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Pericardial Hematoma Following Coronary Angiography

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ABSTRACT

INTRODUCTION: Pericardial hematoma is defined as an accumulation of blood in the pericardial space, located in close proximity to the myocardium and deep to the fibrous pericardial sac, which encloses the heart.

CASE DESCRIPTION: We present a rare case of pericardial hematoma following percutaneous coronary intervention in an individual presenting with stenotic vein graft following symptoms of a myocardial infarction. Initial computed tomography (CT) scan demonstrated hematoma in the pericardial space. This finding was managed conservatively, and hematoma was deemed stable on serial CT scans.

DISCUSSION: In this urgent situation, CT imaging proves valuable due to its speed, convenience, and accuracy in visualizing the target area from different perspectives. Although patients may appear stable initially after a perforation, a pericardial hematoma can rapidly spread, leading to unstable blood flow that requires prompt intervention and long-term monitoring.

KEYWORDS: Pericardial Hematoma, Coronary Angiography, Vein Graft

CASE DESCRIPTION

A 76-year-old male presented to the emergency department due to increasing frequency of chest discomfort and shortness of breath for one week. The pain lasted about 5 minutes and radiated to the elbow, which was relieved by nitroglycerine. On physical examination he had mild pitting edema in the lower limbs bilaterally.

The patient had a significant past medical history of coronary artery disease requiring coronary artery bypass grafting (CABG) in 2002 with left internal mammary artery (LIMA) to the left anterior descending (LAD) artery and saphenous vein grafting to the posterior lateral branch. He subsequently required percutaneous coronary intervention (PCI) to the vein graft in 2020. An echocardiogram within a year from the current presentation revealed left ventricular ejection fraction (LVEF) of 45-50% with marked dyssynchrony due to paced rhythm.

MANAGEMENT

Due to symptoms indicating possible myocardial infarction, the patient was provided appropriate initial medication management and EKG showed atrial fibrillation and ventricular paced rhythm. Lab results showed an elevated Brain natriuretic peptide (BNP) of 158 pg/mL (normal = <100 pg/mL) and elevated troponin level of 0.30 ng/mL (normal = 0 – 0.04 ng/mL). An initial diagnosis of non-ST-elevation myocardial infarction (NSTEMI) was made. Due to worsening dyspnea on exertion and chest discomfort another EKG was performed that revealed atrial fibrillation and heart rate of 83/minute and a chest x-ray was obtained with no suggestion of any acute cardiopulmonary process. A transthoracic echocardiogram was completed showing an unchanged left ventricular systolic function of 45-50% with no new segmental wall motion abnormalities.

Roughly 48 hours after presenting to the Emergency

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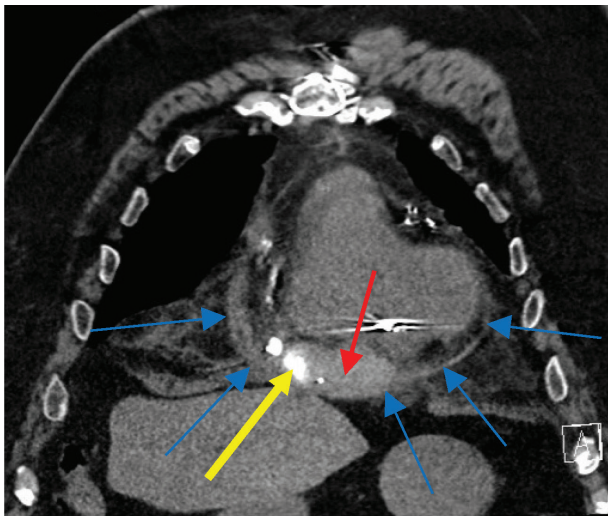

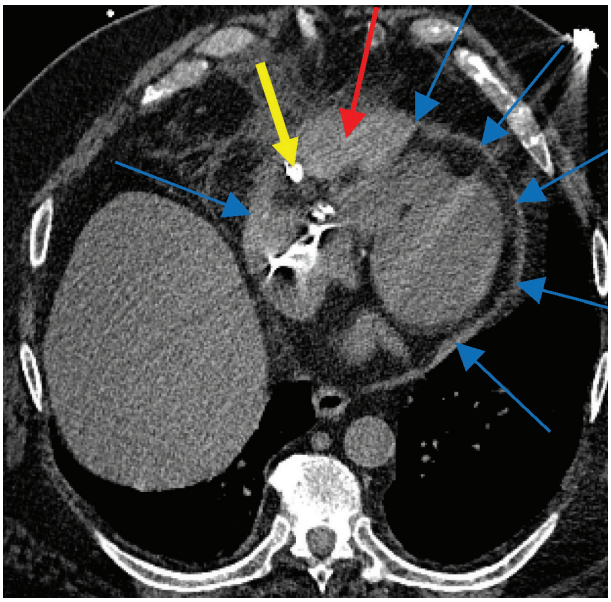

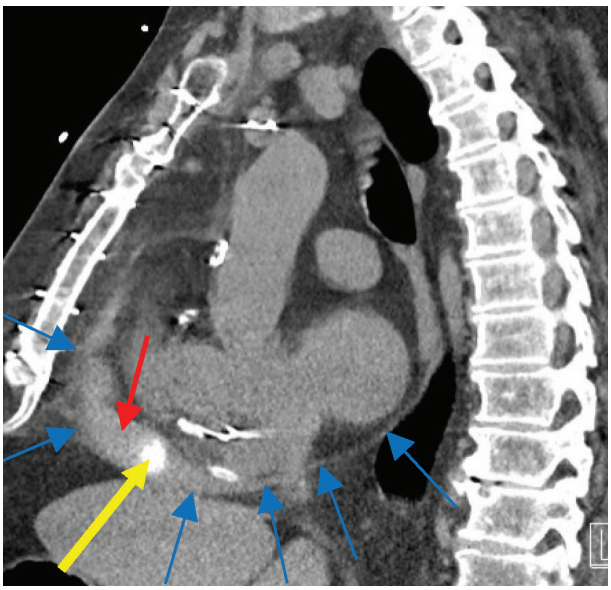

Image 1. (Left top – coronal, left middle – axial, and left right – sagittal): There is a 7.3 x 2.6 x 5.6 cm minimally hyperdense pericardial hematoma primarily anterior and inferior to the right ventricle (red arrows). This contains a small focus of more pronounced hyperdensity, likely extravasated contrast during the angiography (yellow arrows). Deep pericardial location is emphasized through outlining of the pericardium (blue arrows). A small amount of hemopericardium is present primarily caudad. There is minor induration of the anterior pericardial fat. No significant compression is present upon the right ventricle, although the hematoma abuts the right ventricle. Of note, sutures are present from previous heart surgery.

Department, the patient was taken to the cardiac catheterization (cath) lab and was found to have subtotal 99% stenosis of vein graft to Right Coronary Artery (RCA). While in the cath lab, thrombectomy was attempted, but significant challenges were encountered during the procedure. The mid graft stenosis was severe, proving difficult to cross using the thrombectomy catheter. Consequently, pre-dilatation using a 2-millimeter (mm) balloon was performed, followed by the placement of a filter guide wire. After multiple failed attempts to cross the stenosis using a 4.0-mm stent, additional pre-dilatation was performed using a 2.5-mm balloon. Successful advancement of a drug-eluting stent was finally achieved, followed by a series of post-dilatations using a 4.0-mm compliant balloon. However, a small perforation was identified in the vein graft at the stent site requiring prolonged balloon inflation (of 4 minutes duration). Despite this, persistent leakage at the perforation site was observed. A stat echocardiogram demonstrated no significant pericardial effusion. Continual patient observation in the cath lab confirmed hemodynamic stability, while repeated contrast injections revealed a gradual decrease in flow through the perforation site. The procedure was stopped after an hour of observation, as there was gradual lessening of flow through the perforation and the patient continued to remain hemodynamically stable. Ultimately, he underwent successful PCI on the vein graft of the RCA with a small perforation which was self-limiting.

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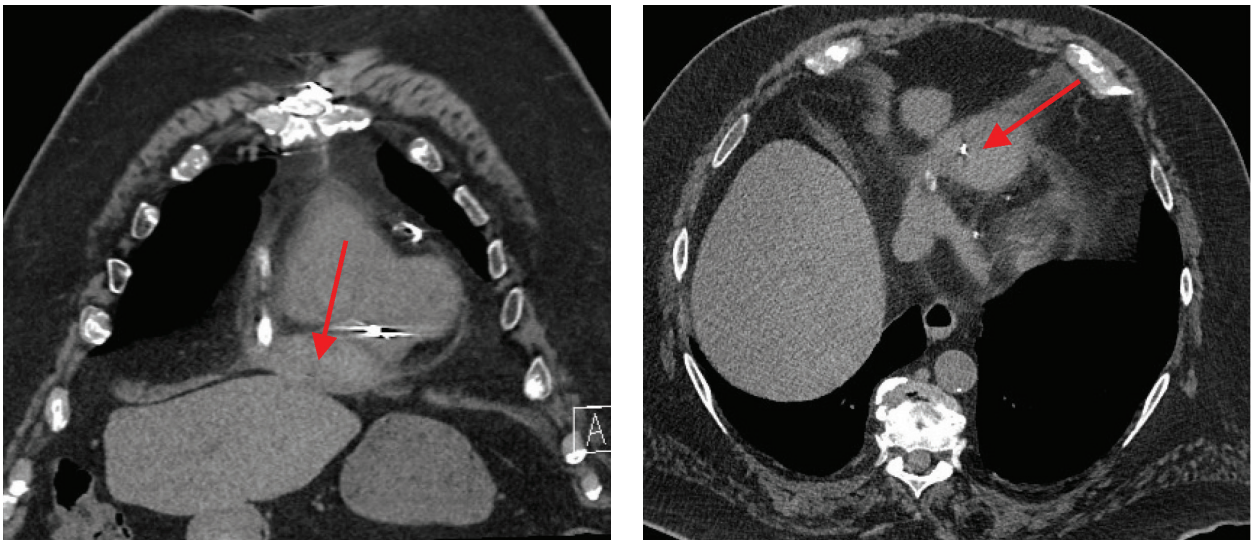

Image 2. (Left – coronal and Right – axial): Hematoma along the inferior pericardium is not substantially changed in caliber measuring 5.3 x 4.1 x 2.3 cm (red arrows). No extravasated contrast is seen. No change from prior. Stable pericardial hematoma.

IMAGING

A non-contrast CT chest was obtained within an hour following PCI to assess for significant hematoma (*Image 1*). The presence of contrast was determined to likely be extravasated fluid containing contrast from the PCI, suggestive of a hematoma in the pericardial space due to vein graft perforation. The patient underwent a repeat cardiac catheterization which revealed no evidence of a leak. Subsequent CT imaging was performed during the inpatient stay for hematoma surveillance (*Image 2*). The hematoma had decreased in size and remained stable, and patient was discharged from the hospital. Follow-up CT scan performed 2 months later demonstrated further shrinkage of the hematoma.

DISCUSSION

This paper reports a rare occurrence of vein bypass graft perforation following PCI, resulting in a right ventricular pericardial hematoma. Coronary artery perforations occur in 2.9% of PCI procedures, but those leading to hematoma occur only 0.1% of the time[1]. While this complication remains rare, its occurrence is increasing in frequency concordant with the use of complex PCI procedures and is associated with significant morbidity and mortality[1]. When perforations do occur, they frequently affect the right coronary artery, occurring 35.3% of the time in comparison to other cardiac arteries[2]. However, to our knowledge there is no research discussing frequency of perforations specifically to a vein graft. Recognition of a perforation deserves clinical focus and attention due to possible adverse outcomes.

While in the cath lab, physicians must determine the size and location of the perforation before proceeding with management. Treatment can be as simple as monitoring or proceeding with an immediate balloon tamponade[3]. Due to the life-threatening nature of perforation, balloon tamponade is typically the gold standard[4]. In severe cases, placement of a covered stent is most effective, sealing off the perforation while maintaining vessel patency; if percutaneous methods fail, emergent referral to cardiac surgery is recommended[3]. For the presented case, balloon tamponade was sufficient, in limiting bleeding and maintaining the hemodynamic status of the patient. Due to a stat echocardiogram showing no evidence of pericardial effusion, further interventions were not taken. The perforation did, however, lead to a pericardial hematoma, as diagnosed on the patient's first CT scan (*Image 1*). Serial echocardiograms can be used to further assess myocardial hematoma or hemodynamic compromise[3].

Our patient had several risk factors that predisposed him to an NSTEMI. However, the direct factors that increased the risk of perforation, in this case, were age greater than 60 years, prior MI, prior PCI, and nearly total (99%) occlusion during current presentation[2]. Along with knowledge of risk factors, physicians must be aware of the complications that could follow a coronary artery perforation, such as a peri-

cardial hematoma. In terms of acute complications, shock-based organ failure can arise which can be controlled with conservative yet emergent management[4,5]. There is also a significantly increased risk for other periprocedural complications following a perforation, such as cardiac tamponade, myocardial infarction, stroke, heart failure, and various bleeding events[2]. Delayed cardiac tamponades have also been reported, along with other complications, such as peripheral vascular injuries, electrical instability (arrhythmias), and acute vessel closures, with the ultimate possibilities of cardiac arrest and death[3]. Due to occurrence of such complications a patient may have to undergo surgical repair or drainage, which can be difficult and often result in adverse outcomes[4,5]. The wide array of potential complications, along with the variability and overlap in presentation timelines, further emphasizes the importance of rapid management and attentive monitoring after coronary perforations occur[2,3,6].

Fortunately, in our case, the patient's hematoma was self-limiting and able to stabilize without surgical intervention. The patient remained stable and had no acute complications. Many reports have demonstrated that patients are often initially stable after a perforation; however, a pericardial hematoma has the potential to rapidly propagate, resulting in hemodynamic instability that must be quickly addressed[4,5]. Recognizing the focal nature and unique location of the hematoma presented in this case, positioned between the pericardium and the myocardium, constitutes how the patient will be managed. Location was confirmed with CT after echocardiogram was completed in the cath lab. Pericardial hematomas of this nature do not usually lead to pericardial effusions or cardiac tamponades, making this complication even more specific to recognize in order to initiate early and adequate treatment measures[4]. However, long-term complications are still a possibility in this patient and therefore proper management and monitoring is required.

A variety of case reports have reported pericardial hematomas, focusing on gross imaging and coronary angiograms[6,7]. Yet CT in this emergent context holds its merits in being a quick, convenient, and precise imaging modality, with the capacity to visualize an area of interest in multiple planes[8]. When compared to magnetic resonance imaging, CT typically demonstrates hematomas consistently while MRI signal intensity varies with the timeline of the hematoma, supporting its use as a clinical tool to estimate the hematoma age[9]. In any case, CT and MRI are best suited for determining a pericardial hematoma compared to an echocardiogram due to examination of the entire chest and superior soft-tissue visualization[10]. Our patient's CT ultimately showed that, due to a perforated vein graft, a focal hematoma formed between the heart and the pericardium, which will need occasional follow-up imaging for an extended period thereafter to monitor for any delayed complications.

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