

## Case Report

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# Closure of coronary arterial fistula by covered stent graft during multivessel percutaneous coronary intervention: a case report

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## ABSTRACT

Coronary arterial fistulae are usually incidental during coronary angiography. We report a case of triple vessel disease treated by multivessel percutaneous coronary intervention using drug-eluting stents (DES) and associated coronary arterial fistula to pulmonary artery with covered stent graft. In this case the coronary fistula from right coronary artery (RCA) was opened during dilatation of the obstructive coronary lesion. RCA had significant coronary lesions in the proximal and distal coronary, mid left anterior descending coronary artery and left circumflex artery, which are revascularized with DES. This patient had coronary arterial fistula arising from right coronary and left main coronary artery. Here, the patient was symptomatic because of the obstructive coronary artery disease.

**Keywords:** Coronary arterial fistula, Covered stent graft

## INTRODUCTION

Coronary arterial fistula is an association between one or more of the coronary arteries, cardiac chamber or multivessel, and infrequent abnormality. The Coronary arterial fistula has a congenital origin, but may infrequently be detected after heart surgery, such as coronary artery bypass grafting (CABG), valve replacement, and after repeated endomyocardial biopsies in heart transplantation.<sup>1</sup> Coronary fistulas are revealed incidentally in angiographic evaluation for Coronary artery disease (CAD). The incidence of coronary artery fistula in the overall population is estimated to be 0.002%. Such fistula is an incidental finding in 0.3% to 0.8% patients who undergo diagnostic coronary angiography.<sup>2</sup> The fistulas mostly emerge from the right coronary artery in about 52% of cases, the left anterior descending coronary artery being the next most commonly implicated in approximately 30% of cases and the circumflex coronary artery in about 18% of cases.<sup>1</sup> The associated problems that occur frequently are angina and myocardial ischaemia (the result of a “coronary

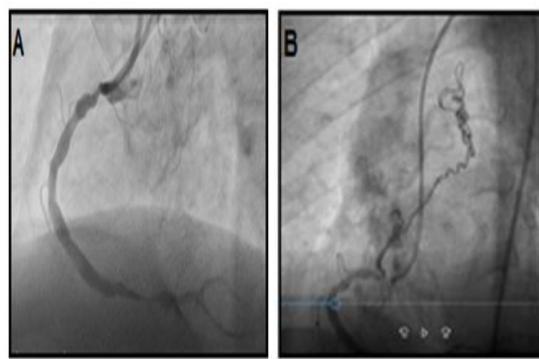
steal”), congestive heart failure (CHF), bacterial endocarditis, cardiac arrhythmia or rupture of an aneurysmal fistula. Present management options include surgical ligation and coil embolisation. Newly covered stents have been effectively employed for the closure of coronary fistulas.

## CASE REPORT

A 61-year-old male patient, with history of hypertension and diabetes, on regular treatment presented with syncope in association with angina. He was found conscious on arrival and findings on examination were PR of 66 bpm, blood pressure of 130/80 mm Hg. The heart sounds were normal without any added sounds or murmurs. ECG showed evolved inferior wall myocardial infarction and Chest X-ray was normal. Patient's baseline blood counts were normal, renal and hepatic parameters were also within normal limits. Colour Doppler echocardiography was performed which showed normal chamber dimensions, with ejection fraction of 50% with mild left ventricular systolic dysfunction, hypokinesia of infero

lateral wall segments. Moreover, there was no thrombus or embolism and no pericardial effusion. The patient was not thrombolysed as he was out of window period. Patient was heparinised and treated with dual antiplatelet therapy, nitrates, high dose statin, beta blockers and angiotensin converting enzyme inhibitors.

Elective coronary angiography showed left main 4 mm vessel with distal 40% disease and left anterior descending artery is a type 3 vessel whereas diffusely diseased after first septal branch, with maximum 95% stenosis. Second diagonal shows that left anterior descending coronary artery (LAD) is mildly diseased and distal LAD is diffusely diseased. Left circumflex was a non-dominant vessel, it was diffusely diseased after first OM (Obtuse marginal), with maximum 90% lesion after second OM. Even, right coronary artery was a dominant vessel, 70% ostial disease, mild proximal – mid right coronary artery (RCA) disease. Distal RCA has 99% eccentric disease in the pre-crux region, and posterior descending artery has ostial disease and postero-lateral branch also diseased distally (Figure 1A).



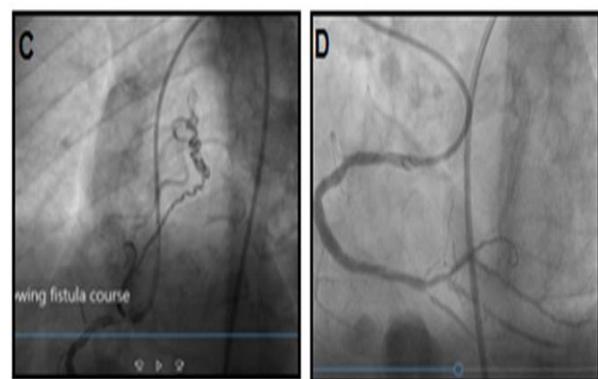
**Figure 1A and 1B: Percutaneous Transluminal Coronary Angiogram (A) RCA angiogram showing ostio proximal and distal RCA lesions, (B) RCA angiogram after pre-dilatation of the proximal RCA lesion.**

Patient was advised CABG in view of multiple tubular disease. Since the patient was not willing for CABG, multivessel PCI was recommended. The patient was informed about all the necessary procedural preparations needed to be performed prior to elective PCI. For surgery, right femoral access was chosen; left main coronary artery (LMCA) engaged with 7F EBU 3.5 guide, the lesion crossed with fielder FC followed by buddy run-through wire for a better support it was parked distally. LAD lesion was predilated with 2x15 fast track semi compliant balloons, stented with 2.25 x 44mm drug eluting stent and, post dilated with 3x12 mm non-compliant balloon at 14 atm pressures. When proximal optimisation was done, left circumflex lesion was crossed with the same fielder FC wire and balloon angioplasty was performed with the 2x15 mm semi compliant balloon; with resultant TIMI (thrombolysis in myocardial infarction) 3 flow post procedure. Right coronary artery

was engaged by 7F JR 3.5 guide and lesion was crossed with the fielder FC wire. Distal lesion was dilated using 2x12 semi compliant maverick balloon at 12 atm pressures which was then tented with 3x23 drug eluting stent. During dilatation of the proximal right coronary lesion with 2x12 balloon, a large fistula opened up from the lesion site coursed anteriorly, which appeared to be draining into pulmonary artery (Figure 1B).

The long tortuous fistula was seen in various views (Figure 1C). Since a flow limiting tight coronary lesion, which was predilated in the proximal coronary artery and a large coronary fistula, were observed to be originating from the same site, an apparent decision was made regarding closure of the fistula with stent graft as the patient was unwilling for an open procedure.

Therefore, after adequate predilatation a covered stent graft 3.5 x 19 mm graft master was placed, at 16 atm pressures, final diameter obtained was 4.03 mm (Figure 1D). Then it was post dilated with 3.5 x 10 mm noncompliant balloon twice at 20 atm pressures.



**Figure 1C and 1D: (C) RCA angiogram showing fistula course. (D) RCA angiogram after stenting of the proximal lesion with covered stent graft.**

Patient developed slow flow and angina during post dilatation and intracoronary tirofiban given to the patient. Angina was subsided using nitrates. Final result was acceptable as flow through the fistula completely ceased after placing the covered stent graft. After the right coronary fistula was closed with the covered stent graft, we reassessed the left coronary artery and decided to close the coronary fistula arising from distal left main artery at a mildly diseased portion of the LMCA.

This fistula again appeared to drain into the pulmonary artery (Figure 1E). After engaging left main, a grand slam wire was passed to cross the predicted lesion, then stented with 4x12 mm JOSTENT graft master, the covered stent graft (Figure 1F). Final angiography showed a significant reduction in the flow though the fistula was present, confirmed by two orthogonal views. Repeat coronary angiography was completed and at 1-month no residual flow into the fistula was observed on right and left side of

coronary artery. Patient was found to be asymptomatic at 12 months post procedure.



**Figure 1E and 1F: (E) LCA angiogram showing LMCA fistula. (F) LCA angiogram after stenting of LMCA with covered stent graft.**

## DISCUSSION

Congenital coronary - pulmonary artery fistula is rare and remain asymptomatic. Patients generally become symptomatic during the 5<sup>th</sup> or 6<sup>th</sup> decade of life and may present sudden cardiac death, heart failure, myocardial ischemia, pulmonary artery systolic hypertension, arrhythmia, rupture, or endocarditis.<sup>3</sup> Treatment option include surgical and endovascular exclusion. Endovascular exclusion offers a less invasive option, which is especially attractive for use in patients who have undergone previous cardiac surgery. This exclusion may be accomplished by transcatheter embolic occlusion with alcohol foam, double-umbrella devices, or stainless-steel coils, or by implantation of a stent-graft. A high incidence of in-stent restenosis or thrombus formation has been reported with the deployment of covered stents. The restenosis rate was 35% and rate of subacute thrombotic occlusion (despite using dual antiplatelet therapy) of 5% to 7%, respectively. Further evaluation is needed in this regard.<sup>4</sup>

Presently he is on regular follow-up and symptom free at 12-month follow-up. In our case, repeat angiogram at 1-month follow-up showed no evidence of restenosis. Congenital coronary fistulae are rare entities, but sometimes have potential for producing fatal consequences. Since in 1980s trans-catheter occlusion was firstly reported, it has been considered as an alternative surgery with good results and appropriate complication rates.<sup>5-7</sup>

## CONCLUSION

The gold standard of investigation is coronary angiography and CCTA. CCTA has got its advantage of

being non-invasive and better delineation of anatomical relations. There are surgical and catheter-based treatments available for coronary fistulae depending upon its anatomy. Catheter treatment includes device and coil closure. However, covered stent graft is an easy, feasible, relatively less time-consuming method of closure of coronary fistula, in cases of fistula with suitable anatomy. As the procedure and hardware required for the procedure are same as that of coronary angioplasty, it could be an acceptable mode of treatment in most of the centers. However, these patients should be followed up closely for restenosis. A minority of patients treated with percutaneous transcatheter closure will experience recanalization.<sup>8</sup> Routine clinical follow-up in all and imaging surveillance after closure in symptomatic patients should be considered after transcatheter coronary artery fistulae closure.

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