

Mechanical Complications Related to Central Venous Catheterization: Lessons to be Learned From Two Cases

Santral Venöz Kateterizasyon İlişkili Mekanik Komplikasyonlar: İki Vakadan Öğrenilecek Dersler

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Abstract

Central venous catheterization (CVC) is an interventional technique which is frequently used in critical patient care for diagnosis and treatment. As in all interventional procedures, CVC may be associated with both short and long-term complications. Here, we report two cases to demonstrate infrequent, but possible causes of mechanical complications related to CVC. The first case was a 24-year-old man with non-Hodgkin lymphoma who initially underwent femoral vein, then internal jugular vein (IJV) catheterization. A forgotten guide wire extending from the left femoral vein to the right IJV was noticed several days after the femoral venous catheterization during an attempt at an IJV catheterization. In the second case, who was a 71-year-old woman requiring CVC for hemodialysis and monitorization, the tip of a left IJV catheter, inserted after several attempts, was found in the right IJV. These cases illustrate the importance of obtaining and appropriately evaluating radiograms after venous catheterization, while bearing the possible mechanical complications in mind. (Yoğun Bakım Derg 2010; 3: 70-2)

Key words: Central venous catheterization, mechanical complication, malposition, critical care

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Özet

Santral venöz kateterizasyon (SVK) özellikle yoğun bakım hastalarının izlemi sırasında tanı ve tedavi için kullanılan girişimsel bir yöntemdir. Tüm girişimsel işlemlerde olduğu gibi SVK işleminde de kısa ve uzun dönemde çeşitli komplikasyonlar görülebilmektedir. Bu yazıda SVK ilişkili nadir olarak izlenen mekanik komplikasyonların gözlemlendiği iki vaka sunulmaktadır. İlk vaka önce femoral ven ardından da internal juguler ven (IJV) kateterizasyonu uygulanan 24 yaşında Hodgkin dışı lenfomalı bir erkek hastaydı. Femoral venöz kateterizasyondan günler sonra, IJV kateterizasyon yapılacağı sırada sol femoral venden sağ IJV'ye uzanan unutulmuş bir kılavuz tel farkedilmişti. Hemodiyaliz ve monitorizasyon için SVK gereken 71 yaşında bir kadın hasta olan ikinci vakada ise bir çok denemeden sonra yerleştirilmiş olan bir sol IJV kateterin ucu sağ IJV'de bulunmuştu. Bu vakalar, venöz kateterizasyondan sonra radyogramlar elde etmenin ve olası mekanik komplikasyonları akılda tutarak onları uygun bir şekilde değerlendirmenin önemini vurgulamaktadır. (Yoğun Bakım Derg 2010; 3: 70-2)

Anahtar sözcükler: Santral venöz kateterizasyon, mekanik komplikasyon, malpozisyon, yoğun bakım

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Introduction

Central venous catheterization (CVC) is one of the interventional procedures often used in critical patient care. A central venous catheter can be inserted for intravenous drug therapy, fluid infusion and parenteral nutrition, hemodialysis and ultrafiltration, and hemodynamic monitorization in almost all critically ill patients. As in each and every interventional procedure, CVC may also be complicated in both emergency and elective settings. Complications can be classified into three groups: mechanical, infectious and thrombotic (1). Femoral venous catheterization is usually used in cases that require an urgent central venous route. Thrombotic and infectious complications have more often been reported in femoral approaches. However, recent

studies have shown that there might be an increased risk of colonization in internal jugular venous (IJV) catheterization as well (2, 3). Mechanical complications, on the other hand, have often been reported in subclavian and IJV catheterizations (2, 3). Arterial puncture, catheter malposition, pneumothorax, hemothorax, air embolism, subcutaneous hematoma and arrhythmia are some of the mechanical complications. Mechanical complications are important because they can occur during or immediately after the catheterization, and additional interventional procedures to treat these complications are necessary. We report two cases with rare mechanical complications due to CVC in the Medical Intensive Care Unit (MICU) to stress the importance of obtaining, and appropriately evaluating, radiograms after the procedure.

Case 1

A 24-year-old man with T-cell non-Hodgkin lymphoma was admitted to the oncology ward for high dose methotrexate chemotherapy. Chemotherapy was complicated by tumor lysis syndrome and acute renal failure. Hemodialysis was performed after the insertion of a 11F catheter inserted to his left femoral vein. During the course of the disease, he developed acute respiratory distress syndrome and respiratory failure, he was intubated and transferred to MICU. Since the femoral catheter could not be used effectively in hemodialysis, the case was consulted with the Interventional Radiology Department for the insertion of another central venous line. When the interventional radiologists examined the right internal jugular vein with ultrasonography, they noticed a foreign object. Fluoroscopy revealed that the foreign object was a forgotten guide wire extending from the left femoral vein to the right internal jugular vein (Figure 1a and 1b). The left femoral catheter was removed and a 10 F sheath was inserted. The guide wire was removed without any complication by using a 20 mm snare (Figure 1c). When the previous chest x-rays were re-evaluated, it was seen that the guide wire was present on the films, but it was not noticed and mistakenly considered as electrode cables (Figure 2).

Case 2

A 71-year-old woman was admitted to MICU with acute renal failure and hypovolemic shock due to gastrointestinal bleeding. Right IJV catheterization was attempted several times for invasive hemodynamic monitoring and hemodialysis, but it could not be performed. Then the catheter was inserted into the left IJV. During follow-up, the left IJV catheter had to be removed due to a catheter infection. Replacing it with a new IJV catheter over a guide wire failed because of a clot obstructing the distal tip of the catheter. A new catheter was inserted into the left IJV after removal of the previous one. The control x-ray after catheterization revealed that the distal tip of the catheter inserted via the left IJV was in the right IJV (Figure 3). The catheter was then removed and catheterization via the right IJV was performed without any complication.

Discussion

Although the definitions of mechanical complications and study designs vary widely in the literature, mechanical complications due to CVC are frequently reported. The femoral route has been claimed to be the safest in terms of mechanical complications. However, a recent study of 289 patients showed a mechanical complication rate of 17.3%

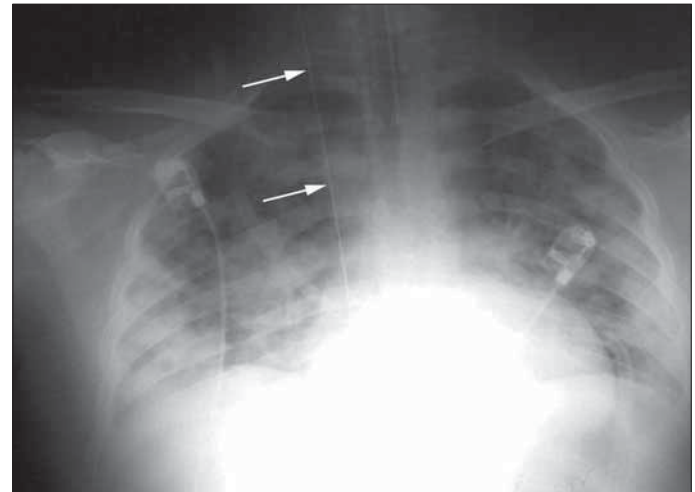


Figure 2. Chest X-ray shows the guide wire in the right internal jugular vein (Arrows point to the guide wire)

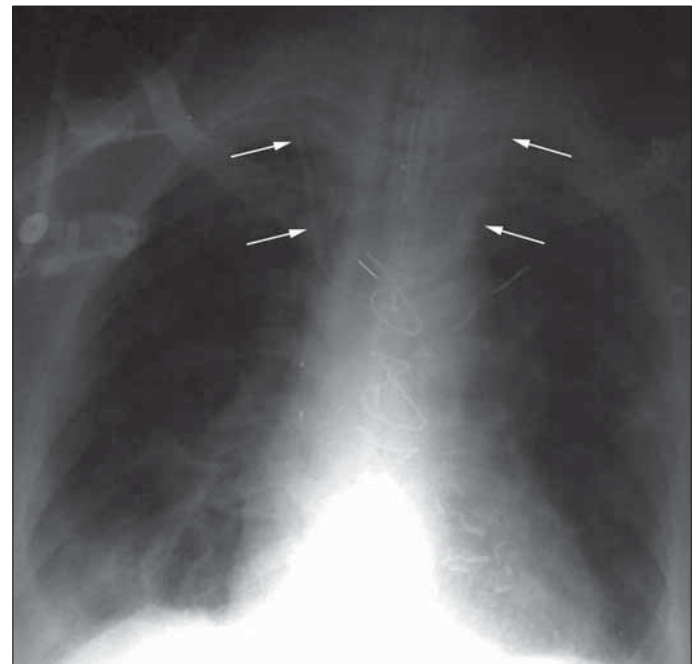


Figure 3. The tip of central venous catheter inserted via the left internal jugular vein is seen in the right internal jugular vein (Arrows pointing the course of the catheter)

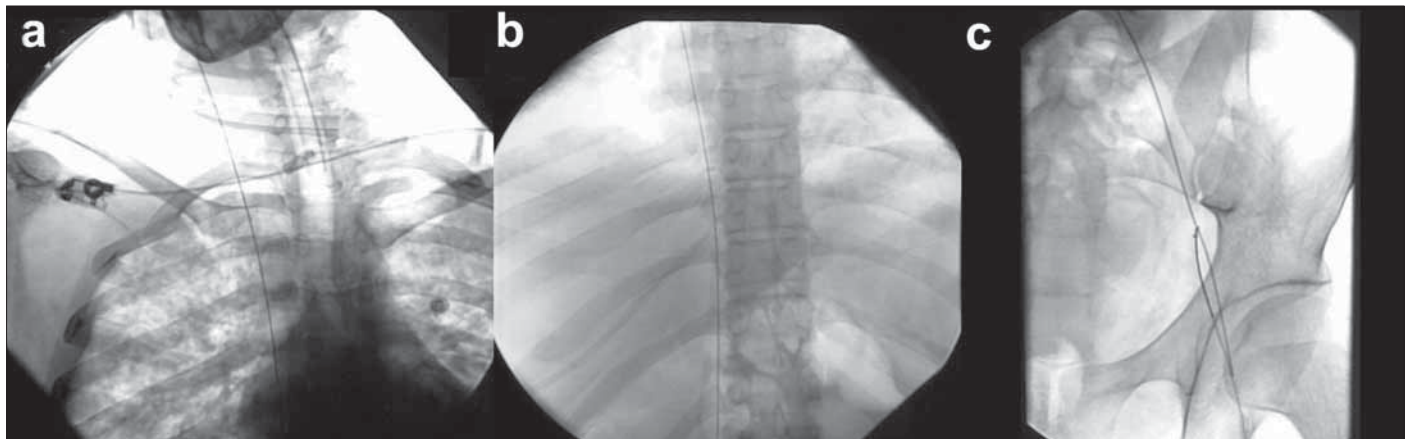


Figure 1. Fluoroscopic views of guide wire extending from right internal jugular vein (1a) to inferior vena cava (1b) and the left femoral vein (1c)

with the femoral route and 18.8% with the subclavian route (2). In another study which recruited 385 patients in an ordinary care setting, mechanical complication rates of subclavian, internal jugular and femoral venous catheterizations were 12.9%, 7.5% and 9.4%, respectively (3). The malposition of the catheter tip into the right ventricle or outside the thorax has been reported in 3.3% of patients overall among 1619 CVC (4). The rate of this complication was particularly higher for subclavian venous catheterization (9.1%).

Factors that increase the rate of mechanical complications are, longer duration of catheterization procedure, catheterization performed at night, insertion of the catheter by a less experienced person, very thin or obese patients, degeneration of the patient's anatomy due to surgery, and irradiation or previous catheterization attempts (2, 4). In addition, the complication rate increases parallel to the number of attempts (3).

In the first case presented, the guide wire was not removed after the insertion of the catheter. The tip of the guidewire should be kept outside the catheter as a safety precaution and it must be ascertained that it is removed after the insertion of the catheter. All the materials used should be inspected after the procedure. These precautions could be undertaken if the catheterization is performed by a more experienced person, and this complication can be avoided.

In the second case, the tip of the catheter which was inserted to left IJV turned to the right IJV. Ruesch et al., in their systematic review, found catheter malposition rates of 5.3% and 9.3% for IJV and subclavian vein catheterization, respectively (5). Malposition of the catheter via IJV is usually seen during left-sided catheterization. While the cath-

eter is being inserted into the left IJV, the guide wire either passes to the superior vena cava or the right brachiocephalic vein and right IJV.

In conclusion, complications might be inevitable during or after central vein catheterization as with other interventional procedures. To reduce the rate and impact of mechanical complications, the physician inserting the catheter should be experienced, should not attempt more than two unsuccessful catheterizations and should investigate the material used carefully after the procedure. The most appropriate route and technique should be chosen by considering the patient's characteristics and the physician's own experience.

Conflict of Interest

No conflict of interest is declared by authors.

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