CARDIOLOGY UPDATES NEWSLETTER

Volume 4| Issue 17| 2025

IN THIS ISSUE

Dear Doctor,

Greetings from Micro Labs Limited. We are happy to bring you "Cardiology updates" which contains latest and interesting news in the field of Cardiology

Predictive value of red blood cell distribution width-to albumin ratio index for the prognosis of cardiac arrest

INTRODUCTION- Cardiac arrest (CA) is the sudden cessation of cardiac activity, requiring resuscitation. It is classified as in-hospital (IHCA) or out-of-hospital CA (OHCA), each with distinct characteristics.[1] CA affects around 300,000 inpatients, with only 25% of patients surviving after having CA. Early mortality risk prediction is crucial for identifying high-risk patients.[1] Red blood cell distribution width (RDW) is an inflammatory marker linked to poor cardiovascular outcomes but is influenced by multiple factors. Serum albumin (ALB) reduces inflammation, and low levels are associated with cardiovascular mortality. The RDW-to-albumin ratio (RAR) is an emerging biomarker for circulatory diseases, offering better risk assessment than RDW or ALB alone. However, RAR's prognostic significance for CA prognosis is unknown. This study investigates the relationship between the RAR index and 30- and 180-day mortality risks in post-CA patients.[2]

Cardiovascular disease

METHODS- This was a retrospective study. Clinical data were extracted from the e Medical Information Mart for Intensive Care IV (MIMIC-IV) database, enrolling 612 patients categorized into three groups based on RAR index tertiles: T1 (<3.7, n=139), T2 (3.7–4.5, n=150), and T3 (>4.5, n=323). Inclusion criteria were: (1) diagnosis of CA using ICD-9 and ICD-10 codes ("4,275," "I46," "I,462," "I,468," and "I,469"); (2) first ICU admission during initial hospitalization; and (3) age ≥18 years. Exclusion criteria include patients without recorded RDW or albumin levels and ICU length of stay. The study endpoints were 30- and 180-day all-cause mortality. Subgroup analyses were conducted for reliability, and ROC analysis assessed the predictive performance of the RAR index, red blood cell distribution width, and serum albumin for 180-day mortality.

RESULTS- In this study, the average age of the included patients was 64.1 ± 17.6 years, with 390 men and 222 women. Compared to the RAR T1 group, higher RAR index levels were associated with increased ICU admissions, an increased proportion of female patients, older age, lower body weight, reduced SBP and DBP, elevated RDW, creatinine, and BUN levels, and decreased albumin and platelet levels. Additionally, patients had worse Sequential Organ Failure Assessment (SOFA) and the Simplified Acute Physiology Score II (SAPSII) scores, a higher prevalence of diabetes and peripheral vascular disease, and a lower prevalence of cerebrovascular disease. A non-linear relationship was observed between the RAR index and 180-day all-cause mortality, with a hazard ratio (HR) >1 when the RAR index exceeded 4.54. Kaplan–Meier survival curves indicated lower 30- and 180-day survival rates in patients with higher RAR tertiles (T2 and T3). An elevated RAR index was significantly associated with

increased 30-day (adjusted HR: 1.08, 95% CI: 1.01–1.15) and 180-day (adjusted HR: 1.09, 95% CI: 1.03–1.16) mortality risk. ROC curve analysis showed that the RAR index had superior predictive accuracy for 180-day mortality compared to RDW and albumin [0.6404 (0.5958–0.6850) vs. 0.6226 (0.5774–0.6679) vs. 0.3841 (0.3390–0.4291)] (Figure 1). The prognostic value of the RAR index remained consistent across subgroups, with a significant interaction observed in white patients, those with chronic pulmonary disease, and those without cerebrovascular disease.

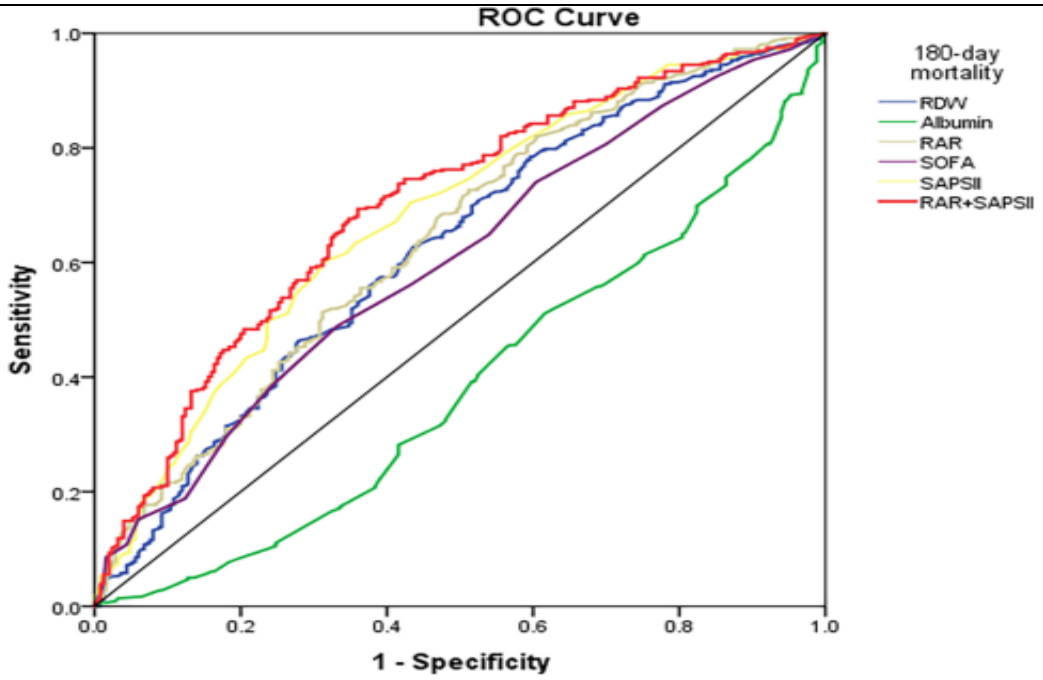

Figure 1. ROC curves predicting 180-day mortality in CA patients

DISCUSSION- The current study found that a high RAR is significantly linked to increased 30- and 180-day mortality in post-CA patients.[2] Similar associations have been reported in other conditions by Xu W et al. which identified RAR as an independent predictor of poor outcomes in sepsis patients.[3] Li H et al. and Xu W et al. also linked elevated RAR to higher mortality in acute myocardial infarction (AMI) patients, highlighting its potential as a prognostic biomarker in cardiovascular diseases.[3,4]

CONCLUSION- RAR index is an independent predictor of 30- and 180-day all-cause death in post-CA patients. The higher the RAR index, the greater the mortality. A high RAR index may be related to a worse prognosis in post-CA patients, reminding clinicians to check these individuals soon.

RAR index is an independent predictor of 30- and 180-day all-cause death in post-CA patients.

REFERENCES

1. Vo J et al. Management and prevention of in-hospital cardiac arrest: present and future. npj Cardiovascular Health. 2024;1:7.
2. Cai Y et al. Association between red blood cell distribution width-to-albumin ratio and prognosis in post-cardiac arrest patients: data from the MIMIC-IV database. Front Cardiovasc Med. 2025 Jan 7;11:1499324.
3. Xu W et al. Association between red blood cell distribution width to albumin ratio and prognosis of patients with sepsis: a retrospective cohort study. Front Nutr. 2022; 9:1019502.
4. Li H, Xu Y. Association between red blood cell distribution width-to-albumin ratio and prognosis of patients with acute myocardial infarction. BMC Cardiovasc Disord. 2023; 23:66.

Effect of Non-Alcoholic Fatty Liver Disease on Abdominal Aortic Aneurysm Progression

INTRODUCTION- Non-alcoholic fatty liver disease (NAFLD) is a leading cause of chronic liver disease globally and is characterized by hepatic steatosis when no other causes of secondary hepatic fat accumulation (e.g., excessive alcohol consumption) can be found.[1] NAFLD is a prevalent metabolic disorder closely linked to systemic conditions such as diabetes, obesity, and cardiovascular diseases. Recent studies highlight the association between NAFLD and arterial stiffness, inflammation, and oxidative stress, all of which may influence the progression of abdominal aortic aneurysms (AAAs). Despite growing evidence, the role of NAFLD as a predictor of AAA progression remains underexplored. So, this study aimed to assess the association between NAFLD, identified via non-enhanced computed tomography (CT), and AAA progression using data from multiple medical centers.[2]

METHODS- This multicenter retrospective study included 151 patients diagnosed with AAA who underwent abdominal CTA and non-enhanced CT between January 2015 and January 2023. Patients who had a non-enhanced abdominal CT examination and the availability of a follow-up CTA scan at least six months following the initial CTA examination were included. Based on abdominal CT results, patients with AAA were categorized as non-progression and progression (growth rate >10 mL/year), as well as NAFLD and non-NAFLD. CT and CTA scans were performed using standardized protocols across participating centres. Univariate and multivariate Cox regression analyses were conducted to identify factors associated with AAA progression. Receiver operating characteristic (ROC) curves were used to evaluate diagnostic performance, and Kaplan-Meier survival curves were plotted to compare progression rates.

RESULTS- The study population had a mean age of 69.1 ± 10.5 years, with 88.1% being male. NAFLD prevalence was significantly higher in the AAA group compared to controls (43.7% vs. 31.1%, $p = 0.024$). Hypertension (62.9% vs. 51.0%, $p = 0.036$) and diabetes (28.5% vs. 15.9%, $p = 0.009$) were also more prevalent in the AAA group, while BMI and smoking history showed no significant differences. Over a median follow-up of 10.7 months (range: 6.0–76.0 months), 57 patients (37.7%) experienced AAA progression (growth rate > 10 mL/year). Progression was more frequent in patients with NAFLD (77.2% vs. 23.4%, $p < 0.001$) and was associated with larger aortic diameter [45.6 mm vs. 37.5 mm, $p < 0.001$], greater AAA volume [65.2 mL vs. 41.2 mL, $p < 0.001$], higher intraluminal thrombus (ILT) prevalence (94.7% vs. 83.0%, $p = 0.035$) and larger ILT maximal diameter [12.3 mm vs. 6.7 mm, $p < 0.001$]. Patients with NAFLD had significantly lower progression-free survival rates (log-rank $p < 0.001$) (Figure 1). Univariate Cox regression identified NAFLD (HR: 5.99; $p < 0.001$),

AAA maximal diameter (HR: 1.07 per mm; p < 0.001), AAA volume (HR: 1.01 per mL; p < 0.001), and ILT maximal diameter (HR: 1.06 per mm; p < 0.001) as predictors. Multivariate analysis confirmed NAFLD (HR: 4.28; p < 0.001) and AAA diameter (HR: 1.06 per mm; p = 0.010) as independent predictors. For predicting AAA progression, the AUCs were 0.769 for NAFLD, 0.793 for AAA maximal diameter, and 0.857 for the combined model. Sensitivity and specificity were 77.2% and76.6% (NAFLD), 80.7% and 71.3% (AAA diameter), and 73.7% and 85.1% (combined) respectively. The combined model had a significantly higher AUC than NAFLD (p<0.001) and AAA diameter (p=0.034), while NAFLD and AAA diameter showed no significant difference (p=0.608). Cohen's kappa values for the intra-observer agreement were 0.917 (ILT) and 0.933 (NAFLD), while inter-observer values were 0.930 and 0.906, respectively. The intraclass correlation coefficients for maximal aneurysm diameter, total aneurysm volume, ILT maximal diameter, and growth rate ranged from 0.963 to 0.982 for intra-observer agreement and 0.954 to 0.977 for inter-observer agreement.

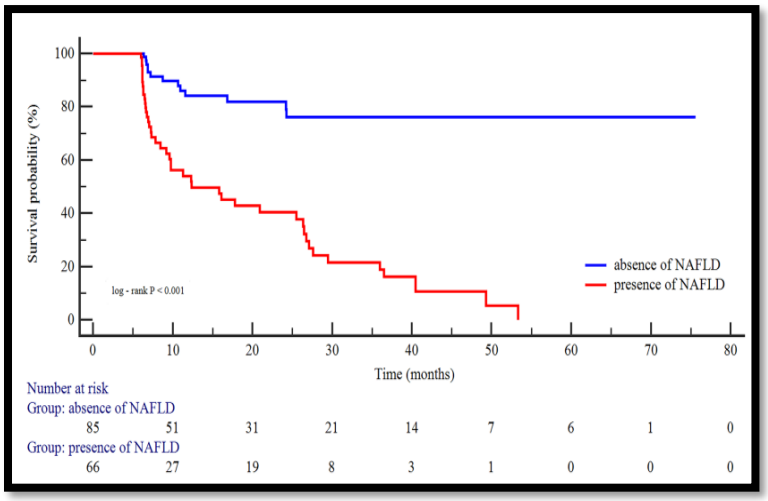

Figure 1. Kaplan-Meier event-free survival curves for AAA progression events in patients.

DISCUSSION- The current study demonstrated that NAFLD is an independent predictor of AAA progression. Additionally, the combined model incorporating AAA maximal diameter and NAFLD provided superior predictive accuracy for AAA progression, as evidenced by an AUC of 0.857.[2] These findings align with previous studies, which also reported a significant association between NAFLD and cardiovascular conditions. For instance, Mahamid et al. observed that patients with AAA had a higher prevalence of NAFLD compared to healthy controls.[3]

CONCLUSION- There was an association between the occurrence and development of AAA and NAFLD. This study found that the maximum diameter of AAA and NAFLD were separate predictors of AAA development. Therefore, NAFLD based on CT could be a non-invasive, dependable, and simple marker to predict the course of AAA.

NAFLD upon non-enhanced CT is an independent predictor of abdominal aortic aneurysms progression.

REFERENCES

1. Pouwels S et al. Non-alcoholic fatty liver disease (NAFLD): a review of pathophysiology, clinical management and effects of weight loss. BMC Endocr Disord. 2022 Mar 14;22(1):63.
2. Wang X et al. Association between non-alcoholic fatty liver disease and progression of abdominal aortic aneurysm: a multicenter study. BMC Med Imaging. 2025 Jan 20;25(1):24.
3. Mahamid M et al. The interplay between abdominal aortic aneurysm, metabolic syndrome and fatty liver disease: a retrospective case-control study. Diabetes Metab Syndr Obes. 2019;12:1743–9.

Association between Triglyceride-Glucose Index and Contrast-Induced Nephropathy in Patients Undergoing Percutaneous Coronary Intervention for Chronic Total Occlusion

INTRODUCTION- The occurrence of coronary artery disease is rising with increasing life expectancy and the elderly population, leading to necessity of percutaneous coronary intervention (PCI) and coronary angiography (CAG) for chronic total occlusion (CTO).[1] A significant complication of PCI is contrast-induced nephropathy (CIN). Recently, researchers have been examining whether certain metabolic indicators may improve CIN risk categorization. The triglyceride-glucose (TyG) index has been considered a measure of insulin resistance and metabolic state. [2] Although its predictive value for CIN in selected populations has been demonstrated, limited evidence regarding its role in CTO patients undergoing PCI. So, this study assessed the association between the TyG index and the development of CIN and mortality in this population.

METHODS - This multicenter, retrospective, cross-sectional study included 218 patients who underwent procedural coronary angiography (CAG) and PCI for CTO lesions in at least one coronary artery. Patients were divided into two groups based on their TyG index: Group 1 (TyG index ≥8.65) and Group 2 (TyG index <8.65). This threshold was established based on previous studies assessing the relationship between TyG index and CIN. The inclusion criteria were adults aged 18–90 years with ejection fraction (EF) ≥40% and at least one CTO lesion requiring PCI. The primary outcomes were the development of CIN and all-cause mortality over a 96-month follow-up period. Logistic regression identified CIN predictors, including variables with $p \leq 0.1$ in univariate analysis. Kaplan-Meier analysis assessed the association of the TyG index with CIN and mortality. ROC curves determined the TyG index cutoff for CIN prediction. A p-value < 0.05 was considered statistically significant.

RESULTS – In this study, the mean age of Group 1 was significantly higher than Group 2 (65.8 ± 10.94 vs. 61.68 ± 11.4 years, $p = 0.009$). Diabetes mellitus (44.8% vs. 13.1%, $p < 0.001$) and dyslipidemia (38.8% vs. 25%, $p = 0.036$) were also more prevalent in Group 1. Other notable differences included higher rates of cerebrovascular disease (4.5% vs. 0%, $p = 0.049$) and in-stent restenosis (16.4% vs. 7.1%, $p = 0.046$) in Group 1. Biochemical analyses revealed that glucose ($p < 0.001$), triglycerides ($p < 0.001$), and uric acid levels ($p = 0.044$) were significantly elevated in Group 1. No significant differences were observed between the groups for ejection fraction (EF), hypertension, smoking status, chronic kidney disease, or peripheral artery disease. Univariate logistic regression analysis identified several predictors of CIN, including age, chronic kidney disease (CKD), peripheral artery disease, left ventricular ejection fraction (LVEF), LDL cholesterol, and the TyG index ($p < 0.05$ for all). The ROC analysis identified a TyG index cutoff of 8.86 for predicting CIN, with a sensitivity of 59% and specificity of 54% (AUC = 0.60, 95% CI: 0.51–0.68, $p = 0.044$) (Figure 1). Kaplan-Meier survival analysis demonstrated a significant association between CIN and mortality (Log-rank = 19.409, $p < 0.001$), while no significant relationship was observed between the TyG index and mortality (Log-rank = 0.808, $p = 0.369$).

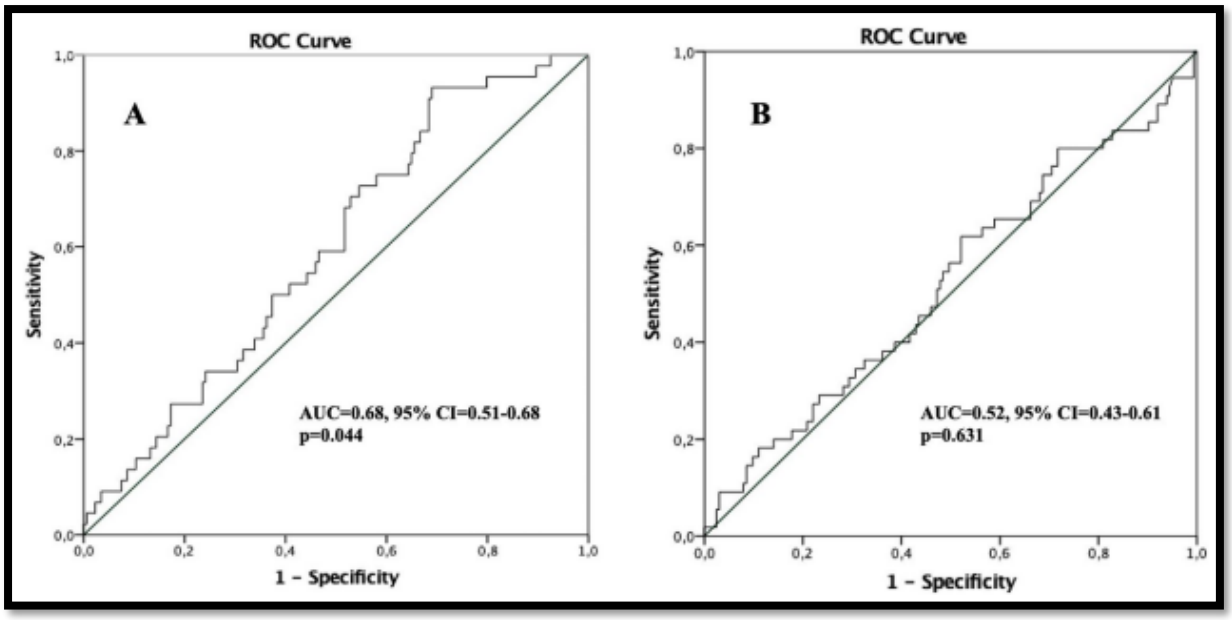

Figure 1. ROC curve analysis of TyG index to predict the development of CIN (A) and death (B)

DISCUSSION-This study demonstrated that a higher TyG index is an independent predictor of CIN in CTO patients undergoing PCI, aligning with prior studies that reported similar findings in different patient groups.[1] Qin Y et al. observed a significant association between the TyG index and CIN in patients with type 2 diabetes and coronary artery disease[3], while Gursoy E et al. noted this relationship in non-ST elevation myocardial infarction patients undergoing PCI.[4]

CONCLUSION- This study concluded that the frequency of CIN in patients with CTO having PCI is correlated with the TyG index. The TyG index is a useful tool for risk stratification in clinical settings due to its affordability and simplicity of use. Patients with CTO having PCI may be protected against the development of CIN by including the TyG index in their clinical evaluation.

The development of CIN may be prevented by including the TyG index in the standard clinical evaluation of CTO patients receiving PCI.

REFERENCES

1. Söner S et al. Association between the triglyceride-glucose index and contrast-induced nephropathy in chronic total occlusion patients undergoing percutaneous coronary intervention. BMC Cardiovasc Disord. 2025 Jan 20;25(1):31.
2. Chang WT et al. Diagnostic efficacy of the triglyceride-glucose index in the prediction of contrast-induced nephropathy following percutaneous coronary intervention. Front Endocrinol (Lausanne). 2023 Nov 22;14:1282675.
3. Qin Y et al. A High Triglyceride Glucose Index Is Associated With Contrast-Induced Acute Kidney Injury in Chinese Patients With Type 2 Diabetes Mellitus. Front Endocrinol (Lausanne). 2021;22(11):522883.
4. Gursoy E, Baydar O. The triglyceride-glucose index and contrast-induced nephropathy in non-ST elevation myocardial infarction patients undergoing percutaneous coronary intervention. Medicine (Baltimore). 2023;102(2):e32629.

Case Report on Sub-Coronary ROSS Operation in a Young Man with Quadricuspid Aortic Valve and Anomalous Aortic Origin of the Left Coronary Artery

INTRODUCTION- Quadricuspid aortic valve (QAV) is a congenital heart defect in which the aortic valve contains four cusps of varying sizes, as opposed to the three symmetrical cusps that are often seen. This heart valve anomaly is uncommon, with an estimated incidence rate ranging from 0.013% to 0.043%, despite recent technical advances in diagnostics contributing to increased diagnosis.[1] It is frequently asymptomatic but can lead to aortic stenosis or regurgitation over time. Additionally, the anomalous aortic origin of a coronary artery (AAOCA) is a significant congenital coronary anomaly. In that, the particularly rare subtype is the anomalous origin of the left coronary artery from the right coronary sinus (L-AAOCA), which has a higher risk of myocardial ischemia and sudden cardiac death (SCD). The co-occurrence of QAV with L-AAOCA is exceptionally rare, necessitating careful diagnostic evaluation and timely surgical intervention. This case report describes the successful surgical management of a young patient presenting with both QAV and L-AAOCA.[2]

CASE PRESENTATION- A 22-year-old male patient was referred to the hospital following the detection of a cardiac murmur during a routine physical examination. Despite the absence of symptoms, preoperative transesophageal echocardiography and three-dimensional computed tomography (3D-CT) confirmed the presence of QAV and an anomalous aortic origin of the left coronary artery from the right coronary sinus with an intramural course. Further imaging revealed severe aortic stenosis and regurgitation, with an aortic annular diameter of 22 mm (Figure 1). Given the high risk associated with L-AAOCA and the severity of the aortic valve dysfunction, the patient underwent a sub-coronary ROSS procedure combined with an unroofing procedure. Intraoperative findings confirmed the presence of QAV and a double coronary artery ostium in the right sinus of Valsalva. The aortic valve was excised, and the anomalous left coronary artery was unroofed. The aortic annulus was expanded using a pericardial patch, and the patient's autologous pulmonary valve was implanted at the aortic position. Postoperative echocardiography demonstrated smooth left ventricular outflow tract (LVOT) function with no aortic regurgitation. Follow-up 3D-CT showed normal coronary artery anatomy and flow.

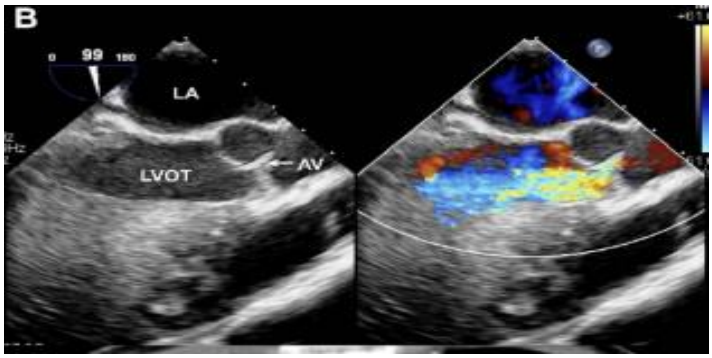

Figure 1. Aortic annular diameter was measured to be approximately 22mm

DISCUSSION- The current case report successfully treated a young patient with QAV and L-AAOCA using the sub-coronary ROSS and unroofing procedures, preventing SCD and ischemia. Postoperative recovery was excellent, with no regurgitation or coronary obstruction.[2] This case findings align with previous studies highlighting the increased risk associated with L-AAOCA. Gaudino M et al. emphasized that L-AAOCA, particularly with an interarterial and intramural course, carries a higher risk of ischemia and SCD compared to R-AAOCA, making surgical intervention essential.[3]

CONCLUSION- This case highlights the importance of early detection and comprehensive imaging in congenital cardiac anomalies. The timely surgical intervention through a sub-coronary ROSS procedure and unroofing technique resulted in excellent clinical outcomes.

Early detection of a cardiac defect resulted in successful surgical treatment, avoiding the risk of cardiac ischemia or sudden cardiac death.

REFERENCES

1. Saith S, Saith S, Murthy A. Quadricuspid Aortic Valve: An Introduction for Clinicians. Cardiol Res. 2022 Feb;13(1):2-10.
2. Xu L, Su Y, Leng Z. Sub-coronary ROSS operation in a young man with quadricuspid aortic valve and anomalous aortic origin of the left coronary artery: A case report. Medicine (Baltimore). 2025 Jan 17;104(3):e41302.
3. Gaudino M et al. Management of adults with anomalous aortic origin of the coronary arteries: state-of-the-art review. J Am Coll Cardiol. 2023;82:2034–53.