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Case report

Unusual case of PICC-PORT migration in the late postimplantation period

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Abstract. Totally implantable vascular access devices provide long-term, secure venous access and are widely used among patients undergoing chemotherapy, parenteral nutrition, or those with challenging venous access. Despite standardized protocols for insertion and maintenance, complications such as catheter tip migration can occur. We report a case of secondary migration of a peripherally inserted central catheter in a male patient undergoing chemotherapy for refractory mantle cell lymphoma, attributed to high-intensity movements of the left upper extremity. Device malfunction characterized by flushing and withdrawal occlusion raised suspicion of catheter tip migration. The chest X-ray revealed the PICC, implanted via the left basilic vein, had retracted, forming a loop within the left subclavian vein. Although proximal migration can be linked to catheter-related thrombosis, this complication was caused by frequent arm movements during regular physical therapy, resembling Ratchet syndrome observed in the realm of cardiac implantable electronic devices. Due to unsuccessful repositioning attempts, the Port system was entirely removed. (www.actabiomedica.it)

Key words: PICC-port, PICC-port complications, PICC-port secondary migration, Ratchet syndrome, peripherally inserted central catheter, totally inserted vascular access devices

Introduction

A totally implantable vascular access device (TIVAD) is a closed-system device consisting of centrally or peripherally inserted venous catheters and a reservoir (port) placed subcutaneously (1,2). It provides safe and easy central venous access for a prolonged period, achieved simply by percutaneous puncture of the port, with no need for special external care (2,3). The primary benefit of PORT catheters is most evident in chemotherapy treatment, parenteral nutrition, and patients with challenging venous access (1-3). The most popular TIVADs are chest ports, inserted via a subclavian, jugular, or axillary vein, but are associated with a greater risk of early complications during vascular puncture (1,2). Before the introduction of ultrasound, ports were also placed in the forearm and inserted via the cubital vein by direct puncture, fluoroscopy-guided puncture, or even by surgical cutdown. These catheters were commonly referred to as arm ports or brachial ports. With the recognition of ultrasound-guided vascular access, the peripherally inserted central catheter (PICC) port system, introduced via the basilic vein, gained popularity due to a reduction in both early and late potential complications (2). The PICC-port insertion protocol is defined by the SIP-2 protocol (Safe Insertion of PICC-Port) developed by the Italian group GAVeCeLT (Italian group for long-term vascular access) (4). The SIP-2 protocol consists of eight steps from pre-procedural ultrasound assessment of the veins of the arm for the most appropriate vein access and location for the reservoir, appropriate antiseptic measures, choice of vein size and tunneling options, and precise identification of median nerve and brachial artery to

the ultrasound-guided venipuncture of the deep veins at the proximal third of the upper limb using micropuncture kits, ultrasound-based tip navigation through supraclavicular view and intra-procedural tip location assessment by intracavitary electrocardiography or echosonographically using "bubble test" (5). The final step involves the appropriate subcutaneous placement of the reservoir above the biceps muscle in a pocket formed in the mid-third of the upper arm by hydrodissection with normal saline and local anesthetic, and closing the incision with intradermal absorbable sutures (4,5). Although PICC ports have been proven to be a safer long-term vascular access device compared to chest ports and brachial ports in terms of occlusion, certain complications do happen (6). Besides complications related to pocket and wound healing (including localized or bloodstream infections), there are reports of catheter-related thrombosis, malfunction, or occlusion of the device, and catheter dislodgment with tip malposition in the literature (6-9). Meticulous implantation, routine maintenance, and careful handling can reduce the aforementioned adverse events (1,3). In our case, we report a secondary proximal migration of PICC-PORT that resulted in device failure in the late postimplantation period.

Case report

A 77-year-old male with a medical history of refractory mantle cell lymphoma in clinical stage IV was presented for PORT system implantation during a third-line chemotherapy regimen with the R-CHOP protocol. Other comorbidities included anemia in neoplastic disease, recurrent Clostridium difficile colitis, and benign prostate hyperplasia. Previous medical therapy consisted of dexamethasone, antiviral, antimycotic, and antimicrobial prophylaxis, a proton pump inhibitor, a 5-alpha reductase inhibitor, a xanthine oxidase inhibitor, and food for special medical purposes. In the event of cachexia and elevated risk of vascular complications, we decided to implant the PICC-PORT system. A complete blood count revealed pancytopenia, with a leukocyte count of 1.71 x 10^9/L, a hemoglobin level of 100 g/L, and a platelet count of 110 x 10^9/L. Coagulation tests were normal, as well as liver and kidney function tests. We performed a preprocedural ultrasound assessment of the veins in the left arm, confirming the appropriate anatomy and anatomical relationships of the neurovascular structures. The procedure was performed in entirely aseptic conditions after a 2% chlorhexidine wash and sterile covering of the implantation field. After the confirmation of adequate basilic vein caliber by ultrasound, with the ratio of the caliber of the 5 Fr catheter to the caliber of the vein of 1:3-4, we performed ultrasound-guided venipuncture of the basilic vein at the proximal third of the left arm, i.e., yellow zone according to Dawson's Zone Insertion Method (10). Then, using a micro-Seldinger technique with micro-puncture kits, we navigated the guidewire to the superior vena cava via a supra-clavicular ultrasound scan, and finally, the catheter was introduced through the micro-introducer. The total length of the catheter was 37 cm, measured by the traditional method from the insertion site to the parasternal notch and down to the fourth intercostal space, including the distance from the insertion site to the expected location for the pocket of the PORT reservoir. A proper location of the catheter tip could not be confirmed by intracavitary electrocardiography (IC-ECG) due to the patient's restlessness and lack of cooperation. Subsequently, we decided to perform a chest X-ray to verify the catheter tip position, deviating from the recommended echocardiography bubble test (5). The chest X-ray revealed a suboptimal position of the tip, located just below the carina, in the projection between the middle and lower third of the superior vena cava (11) (Figure 1).

The Port reservoir was implanted subcutaneously in a pocket formed by hydrodissection with lidocaine and normal saline and blunt dissection, located 5 cm distally from the puncture site in the mid-third of the upper arm, i.e., the green zone, according to the Zone Insertion Method (10). The skin was closed with intradermal stitches using absorbable monofilament sutures. The postprocedural function of the PICC-port was immaculate. The wound healed without complications. The maintenance and handling of the Port device were performed by trained nurses in the hematology ward. Routine maintenance included flushing the system with saline before and after every application (using the pulsatile or "push and pull" method)

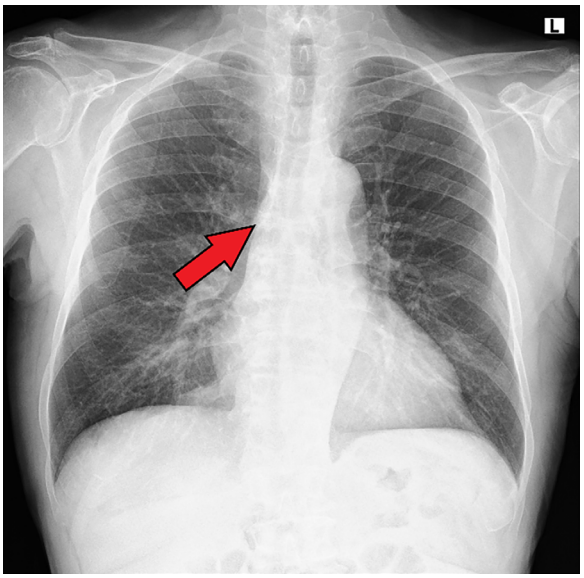

Figure 1. Chest radiogram (anteroposterior view): Peripherally inserted central catheter implanted via left basilic vein with suboptimal placement; the tip is located between the middle and lower third of the VCS.

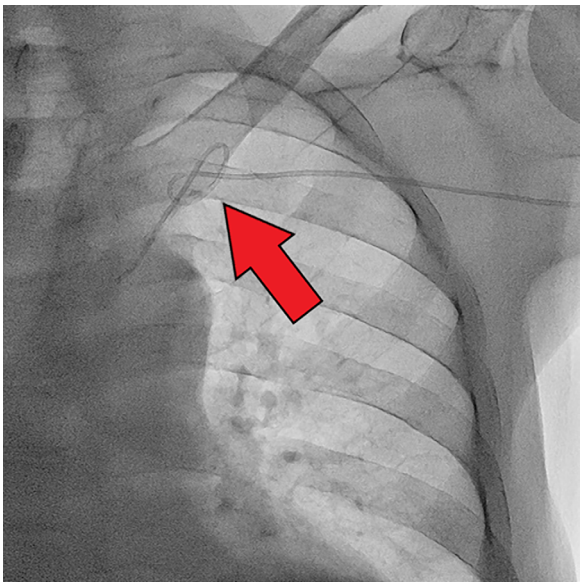

Figure 2. Chest radiogram (anteroposterior view): peripherally inserted central catheter implanted via a left basilic vein, a loop is formed in the left subclavian vein, and the tip is withdrawn proximally in the same level.

and at least once every 2 months if the device was not in use (1-3). After more than 6 months of routine usage, a complete anterograde and withdrawal occlusion during drug application was noticed. The repeated pulsatile flushing method did not make any improvement. A chest X-ray revealed the withdrawal of the looped catheter tip into the left subclavian vein (Figure 2).

The patient denied deliberate excessive arm movement but was regularly doing physical therapy. Given that the patient was completely asymptomatic, we decided to reposition the catheter under fluoroscopy guidance. However, despite unsuccessful attempts even with specialized, extra-support coronary guidewires, an agreement was made to remove the PICC-PORT altogether and, eventually, replace it with a new one after reassessment of the disease.

Discussion

Certain complications with peripherally inserted central catheter port systems usually become apparent through sudden handling difficulties, such as the inability to flush the port or aspirate blood, as well as a slow infusion rate or infusion disruption (6,8). Complications may exist even in the absence of evident clinical symptoms or radiological signs (6). The catheter retraction observed in this case was likely caused by the patient's excessive movement of the ipsilateral upper extremity, particularly extension and abduction at the shoulder joint. A similar phenomenon is described in cardiac implantable electronic devices (CIED) as Ratchet syndrome. It is characterized by the proximal dislocation of one or both pacemaker electrodes without typical rotation of the pulse generator (12). The suboptimal primary catheter tip location certainly represents one of the risk factors for secondary migration and even for catheter-related venous thrombosis (4,11). Furthermore, the traditional total catheter length measurement method, which includes measuring from the insertion site to the parasternal notch and down to the third or fourth intercostal space, has shortcomings. This method may result in an overestimation or underestimation of the PICC length due to the thickness of the pectoralis major and anterior chest wall (13). Additionally, some studies suggest that postural changes, such as transitioning from a supine to an upright position and frequent arm abduction, can lead to proximal catheter migration by up to 19 mm (14). Accordingly, it is advisable to leave the catheter 2 cm longer than the distance recorded by

the IC-ECG since 1 cm of the catheter will be used for connection to the reservoir, and the other 1 cm must be taken into account for catheter proximal retraction during the aforementioned postural changes (4). In addition to other known risk factors, excessive upper extremity movement and high-intensity exercise may lead to mechanical complications of a venous access device.

Ethic Approval: All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This is an observational study. For this type of study, formal consent is not required because no personal data was contained, and there is no concern about identifying information.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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