Catheter-induced pulmonary artery rupture: haemodynamic compromise necessitates surgical repair

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Abstract

Pulmonary artery haemorrhage is thankfully a very rare complication following pulmonary artery catheter insertion. It carries a significant mortality of 50%, and most cases are managed conservatively or with embolization therapy. We present an occult case, in which a patient presented with haemodynamic compromise without haemoptysis or significant haemothorax, who required surgical intervention. We discuss surgical treatment management options and the need for a high index of clinical suspicion to prevent mortality from this condition.

Keywords: Pulmonary artery • Catheter-induced haemorrhage • Iatrogenic pulmonary artery haemorrhage

INTRODUCTION

This case report describes a case of iatrogenic rupture of the superior trunk of the right pulmonary artery (PA) post-pulmonary artery catheter insertion in a 68-year old gentleman following elective coronary artery bypass grafting.

CASE HISTORY

A 68-year old gentleman underwent elective coronary artery bypass grafting. Preoperatively, he had an additive EuroSCORE of 2 (logistic 1.59%). He underwent on-pump, beating heart coronary artery bypass grafting with left internal mammary artery (LIMA) to left anterior descending (LAD) artery, long saphenous vein (LSV) to the 1st obtuse marginal (OM1) and also to the 2nd obtuse marginal (OM2). The procedure thereafter was straightforward; he was taken off bypass on the first attempt, and the total procedure time was 179 min. At this stage, he was managed with a central and left radial arterial line only. No preoperative PA catheter had been inserted.

In the initial postoperative period, 2 h after returning from theatre, the patient required increased vasoconstrictive support and a decision was made to perform a Trans-Oesophageal Echocardiogram (TOE) to evaluate heart function. This revealed a right ventricular dilation and tricuspid regurgitation with good left ventricular function. A decision was therefore made to insert a PA catheter to monitor filling pressures more accurately to guide inotropic management. The PA catheter was inserted with no noted difficulty and the first postoperative night thereafter was straightforward, with 300 ml drainage from one left pleural and two mediastinal drains. Inotropic support remained stable in the first 12 h period overnight with 5 µg/kg/min of dopamine and noradrenaline infusion of 36 µg/kg/h. With satisfactory arterial blood gases and a urine output of 1810 ml in the first 13 h post-operatively, the chest drains were removed and the patient was extubated 21 h post-procedure, while still requiring inotropic support.

On the 26th postoperative hour and 23 h following the insertion of the PA catheter, the patient was noted to be in acute respiratory distress, without increasing oxygen requirements (Table 1). A chest X-ray (CXR) taken at this time did not show a pneumo or haemothorax and filling pressures were noted to be elevated (Fig. 1). Central venous pressure (CVP) was recorded at 20, systolic PA pressure was 30, systolic arterial pressure was 70 and a drop in haemoglobin was seen on laboratory investigation. Clinical examination revealed reduced air entry over the right anterior haemithorax only and a clinical decision was made to perform a resternotomy; on opening the right pleural to investigate for a source of bleeding, fresh blood was seen and evacuated. Bleeding was observed from the superior trunk of the right PA. A clamp was applied across the PA and immediately the patient was able to be resuscitated with noted improvement in pulse, arterial pressure and filling pressures. At no stage had any haemoptysis been noted on reintubation.

Once the hilum was dissected, a clear perforation from the PA catheter was noted at the anterior superior trunk of the PA, which was repaired with pledgeted 4-0 prolene. The patient remained in-hospital for a further 7 days prior to discharge and was well at a postoperative review 6 months following discharge.

DISCUSSION

Catheter-induced PA perforation is fortunately a relatively uncommon complication and its reported incidence in the...
literature is 0.1–0.2% [1]. It was first reported in 1971 [2]. Mortality as a result of this complication, however, is as high as 50% [1, 3, 4]. Most mortality results from consequences of haemoptysis and flooding of the opposite lung with resultant hypoxia and asphyxiation. In this case, the ‘silent’ nature of the complication is demonstrated without warning signs such as haemoptysis or significant haemothorax to alert the attending physician to the cause of the deterioration of the patient. The time delay from insertion to perforation with ‘wedging’ of the catheter, as in our case, also suggests an occult nature, with a high index of suspicion being needed to both diagnose and treat these patients effectively. The best surgical management of these patients when conservative measures such as endotracheal intubation with a double-lumen tube for airway management and risk factor modification are not enough leads one to discuss the best surgical management options. Previously described, lobectomies for bleeding carry increased mortality and morbidity risks for the patient. They are more easily performed through a posteriolateral thoracotomy, so perhaps direct pledgeted suture, as was used in our case, is a less invasive and effective management strategy and could be suggested as first-line therapy with lobectomy as a salvage procedure [5].

PA bleeding is from a relatively low pressure system and is therefore unlike bleeding with systemic pressure such as bronchial arterial supply. Catheter-induced PA haemorrhage is commonly described as being managed by the modification of pulmonary hypertension, control of anticoagulation and airway protection [6]. It has, however, been noted that these patients can re-bleed, even when they are considered to be controlled, and in a case series of five reported in the literature, two patients re-bled within 1 week post-conservative management [6, 7]. Our case highlights the occult nature of the condition and the very high index of suspicion needed for such a rare complication. If, in our case the patient had not had a re-sternotomy, the pleura would not have been opened and the bleeding source discovered. It was also clear with the haemodynamic compromise of this patient that a clear surgical strategy had to be adopted. Resuscitation with fluid was only possible on clamping of the PA. Control of bleeding was accomplished with direct closure using a pledgeted prolene suture.

### CONCLUSION

The previously described investigational algorithm is very helpful, but only describes pulmonary angiogram and embolization as a method of treatment [8]. Clearly in a small minority of

| Table 1: Vital signs recorded before during and after PA catheter insertion |
|-----------------------------|-------------------|---------------------|-------------------|
| Vital signs                 | 1 h postoperative | Prior to PA catheter insertion | 1 h post catheter insertion |
| Pulse                       | 85               | 75                   | 80                |
| BP                          | 110/90           | 90/67                | 100/72            |
| CVP                         | 10               | 17                   | 13                |
| PA systolic pressure        | N/A              | N/A                  | 25                |
| Haemoglobin                 | 10               | 9.5                  | 9.8               |
| Oxygen saturation           | 100              | 100                  | 100               |

Figure 1: Comparison of CXRs—initial postoperative film (A) and CXR post PA catheter insertion (B) and 30 min prior to emergency resternotomy (C).
cases, like the one we describe, surgical control of bleeding is indicated. Following coronary artery bypass grafting, we suggest that with a high index of suspicion, these cases can be managed safely and effectively with surgical control if the patient is too unstable for an interventional procedure.

Conflict of interest: none declared.

REFERENCES


