

Original article

Observational study of anomalous coronary artery disease and interventions, in a real-life large group of contemporary patients undergoing cardiac proceduresAthauda arachchi P^{1,2},  De Silva S²¹ General Sir John Defence University, Colombo, Sri Lanka² Durdans Hospital, Colombo, Sri Lanka

Article Information

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Abstract

Coronary heart disease involving anomalous coronary arteries can have implications on the prognosis, revascularization methods pose technical challenges in achieving successful outcomes.

The accurate estimates on the prevalence of anomalous coronaries in a contemporary large series of patients are not available in Sri Lanka. The types of such anomalies and the outcomes of interventional procedures in them is hitherto not known.

A retrospective study of 5093 consecutive cardiac cathlab procedures over 8 years was conducted, which showed a prevalence of anomalous coronaries in 1.51% of the records (involving 45 males and 15 females with a mean age of 59 years). Of this group, 22 percutaneous coronary interventions involving anomalous coronary arteries were identified. Multiple coronary anomalies were also seen in 2 patients. All of the 22 cases (100%) requiring intervention, were completed successfully by PCI without any in hospital major adverse cardiac/cerebral events (MACCE) or serious complications, despite the procedures requiring additional hardware or maneuvers for successful completion of PCI of the anomalous coronary arteries.

Introduction

Coronary artery anomalies are stated to be present in approximately 0.3-1.3% of the general population, and their impact on ischemic heart disease (IHD), decisions on revascularization, and subsequent morbidity and mortality has become a significant area of focus in contemporary research.¹ Among these anomalies, certain origins and courses of coronary arteries, such as the anomalous origin of the left coronary artery from the right sinus of Valsalva or the right coronary artery from the left sinus, have been associated with an elevated risk of ischemia, myocardial infarction, and sudden cardiac death.^{2,3} The prevalence and incidence of IHD in patients with anomalous coronary arteries are not entirely understood, with variations across different demographics, and these cases frequently present unique clinical and procedural challenges.⁴ Whilst coronary disease is highly prevalent and challenging to treat in Sri Lanka,⁵ no local data exists on the impact of coronary anomalies on coronary intervention.

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Understanding the clinical impact of anomalous coronaries is essential for effective management and intervention strategies. The literature reveals that these anomalies complicate diagnostic and therapeutic procedures due to atypical coronary courses, which can hinder access during percutaneous interventions (PCI).⁶ Difficulties are particularly pronounced during catheter engagement in PCI, where accessing anomalous coronary arteries requires specialized techniques and an in-depth understanding of each unique anatomical variation. Some studies have highlighted that performing PCI on anomalous coronaries can result in increased procedural time, radiation exposure, and a higher rate of complications, emphasizing the need for thorough pre-procedural planning and expertise.⁷

In this study, we aim to provide findings from a large real-life population of patients, the prevalence of anomalous coronary arteries, examine the real-life procedural difficulties faced during contemporary PCI, and discuss additional advancements in imaging and interventional techniques that may facilitate safer and more effective management of these challenging cases.

Methods

This was a retrospective review of records. Population included all patients undergoing coronary angiography or coronary interventions over a period of 8 years (2016-2024) in a tertiary level cardiac centre. Their cine-angiograms and records were all reviewed by an experienced interventional cardiologist and patient outcomes were monitored. Anonymised data analysis was performed using Excel and Statistical Package for the Social Sciences (SPSS).

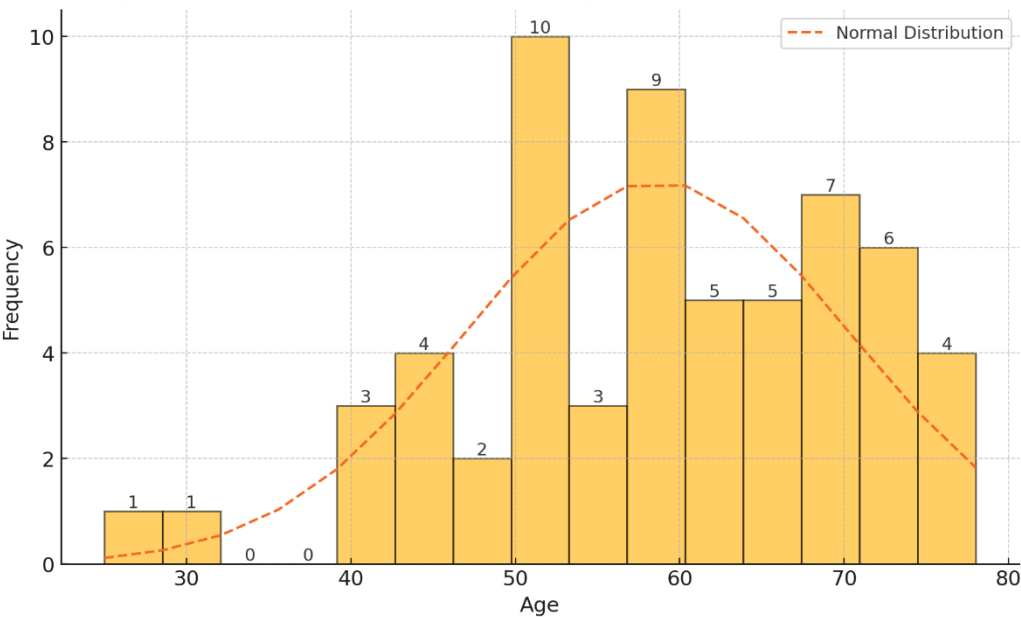
Results

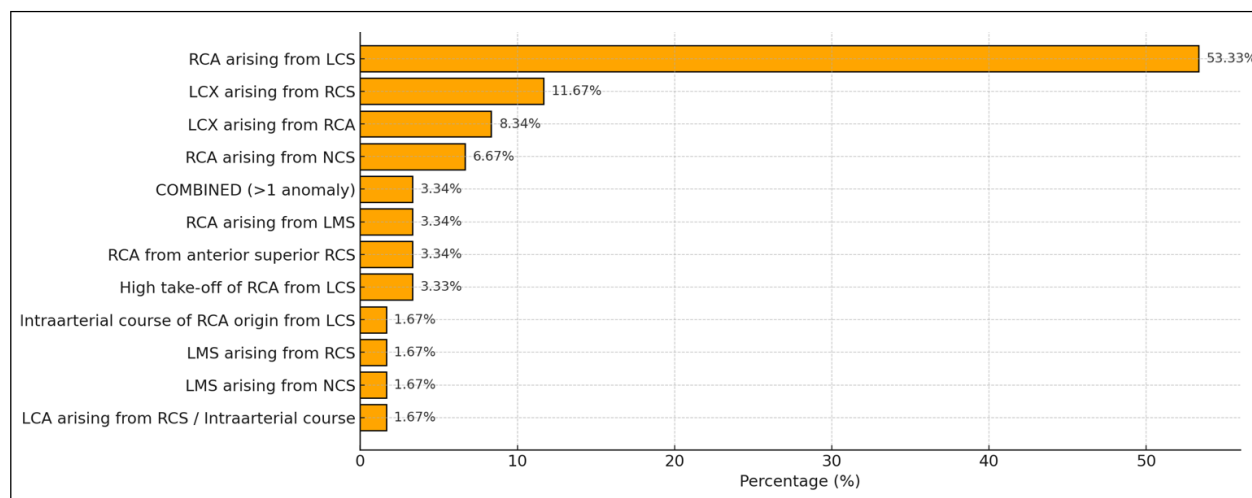
A total of 5093 coronary angiograms and percutaneous coronary interventions were studied. Of these, 57 coronary angiograms and 22 PCI procedures, amounting to 1.51% of procedures in 60 patients demonstrated the presence of anomalous coronaries. The age and sex distributions and the commonest anomalies detected are listed in Table 1, Graph 1 and 2.

Table 1. Demographic data

	Gender	Count	Percentage %	Median age	Mode age
1	Male	45	75.00	58.0	50
2	Female	15	25.00	62.0	

Graph 1: Age distribution of patients with superimposed normal distribution curve



Graph 2: Final classification of coronary anomalies and their frequencies

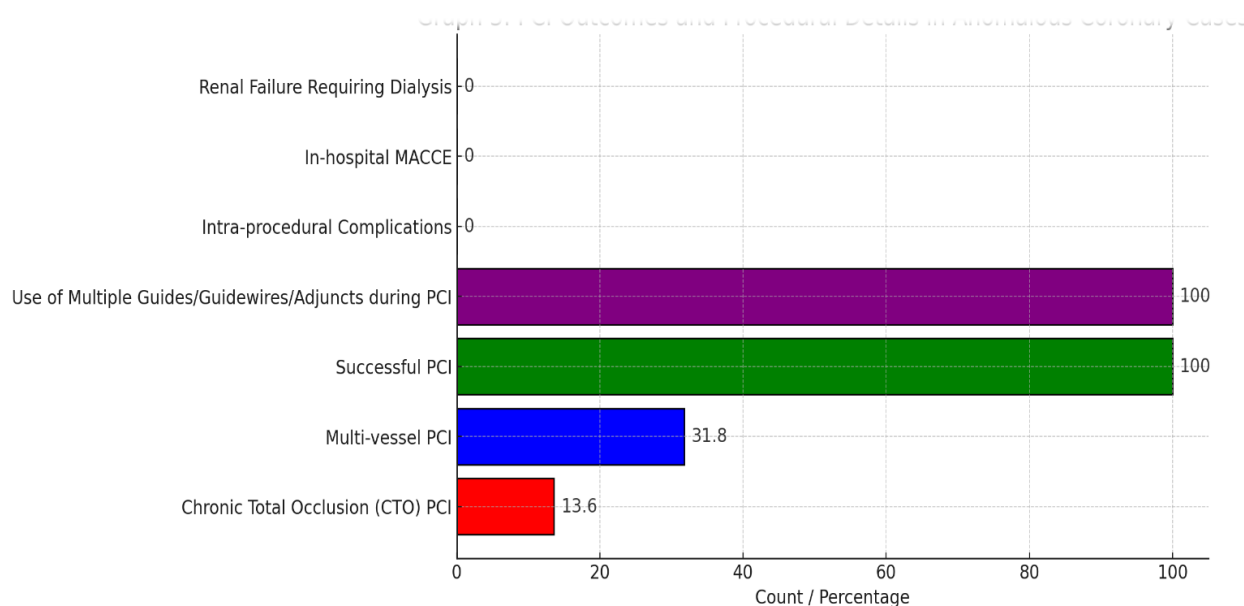
Coronary anomalies types and frequencies in all patients with anomalies. RCA= right coronary artery. Lcx=Left circumflex artery. LMS= left main stem. LCS/RCS/NCS = Left, Right, Non coronary sinuses respectively.

A total of 22 PCIs on anomalous coronaries was undertaken, in this group of patients. Of these, 7 (31.8%) cases were multi-vessel PCI including the anomalous vessel and 3(13.6%) cases included a 100% chronic total occlusion (CTO) of the anomalous vessel. Use of multiple guides /guidewires was noted in all 22 cases. The immediate success rate was 22/22 (100%) with no intra procedural complications, in-hospital major adverse cardiac or cerebral events (MACCE) or renal failure requiring dialysis. These features are depicted in Graph 3.

In reviewing of the medical records during PCI of

anomalous coronary artery interventions in these patients, in almost all cases, it was noted that reference to one or more difficulties in guide catheter selection and optimization of back-up, caution at atraumatic positioning at ostium, difficulty in delivery of long stents, manoeuvres to avoid protrusion at ostia, considerations for future PCI of other arteries.

An illustrative example of such a case is shown in Figure 1, where severe left main coronary disease and anomalous right coronary ostial disease had to be treated by PCI in a single setting.

Graph 3: PCI outcomes and procedural details in anomalous coronary cases

Characteristics of PCI in anomalous coronaries: % of each parameter is illustrated.

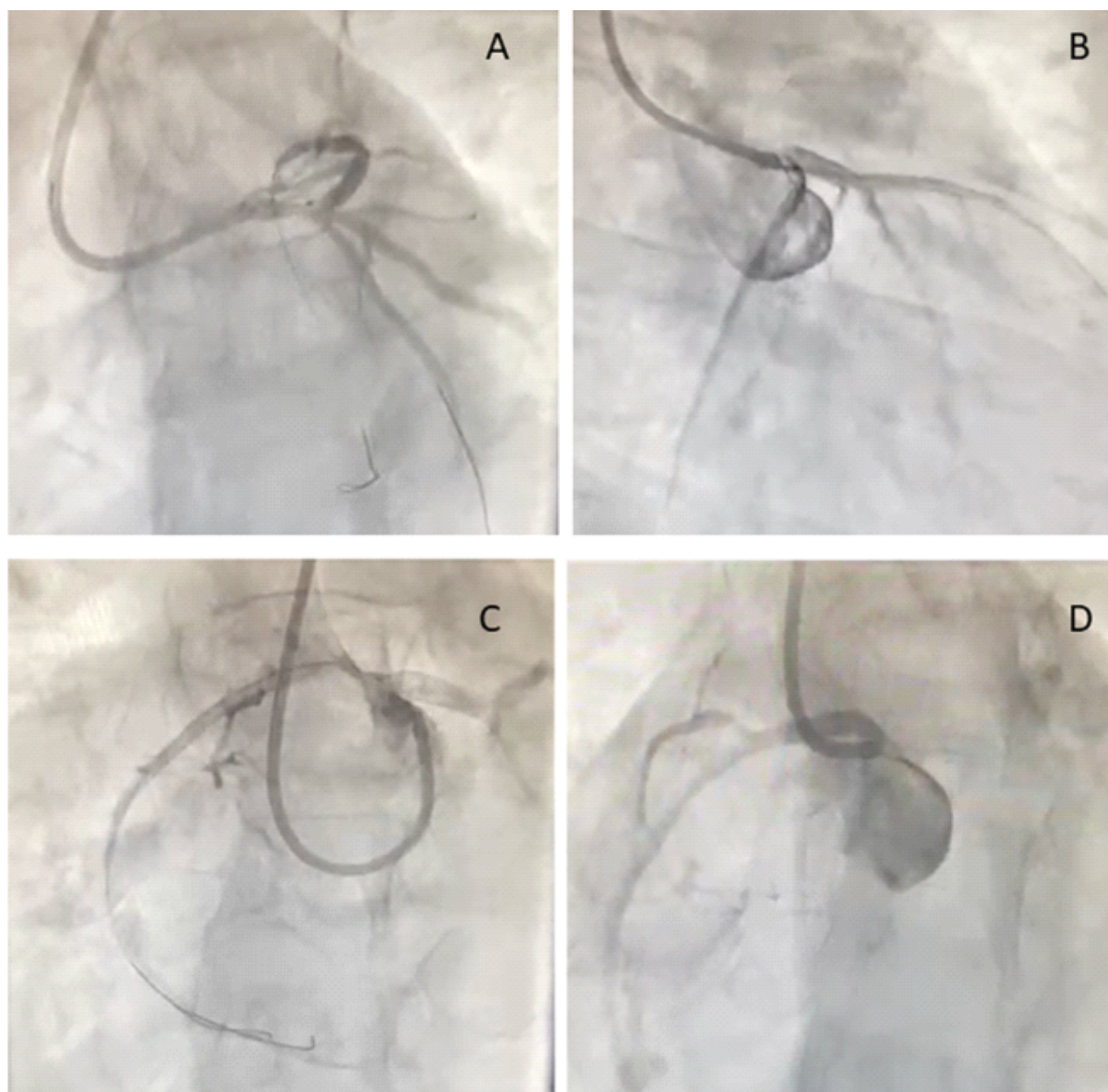


Figure 1. Disease of Left main and anomalous RCA ostium from left coronary sinus, in very close proximity to one another : A – successful Left main PCI, B – wiring of anomalous RCA for guide stability, C – ostial RCA disease, in relationship to stented LMS. D – successful PCI of ostium of anomalous RCA.

Conclusion

The prevalence of anomalous coronary arteries seen in this series of 5093 procedures in a tertiary level Sri Lankan facility is higher (1.51%) than reported values globally.

Anomalous coronary artery interventions present unique challenges compared to standard procedures due to atypical anatomical features. These challenges can affect procedural success and patient outcomes.

Anomalous origins may complicate catheter engagement and stability, necessitating specialized catheters or techniques such as use of buddy wires, anchoring balloons or guide liner techniques, to ensure adequate support

during interventions. The unusual course of anomalous arteries can make stent delivery more complex, increasing the risk of complications such as stent malposition, stent deformation or incomplete lesion coverage.

However, from the data in this real-world series, no in-hospital or short term MACCE was recorded, despite performance of interventions in anomalous coronaries.

Discussion

Outcomes compared to standard procedures:

While interventions on anomalous coronary arteries can be technically demanding, with appropriate planning and

expertise, success rates can be comparable to standard procedures.⁸

There may be a higher incidence of certain complications, such as coronary dissection or perforation, due to the complex anatomy. However, with meticulous technique and the use of advanced imaging modalities, these risks can be mitigated.⁹

Long-term outcomes, including survival rates and freedom from major adverse cardiac events, are generally favorable when interventions are performed by experienced operators in specialized centers in contemporary practice.¹⁰ The impact of optimal novel antiplatelet/anticoagulant therapies used in these cases requires further analysis as there may be theoretical concerns on the different flow characteristics of these anomalous coronaries with interventions.

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