Case Report

Successful surgical management of atherosclerotic dual right coronary artery with short-term follow-up

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A B S T R A C T

Congenital anomalies of the coronary arteries are present in 0.2–1.4% of the general population. Dual right coronary artery is one of the rarest congenital anomalies (0.01%) of the coronary arteries. We report a patient with unstable angina with severe triple vessel disease who had diseased dual right coronary artery. He was successfully managed with surgical revascularization and followed up with computed tomography angiography. Surgical revascularization of both the coronary arteries of right side is hardly reported in literature.

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1. Introduction

Coronary artery anomalies are usually found incidentally during angiography or autopsy. Congenital anomalies of the coronary arteries are present in 0.2–1.4% of the general population.1 Dual right coronary artery is one of the rarest congenital coronary anomalies. Haririshnan et al. performed 7400 conventional coronary angiographies and reported 34 patients (0.46%) with congenital coronary anomalies with only one double right coronary artery (0.01%).2 They are usually benign lesions but sometimes may present clinically as acute coronary syndrome. Although many of the primary congenital coronary anomalies are hemodynamically insignificant, it is important to know the anatomic variants in patients with coronary artery disease who are undergoing either surgical myocardial revascularization or coronary angioplasty.3 We report a patient with severe triple vessel coronary artery disease with unstable angina who had dual right coronary artery. He was successfully managed with surgical revascularization and followed up with computed tomography (CT) angiography.

1.1. Case report

A 60-year-old male patient with a background of Type 2 Diabetes mellitus and Hypertension presented with angina of three months duration. Examination of cardiovascular system
was unremarkable. The blood pressure and pulse rate were 146/88 mm Hg and 88 beats per minute respectively. Electrocardiogram was essentially normal. Trans-thoracic echocardiography was done which showed no regional wall motion abnormality. Cardiac enzymes were within normal range. He underwent selective right and left coronary angiography which revealed severe triple vessel disease and two coronary arteries on the right side. The origin and course of both these right-sided arteries were similar after arising from a common ostium (Fig. 1a). The anterior and posterior right coronary artery were seen in right atrioventricular groove and terminated as individual posterior descending arteries (Fig. 1b). Both segments had significant atherosclerotic stenotic lesion in the proximal part (Fig. 1a). The left main artery was normal and divided into left circumflex and left anterior descending coronary artery. There were severe diseases in proximal left anterior descending artery (LAD) and proximal circumflex artery before giving origin to major obtuse marginal artery.

Multivessel coronary artery bypass grafting (CABG X 4) was performed using off pump technique. Left internal thoracic artery was anastomosed to mid LAD, while reverse saphenous venous graft was used to perform other grafts. Proximal anastomosis of vein graft was done on ascending aorta using partial aortic clamp. Proximal anastomoses were completed in a single clamp, one for the obtuse marginal and other for the right coronary arteries (Fig. 2b). Distal end of one vein was

Fig. 1 – (a and b) The right coronary artery angiogram showing two right coronary artery arises from a single ostium. Both branches are of similar caliber, typical course, and both gave individual PDA supplying inferior myocardium. Both segments are involved in atherosclerotic disease.

Fig. 2 – (a and b) Post-operative CT angiogram showing common origin of dual RCA, course of dual RCA in right AV groove, and two large PDA. It also demonstrates patent graft supplying both PDA sequentially.
grafted to obtuse marginal with 7-0 polypropylene after stabilization of heart using octopus evolution (Med Inc, NYC). The other saphenous vein was used to graft both the right coronary arteries sequentially (Fig. 2b). The patient had uneventful hospital course and echocardiography at the time of discharge showed no regional wall motion abnormality. A follow-up CT angiography after 2 years confirmed patent grafts to all the target vessels (Fig. 2a).

2. Discussion

Double right coronary artery is one of the rarest congenital anomalies. Usually patients are unaware of this condition as mostly are asymptomatic. Total number of reported double coronary artery is very low. However, incidence of coronary artery disease involving the dual right coronary artery is reported to be around 26.1% and it may present with acute coronary syndrome or acute myocardial infarction.

Till now, 46 cases of double right coronary artery have been reported in literature. Out of these, 28 cases had a common origin and remaining 18 had separate origin. Chest pain was presenting symptom in 69.6% of these 46 patients (32/46) while 26.1% of them (12/46) had imaging studies proven stenotic lesion. A total of 11 of these 28 (39.3%) patients with single origin had stenotic lesion whereas only 1 out of 18 (5.6%) patients had disease with separate origin. It is reported that single ostium origin had much higher incidence of stenosis as compared to separate origins. This fact can be attributed to higher incidence of stenosis at bifurcations and curves as compared to straight segments.

There are no standard and authoritative definitions of double right coronary artery. It has been described as a right coronary system formed of two distinct branches and the two double right coronary arteries have similar diameters. Sato et al. have proposed that double right coronary arteries are defined when they supply blood to the inferior left myocardium; thus, both arteries should course downwardly to reach the interventricular sulcus whether or not they cross the crux.

It is predominantly seen in males and might originate from either single or separate ostium. Incidence of right and left system involvement as well as complications in the form of acute MI is also much higher in the single right ostium group.

This anomaly offers a diagnostic challenge to the clinicians. It is almost always accidentally detected during conventional angiography. Right anterior oblique view during angiography provides the best chance to differentiate this anomaly from a high take off right ventricular branch. Multidetector CT is cost-effective, noninvasive, fast imaging tool which is more accurate in defining origin and course of anomalous coronary artery.

During conventional angiography, the single ostium giving rise to two right coronary arteries can be misinterpreted as dissection and may risk inappropriate decisions. Further, it is challenging to catheterize correct artery without blocking flow to the other artery in case of intervention. In our case, dual right coronary was arising from a single ostium in a male patient. It was detected accidentally on conventional angiography for unstable angina. After arising from a common ostium, the right coronary artery divided into two similar caliber branches that coursed along right atrioventricular groove and supplied inferior myocardium. Both the arteries were critically stenosed. Surgical revascularization was done to each branch of the dual right coronary artery along with the left sided arteries. It was planned to graft both the right-sided coronary arteries as their caliber was similar with similar myocardial value. Sequential anastomosis was preferred because of the close lie of both the arteries and better patency in follow-up. A two-year post-operative follow-up with CT angiogram showed good result with patent grafts (Fig. 2a and b).

3. Conclusion

Dual right coronary artery is a rare congenital anomaly and can present as an acute coronary syndrome due to atherosclerotic lesion. It is important to obtain information on the anatomic variants of this congenital anomaly in patients undergoing cardiac surgical intervention for successful outcome. Surgical revascularization of this anomaly with follow-up is hardly reported in English literature.

Conflicts of interest

The authors have none to declare.

REFERENCES

1. Jacobs ML, Mavroudis C. Anomalies of the coronary arteries: nomenclature and classification. Cardiol Young. 2010;20:15–19.
2. Harikrishnan S, Jacob SP, Tharakan J, et al. Congenital coronary artery anomalies of origin and distribution in adults: a coronary arteriographic study. Indian Heart J. 2002;54:271–275.
3. Erbagci H, Davutoglu V, Turkmen S, Kizilkiran N, Gumusburun E. Double right coronary artery: review of literature. Int J Cardiovasc Imaging. 2006;22:9–11.
4. Chien TM, Chen CW, Chen HM, Lee CS, Lin CC, Chen YF. Double right coronary artery and its clinical implications. Cardiol Young. 2014;24:5–12.
5. Dai G, Kaazempur-Mofrad MR, Natarajan S, et al. Distinct endothelial phenotypes evoked by arterial waveforms derived from atherosclerosis-susceptible and -resistant regions of human vasculature. Proc Natl Acad Sci U S A. 2004;101:14871–14876.
6. Misuraca I, Balbarini A. Double right coronary artery or split right coronary artery: the same anomaly? J Cardiovasc Med (Hagerstown). 2010;11:398.
7. Sato Y, Kunimasa T, Matsumoto N, Saito S. Detection of double right coronary artery by multidetector row computed tomography: is angiography still gold standard? Int J Cardiol. 2008;126:134–135.
8. Altun A, Akdemir O, Erdogan O, Ozbay G. An interesting diagnostic dilemma: double right coronary artery or high takeoff of a large right ventricular branch. Int J Cardiol. 2002;82:99–102.
9. Misuraca I, Rutigliano D, Pestrechella V, Contegiacomo G, Balbarini A. A very rare congenital abnormality: double right
10. Okmen AS, Okmen E. Split right coronary artery: a report of two cases. Turk Kardiol Dern Ars. 2010;38: 38–40.

11. Garatti A, Castelvecchio S, Canziani A, et al. Long-term results of sequential vein coronary artery bypass grafting compared with totally arterial myocardial revascularization: a propensity score-matched follow-up study. Eur J Cardiothorac Surg. 2014;46:1006–1013.