ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 6, Issue – 4, August – 2021 , Page No. : 212 - 215

Difficulty in Removal of Pulmonary Artery Catheter: A Case Report

[1]Amit Kumar, Deptt. of Anaesthesiology, Pandit Bhagwat Dayal Sharma, University of Health Science, Rohtak, Haryana, India.

[2]Geeta Choudhary, Deptt. of Anaesthesiology, Pandit Bhagwat Dayal Sharma, University of Health Science, Rohtak, Haryana, India.

[3]Shreya Sharma, Deptt. of Anaesthesiology, Pandit Bhagwat Dayal Sharma, University of Health Science, Rohtak, Haryana, India.

[4]Prakriti, Deptt. of Anaesthesiology, Pandit Bhagwat Dayal Sharma, University of Health Science, Rohtak, Haryana, India.

[5]Satyaveer Verma, Deptt. of Anaesthesiology, Pandit Bhagwat Dayal Sharma, University of Health Science, Rohtak, Haryana, India.

Corresponding Author: Amit Kumar, Deptt. of Anaesthesiology, Pandit Bhagwat Dayal Sharma, University of Health Science, Rohtak, Haryana, India.

Citation this Article: Dr Amit Kumar, Dr Geeta Choudhary, Dr Shreya Sharma, Dr Prakriti, Dr Satyaveer Verma, "Difficulty in Removal of Pulmonary Artery Catheter: A Case Report", IJMSIR- August - 2021, Vol – 6, Issue - 4, P. No. 212 – 215.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

A pulmonary artery catheter (PAC) is a very important tool in cardiac management during peri-operative period and it provides measurements which helps in the patient management. During open heart surgery this catheter tends to rest against the anterior lateral wall of the right atrium where the catheter may be caught by a suture in the cannulation for cardiopulmonary bypass.[1] Here we describe a very rare complication which is inadvertent surgical suturing of the PAC to the wall of the right atrium that necessitated reopening the chest, cutting the suture and removing the catheter.

Keywords: Pulmonary artery catheter, PAC entrapment, Cardiac surgery.

Introduction

A pulmonary artery catheter (PAC) is a very important tool in the cardiac management during peri-operative period and it provides the following measurements, central venous pressure, pulmonary artery pressure, cardiac output, systemic vascular resistance, pulmonary vascular resistance, wedge pressure, and mixed venous oxygen saturation. There can be complications like bleeding, infection, fragmentation and knotting. Entrapment of the PAC to an intra cardiac structure is a rare but very serious complication. During open heart surgery the catheter tends to rest against the anterior lateral wall of the right atrium where the catheter may

be caught by a suture in the cannulation for cardiopulmonary bypass (CPB).[2] Here we describe a very rare complication which is surgical suturing of the PAC to the right atrium that necessitated reopening the chest, cutting the suture and removing the catheter.

Case Report

A 30-year-old female patient known case of rheumatic heart disease, presented with a history of shortness of breath and palpitations since 6 months. Patient was previously operated for mitral valve repair in 2008 as well. Echocardiography revealed, in addition to normal left ventricular function, severe mitral stenosis, moderate mitral regurgitation, mild to moderate tricuspid regurgitation, dilated left atrium and mild atrial regurgitation. Vital signs were within the normal range. The patient was receiving the following medications: Inj. ceftriaxone sulbactam, piperacillin tazobactam, linezolid, lasilactone, metolazone, sildenafil. During pre operative investigations, patient was diagnosed as hypothyroid and started on 100 micrograms levothyroxine. On airway examination, patient's Modified Mallampatti grade was found to be Grade 0.

The patient was then scheduled for mitral valve replacement. In the operating room PAC was inserted smoothly in the right internal jugular vein. Mitral valve replacement was performed through median sternotomy. Surgery was uneventful and the patient was shifted to intensive care unit where he was fully stable and the patient was extubated 10-12 hours later. The patient was stable on the first postoperative day, and it was planned to remove the PAC but there was resistance on attempt to withdraw the PAC.

Chest radiograph showed angulation of PAC towards right side which gave a possible diagnosis of PAC suture entrapment (Figure 1). Based on the clinical assessment and chest radiograph, it was decided to remove the entrapped PAC surgically. The patient was shifted to operating room again to remove the PAC. In the operating room induction was performed using fentanyl 2µg kg^{-1}, thiopentone 5mg kg^{-1} and vecuronium 0.1mg kg^{-1}. The trachea was intubated and lung ventilated. Left femoral artery and left femoral vein were cannulated. Surgeon performed the median sternotomy (Figure 2). After opening the chest it was found that it was fixed to a suture in the right atrium purse suture. Patient was taken on cardiopulmonary pump, the surgeon managed successfully to free the catheter, which was then pulled out completely. (Figure 3).

After successful surgery, patient was shifted to Cardiac ICU post operatively for elective ventilation and was extubated the next day.

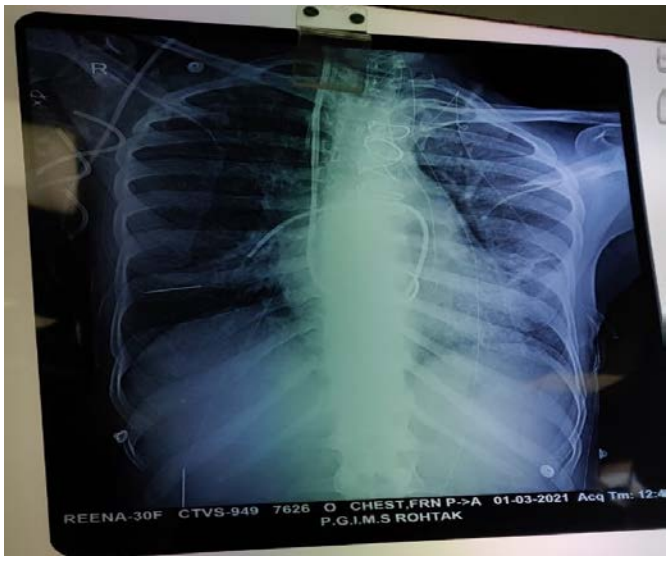

Figure 1: Showing chest radiograph image showing angulation of Pulmonary artery catheter

Figure 2: Showing surgical reexploration after median sternotomy

Figure 3: Showing PAC catheter after surgical removal

Discussion

A PAC is an important tool, which is very useful in the management of patients undergoing cardiac surgery and diagnosis of hemodynamic instability.

Indications for using it include cardio-surgical patients, non cardiac surgery patients with severe left ventricular dysfunction or severe pulmonary hypertension, in the setting of intensive care medicine: septic shock, cardiogenic shock, pulmonary edema, and severe toxemia of pregnancy. In a review of 6245 patients undergoing pulmonary artery catheterization, Shah et al reported extremely low rates of morbidity resulting from the PAC itself.[3] Complications of the PAC include tachyarrhythmia, complete heart block, infections, catheter knotting, and pulmonary artery rupture.

PAC entrapment to intracardiac structures during open heart surgery has been described in the literature, most of the catheter entrapment happened in the right atrium. In this case also the PAC was sutured surgically to the wall of the right atrium while doing the purse suture for inserting the inferior vena cava cannula prior to CPB and necessitated re-exploration of the chest to remove it. There are other case reports of suture entrapment to purse string of superior vena cava, pulmonary artery, retrograde cardioplegia cannula in the right atrium, and to the venting cannula.[4-6] It has to be stressed here that attempts to remove the PAC was done very gently, as forceful traction on the PAC may lead to rupture of the area where the PAC is fixed, leading to fatal bleeding. Possible causes of resistance while removing the PAC are catheter knotting, suture entrapment and catheter deformation.[7,8] Acute angulation of the PAC on chest radiograph suggests suture entrapment.[9] Fluoroscopy can be helpful in diagnosing the reason for entrapment.[10] Transesophageal echocardiography (TEE) is an important tool, which shows deformity of heart contour wall when traction is applied on the PAC.[11,12] In this case PAC entrapment was based on the angulation of PAC which was obvious on the plain chest radiograph. TEE is an important tool for the diagnosis, but could not be done because the patient was uncooperative. As the gentle trial failed to move the PAC it was decided to remove it surgically. If the PAC has not been stitched, non-surgical procedures to

remove the PAC include stone retriever basket, and if the catheter is tethered by a simple stitch around it, simple slipping through the stitch might be useful. In this case although the PAC was pulled about 5 cm at the end of CPB there was bleeding from the site of the purse string after removing the CPB cannula from the inferior vena cava after weaning from CPB; therefore, the surgeon did extra sutures to stop the bleeding from this place, probably at this stage, the PAC was sutured.[9]

Conclusion

In conclusion, we do recommend withdrawal of the PAC 5 to 10 cm at termination of CPB to ensure that it is free. Also trial to pull the PAC has to be very gentle, and force should not be applied under any circumstances. Chest X-ray can be helpful in the diagnosis of PAC entrapment due to suture fixation. Angulation of the catheter is an important diagnostic sign. Finally, if gentle pulling of the catheter fails, then re-exploration is the only option.

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