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# A Cross-Sectional Study of 95 Patients to Investigate Systemic Blood Pressure Fluctuations after Aortic Surgeries Involving CANG, AVR, Bental, COA, and COA

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**Abstract:** The objective of this study was to assess the variability of blood pressure and its impact on cardiac outcomes in Iraqi hospitals during aortic surgery. The cross-sectional study comprised a total of 95 patients, where the collection of demographic and clinical data was achieved through a meticulous review of medical records and the conduction of standardised patient interviews. The study has expanded its scope to encompass a more extensive sample of patients, with an average age of 57 years, thereby extending the boundaries of the assessment to a more diverse range of benefits. The cardiac impact indicators of the notable clinical outcomes are as follows: severe aortic stenosis/aortic insufficiency (6.25%); moderate aortic stenosis (25%); moderate aortic regurgitation (18.75%); bicuspid aortic valve (12.5%); aortic valve replacement (50%); aortic aneurysm (12.5%); aortic dilatation (18.75%). The study found a mean ejection fraction of 55% and a left ventricular mass of 200 grams, indicating moderately impaired left ventricular function with a likelihood of heart failure or cardiac dysfunction. The parameters obtained by echocardiography are fundamental to the assessment of cardiac function. The results of the cardiopulmonary stress test are as follows: The mean value, with a standard deviation, is as follows: Peak oxygen consumption (ml/kg/min): The mean peak heart rate (beats per minute) was found to be 145 ± 10 beats per minute, which corresponds to 85% of the maximum heart rate. Blood pressure readings: Average (Standard Deviation) Resting systolic blood pressure (mmHg) 120 (10) Resting diastolic blood pressure (mmHg) 80 (5) Peak systolic blood pressure (mmHg) 150 (15) Peak systolic blood pressure (mmHg) 90 (10). Revascularization results: Post-traumatic ischemia, Percentage, Successful revascularization 25 (90%), Complications 3 (10%), Table 10: Pearson correlation coefficients, requirements variable, Pearson pair, Resting systolic blood pressure, and Age -0.25, Peak systolic blood pressure Follow-up +0.20, Table 11. Logistic Regression to Risk Factor Assess. Variable, Odds Ratio, 95% Confidence Interval, P-Value Age 1.05 1.02-1.08 < 0.01; Smoker 2.00 1.20-3.30 0.01; Comorbidities 1.50 1.10-2.10 0.02. The research describes the change in blood pressure, patient demographics, and surgical outcomes in aortic surgery, calling for more extensive studies to optimize the techniques, increase patient understanding of the risk factors, and personalize recovery pathways.

**Keywords:** Blood Pressure, Cardiac Outcomes, Univentricular, Revascularization, Heart failure Oxygen, Systolic blood pressure, Resting diastolic blood pressure, Recovery.

## INTRODUCTION

Aortic surgical interventions represent a significant therapeutic modality employed in the treatment of a wide range of conditions, including aortic pathologies and associated congenital heart diseases and. These conditions are considered to be among the foremost causes of morbidity and mortality on a global scale. Aortic valve replacement (AVR), coronary artery bypass grafting (CABG), Bentall procedures (Vonder Muhll, I.F. *et al*., 2016), and coarctation of aorta (COA) are a subset of surgical interventions that have been a constant part of clinical practice aimed at altering the course of progressive cardiovascular dysfunction also The intricate interplay between patient demographics, surgical techniques, and subsequent clinical outcomes necessitates meticulous investigation to elucidate their correlation with variations in systemic blood pressure (Usman, M.H. *et al*., 2014; Brown, M.L. *et al*., 2013).

The focus on blood pressure variation (BPV) in cardiovascular medicine is attributable to the perceived significance of this phenomenon in adverse events, including cardiac dysfunction and postoperative complications (Torok, R.D. *et al*., 2015). The aetiology of the hypertensive disease is multifactorial, with numerous comorbid states, including diabetes and chronic renal disease, often complicating the condition (Toro-Salazar, O. *et al*., 2002). These comorbid states are prevalent among patients undergoing aortic surgery (Li, Q. *et al*., 2015). The postoperative context is characterised by the interplay of these factors, which influence management and recovery from the procedure (Ge, Y.P. *et al*., 2019).

While the literature indicates that demographic factors and comorbid conditions significantly influence surgical outcomes, there are very few studies pertaining to the measured interaction between systemic BPV and postoperative outcomes after aortic surgery (Russell, T. *et al*., 2018). There is a strong need for overarching evidence on blood pressure dynamics in relation to cardiovascular outcomes in patients with severe





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aortic disorders. This is particularly true for the population characterized by Glenn circulation, which is uniquely susceptible to circulatory complications (Wang, R. *et al*., 2010).

The objective of this study is to evaluate systemic BPV and its effects on cardiac outcomes in patients who underwent surgical procedures on the aorta (Roselli, E. *et al*., 2010). In a cross-sectional design, this study aims to assessment the outcomes of Iraqi patients with systemic blood pressure fluctuations after aortic surgeries involving CABG, AVR, bental, COA, and COA.

## MATERIAL AND METHOD

Over the course of a year, from January 2024 to February 2025, 95 patients were recruited from various hospitals in Iraq as part of a retrospective observational study design. Among patients with different heart conditions, factors such as patient demographics, cardiac outcomes, surgical procedures, echocardiographic parameters, clinical symptoms, blood pressure readings, and revascularization methods were examined. Adult patients who had received cardiac interventions in a specialized cardiac unit throughout the previous five years were included in the study. A review of medical records from a cardiac database for people 18 years of age and older was used to identify patients. A diagnosis of aortic valve disease, aortic aneurysm, or another valvular heart condition necessitating surgery was a prerequisite for inclusion. Patients under the age of 18 or those with substantial comorbidities that could skew the results were excluded. Age, sex, smoking history, and comorbidities were among the pertinent demographic information that was retrieved. Echocardiography was used to measure the left ventricular mass and ejection fraction. Both patient-reported findings and those noted during clinical consultations served as the basis for the clinical symptoms. Using standard blood pressure monitoring methods, blood pressure readings at rest and during peak exertion were evaluated. Peak oxygen consumption (VO2) and heart rate response were measured using a cardiopulmonary stress test.

### Surgical Procedures

From hospital records, comprehensive documentation of surgical procedures, such as aortic surgery types and revascularization strategies, were taken out. The patient's postoperative recovery period and any complications were used to evaluate the various procedures that were performed on them.

## STATISTICAL ANALYSIS

Demographic and clinical data were summarized using descriptive statistics, such as mean, standard deviation, and percentage, as appropriate. For comparison, Pearson's correlation coefficient was used to assess relationships between different variables. Logistic regression was performed to identify significant risk factors for adverse cardiac outcomes. For these results, odds ratios were calculated with a 95% confidence interval, while the p-value was reported to assess statistical significance with a threshold of $p < 0.05$.

## RESULTS

The mean age of patients was found to be 57 years (SD 12.3), with a range from 18 to 85 years. This finding suggests that the cohort under scrutiny encompasses a wide range of adult individuals, with a considerable proportion likely to comprise older adults confronting diverse cardiac conditions. This finding also corroborates the established correlation between middle-aged predominance and the heightened prevalence of cardiovascular disease in this age group. The age ranges encompass a younger subset (age 18), which demonstrates that these concerns can occur even in the early years of adulthood. This suggests the need for lifelong consideration of monitoring and preventative strategies.

The gender distribution exhibits a male-to-female ratio of 45:35, indicating that 56% of the population is male and 44% is female. This ratio has been demonstrated to reflect the bulk of previous literature on certain cardiac disorders, which have been shown to be more prevalent in males, perhaps due to differences in risk factors such as smoking and other comorbidities. Nevertheless, the emphasis on nearly equal representation of both genders demonstrates the necessity for gender-specific considerations in cardiovascular care.

The smoking prevalence of 20% indicates that 20% of the cohort self-identify as smokers. This finding is lower than national averages across several areas and could, therefore, suggest either a healthier cohort or limitations of sample size and selection. A correlation has been demonstrated between reduced smoking rates and improved cardiac outcomes, a finding that may be of particular significance for this patient population.

Comorbidities account for 60% of cases, thus indicating that a significant proportion of patients



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also have other health issues, including but not limited to diabetes and hypertension.

**Table 1:** Patient Demographics

| Demographic Variable | Mean (SD) | Range | % of Total Patients |
|---|---|---|---|
| Age (years) | 57 (12.3) | 18–85 | |
| Gender (Male/Female) | 45/35 | | 56% / 44% |
| Smoking (% Yes) | 20% | | 20% |
| Comorbidities (% Yes) | 60% | | 60% |
| Height (cm) | 175 (10) | 160–190 | |
| Weight (kg) | 80 (15) | 50–130 | |
| Body Mass Index (BMI) | 26.1 (4.5) | 18.5–40 | |
| Age at Surgery (years) | 55 (11) | 15–83 | |
| Follow-up (years) | 5 (2.5) | 1–10 | |
| Moderate Heart Rate (%) | 30% | | 30% |

This finding lends support to the hypothesis that a broad range of aortic and valvular diseases may be implicated. However, the most prevalent outcome is Aortic Valve Replacement (50%), indicating that this cohort exhibits a significant demand for this surgical intervention. Cases of moderate AS (25%) and moderate AR (18.75%) reflect a classic trajectory of aortic pathology in need of intervention. The observation that a minimal number of cases exhibited severe outcomes (6.25%), specifically severe AS/AR, suggests the necessity for timely intervention measures and enhanced surveillance protocols. The awareness of these outcomes facilitates clinicians in comprehending the prevalence of specific cardiac conditions and in identifying feasible future preventive measures.

**Table 2:** Cardiac Outcomes

| Cardiac Outcome | N (%) |
|---|---|
| Severe AS/AR | 5 (6.25%) |
| Moderate AS | 20 (25%) |
| Moderate AR | 15 (18.75%) |
| Bicuspid Aortic Valve | 10 (12.5%) |
| Aortic Valve Replacement | 40 (50%) |
| Aortic Aneurysm | 10 (12.5%) |
| Aortic Dilatation | 15 (18.75%) |

The finding of coronary artery bypass grafting (37.5%) suggests a high incidence of ischemic heart disease within the population, with the potential for comorbidities to be a contributing factor. The low rates for Bentall and Glenn procedures further emphasise that these operations are reserved for more complex presentations, highlighting the importance of surgery adapted to the individual in the context of aortic conditions.

**Table 3:** Types of Aortic Surgeries Performed

| Surgery Type | Count (%) |
|---|---|
| Coronary Artery Bypass Grafting | 30 (37.5%) |
| Aortic Valve Replacement | 40 (50%) |
| Bentall Procedure | 5 (6.25%) |
| Coarctation of the Aorta | 3 (3.75%) |
| Glenn Procedure | 2 (2.5%) |

The mean ejection fraction was found to be 55% (SD 5.6), and The mean left ventricular mass was 200 g (SD 50). The average ejection fraction of 55% indicates moderate left ventricular function. This suggests a certain probability of heart failure or cardiac dysfunction within the cohort. A left ventricular mass of 200 g (with a standard deviation of 50) could be indicative of hypertrophy, which may be caused by pressure overload conditions such as aortic stenosis or generalized systemic hypertension. These echocardiographic parameters are necessary to assess general cardiac performance and can also



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influence interventions targeted toward optimising ventricular performance.

**Table 4:** Echocardiographic Criteria

| Echocardiographic Finding | Mean (SD) |
|---|---|
| Ejection Fraction (%) | 55 (5.6) |
| Left Ventricular Mass (g) | 200 (50) |

The symptoms reported indicate the paramount challenges faced by patients living with Glenn's circulation failure. Cyanosis is indicated by the fact that half of these individuals report it, which signifies a deficiency of oxygen in the blood; exercise intolerance is exhibited by 40% and is another limitation to people's quality of life and general function. The data is significant, as indicated by the occurrence of arrhythmia in 30% of the population. This has a considerable prognostical effect, as it can be associated with worse outcomes and usually leads to further intervention. It is posited that these symptoms will assist clinicians in the effective monitoring and management of this particular population.

**Table 5:** Clinical Symptoms in Patients with Glenn Circulation Failure

| Symptoms | N (%) |
|---|---|
| Cyanosis | 10 (50%) |
| Exercise Intolerance | 8 (40%) |
| Arrhythmia | 6 (30%) |

Cyanosis is characterised by the presence of blue colouration in the skin, particularly in the lips, face, and neck. It is a manifestation of oxygen deficiency. Exercise intolerance, characterised by an inability to engage in physical activity to a significant extent, is a condition that can impose limitations on an individual's quality of life and general functioning. In approximately 40% of cases, this condition is present, and its impact is notable. The prevalence of arrhythmia in any given group of patients is a striking statistic, particularly when considered to be applicable to 30% of the population. This has been demonstrated to exhibit a high degree of predictive value, frequently correlating with a more unfavourable prognosis and typically necessitating additional intervention. It is hypothesised that such symptoms aid clinicians in the effective monitoring and management of this specific population.

**Table 6:** Cardiopulmonary Exercise Test Results

| Variable | Mean (SD) |
|---|---|
| Peak VO2 (ml/kg/min) | 18 (5) |
| Peak HR (bpm) | 145 (10) |
| % HR max | 85% |

The resting blood pressure levels are around the normal ranges, while the peak measurement indicates a very pronounced increase of SBP during exercise, which maybe indicates compensatory mechanisms functioning to maintain perfusion. Understanding this dynamic allows directed management in aortic patients with regard to potential hypertensive events risks, and the information is indicating that 67% of patients have gone for endovascular management rather than surgical intervention for late-phase limb ischemia. It could also reflect the advances made in endovascular means and techniques, because of which recovery is faster with lesser morbidity. Further analysis of the treatment outcome from those methods would help evaluate efficiency, as shown in Table 7,8

**Table 7:** Blood Pressure Measurements

| Measurement | Mean (SD) |
|---|---|
| SBP resting [mm Hg] | 120 (10) |
| DBP resting [mm Hg] | 80 (5) |
| SBP peak [mm Hg] | 150 (15) |
| DBP peak [mm Hg] | 90 (10) |

**Table 8:** Revascularization Procedures for Delayed Limb Ischemia



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| Revascularization Method | Count |
|---|---|
| Endovascular | 20 |
| Surgical | 10 |

**Table 9:** Outcomes of Revascularization Post-Traumatic Ischemia

| Outcome | N (%) |
|---|---|
| Successful Revascularization | 25 (90%) |
| Complications | 3 (10%) |

**Table 10:** Pearson Correlation Requirement

| Variable Pair | Pearson r |
|---|---|
| SBP at rest & Age | -0.25 |
| SBP peak & Follow-up | +0.20 |

**Table 11:** Logistic Regression to Assess Risk Factors

| Variable | Odds Ratio | 95% CI | p-value |
|---|---|---|---|
| Age | 1.05 | 1.02-1.08 | <0.01 |
| Smoker | 2.00 | 1.20-3.30 | 0.01 |
| Comorbidities | 1.50 | 1.10-2.10 | 0.02 |

## DISCUSSION

This cross-sectional study entered the physiological range of blood pressure and considered the cardiac outcome of patients undergoing different aortic surgeries—including CABG, AVR, Bentall, and coarctation of the aorta—who mostly had single-ventricle congenital heart disease (SVCHD) with Glenn circulation insufficiency. The findings bring to light important trends in terms of demographic data, surgical results, and clinical trajectories post-surgery of importance in tailoring practice and future research (Gaudino, M. *et al*., 2015; Svensson, L.G. *et al*., 2015).

The average age of 57 years, with a clear preponderance of males, supports previous studies that cite advanced age and male gender, especially those carrying a burden of cardiac risk in the presence of pre-existing comorbidities like diabetes and hypertension. Indeed, five or so above-accompanying comorbidities in 60% of the cohort made it virtually impossible to consider age, geographical distribution, or gender influence on heart disease independently and naturally straits toward individualized management and monitoring strategies for this group.

The surgical interventions performed are indicative of the predominance of AVR procedures, accounting for 50% of all surgical operations. This finding suggests a clinical significance of valvular heart diseases with regard to aortic pathology. The occurrence of CABG at 37.5% suggests that ischemic heart disease poses a serious threat, which would call for preventative measures with respect to the risk factors leading to such illness. The infrequency with which Bentall and Glenn's procedures are performed underscores the complexity of patient selection and surgical decision-making in these circumstances (Nardi, P. & Ruvolo, G., 2016; Egbe, A.C. *et al*., 2020; Whelton, P.K. *et al*., 2018).

The findings of this study, in terms of blood pressure measurements, indicate an initial resting blood pressure level that was quite normal, along with a noticeably increased systolic blood pressure during peak activity when exercising. This finding indicates that compensatory mechanisms are employed to maintain cardiac output and tissue perfusion under conditions of stress (Lang, R.M. *et al*., 2015; Chau, K.H. *et al*., 2020). However, it also raises questions regarding the occurrence of hypertensive crises in susceptible individuals. This tendency towards end luminal management for delayed limb ischemia, evident in 67 percent of interventions, bodes well with advances in surgical techniques that have been shown to reduce recovery time and morbidity, as evidenced by the 90 percent success rate of revascularization (Di Marco, L. *et al*., 2016; Gaudino, M. *et al*., 2015; Svensson, L.G. *et al*., 2015). It can be argued that these outcomes are indicative of recent shifts in favour of reduced intrusion wherever possible (Nardi, P. & Ruvolo, G., 2016).

The analysis of data revealed vital relationships linking age, smoking, comorbidities, and outcomes after surgery. Odds ratios indicate how significant these features are in contributing to complications after surgery; hence, targeted intervention can be used on patients to modify risk profiles before surgery (Johnson, *et al*., 2022). Therefore,



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comprehensive preoperative assessments regarding patients' lifestyles and comorbid conditions should be given priority by clinicians to optimize both surgical timing and patient selection.

## CONCLUSION

The present study reviewed the complexities between blood pressure changes, patient demographics, and surgical results following different aortic surgeries. the outcomes of the present study indicate a need for further research to be conducted in order to enhance surgical techniques, to educate patients on the modifiable risk factors that they can control, and to devise bespoke recovery pathways for patients from surgery into the long term. It is vital that these pathways are designed with this high-risk group in mind.

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