British Journal of Cancer Research
2018; 1(4): 217 - 221 . doi: 10.31488/bjcr.119

Case Report

Peripheral Inserted Central Catheter Associated Bloodstream Infection Concurrent With Upper Extremity Venous Thrombosis : a Case Report

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Received: August 28, 2018; Accepted: September 25, 2018; Published: September 20, 2018

Abstract

Purpose: To discuss the concurrent onset of venous thrombosis and catheter-related bloodstream infection (BSI) after the insertion of a peripheral inserted central catheter (PICC) to determine better management and prevention of these complications. Methods: PICC was used in a 52-year-old male patient diagnosed with small cell lung cancer. At first, dirty water leaked into the dressing covering the tip of catheter. However, after removing the catheter, the patients suffered from both venous thrombosis and BSI nearly concurrently which were confirmed by organism culture and Doppler study. Results: The patient was treated with combination of antibiotics and anticoagulation therapy. Finally both complications were cured. Conclusion: This case showed a possibility of concurrent venous thrombosis and BSI which was scarcely reported before.

Keywords: catheterization, peripheral, catheter-related infections, venous thrombosis

Introduction

Peripherally inserted central venous catheters (PICCs) are widely used in oncology patients receiving chemotherapy because of the ease of placement, long-term viability and lower preoperative complications compared to central venous catheters(CVCs) [1, 2]. Despite these benefits, PICC is related to the risk of thrombosis and PICC-related bloodstream infection(BSI), which are not very common but severe complications which may increase morbidity and healthcare cost[3]. According to some reports, the incidence of PICC-related venous thrombosis ranges from 2.6% to11.38% [2, 4-9,] , while PICC-related bloodstream infection is 1.8% to 7.7%[10- 12].

PICC related thrombosis always involves deep vein of upper extremity. Interestingly, 35%-71.9% of PICC related thrombosis are asymptomatic, while 1%-25.7% of them are symptomatic [13,14]. PICC related BSI means laboratory confirmed infection of both bloodstream and catheter segment, with the same organism. The classic symptoms of BSI was fever and chill, sometimes but not necessarily with local redness, swelling and purulent secretion of exit site [15].

Though there has been many reports of PICC related BSI or PICC related thrombosis respectively, it is scarcely reported that patient got both of them simultaneously. Here we present an interesting case of a small cell lung cancer (SCLC) patient who was suffered from both PICC related BSI and PICC related thrombosis.

Case Presentation

This case involved a 52-year-old male patient who complained bloody sputum for three weeks and chest pain for two weeks. He was then admitted to respiratory department to get further examination. Chest computed tomography showed left lung central type tumor with left hilar and mediastinum lymph node metastasis. Pathologic diagnosis was small cell lung cancer. He was finally diagnosed with small cell lung cancer T2N2M0, stage IIIA. He was recommended to receive chemotherapy of EP(etoposide&cisplatin) therapeutic regimen. During his chemotherapy, the patient received radiotherapy towards the tumor in left lung with DT6020cGy for 28 days.

PICC line was inserted in the right basilic vein before his first chemotherapy, which was cared every 7days. There had been no PICC related complication until the

patient complained that he carelessly made the transparent dressing wet and the water leaked into the PICC exit site when he was taking a shower, 10 days after his eleventh chemotherapy. At first, the skin of exit site was red without little purulent secretion and there is no edema of the arm (Figure 1A). Antibiotic topical agent was used on the exit site and the dressing was changed every two days. After two days, the patient's arm was slightly edematous and obviously red. His PICC upper arm circumference at that time was about 33 cm compared to initial arm circumference of 31 cm. The patient complained swelling pain of the arm. At the same day, his temperature climbed to 38.1℃. Doppler study of the arm was conducted and revealed just phlebitis. The patency of blood flow is good. On the next morning, the patient complained no remission of pain and edema. The arm was even more painful and the swelling extended to the whole arm. The exit site of PICC was not only red but also with a little purulent secretion. PICC was removed (Figure 1B) because of these complications. At the same time, Catheter segment culture, blood culture and blood test were initiated. The result of blood test showed: White blood cell (WBC): 11.7*109mmol/l, CRP (C-reactive protein): 217.5μg/ml, and D-dimer: 690μg/l. Antibiotics (piperacillin-tazobactam, Qilu Pharmaceutical, 4.5g, introvenous injection, every 8 hours) was administrated by experience. The next day, the arm was still severely swelling and painful. Doppler study was done again and this time it showed venous thrombosis from basilic vein to the axillary vein. In ordered to treat the thrombosis, Nadroparin Calcium injection (GlaxoSmithKline plc., 0.6mL, subcutaneous injection, every 12 hours) was used. Both catheter segment culture and blood culture showed staphylococcus aureu. Drug sensitive test confirmed the organism was sensitive to piperacillin-tazobactam. After two-week's medication, patient's temperature turned normal and the blood culture became negative. The arm circumference returned to normal gradually. Thrombosis was relatively persistent and did not under control until one more month later (Figure 2). During the whole process, white blood cell (WBC) count (Figure 3) , C-reactive protein (CRP) (Figure.4), and D-dimer varied (Figure.5) with the patient's status.

Discussion

This case that PICC related BSI and thrombosis happened nearly concurrently has been rarely reported ever. However, if analyzing the case carefully, we found that "infection" was a little earlier than "thrombosis". In this case, the original symptom is erythema and pyosis, and two days later, patient got fever. At that time, there was no thrombosis according to the Doppler study which showed phlebitis with good blood flowing. Although without microbiological proof, according to clinical manifestation of fever, pyosis at the exit site, and the B ultrasound study, we diagnosed it as bacterial phlebitis and catheter related blood stream infection. Then one day later, the second Doppler study showed obvious venous thrombosis. We summarized the whole process as a sequential events, namely "local infection", "BSI " and at last "thrombosis". We thought these events were related with each other. "Thrombosis" was probably a result of infection, though it was rarely happened and reported in PICC.

In fact, though rarely reported in PICC, infection is involved in mechanism of thrombosis. Thrombosis is the formation of a blood clot inside a blood vessel, obstructing the flow of blood through the circulatory system. The process of thrombosis is a critical protective response that staunches blood loss by generating thrombin and precipitating fibrin and platelet deposits at sites of vascular endothelium or endothelium-endocardium [16, 18]. However, thrombosis also can acted as a "bad guy" when something like "heart failure", "arrhythmia", "cancer" and "inflammation" happens. A relationship between inflammation and thrombosis has been identified in different clinical scenarios where the inflammatory process and coagulation abnormalities are clearly interlinked. For example, there had reported a case that inferior venous cava thrombosis secondary to amoebic liver abscess [17] and two cases of IBD and PICCs developed thrombosis [18]. Researches have demonstrated that inflammation is a potent prothrombotic stimulus [16]. Inflammation can trigger thrombosis through different ways and produce or upgrade C-reactive protein, complements and interleukin-6 [16, 19-20]. C-reactive protein affects the extrinsic blood coagulation cascade and the fibrinolytic system, enhancing the thrombotic response to vascular injury in vivo [19]. Complements can not only induce platelet activation and aggregation but also potentiate thrombin-induced platelet secretion and aggregation [21]. Interleukin-6 induces the expression of intravascular tissue factor, fibrinogen, factor VIII, and von Willebrand factor and lowers the concentration of the natural inhibitors of hemostasis such as antithrombin, protein S and thrombomodulin, a natural anticoagulant [20, 22-24]. In this case, the infection was not only in blood stream, but also concentrated in the focus of the right arm, which explained the local thrombosis.

As it is rarely happened before in PICC patients, we didn't have enough experience of treatment and prognosis. Fortunately, infection and venous thrombosis are eventually under control after a series of anticoagulant and antibiotics therapy.

For the future, we should caution ourselves the possibility of BSI related thrombosis, especially when there are obvious local inflammation. If happens, antibiotic and anticoagulant should be combined to treat it as early as possible.

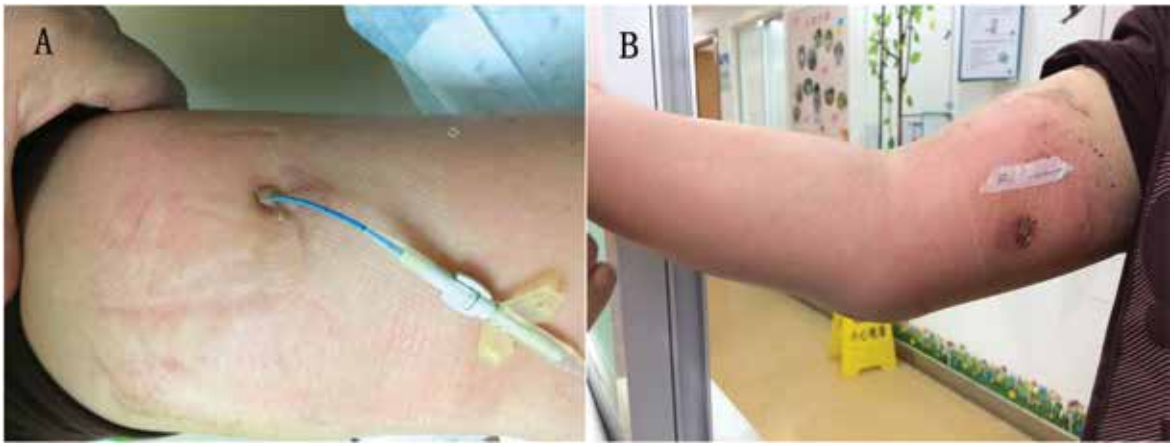

Figure1. Patient's arm. A: Patient's arm with PICC on day 1 after water leaking into the dressing. B: Patient's arm after PICC line was removed.

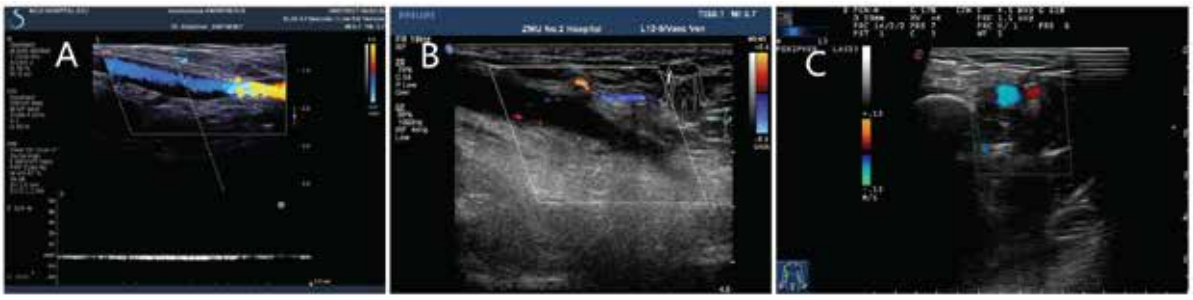

Figure 2. Blood patency variation with the arm by Doppler study. A: Day 3, the patient got a fever and the arm became "red, edema, warm and painful". Doppler study showed "phlebitis without thrombosis"

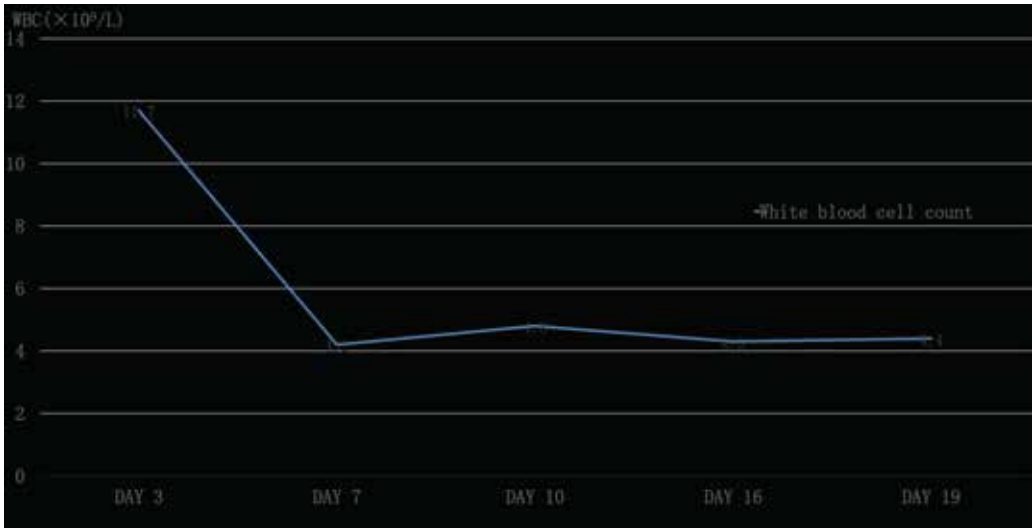

Figure 3. White blood cell (WBC) count variation.

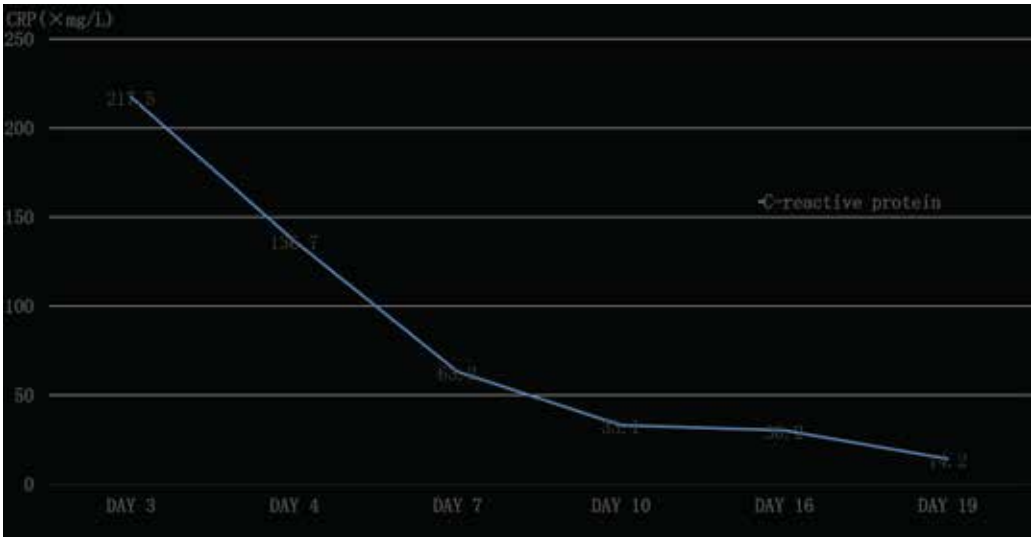

Figure 4. C-reactive protein (CRP) variation.

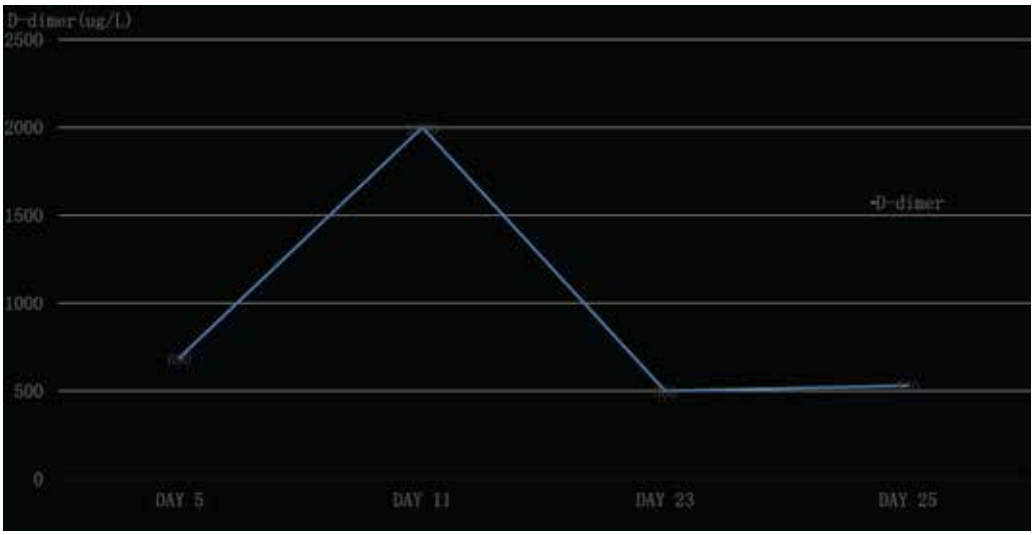

Figure 5. D-dimer variation.

Conflict of Interest

None, allow the journal to review their data if requested.

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To cite this article: Yuejiao Zhang, Shoude Zhang, Ruiyi Zhao. Peripheral Inserted Central Catheter Associated Bloodstream Infection Concurrent With Upper Extremity Venous Thrombosis : a Case Report. British Journal of Cancer Research. 2018: 1:4.