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A Case Report on Percutaneous Coronary Intervention in Chronic Total Occlusion by Retrograde Visualization.

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ABSTRACT

As bilateral approach is paramount in chronic total occlusions with retrograde flow, the use of two radial arteries,two femoral arteries or combination technique using one radial and one femoral artery will probably be increasingly reported in the near future. After puncture of opposite groin, a diagnostic 6 Fr catheter is used to intubate the ostium of the contralateral artery. By visualizing the distal vessel in multiple projections, contralateral injections help to direct the progression of the wire in the occluded segment towards the distal true lumen. and confirm the intraluminal position of the wire after the occluded segment. We are reporting a case with chronic total occlusion where we used bilateral femoral access and simultaneous contrast injection to visualize retrograde flow in LAD while opening CTO through ante-grade pathway.

Keywords: CTO, PCI, CART, IVUS, PCI, RCA, LAD, DNT.

INTRODUCTION

Chronic total occlusions (CTO) are common finding in patients with coronary artery disease.Although one or more totally occluded coronary vessels are identified in diagnostic coronary angiograms,recanalization is attempted in only 8% to 15% of patients undergoing percutaneous coronary intervention (PCI).By nature of their complexities,PCI for CTO is associated with lower rates of procedural success,higher complication rates,greater radiation exposure and longer procedure times compared to interventions in non-CTO lesions.Despite these obstacles,the reported benefits of successful CTO PCI include symptom reduction,lower need of surgical revascularization and improvement in both ventricular function and survival.[1]

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CASE REPORT

50 years old gentleman was admitted in Coronary Care Unit at Bangabandhu Sheikh Mujib Medical University with central chest pain of two hours duration associated with profuse sweating and vomiting. Haemodynamically he was stable with a heart rate of 84 bpm, regular and blood pressure of 140/110 mm Hg. There was no evidence of pulmonary edema. Precordial examination was unremarkable.

His ECG confirmed inferior myocardial infarction with lateral ischaemia. His Troponin I was 2.8, CKMB 75 and creatinine 1.2 mg/dl. He was given loading dose of 300 mg Aspirin and was started on atenolol 50 mg once daily and nidocard 2.6 mg twice daily. He was given streptokinase via central venous line after ruling out contraindications. Door to Niddle (DNT) time was two and half hours.Following thrombolysis, his blood pressure dropped to 85/50 mm Hg and pulse rate showed bradycardia 50 bpm. He was treated with inotropic agents (Dopamine and Dobutamine). He responded well to this therapy and on day 4 post-MI, he was taken to cardiac catheter laboratory for coronary angiogram.

Selective coroanary angiogram revealed chronic total occlusion (CTO) in proximal LAD with no antegrade flow. There was 100% occlusion in mid-RCA with retrograde flow to LAD from distal RCA LCX was patent with good collaterals to LAD. Left ventriculography showed moderate inferior and anterior hypokinesia.

We planned to visualize LAD by simultaneous contrast injection via both femoral arterial access & retrograde visualization of LAD via RCA. To achieve this, 6 Fr cordis sheath was introduced to left femoral artery and 7 Fr cordis sheath to right femoral artery. A diagnostic catheter 3.5 Judkin was placed on right coronary ostium and an EB guiding catheter 3.5 was placed on left coronary ostium.

An extra support guide wire mounted with 1.5 mm balloon approached through proximal LAD and retrograde filling was visualized via RCA diagnostic catheter [Figure1]. LAD was then pre-dilated with 1.5 X 10 mm complaint balloon at proximal, mid and distal LAD). A (2.75 X 15) mm cobalt chromium stent was deployed at proximal LAD with high pressure inflation (16-18 ATM). Result was excellent with TIMI-3 flow in distal LAD [Figure 2]. A satisfactory post-PCI result was reconfirmed by giving contrast to RCA catheter which showed no retrograde filling to LAD.

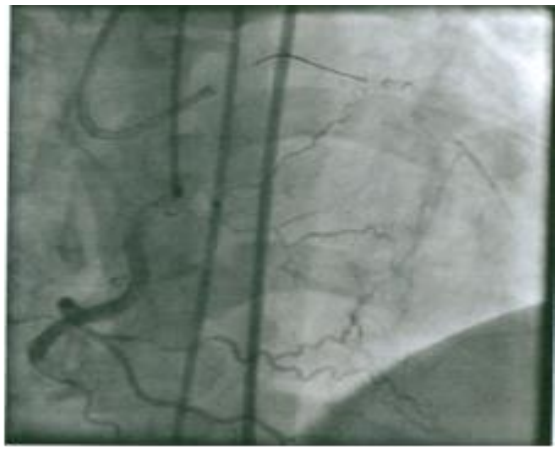

Figure 1: Retrograde filling visualized via RCA diagnostic catheter.

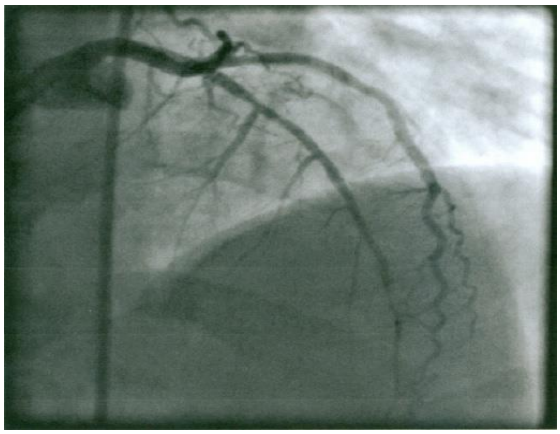

Figure 2: TIMI-3 flow in distal LAD.

RCA diagnostic catheter is then replaced with a RCA guiding catheter (RJ, size 3.5 mm). An intermediate guide wire was passed through RCA without any difficulty. A (1.5 X 10) mm balloon was used to pre-dilate mid and distal RCA. A 2.5 X 15 mm stent (DES) was deployed in mid-RCA at 16-18 ATM. However result was sub- optimal with distal RCA showing diffuse narrowing with 30 to 40% stenosis. Therefore, guide wire was re-inserted in RCA and another DES stent size (2.5 X 12) was deployed before bifurcation at 16-18 ATM. Result was excellent with TIMI 3 flow in distal RCA. [Figure 3&4].

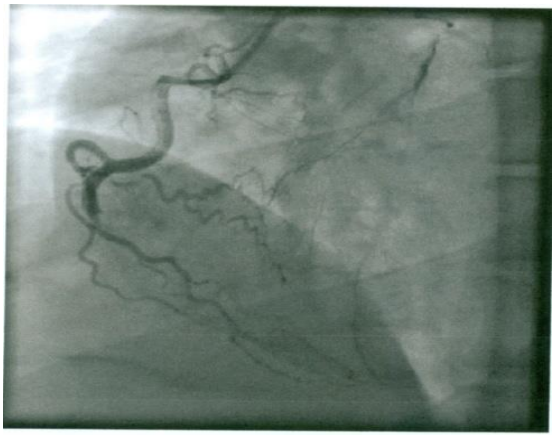

Figure 3: TIMI 3 flow in 100% Occlusion at Mid-RCA RCA.

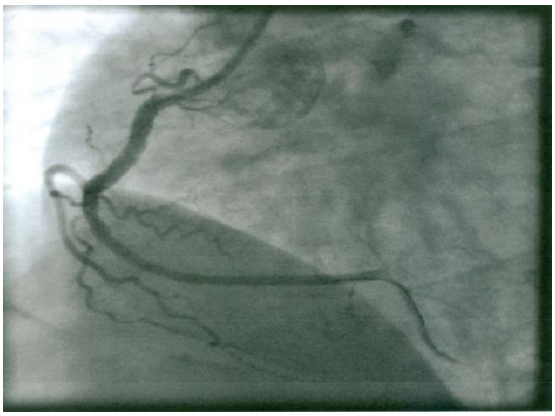

Figure 4: TIMI 3 flow in distal RCA.

Full revascularization completed with excellent result in RCA and LAD. Intregillin was given in bolus and maintainance doses. There was no complication during and after procedure. We followed this patient after one month with no complaints or complications.

DISCUSSION

For successful recanalization procedure in CTO, it is essential to have guiding catheter which gives maximum support during advancement of guide wire and balloon.[2] Another important element that contributes to the success and safety of recanalization procedures in the presence of retrograde collateral flow is the use contralateral injections.Simultaneous contralateral injection should be performed to evaluate the length of the

lesion, as a target landmark of PCI guide wire and as a route of the retro-grade approach.[3]

When the distal vessel is mainly filled by retrograde collaterals or there are bridging collaterals originating near the occlusion that are likely to have their flow impaired after wire catheter advancement, contralateral injection is mandatory from the start of the procedure.[4]The contralateral approach can also be achieved by puncturing the same groin with a 5 Fr or 6 Fr diagnostic catheter which may allow the procedure to be better tolerated.

As bilateral approach is paramount in CTO with retrograde flow,the use of two radial arteries,two femoral arteries or combination technique using one radial and one femoral artery will probably be increasingly reported in the near future.After puncture of opposite groin, a diagnostic 6 Fr catheter is used to intubate the ostium of the contralateral artery. By visualizing the distal vessel in multiple projections, contralateral injections help to direct the progression of the wire in the occluded segment towards the distal true lumen. and confirm the intraluminal position of the wire after the occluded segment.[5]

Another important consideration is choosing the appropriate guide wires and its structural differences in terms of tip form,diameter,and coating.CTO's are frequently consists of a hard fibrotic cap proximally, loose fibrotic tissue with in the occlusion and a second hard fibrotic distally(second fibrotic cap most difficult to cross).In this scenario, stiff wires might be used to penetrate the proximal cap and distal cap.Floppy hydrophilic coated wires with low friction may be preferable to advance with in the occlusion.[6]

A floppy wire is often the best initial choice to negotiate the segment proximal to the occlusion. An over the wire (OTW) catheter can be advanced up to the proximal stump and then exchange to a stiffer dedicated wire. More aggressive CTO wires may cause damage to the tortuous proximal segments before reaching the occlusion.[7]

When wire enters a false channel, it is left in place in the dissection plane as marker and a second guide wire is passed along the same path parallel to the first wire (Parallel Wire Technqiue). PW technique has two main purpose:a) redirecting a wire inside the body of the CTO and b) puncturing distal CTO fibrous cap.PW technique has been shown to increase success rate after failed attempt with the conventional single wire technique.

The controlled ante-grade and retrograde sub-intimal tracking (CART) technique is safe and most successful bilateral approach in CTO intervention.The basic concept of the CART technique is to create a sub-intimal dissection with limited extension,only at the site of CTO. First a wire is advanced in an ante-grade manner from the proximal true lumen into the sub-intimal space at the CTO site. Next the retrograde wire is advanced from distal lumen into the CTO, then into the sub-intimal space at the CTO site. In order to enable the two wires to meet a balloon is brought on the retrograde wire and inflated from the sub-intimal space to the distal end of the CTO. The two sub-intimal dissections tend to expand spontaneously towards each other and get connected. To keep the dissection open, it is important to leave the deflated balloon inside the sub-intimal space ,then manipulate the ante-grade wire targeting the deflated balloon. Currently, reverse CART technique is a more popular method of the retrograde approach in Japan following development of stabilizing devices for retrograde wires, such as combination of Fielder XT wire and Corsair supporting catheter.[8]

Another novel technique is IVUS guided wiring at the CTO entrance and IVUS guided penetration from sub-intimal space. When a contralateral angiography fails to identify an entry point of CTO, IVUS can be used to identify the the entry point of CTO if the branch is large enough to advance an IVUS catheter.[9]

Further development in future in treating CTO will include the safe-cross radio-frequency combines optical coherence reflectometry that warns operator when the wire tip moves to within 1mm of the outer vessel wall, combined with radiofrequency energy pulses to facilitate the passage. The CROSSER catheter mechanically vibrates against the face of the CTO at 20 KHz at a stroke depth of approximately 20 micron creating a channel through CTO. The most novel approach will be the biologic one, in which proteolytic enzymes that digest the CTO cap to facilitate the mechanical passage.[10]

By nature of their complexity, percutaneous revascularization of coronary CTO is associated with lower procedural success, higher complication rates, greater radiation exposures and longer procedural times. Despites these obstacles reported benefits of successful PCI in chronic total occlusion include symptom reduction and improvement in both ventricular function and survival. Throughout the recent evolution of both equipment and techniques ,percutaneous revascularization of coronary CTO remains a formidable endeavor.

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