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Use of CT Angiogram in Interventions Involving Coronary Artery Anomalies: A Case Series

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Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Conflict of interest: None declared

Case series
Patient: —
Final Diagnosis: Coronary anamolies
Symptoms: Chest pain
Medication: None
Clinical Procedure: PTCA with stent/CABG
Specialty: Cardiology

Objective: Challenging differential diagnosis

Background: Coronary artery anomalies are rare, accounting for about 0.3–1.3% of patients undergoing diagnostic coronary angiography. Interventions in these cases are still rare, and therefore pose technical challenges during intervention. CT Angiography provides a non-invasive means of assessment of coronary artery disease and also shows the anatomy of the coronary tree. This helps in knowing the origin of the coronaries and also to plan selection of hardware. There are no specific guidelines for use of guiding catheters and guide wires in anomalous coronary artery intervention.

Case Report: We report a series of 5 patients presenting with effort angina who had anomalous coronary arteries with coronary stenosis diagnosed by CT angiography. Three patients received percutaneous intervention, 1 patient underwent CABG, and 1 patient received medical management.

Conclusions: CT Angiography provides a useful tool for showing the coronary anatomy and for selecting the guiding catheter and the guide wire that remain the mainstay of interventions in coronary artery anomalies.

MeSH Keywords: Angioplasty, Balloon, Coronary • Coronary Angiography • Percutaneous Coronary Intervention

Full-text PDF: http://www.amjcaserep.com/abstract/index/idArt/894107

Background

Coronary artery anomalies are rare, accounting for about 0.3–1.3% of patients undergoing diagnostic coronary angiography. Most coronary artery anomalies are clinically silent and do not affect quality of life. However, specific forms of anomaly may be associated with symptoms such as myocardial ischemia, congestive heart failure, and sudden death. The exact incidences of these events are not known. CT angiography provides a non-invasive means of assessment of coronary artery disease and also shows the anatomy of the coronary tree. Multislice computed tomography (MSCT), in the presence of an expert interpreter, may achieve a high level of reliability and accuracy in the visualization of the coronary tree.

This modality obviates much of the risk and discomfort associated with catheterization, although it retains the risks inherent in radiation exposure and use of contrast agents.

Case Report

We report a case series of 5 patients aged 40–60 years, of which 2 were women. All the patients presented with effort angina and were treadmill-test positive for inducible ischemia. The demographic characteristics of the patients are shown in Table 1.

These patients opted for a form of non-invasive coronary angiography – CT coronary angiography (CT-CAG). Incidentally, these patients were found to have anomalous origin of coronary arteries along with coronary stenosis on CT-CAG.

Of the 5 patients, 3 patients had anomalous left circumflex originating from right coronary artery and 2 patients had anomalous right coronary artery originating from the left sinus. Of the 5 patients, 3 had coronary stenosis in an anomalous artery, 1 had stenosis in a non-anomalous artery, and 1 patient had stenosis in both anomalous and non-anomalous arteries. These patients were later subjected to an invasive procedure – percutaneous coronary intervention (PCI).

Appropriate guiding catheters and guide wires were selected as the coronary anatomy was already known by CT coronary angiography. Three patients successfully underwent coronary angioplasty with stenting. The details of the angioplasty (i.e., type of catheter used, guide wire selection, location of lesion, stent type and size) are provided in Table 2.

Non-ionic contrast agent (Iohexol – trade name: Omnipaque) was used and the amount of contrast agent used ranged from 50 ml to 110 ml. The total fluoroscopic times ranged from 20 to 70 min. Procedures were uneventful. All 3 angioplasty patients were discharged with dual antiplatelets, statins, beta-blockers, and other medications.

One patient was underwent CABG and another patient had anomalous coronaries with no significant stenosis on coronary angiography.

Discussion

Coronary artery anomalies (CAAs) are a diverse group of congenital disorders whose manifestations and pathophysiological mechanisms are highly variable [1,2]. Coronary artery anomalies are rare, accounting for about 0.3–1.3% of patients undergoing diagnostic coronary angiography [3–6]. Most coronary artery anomalies are clinically silent and do not affect the quality of life. However, specific forms of anomaly (e.g., ostial atresia, coronary compression between great vessels, coronary fistula, anomalous left coronary artery arising from pulmonary artery [ALCAPA], and muscular bridge) may be associated with symptoms such as myocardial ischemia, congestive heart failure, and sudden death [7–10].

Conventional coronary angiography is currently the criterion standard for evaluation of known or suspected coronary artery disease; however, it is associated with use of contrast agent and ionizing radiation, and is an invasive procedure. In contrast, CT angiography is a non-invasive procedure but also uses contrast agents and radiation. Multislice computed tomography

Table 1. Demographic characteristics of patients.

Patient no.	Age	Sex	Presenting complaints	H/o DM/HTN	Prior IHD	Smoking
I	41	M	Effort angina, TMT positive	Type II DM & HTN	No	No
II	60	F	Effort angina, TMT positive	Type II DM & HTN	S/P PTCA done (LAD)	No
III	49	M	Effort angina, TMT positive	No	No	Yes
IV	55	F	Effort angina, TMT positive	No	No	No
V	40	M	Effort angina, TMT positive	No	No	Yes

H/o – History of; DM – diabetes mellitus; HTN – hypertension; IHD – Ischemic Heart Disease; TMT – tread mill test; M – males; F – Female; PTCA – percutaneous transluminal coronary angioplasty; LAD – left anterior descending artery.

Table 2. Patient interventional profiles.

Patient no.	CT Angiogram (anomaly seen)	Coronary lesion	Revascularization (angioplasty or CABG)	Guiding catheter	Guide wire	Contrast amount used	Fluoroscopy timings	Result	Figures
I	RCA from left sinus	ProximalRCA	2.5×15 mm Xience V	AL 1	0.014" Galeo	85 ml	40 min	TIMI 3	1, 2
II	LCX from right sinus	Mid RCA	2.5×15 mm Xience V	JR 3.5	0.014" Floppy II	50 ml	20 min	TIMI 3	3
III	LCX from right sinus	Ostioproximal OM1 & distal LCX	OM – 2.5×24 mm Endeavor Resolute, LCX – 2.5×15 mm Xience V	JR 3.5	0.014" Floppy II	110 ml	70 min	TIMI 3	4
IV	RCA from left sinus	Insignificant stenosis	Medical management						–
V	LCX from right sinus	Ostial LCX & Ostial RCA	CABG						5

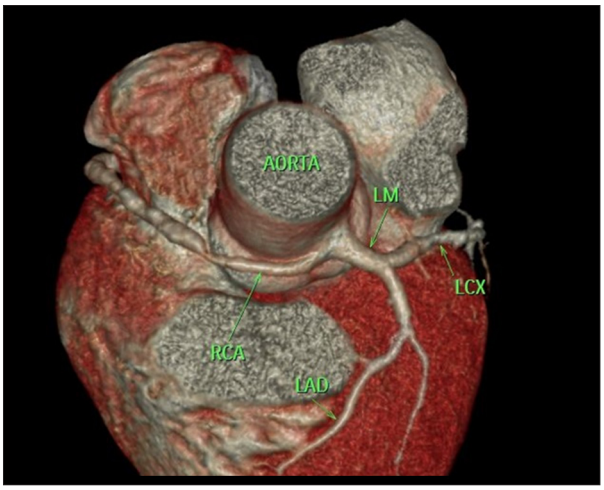

Figure 1. CT Angiogram showing anomalous RCA originating from left sinus with stenosis in proximal RCA.

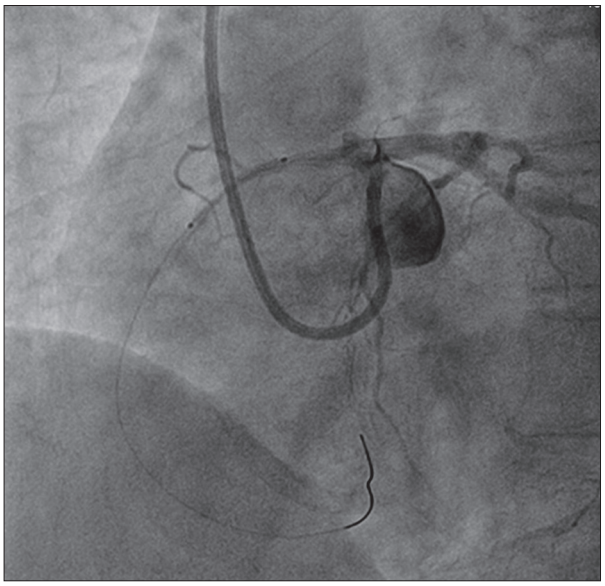

Figure 2. Coronary angiogram showing anomalous RCA originating from left sinus with stenosis in proximal RCA, stent deployment in proximal RCA using AL1 catheter.

(MSCT) achieves a high level of reliability and accuracy in the visualization of the coronary tree [11,12] but requires expertise in interpretation of the images [13].

In patients with anomalous coronary arteries, invasive coronary angiography is associated with difficult cannulation/non-selective angiogram/aortic root angiogram; therefore, it uses more contrast agent, requires multiple pieces of hardware, and gives increased radiation doses to the patient and the staff performing the procedure. CT angiography overcomes this and provides information on anomalous coronaries and lesions using the same amount of contrast and radiation as that for the normal coronaries.

Isolated cases of PCI for acute MI involving the anomalous arteries have been reported previously (PCI in single coronary artery [14], PCI in anomalous RCA originating from left coronary sinus [15]). In prior case reports, selection of the guiding catheters was based on experience and trial-error method. Few authors have suggested specific catheters based on the site of origin of the anomalous vessels or its ostial anatomy [16–18]. The use of Hockey Stick or Multipurpose catheter may be considered when the usual techniques fail to visualize an anomalous RCA.

Isolated case reports of CT-CAG guided anomalous coronary artery interventions have also been described in the literature

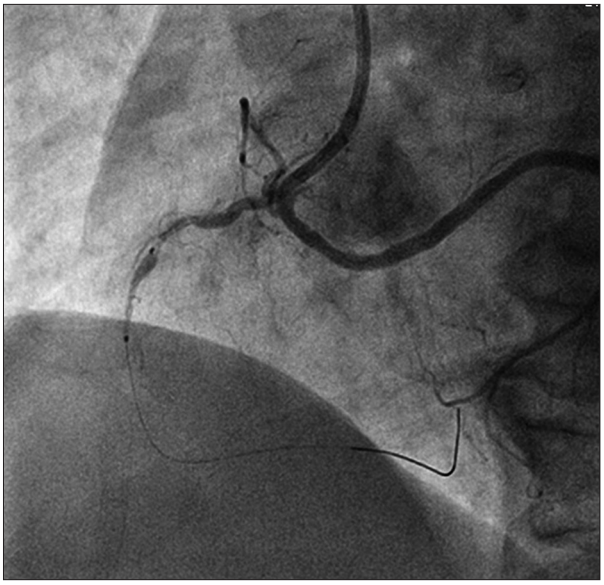

Figure 3. Coronary angiogram showing anomalous LCX originating from right sinus with stenosis in mid-RCA, stent deployment in mid-RCA.

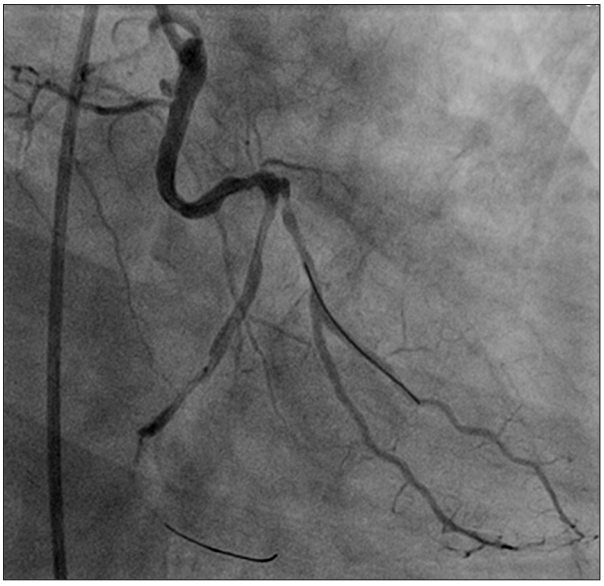

Figure 4. Coronary angiogram showing anomalous LCX originating from right sinus with stenosis in distal LCX and ostioproximal major OM, stenting to distal LCX with PTCA wire in major OM.

(CT-CAG guidance for intervention of an anomalous origin of RCA from the left sinus [19–21]).

We report a case series of 5 patients with anomalous coronary arteries detected by CT angiography, who presented with effort angina and were treadmill-test positive for inducible ischemia. However, in 1 patient in whom CT angiography showed

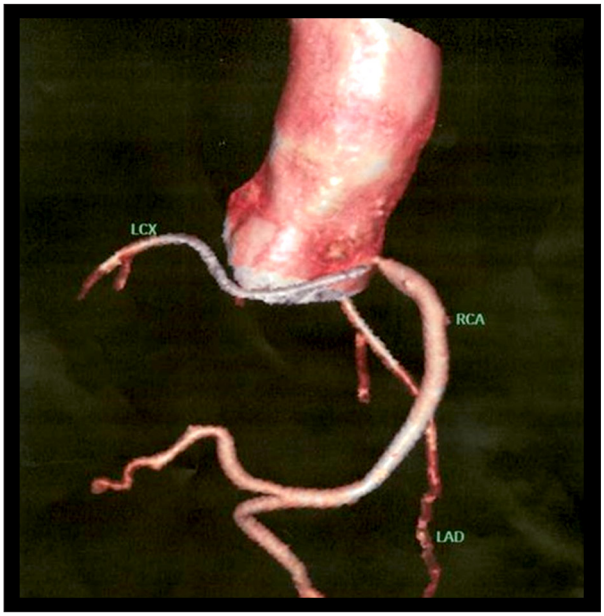

Figure 5. CT Angiogram showing anomalous LCX originating from right sinus with critical ostial stenosis of RCA and LCX.

anomalous coronaries with stenosis, conventional angiography showed anomalous coronaries with no significant stenosis and was advised to receive medical management. Based on the CT angiography report, we could select appropriate guiding catheters and guide wires in 3 patients. Knowing the origin of the anomalous artery for intervention, we could reduce the amount of contrast used and lower the radiation dose.

The limitations of CT-CAG are that it cannot be done in STEMI patients where primary PCI is being performed, and it requires an expert interpreter.

Conclusions

Anomalous coronary arteries pose technical difficulties, not only during diagnostic imaging, but also during interventions. CT coronary angiography, if available, can be performed in stable angina patients if an experienced interpreter is available. CT angiography not only helps to delineate the anatomy of the coronary vessels and the lesions, but also guides selection of the hardware for a successful intervention. However, challenge remains in acute myocardial infarction patients with anomalous coronary arteries who are taken for primary percutaneous coronary interventions.

Conflict of interest

None.

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