EJCRIM
European Journal
of Case Reports
in Internal Medicine

PICC LINE ASSOCIATED BRACHIOCEPHALIC VEIN RUPTURE WITH CONSEQUENT MEDIASTINAL PLACEMENT CAUSING PNEUMOMEDIASTINUM AND LARGE TOTAL PARENTERAL NUTRITION BILATERAL EFFUSION

Gonçalo Andrade Soares Ribeiro de Campos

Intensive Care Department, James Paget University Hospital, Lowestoft Road, Gorleston, Norfolk, UK

Corresponding author: Gonçalo Andrade Soares Ribeiro de Campos **e-mail:** goncalo.campos@jpaget.nhs.uk

Received: 12/09/2023 **Accepted:** 16/09/2023 **Published:** 29/09/2023

Conflicts of Interests: The Authors declare that there are no competing interests.
Patient Consent: This was obtained and granted for publication.

How to cite this article: Andrade Soares Ribeiro de Campos G. PICC line associated brachiocephalic vein rupture with consequent mediastinal placement causing pneumomediastinum and large total parenteral nutrition bilateral effusion. *EJCRIM* 2023;**10**:doi:10.12890/2023_004103.

ABSTRACT

We present a rare case of large bilateral pleural effusion, pericardial effusion and pneumomediastinum caused by a peripherally inserted central catheter (PICC) line rupturing the left brachiocephalic vein, causing severe respiratory failure. The PICC line had been inserted with the aim of providing total parenteral nutrition (TPN). The patient developed symptoms within a day with effusions diagnosed on computer tomography pulmonary angiogram (CTPA). Bilateral pleural drains were inserted with a white milk-like substance drained consistent with TPN, prompting a further review of the CTPA revealing the mediastinal-positioned PICC line. The patient was transferred to the thoracic unit and was successfully managed with conservative measures. We propose some ideas such as the use of intracavitary electrocardiogram (IC-ECG) guidance as an adjuvant to obtain a correct and safe position.

KEYWORDS

Intensive medicine, Vascular Access, Thoracic Medicine

LEARNING POINTS

- PICC lines, although seen as safer, have potential for catastrophic adverse effects.
- The use of intracavitary electrocardiogram may be a safe adjunct and even an alternative to the use of a chest X-ray.
- Aspirating blood from all lumens with particular emphasis on the distal most lumen is very important.

INTRODUCTION

The use of PICC lines has revolutionised the way we manage long-term and concentrated intravenous (IV) drug nutrition administration. Although a common intervention often regarded as benign, there can be significant associated complications. However, these have decreased over the years with implementations such as the use of ultrasound, aseptic techniques and chest X-rays to confirm the position. This case describes a rare occurrence with devastating effects; our aim is to bring awareness and propose methods to avoid its occurrence in the future.

CASE DESCRIPTION

A 26-year-old female was referred by her general

EFIM
European Federation of Internal Medicine

Publisher
smc media srl

practitioner with complaints of severe umbilical pain ongoing for 6 days, with a past history of asthma and diplopia. Incidentally found to be Covid positive, she underwent a CT scan which suggested features of Crohn's disease as well as a localised abscess adjacent to the ileum, thus was admitted under the surgical team. An MRI of the small bowel was performed confirming active penetrating terminal ileal Crohn's disease with an adjacent inflammatory mass. She was started on Modulen® IBD and later Fresubin, due to nutritional intolerance, but despite antibiotic therapy she continued to deteriorate clinically, with spiking fevers and inflammatory markers rising. A further CT of the abdomen showed worsening of the terminal ileal abscess with severe colitis prompting surgical intervention. She underwent a laparotomy revealing a complex mass with abscesses containing ileum, omentum and sigmoid which was resected, and an ileostomy was created.

Post-op she was unsupported and stable, needing only 2L oxygen via a nasal cannulae, but due to dietary intolerance a PICC line had been inserted *(Fig. 1)* with a plan to start total parenteral nutrition. Initially admitted to the high dependency unit (HDU), due to good progress over the day she was discharged to the surgical ward with TPN commenced that afternoon.

The following day an acute deterioration of the respiratory system was noted with the patient needing escalated levels of oxygen, and there were some reports of diffuse burning chest pain. A CT pulmonary angiogram (CTPA) *(Fig. 2)* was performed in view of a suspected pulmonary embolism, revealing instead significant bilateral pleural effusions with oedema of the pericardial fat and a small pericardial effusion. The patient was readmitted to the HDU needing high-flow nasal oxygen at a fraction of inspired oxygen of 60%. This eventually escalated to continuous positive airway pressure at an expiratory positive airway pressure (EPAP) of 10 cmH_2O, achieving saturations above 94%. Bedside ultrasound revealed significant effusions bilaterally; FR 18 chest drains were inserted *(Fig. 3)* with 1L of chylous fluid immediately draining from each side *(Fig.4)*. In view of the suspicious findings, the HDU team asked for a further review of the CTPA with the on-call radiologist, revealing

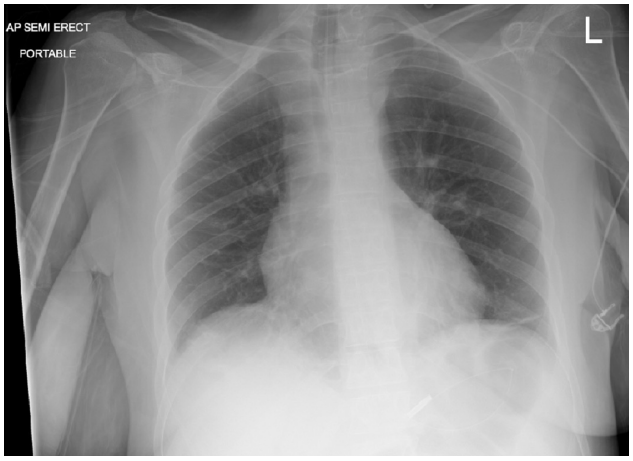

Figure 1. Chest X-ray post PICC line insertion

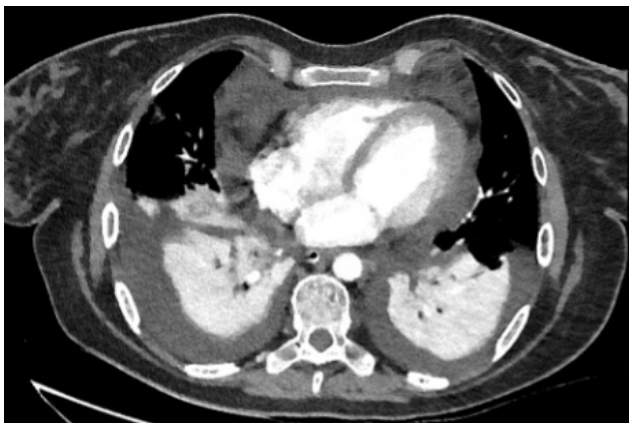

Figure 2. Axial view of CTPA showing large pleural and small pericardial effusions

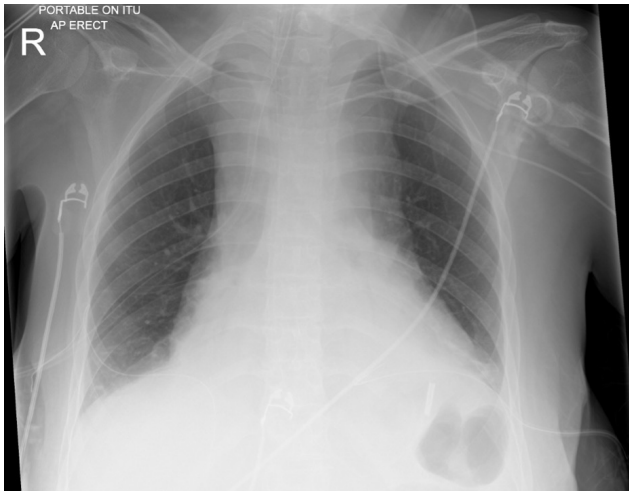

Figure 3. Chest X-ray post BL chest drain insertion

Figure 4. Left and Right drains with white milky (TPN) fluid

the mediastinal position of the PICC line through the left brachiocephalic vein causing a pneumomediastinum and bilateral pleural effusions *(Fig. 5)*. The case was immediately discussed and the patient was transferred to the regional thoracic unit; all use of the line was stopped and the PICC line was kept in place to avoid a potential haemothorax, with the involvement of the vascular team. She was intubated for the transfer and extubated 3 days later at the tertiary centre, improving with conservative management.

The patient was managed on the thoracic unit with a further drain being inserted on the left side; the PICC line was

Figure 5. Sagittal view of CTPA showing PICC line in the mediastinal space illustrated by the arrow

removed without the need for vascular repair. She improved over the next few days and was discharged home 12 days later making progress towards a full recovery.

DISCUSSION

Central venous catheters are used worldwide in the order of millions of insertions per year, and are considered a core procedure in today's healthcare[1]. Peripherally inserted central catheters have been a successful alternative, increasing in popularity with suggestions of a safer profile[2]. Their popularity has been driven by ease of insertion, usability in outpatient settings, potential avoidance of chest and neck complications and a reduction in central line associated bloodstream infections (CLABSI)[3-4].

In our case, despite following standard procedure the migration still occurred thus we would like to propose some ideas to further minimise the risks. Aspiration of blood from all lumens must not be underestimated and failure to aspirate should be seen as a potential sign for abnormal line position[5]. In our case, the PICC line utilised was a double lumen – aspirating from the distal lumen is imperative as there is often a significant distance between the exit orifices. Aspirating from the proximal lumen may be positive for good blood flow while the distal exiting lumen may not, if just the tip is positioned outside the vessel. We suggest considering standardising the use of the intracavitary electrocardiogram (IC-ECG) guided insertion method along with the gold standard chest X-ray. The use of IC-ECG guidance has been shown to correlate with good positioning of the PICC line as shown in multiple studies including a two-centre cohort study[6-7]. This is even effective in patients with abnormal atrial rhythms such as atrial fibrillation, where its use is sometimes labelled as contraindicated[8]. Advantages are immediate repositioning of the line during insertion maintaining sterility, reduction in costs, ionising radiation reduction and efficiency by avoiding delays in giving intravenous drugs.

REFERENCES

1. Deere M, Singh A, Burns B. Central venous access of the subclavian vein. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2022.
2. Fearonce G, Faraklas I, Saffle JR, Cochran A. Peripherally inserted central venous catheters and central venous catheters in burn patients: a comparative review. *J Burn Care Res* 2010;**31**:31–35.
3. Mavrovounis G, Mermiri M, Chatzis DG, Pantazopoulos I. Peripherally inserted central catheter lines for intensive care unit and onco-hematologic patients: a systematic review and meta-analysis. *Heart Lung* 2020;**49**:922–933.
4. Santos FKY, Flumignan RLG, Areias LL, Sarpe AKP, Amaral FCF, de Ávila RB, et al. Peripherally inserted central catheter versus central venous catheter for intravenous access. *Medicine (Baltimore)* 2020;**99**:e20352.
5. Vos T, Abajobir AA, Abate KH, Abbafati C, Abbas KM, Abd-Allah F, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet* 2017;**390**:1211–1259.
6. Smith B, Neuharth RM, Hendrix MA, McDonnall D, Michaels AD. Intravenous electrocardiographic guidance for placement of peripherally inserted central catheters. *J Electrocardiol* 2010;**43**:274–278.
7. Shen Y, Wang G, Song L, Yan X. A retrospective two-center cohort study on the use of routine chest X-ray after peripherally inserted central catheter placement under ultrasound and intracavitary electrocardiography guidance. *Ann Transl Med* 2022;**10**:1315–1315.
8. Yang H, Sloan G, Ye Y, Wang S, Duan B, Tesfaye S, et al. New perspective in diabetic neuropathy: from the periphery to the brain, a call for early detection, and precision medicine. *Front Endocrinol (Lausanne)* 2020;**17**:929.