



Closure of RV Perforation during Pericardiocentesis with PDA Device Closure

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Abstract

Iatrogenic perforation of right ventricle is one of major and life threatening complication of Pericardiocentesis. Treatment modalities include either surgical repair or percutaneous device closure of perforation site. In this case we use amplatzer duct occluder device to seal off the RV perforation secondary to incorrect placement of pericardial drain.

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Introduction

Cardiac tamponade is a life threatening condition, in which there is rapid or slow compression of cardiac chambers that can lead to hemodynamic instability. Pericardiocentesis is a lifesaving procedure for diagnosis and management of large pericardial effusions as well as cardiac tamponade [1].

Pericardiocentesis may cause some serious and life-threatening complications. Pericardiocentesis had a high a complication rate with procedure related complications occurring in more than 20% of cases and a mortality of almost 6%. Image guided (echo and fluoroscopy) Pericardiocentesis has reduced these complications significantly [2].

The major complications are pneumothorax, puncture of abdominal viscera, injury to intercostal vessels, injury to coronary arteries, perforation of cardiac chambers and death. Minor complications include arrhythmias, transient vasovagal hypotension, bradycardia and pleuro-pericardial fistulas [3].

Iatrogenic perforation rate of Right ventricle in interventional procedure is 0.3% - 5%, almost half of these cases are reported from Pericardiocentesis. Perforation of right ventricle with the introducer needle is a minor complication. The canal created by the needle may close spontaneously once the needle is removed because of thickness and contractility of myocardium, But if sheath is misplaced in right ventricle that may be a dilemma [4].



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Perforation of Right ventricle is a rare but serious complication. Treatment strategy include either a surgical repair or device closure of perforation site. Surgical repair is most traditionally used method, but closure devices are now being introduced to close the RV perforation as it is a minimally invasive procedure and with lesser complications [5].

Case report

History

History of presenting illness

A 26 year old male patient presented with sudden onset of shortness of breath orthopnea and paroxysmal nocturnal dyspnea. On examination the patient had a blood pressure of 110/60, with a pulse of 120/min with spo2 of 95 % with 5lire of oxygen, the patient had a raised JVP with muffled heart sounds.

Past medical history

Patient had a known diagnosis of End Stage Renal Disease (ESRD) was being treated with hemodialysis twice a week for the last 2 years

Investigations

The patient's urgent bedside ECHO was showing large pericardial effusions with signs of cardiac tamponade (right atria and right ventricle compression). Patient was shifted to Cath lab.

Management

A Sub- Xiphoid approach was under taken 6 Fr sheath was passed under echo guided imaging. Hemorrhagic fluid was drained but procedure related complication was suspected because clotted fluid was being drained. The Sheath was confirmed in Right ventricle and not the pericardial space via echo and fluoroscopy guided images (with contrast hand injections in sheath) and with further confirmation done with the pressure tracings .We also confirmed that there was no major leak from RV.

We secured the sheath in RV. Another 6 Fr sheath and pig-tail catheter was introduced in pericardium and pericardial fluid was drained to relieve patient's symptoms.

The heart team was involved with Cardiac surgeon also taken on board to remain on standby. 2 pints of Red cell concentrate was transfused for the patient.

We planned to close the perforation site with Amplatzer duct occluder device. We passed the JR-4 catheter through femoral vein and parked in right ventricle. We confirmed the sheath again in RV with injections through sheath and through JR-4 catheter (Figure 1) (Figure 2).

8/6 occluder device was selected to close the puncture site. We deliver the device through same 6 Fr sheath (Figure 3). Post-deployment RV gram showing punctured site was completely sealed off and there was no residual leak (Figure 4).

Echo done the next day showed device had completely sealed the RV wall with no residual leak on color doppler, and minimal pericardial effusion. (Video 1&2).

We followed the patient for 15 days. Pigtail catheter and sheath in pericardium were removed as there no re-accumulation of fluid in the pericardial space.

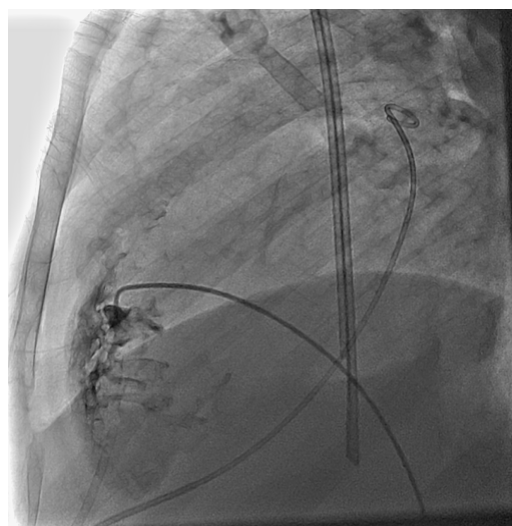


Figure 1: RV gram through JR4 Catheter.

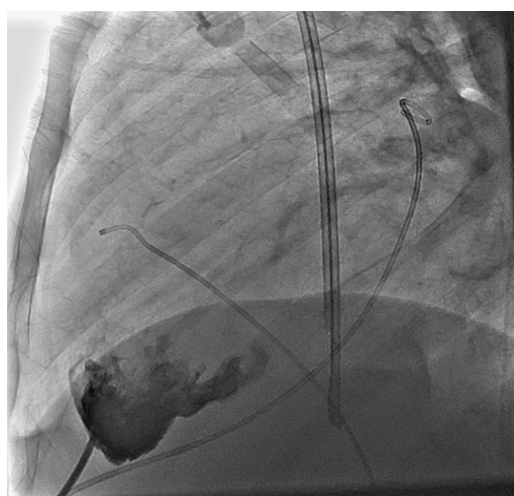


Figure 2: RV gram through sheath.

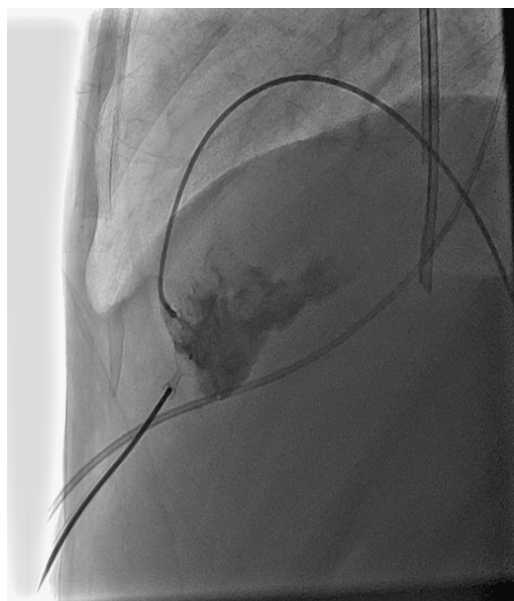


Figure 3



Figure 4

Discussion

Pericardiocentesis is a lifesaving procedure in case of large pericardial effusion or cardiac Tamponade, but it may cause some serious and life-threatening complication. RV free wall rupture is one of major and serious complication of Pericardiocentesis. Even echo and fluoroscopic guided Pericardiocentesis has 1% risk of free wall rupture [6].

In recent years variety of percutaneous closure devices have been used for the Right Ventricle wall perforations, as they are less invasive and can be delivered even in high-risk cases. V Stolt [7] reported five cases of iatrogenic heart chamber perforations that were successfully closed with amplatzer septal occluder devices. The muscular VSD device for closure of RV wall perforation has also been reported [8].

Other devices that have been successful in closure of RV perforations are amplatzer vascular plugs duct occluder device and angioseal [5,9].

We decided to use Amplatzer duct occluder device as it was easily available, minimally invasive, easy to deliver and had less chances of complications.

There are multiple cases reported of successful closure cardiac chamber perforations with duct occluder devices [10].

Conclusions

ECHO and fluoroscopic guided drainage reduces the risk of complications of Pericardiocentesis. If RV wall is perforated then it's imperative not to withdraw the sheath. It's better to secure the sheath In-situ. Percutaneous device occlusion is a minimally invasive, safe and effective procedure for closure of RV wall puncture.

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