

An alternative treatment for iatrogenic right ventricular puncture in primary percutaneous intervention

Primer perkütan girişim sırasında iyatrojenik sağ ventrikül delinmesinin alternatif tedavisi

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Summary– Right ventricle perforation is an uncommon, but potentially fatal, possible complication of pericardiocentesis. We presented a case of right ventricular perforation that developed during urgent pericardiocentesis due to tamponade. This case was successfully treated with the incremental removal of the drainage catheter, replacing it with a smaller catheter at 10-minute intervals. This may be an alternative option to treat iatrogenic right ventricle puncture occurring during pericardiocentesis without cardiac surgery or a vascular closure device.

Right ventricle perforation is an uncommon, but potentially fatal, possible complication of pericardiocentesis, and typically requires open heart surgery. Recently, cases of the off-label use of vascular closure devices to close the ventricular puncture site have been reported.^[1,2]

Presently described is a case of iatrogenic right ventricle perforation while performing a percutaneous coronary intervention and unexpected drainage catheter advancement into the right ventricle during pericardiocentesis that was successfully treated by removing the drainage catheter incrementally, using progressively smaller catheters at 10-minute intervals.

CASE REPORT

A 76-year-old woman presented at the emergency department with severe chest pain and anterolateral ST segment elevation. Immediately, the patient was taken to the catheterization laboratory. The patient

Özet– Sağ ventrikül delinmesi perikardiyosentezin seyrek fakat ölümcül olabilen bir komplikasyonudur. Tamponat nedeniyle acil perikardiyosentez uygulaması sırasında sağ ventrikülde perforasyon olan bir olgu sunuldu. Bu olgu, drenaj kateteri çıkartılıp, 10 dk'lık aralıklarla küçük boyutlu kateterler kademeli olarak değiştirilerek başarıyla tedavi edildi. Kalp cerrahisi ve damar kapatma cihazı olmaksızın perikardiyosentez sırasında iyatrojenik sağ ventrikül ponksiyonunun tedavisi için ilk yerleştirilen kateterin daha küçük boyutlu kateterlerle adım adım değiştirilerek çıkarılması bir tedavi seçeneği olabilir.

was pretreated with aspirin and clopidogrel, and then a bolus of intravenous unfractionated heparin was administered. Coronary angiography revealed total occlusion of the proximal left anterior descending (LAD) and obtuse marginal arteries (Video 1*). Two soft-tip 0.014-inch coronary guidewires (Asahi Intecc Co., Ltd. Nagoya-shi, Japan) were advanced into the LAD artery and the diagonal branch. Following predilation of the LAD artery with a 1.5x20-mm and a 2.5x12-mm balloon (Invader; Alvimedica Tıbbi Ürünler San. ve Dış Tic. A.Ş., Istanbul, Turkey), the lesion was stented with a 2.75x28-mm bare metal stent (VeriFLEX Liberte; Boston Scientific, Corp., Marlborough, MA, USA). Angiography revealed a grade 3 coronary perforation from the distal edge of the stent struts (Video 2*, Figure 1a). The percutaneous transluminal coronary angioplasty balloon that caused the rupture was immediately inflated at the site of the rupture for 8 to 10

Abbreviation:

LAD Left anterior descending

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minutes; however, repeat angiography demonstrated that the inflated balloon was not sealing the perforation. Next, 3.0x18-mm and 2.5x16-mm covered stents (BeGraft coronary system; Bentley InnoMed GmbH, Hechingen, Germany) were implanted mid-LAD artery. A final angiography confirmed seal of the perforation without further contrast extravasation, but the patient became severely hypotensive. Echocardiography confirmed the presence of pericardial effusion and cardiac tamponade. Immediate pericardiocentesis was performed with a 6-F pigtail catheter. Echocardiography, fluoroscopy, and contrast injection revealed the incorrect position of the drainage catheter within the right ventricle (Video 3*, Figure 1b). Without removing the primary, misplaced drainage catheter, pericardiocentesis was performed again lat-

erally via another 6-F pigtail catheter placed in the pericardial space, achieving immediate hemodynamic stability (Figure 2a). Approximately 200 mL of blood was aspirated from the pericardial space. A control angiography of the right coronary artery was performed following the drainage catheter misplacement (Video 4*, Figure 2a). No injury to the coronary artery was observed. At the beginning of the procedure, 8000 IU heparin (Nevparin 5000 IU/mL; Mustafa Nevzat İlaç Sanayii A.Ş., Istanbul, Turkey) had been administered to the patient, and the heparin was subsequently antagonized with 2500 IU protamine (Protamin ICN 5000 IU/5 mL; Meda Pharma İlaç San. ve Tic. Ltd. Şti., Istanbul, Turkey). The primary, misplaced 6-F drainage catheter was exchanged for a smaller, 4-F drainage catheter. Ten minutes later, the 4-F catheter

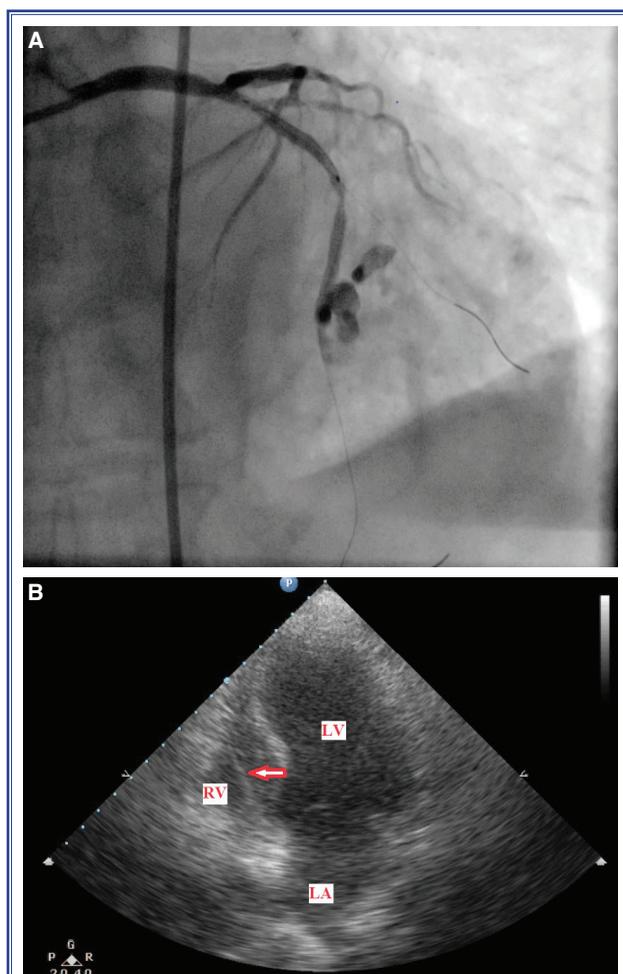


Figure 1. (A) Angiographic image of grade 3 coronary perforation of the left anterior descending artery. (B) Misplaced drainage catheter in the right ventricle seen in modified 4-chamber view echocardiography image (arrow).

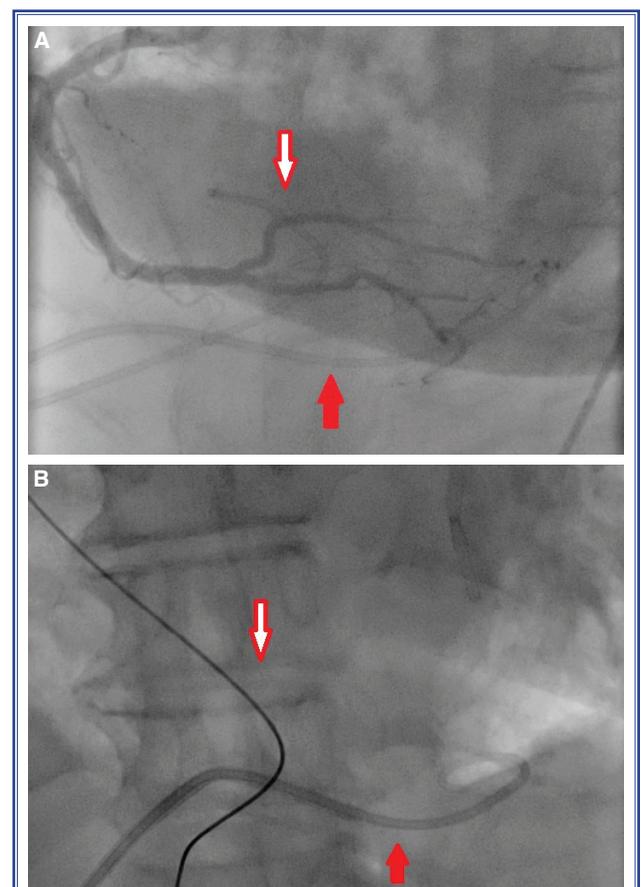


Figure 2. (A) Fluoroscopic image of the misplaced drainage catheter in the right ventricle (white arrow) and the true placement of the drainage catheter in the pericardial space (red arrow). (B) Fluoroscopic image of the misplaced 0.038-inch guidewire in the right ventricle (white arrow) and the true placement of the drainage catheter in pericardial space (red arrow).

was exchanged for a 0.038-inch guidewire. Finally, the guidewire was removed from the right ventricle under fluoroscopy (Video 5*, Figure 2b). Each step took place at a 10-minute interval. Echocardiography confirmed the absence of pericardial effusion or cardiac tamponade at every step. The patient was consulted to a cardiac surgeon, but since the patient was stable after the procedure, no further intervention was required. The patient was then transferred to the intensive care unit. Several hours later, a control echocardiography demonstrated minimal residual effusion in the pericardium without any hemodynamic effect and the second drainage catheter was removed. The patient was discharged from the hospital on the sixth day with good clinical status.

DISCUSSION

Possible complications of pericardiocentesis include right atrium-ventricle laceration or rupture, liver laceration, coronary artery injury, injury to the mammary or intercostal arteries, arrhythmia, pneumothorax, pericardial decompression, and death.^[3,4] The overall major complication rate is 3%, and the rate of iatrogenic ventricle rupture is 1%.^[5] Ventricle rupture typically requires open surgery. Petrov and Dimitrov reported a case of successful percutaneous closure of a perforated right ventricle using the Angio-Seal femoral closure device (Terumo Corp., Tokyo, Japan).^[1] Bakos and Harnek also reported a case of sealing a puncture hole successfully with a vascular closure device.^[2] These cases demonstrated the possibility of treating iatrogenic right ventricle puncture during pericardiocentesis without cardiac surgery.

A number of cases have also been reported describing right ventricular rupture during transient or permanent pacemaker implantation.^[6,7] Most of these cases were asymptomatic, and tamponade can be treated with a conservative strategy after pericardiocentesis. Right ventricular pressure is not high, and the right ventricular free wall has a myocardial thickness of 4 to 5 mm, so perforation can close spontaneously.

In our opinion, this case presents an alternative technique to treat iatrogenic right ventricle puncture occurring during pericardiocentesis without resorting to cardiac surgery or a vascular closure device:

removal of the misplaced catheter by incrementally exchanging it for smaller catheters. This case report offers a method that can be used as a non-surgical treatment option for intracavitary cardiac puncture occurring during pericardiocentesis in a critical situation in patients with high surgical risk and without an on-site surgery center.

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Conflict-of-interest: None declared.

***Supplementary video file associated with this article can be found in the online version of the journal.**

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Anahtar sözcükler: Perikardiyosentez; perforasyon; sağ ventrikül; tamponat.