Successful Sealing of Elli’s Type 3 Coronary Artery Perforation with Cyanoacrylate Glue

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Abstract

Coronary artery perforation (CAP) is a rare (0.43%) but scary complication of percutaneous coronary intervention with its associated morbidity and even mortality at times. It needs to be treated urgently either by percutaneous means or by open heart surgery, as the situation demands. In this report we are discussing a left anterior descending coronary (LAD) artery perforation sealed successfully using cyanoacrylate glue.

Introduction

Coronary angioplasty since first performed by Andreas Gruntzig in 1977 has advanced by leaps and bounds. Although the procedure related complications have reduced with advancement in technology and hardwares it is still a finite possibility. Guidewire (especially with heavy tip load) induced perforation is one such part and parcel of this procedure. Optimum selection of guidewire(s) and careful advancement is the key for chronic total occlusion angioplasties. Sound knowledge about handling, preparedness and well equipped catheterisation lab to overcome these unforeseen complications is also important.

Case Report

A 45 year old male with no premorbid illness presented with exertional angina pectoris CCS class symptoms for last 6 months. 12 lead ECG showed QS complexes in anterior lead suggestive of old AWMI. His echocardiogram showed RWMA in distal septum, apex and anterolateral wall with EF of 30%. He was given maximal antianginal medications along with antiplatelets, statin but with partial improvement in his symptoms. So he was taken up for angiogram which revealed 100% occlusion from mid LAD (Figure 1). His stress test showed provocative myocardial ischaemia in stage 2 only. Patient was taken up for angiogram which revealed 100% occlusion from mid LAD (Figure 1). His stress test showed provocative myocardial ischaemia in stage 2 only. Patient was taken up for percutaneous coronary intervention (PCI) after informed written consent. Guiding catheter XB 3.0/6Fr was engaged across LMCA after adequate heparinisation. Lesion was attempted first with miracle (Asahi, Japan) 6 gm tip load 0.014 inch coronary guide wire but it could not be advanced beyond the proximal cap. So conquest pro tip load 12 gm (tip is 0.014 inch tapered to 0.09 inch) was taken and the lesion was crossed. Balloon dilatation was done with 1.1 mm followed by 2.0 10 mm balloon. Check angio showed perforation of mid LAD with spilling of the contrast into pericardium (Figure 2). Immediate 80 mg protamine was given intravenously so as to revert the blood thinning effect of heparin and minimize the bleeding. This is followed by balloon occlusion using 2.5 mm x 10 mm balloon for 15 seconds inflating the balloon proximal to the rent in the artery (Figure 3). This was repeated twice but without much benefit. In view of the worsening hemodynamics it was decided to use glue. Cyanoacrylate glue (histoacryl, B Braun, Germany) about 0.3 ml was taken and diluted in lipoidal solution (radioopaque) of the same volume. A microcatheter transcend EX was taken and flushed with dextrose solution and was parked in the LAD just before the perforation site over a coronary wire. Coronary wire was removed followed by slow injection of the glue at the perforation site and slightly proximal to the rent (Figure 4). Check shoot through the guiding catheter showed complete sealing of the perforation site with no spill at all (Figure 5). The touhy of the angioplasty assembly kit was opened.

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and the microcatheter was pulled back in one go so as to avoid contact with the blood because once glue comes in contact with the blood or sodium ion it immediately solidifies and if this happens then the microcatheter will be stuck and patient will need urgent surgery.

### Discussion

Coronary artery perforation has a incidence of about 0.43% according to a metaanalysis done by Avi shimony et al involving 187,061 patients. Other than percutaneous coronary interventions, pericardial effusion tamponade are commonly seen with procedures such as biopsies, procedures involving atrial septal puncture as one of the step namely, balloon mitral valvotomy, left atrial appendage occlusion and percutaneous device closures as well as pacemaker implantations, etc.

Normally pericardium contain about 20-50 cc of clear serous fluid but at times even rapid collection of as small as 50-100 ml can cause tamponade.

Fluoroscopy itself can give a idea regarding pericardial effusion as appearance of a new clear lines at cardiopericardial silhouette; the epicardial halo sign or fat pad sign.

Ellis et al has classified coronary artery perforation (CAP) in to three types based on severity of rent on the arterial wall.

**Type 1:** Extraluminal crater without extravasation.

**Type 2:** Pericardial or myocardial blush without contrast jet extravasation.

**Type 3:** Extravasation jet through a frank (1 mm) perforation or cavity spilling into an anatomic cavity or chamber (ventricles, pericardial space).

Fukutomi et al and Kini et al have classified coronary perforation into two main types depending on whether contrast is extravasating into pericardium or some cavity or not. Many a times, microperforation is there and is not seen immediately but patients presents late after the procedure with pericardial effusion and tamponade and can be a diagnostic and therapeutic challenge.

Coronary artery perforation are mainly due to coronary guidewires; especially the hydrophilic ones and the hard wires (those with added tip load) and those with tapered tips (0.014 tapered to 0.09 inch). Besides guidewires perforation are also seen with oversized balloons and stents, special debulking devices such as cutting balloons (blade), atherectomies, rotaablations, tornus catheters for CTO’s etc.

Patient comorbidity which has added risk of perforations are old age, calcified lesions and tortuosity of arteries. Use of gp2b/3a inhibitors further adds to morbidity associated with perforation.

As soon a perforation is seen which can be of haemodynamic importance, the immediate measure is to revert the anticoagulation partially or fully with protamine 1 mg of protamine neutralizes 100 units of heparin. In our case reversal was full because the perforation was large with almost the size of about 2 mm and since we had not deployed any stent so the possibility of stent thrombosis after protamine was not there. Gp2b/3a inhibitors should be stopped immediately. Pericardiocentesis for impending tamponade should be done. Other supportive measures like blood transfusion, IV fluids (colloids as well crystalloids) should be started. One of the easiest and feasible method to stop bleeding is to inflate a balloon of about the size of the artery proximal to the perforation site for about 1-15 minutes. Duration can be varied depending upon the ischaemia the patient tolerates. Balloon perfusion catheter is one such option in those patients which tolerates ischaemia poorly as it occludes the perforation site but at the same time allows perfusion distally. In our patient since the artery totally occluded since presentation the patient was tolerating the ischaemia well when the balloon was inflated three for about 15 minutes each. But without much improvement in pericardial leak, we decided to go for glue injection which was successfully done.

Microcoil embolization, gel foam embolization, embolization using catheterization laboratory scrap material like tip of floppy tip coronary guidewire, autologous fat embolization, autologous anticoagulated blood embolization. Covered stents (polytetrafluoroethylene; PTFE) is another option if the artery is large enough.

It is usually available in 3.0 and 3.5 mm size.

If any of the percutaneous means fails or the patient deteriorates or if the operator is not well versed with these techniques then the patient should be sent for surgery immediately.

### References