drainage at specific hours.

Post-operative parameters:
The post-operative parameters included readmission due to intubation need, reopening due to bleeding or tamponade, in-hospital mortality, complications, etc.

Statistical analysis:
The collected data were analyzed and managed using the Statistical Package for the Social Sciences (IBM SPSS V.21.0). Descriptive statistics were presented as frequencies and percentages for categorical variables, and median ± standard deviation (SD) for continuous variables.

Ethical Issue:
The Institutional Review Board of the hospital approved this study and waived the need for patient consent. The research project was conducted with ethical guidelines in mind, and a properly structured questionnaire was used.

RESULTS

A total of 24 coarctation of aorta repair procedures were performed from July 2017 to December 2021. The mean age of the patients was 22.29±13.7 years, with 20 (83.3%) males and 4 (16.7%) females. Out of the 24 patients, only 2 had diabetes, which was controlled with oral medications. One patient was a tobacco user. No other co-morbidity was present. Most of the patients had high blood pressure (11, 45.8%), which is a symptom of coarctation of aorta. The mean systolic bp was 141±22.9 and ranged from 110 mmHg to 205 mmHg. Mean diastolic was 79.13±20.6 and ranged from 37 mmHg to 126 mmHg. As shown in Table 1.

Table1. PATIENT DEMOGRAPHICS

Mean Age	22.29±13.7 years
Tobacco use	1 (4.1%)
Diabetes	2 (8.2%)
Raised blood pressure	11 (45.8%)
Mean systolic blood pressure	141±22.9 mmHg
Mean diastolic blood pressure	79.13±20.6 mmHg

The mean initial ICU stay was 35.75±12.5 hours, and there were no readmissions to the ICU. One out of twenty-four patients was extubated in the Operating room. Mean initial hours of intubation were 3.88±3.34 hours. As shown in Table2. And Table3.

Table 2. ICU PARAMETERS

Initial ICU hours	35.75±12.5 hours
Initial hours of intubation	3.88±3.34 hours
Drain at 12 hours	280±340 ml
Drain at 24 hours	346±363 ml

Table 3. POST OPERATIVE PARAMETERS

Re-intubated during hospital stay	0
Re-opening for bleeding /tamponade	4 (16.6%)
Readmission	0
In hospital mortality	0
Surgical emphysema	1
Discharged	24 (100%)

None of the patients was re-intubated during the postoperative period. 4 (16.6%) patients were reopened and shifted back to the operating room for bleeding/tamponade. The in-hospital mortality was 0%. All the patients were discharged from the hospital on the fourth post-operative day with no in-hospital mortality.

DISCUSSION

Our study reports immediate surgical outcomes and perioperative parameters of CoA surgical repair in a small cohort of patients. The mean age of the subjects was 22.9 years. Comparing this number with other reports published in 2006, we found that several studies reported a mean age of 37 years [12]. The most common complication that occurred post op was bleeding 4 (16.6%), similar stats were reported in another study by Carr, in which 3 (6.6%) patients had post op bleeding [13]. No other common complication, such as recurrent laryngeal nerve injury (leading to vocal cord paralysis), ventricular tachycardia, or transient lower limb weakness, was reported in our study, but reports from other countries have mentioned these complications in their results [14,15]. Due to a lack of previous data in our archives, we were unable to find long-term outcomes in our cohort. No mortality was found in our study. A study on lifelong surveillance of coarctation of aorta patients reported survival rates of 93.3%, 86.4%, and 73.5% at 10, 20, and 30 years [16]. A vascular cause of death is reported in these cases, attributed to endothelial dysfunction and impaired arterial dilatation. Despite repairing the coarctation, it is found that patients have increased ventricular mass regardless of being normotensive. This can lead to ischemia, diastolic heart failure, and arrhythmias [17,19].

We found no cases of reoperations, re-interventions, or re-coarctation in our cases. Studies with a longer-term follow-up period reported cases of reinterventions and found they are associated with the type of operative technique and age of the patient. Resection and End-to-end anastomosis is the preferred type of surgical repair and is associated with decreased incidence of reintervention [16].

Short and limited follow-up period, lack of detailed data in our archives, and observational nature of the study are some of our limitations. In the future, we would like to observe improvements in blood pressure post-operatively, re-intervention and re-coarctation events, and other cardiovascular procedures performed in later life. Finding a correlation between the type of surgical technique used and short and long-term complications is also one of our objectives.

LIMITATIONS:

Our study has several limitations. First of all, it is a retrospective observational study with a very small sample size; further studies with a larger sample size can improve the results of the study. The data was collected from only one institute, which can't be generalized to the rest of the population. Due to the lack of follow-up, our study didn't record long-term complications and re-intervention.

CONCLUSION

Surgical repair for CoA in adolescents and adults is a good option with improved outcomes. The morbidity rates are minimal, and no mortality was observed in our study with surgical repair.

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