



Akım Yönlendirilmiş Balon Uçlu Katater ile Oluşan İyatrojenik Pulmoner Arter Rüptürü: Nadir bir Vaka ve Literatür İncelemesi

Iatrogenic Pulmonary Artery Rupture by Flow Directed Balloon-Tipped Catheter: A Rare Case and Review of The Literature

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ÖZET

Akım yönlendirilmiş balon uçlu kataterler ile oluşan iyatrojenik pulmoner arter (PA) rüptürü sağ ve sol kalp kataterizasyonu ve invaziv monitörizasyonun iyi bilinen ve nadir bir komplikasyonudur ve vakaların yaklaşık %50'si ölümcüldür. Çoğu vaka rapor edilmemekte ve küçük yaralanmalara da muhtemelen olduğundan daha az tanı konulmaktadır. Swan-Ganz kataterizasyonundan sonra korkulan ve öldürücü olabilen PA yaralanmasının erken dönemde tanınması ve tedavi edilmesi önem taşımaktadır. Bu yazıda, sağ kalp kataterizasyonu sırasında ani başlangıçlı pulmoner alveolar hemoraji gelişen 64 yaşında pulmoner arteriyel hipertansiyonlu bayan hasta sunulmuştur. Hasta konservatif destek tedavisi uygulandı, kliniği stabil olan hasta sağlıklı olarak taburcu edildi.

Anahtar kelimeler: sağ kalp kataterizasyonu, pulmoner arter rüptürü, pulmoner arter yaralanması, Swan-Ganz katateri

ABSTRACT

Iatrogenic pulmonary artery injury caused by a flow directed balloon-tipped pulmonary artery catheter is a rare complication but remains fatal in almost 50% of cases. It is well-recognized complication of left and right heart catheterisation and invasive monitoring. Many cases are not reported and lesser injuries are probably underdiagnosed. Because of PA injury is a feared complication after Swan-Ganz catheterisation and can be fatal, quick recognition and treatment are essential. Herein, we reported a 64-year-old female of sudden onset pulmonary alveolar hemorrhage during right heart catheterisation in a pulmonary artery hypertension patient underwent catheterisation. The patient managed with conservative and supportive therapy and remained stable. She was discharged with complete healing.

Key Words: right heart catheterisation, pulmonary artery rupture, pulmonary artery injury, Swan-Ganz catheter

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INTRODUCTION

Pulmonary artery (PA) rupture is an uncommon iatrogenic complication of catheterisation during invasive cardiopulmonary monitoring. In the flow directed pulmonary artery Swan-Ganz catheterisation, pulmonary artery rupture is estimated to occur at a frequency of 0.05 to 0.2% (1,2). The mortality rate is 40-50% with this severe complication and can reach as high as 75% in anticoagulated patients (3). Pulmonary artery hypertension, elderly and female gender are other predisposing factors. In most cases, especially during pulmonary artery wedge catheterisation, advanced catheter tip causes arterial wall damage and rupture (4). Due to having small bleeding areas death usually occurs secondary to asphyxia rather than hypovolemic shock.

In the case reports about PA rupture, it usually manifests as cardiogenic shock or sudden death, and is diagnosed postmortem (1,5). In this case report, we described an iatrogenic rupture of a branch of the right pulmonary middle lobar artery due to insertion of a flow directed balloon-tipped pulmonary artery catheter in a 64-year-old female and successful conventional management.

CASE REPORT

A 64-year-old female admitted to cardiology department with progressive dyspnea and shortness of breath, especially in one month. The patient was diagnosed severe mitral regurgitation by echocardiography in an external center and referred to our hospital. Her previous medical treatment includes carvedilol, aspirin, spironolactone/hydrochlorothiazide and digoxin. Electrocardiography showed atrial fibrillation (72 beat/min). The 2-dimensional echocardiography showed severe tricuspid regurgitation, mild aortic regurgitation, moderate aortic stenosis, biatrial dilatation, general hypokinesia of left ventricular and left ventricular ejection fraction was 30% by simpson method. Systolic PA pressure was measured 76 mmHg on echocardiography by bernoulli principle. Preoperative laboratory tests revealed no coagulation abnormalities or any other notable abnormalities, the INR (International Normalized Ratio) value was 1,03.

We planned invasive catheter to the patient because of echocardiography findings. She underwent to pulmonary artery catheterisation using a right femoral venous approach. Catheterisation was performed under radioscapy a guidance with a Swan-Ganz catheter. Systemic arterial blood pressure of the patient during right heart catheterisation was 143/87 mmHg. The catheter was advanced and the balloon wedged into the left pulmonary artery. Pulmonary capillary wedge pressure was found 23 mmHg after balloon-tipped PA catheter inflation in a branch of the right pulmonary artery. After balloon-tipped PA catheter deflation, the patient started coughing and soon afterward experienced massive hemoptysis with loss of at least 100 ml of fresh blood. General state of the patient worsened and the partial oxygen saturation of the patient reduced to 89%. Patient's systemic arterial blood pressure value measured 180/100 mmHg and we quickly started intravenous nitrate infusion and intravenous furosemide (60 mg) with nasal oxygen therapy. We stopped the catheterisation, systemic arterial blood pressure measured 128/81 mmHg after nitrate and furosemide therapy and the patient was transferred to the coronary intensive care unit (ICU). While the patient was in the ICU, a chest radiograph showed cardiomegaly and pulmonary paranchimal opacity in the middle zone thought as pulmonary hemorrhage (Figure 1). Contrast computed tomography scan (CT) of the chest demonstrated about 3x1,5 cm hematoma and pulmonary parenchymal hemorrhage in the right lung middle lobe periphery (Figure 2). The patient was evaluated by thoracic surgeons, and she was recommended tranexamic acid. We started intravenous tranexamic acid (500 mg, three times a day) for two days. The patient remained hemodynamically stable and she was free of hemoptysis. Catheterization was postponed to a later time. We did not give any antiplatelet or anticoagulant therapy to the patient for three days. The patient's hemoglobin levels were stable in the follow up. We followed a 'watch and wait' method. We started warfarin therapy for atrial fibrillation and she was discharged after 6 days.

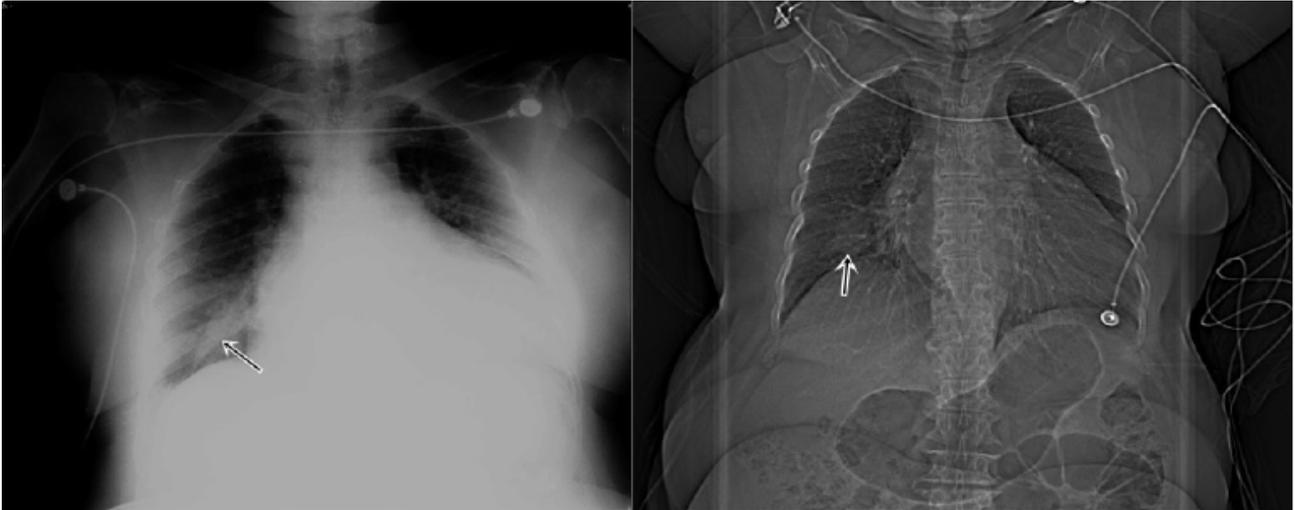


Figure 1: Chest radiography and computed tomography scan: cardiomegaly and pulmonary parenchymal opacity in the middle and lower lobe thought as pulmonary hemorrhage.

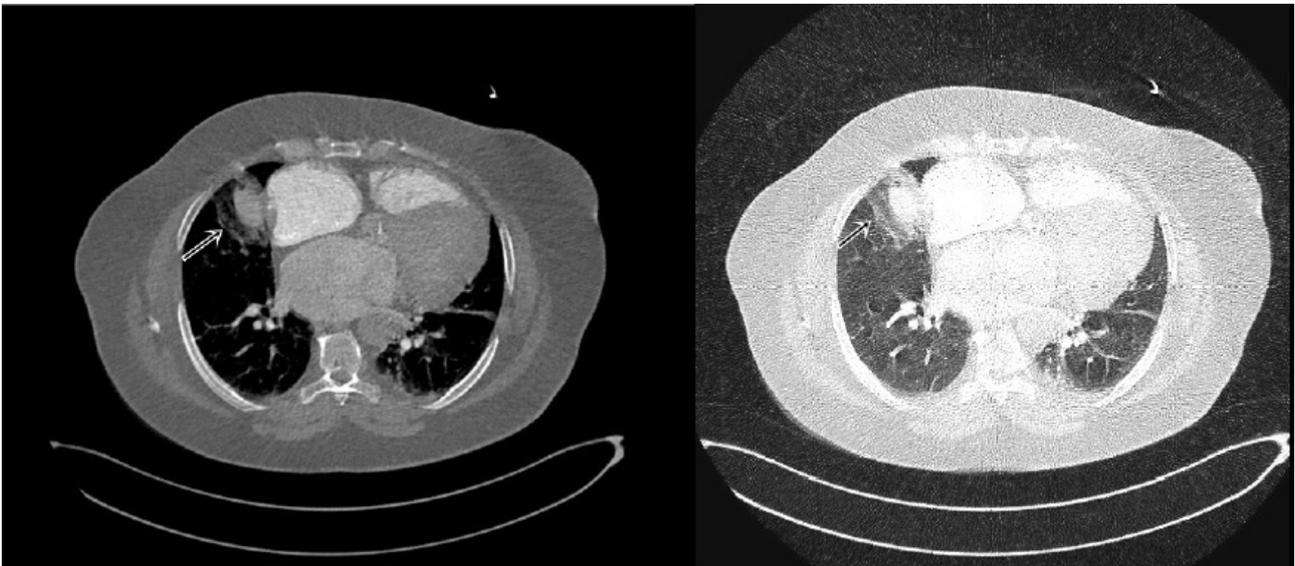


Figure 2: Contrast computed tomography scan (CT) of the chest, in the transverse section: about 3x1,5 cm hematoma and pulmonary parenchymal hemorrhage (intra-pulmonary extravasation of contrast) in the right lung middle lobe periphery.

DISCUSSION

The flow directed balloon-tipped pulmonary artery catheter introduced by Swann and Ganz in 1970 has made possible the measurement of filling pressures in the heart and is extensively used in cardiac catheterisation laboratories and in intensive care units (6,7). In PA catheterisation the balloon-tipped catheter is floated through a central venous access, through the right atrium and right ventricle to the PA. When the balloon is inflated in distal segment of PA, it measures pulmonary capillary wedge pressure.

Arterial puncture problems, postoperative pain and sensation deficit, air embolism, pneumothorax, dysrhythmias, heart block, pulmonary artery rupture, pulmonary infarction, pulmonary artery pseudoaneurysm, pulmonary venous thrombosis are complications of heart catheterisations (8). The rupture of the PA is one of uncommon complication associated with a high mortality rate. It is a serious complication that has been observed with the use of Swan-Ganz catheters and has an estimated incidence of 0.031% and mortality rates of 70% in one

study (9), incidence of 0.05% and mortality rates of 50% in another study (10).

Risk factors in PA injury or rupture with flow directed balloon-tipped PA catheter use include age > 60 years, female gender, pulmonary hypertension, systemic anticoagulation, long-term steroid use and surgically induced hypothermia (11). Complications generally occur when excessive catheter manipulation, advancing the catheter tip too far peripherally and leaving the inflated balloon in the wedge position for long periods. Main symptoms are cough, hemoptysis, dyspnea and cardiac shock. In our case, cough and hemoptysis occurred just after deflation of the catheter.

It is assumed that PA injuries often decrease completely with conservative treatment, but the natural progress of PA rupture is unclear. Some injuries recover without significant traces, but in some cases progress to pseudoaneurysm is seen. Nellaiyappan et al. reported one of the cases about PA injury with pseudoaneurysm formation after Swan-Ganz catheterization (12). It should be remembered that conservative management of the PA injury during catheterisation might have contributed to the higher mortality rate. In conclusion, PA injury is a feared complication after Swan-Ganz catheterization and can be fatal, so when this complication occurs, quick recognition and treatment are essential. Satler LF has developed a document for the

recognition and management of PA injury (13). Also, Mullerworth et al. reported an algorithm about recognition and management of catheter induced PA rupture in seven patient undergoing cardiopulmonary bypass (4). Minor bleeding may cease spontaneously, or may be controlled by bronchial intubation, correction of coagulation deficiencies and positive end expiratory pressure. In patients who develop massive or recurrent hemoptysis after PA catheterisation, PA injury must be considered quickly and aggressive airway protection should be employed along with appropriate catheter based or surgical interventions (4). In our case, she presented with massive hemoptysis but after reducing blood pressure and furosemide injection her hemoptysis decreased, vital signs remained stable, oxygen saturation remained within normal limits.

In conclusion, PA rupture is a life-threatening and potentially lethal complication following PA catheterisation. PA catheters are routinely used in the cardiac catheterisation laboratories, intensive care units and especially for patients with decreased cardiac function and during cardiovascular surgical procedures. The flow directed balloon-tipped pulmonary artery catheters need to be operated with much caution, especially in patients who has risk factors.

Conflicts of interest: None declared.

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