



A Devastating Complication of Central Venous Catheter Insertion

Maryam Bahreini¹, Alireza Jalali², Atefeh Abdollahi^{1*}, Babak Choobi Anzali³

¹Department of Emergency Medicine, Sina Hospital, Tehran University of Medical Sciences, Tehran, Iran

²Zabol University of Medical Sciences, Zabol, Iran

³Urmia University of Medical Sciences, Urmia, Iran

Retained guidewire is a major complication of central line placement. We present a patient with infective endocarditis caused by a retained guidewire. A young man admitted to our emergency department complained of debilitating weakness, productive cough, and fever for seven days. Chest radiography showed some lesions in both lungs as well as a retained guidewire. Past history revealed a thermal burn injury one month before, during which an internal jugular central venous line was inserted. Echocardiography showed multiple large vegetations in right atrium and right ventricle. Thus, infective endocarditis and multiple embolic lung lesions were treated with empirical antibiotics. Guidewire was removed by vascular surgery service. Unfortunately, the patient died before undergoing open-heart surgical intervention. It is believed that central vein catheterization requires special attention to perform through the Seldinger technique skillfully and under supervision to avoid preventable complications.

Key words: *central venous catheterization, complication, infective endocarditis*

Introduction

Central venous catheter insertion might lead to significant complications besides the numerous benefits they have.¹ The morbidity, mortality, and financial consequences of a retained guidewire are devastating rendering special attention to avoid them. We present a case of infective endocarditis with multiple infectious infarcts secondary to a retained guidewire. Informed consent was obtained. The ethics of this article has been approved by the Tehran University of Medical Sciences Institutional Review Board. This report is in line with the surgical case report guidelines (SCARE) criteria.²

Case Report

A 18-year old man presented with progressive generalized weakness for 20 days which made

him unable to ambulate. He has also complained of productive cough with some blood-tinged sputum, frequent episodes of fever, and chills without any sequential pattern for seven days. In addition, he complained of a pleuritic chest pain, decreased appetite, and weight loss. Past medical history revealed that the patient had been admitted to a burn center because of electrical injury leading to an upper limb fourth-degree burn and subsequent right above-elbow amputation two months before. Vital signs showed sinus tachycardia of 127/min, tachypnea 32/min, and oral temperature of 38.8°C. Physical exam findings include pallor, no meningismus, a II/VI systolic murmur in the left sternal border, and basilar coarse crackle in both lungs. Muscle strength of proximal and distal upper and lower extremities was symmetric with normal sensory, reflex, and coordination exams and there was no focal neurologic deficit.

Received: September 6, 2018; Revised: October 22, 2018; Accepted: November 23, 2018.

*Corresponding author: Atefeh Abdollahi, MD, Department of Emergency Medicine, Sina Hospital, Tehran University of Medical Sciences, Imam Khomeini Ave., Hasan Abad Square, Tehran 1136746911, Iran. E-mail: draa80@gmail.com

Laboratory data findings were severe hypochromic-microcytic anemia with hemoglobin 4.8 g/dL, hyperbilirubinemia (total = 2.4 mg/dL, direct = 0.6 mg/dL), elevated lactate dehydrogenase, elevated international normalized ratio, a respiratory alkalosis and metabolic acidosis (pH = 7.52, HCO_3^- = 18 mEq/L, partial pressure of CO_2 [PCO_2] = 22 mmHg), normal urine analysis, thrombocytopenia, and elevated C-reactive protein.

Chest X-ray and chest computed tomography showed basal patchy infiltration in favor of a necrotizing pneumonia and also a retained guidewire of which, one end was located in the right subclavian vein while the other end was within the inferior vena cava coiling back into the right ventricle (Figs. 1 and 2).



Fig. 1. Scout view of the patient's chest computed tomography showing a retained guidewire of a central venous catheter located in the right subclavian vein while the other end was within the inferior vena cava coiling back into the right ventricle.

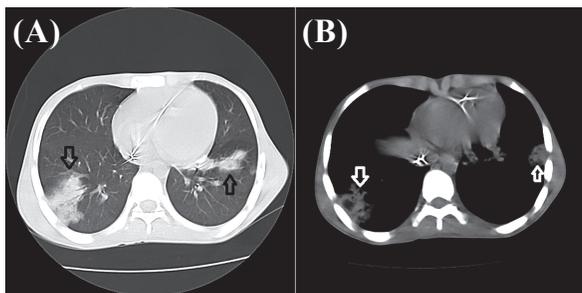


Fig. 2. Axial chest computed tomography showing the retained guidewire coiled in inferior vena cava back into the right ventricle as well as multiple basal mass-like consolidations in favor of the necrotizing pneumonia (shown by arrows); (A) mediastinal window, (B) pulmonary window.

It was retained while inserting the central line in the previous admission two months before and was not detected and missed in place.

In trans-thoracic echocardiography, multiple vegetations were detected on tricuspid leaflets, right atrium, and right ventricle resulting in severe tricuspid regurgitation with mild pulmonary hypertension due to a large embolized vegetation into pulmonary artery requiring emergent cardiac surgery. He was empirically treated with piperacillin-tazobactam and vancomycin and the guidewire was removed by endovascular intervention. He was admitted to the intensive care unit and planned to be transferred to the cardiac surgery ward. At once, the patient exhibited an episode of jaw locking and unresponsiveness during which asystole was occurred and generous efforts according to the advanced cardiac life support guidelines were not successful. Unfortunately, he died of an iatrogenic retained wire complication.

Discussion

Central vein catheterization (CVC) provides a useful route for hemodialysis, intravenous medications, parenteral nutrition, monitoring hemodynamics, plasmapheresis, etc. The Seldinger technique is the most common method for placing a CVC. It is characterized by inserting the guidewire through the hub of the needle, removing the needle and then, advancing the catheter until the guidewire comes out of the catheter, then, advancing the catheter into the vessel while holding the guidewire and finally conducting the critical step of removing the guidewire.³

Generally, CVC has some early and late complications. Arterial puncture and hematoma, pneumothorax, hemothorax, and air embolism are reported early complications whereas, venous thromboembolism or infection are commonly late ones.³ However, retained central line guidewires or embolization of catheter fragments are rare but can lead to life-threatening embolic complications depending to the site they are being entrapped.³ Patients usually present with respiratory symptoms, dysrhythmias, myocardial or vessel wall perforation, tamponade, sepsis, superior vena cava syndrome, or symptoms related to the various thromboembolisms and may rarely be complicated by endocarditis as seen in our patient.³ Regarding the risk of wire thrombosis and endocarditis, these manifestations should raise our suspicion in patients with suggestive symptoms in conjunction with a history of

catheterization. Late complications manifest diversely and suggest a wide range of differential diagnoses including sepsis syndromes, parasitic infections with febrile paroxysms, chronic lung infections such as tuberculosis in endemic areas, high pulmonary artery pressure states, etc.^{1,3} Mortality rate is significant and related to the exact route of guidewire passage through heart and great vessels. Pulmonary artery retained guidewires lead to lower mortalities than those in the right heart which results in the highest mortality rates.³ Although rare cases of asymptomatic retained guidewires have been reported, mostly attached to the vessel wall and were discovered after 14 or 20 years, it is believed that missing the wire is nearly fatal.^{4,5}

The preferred removal method is percutaneous retrieval and surgery is reserved for removal failure. It can be best performed under fluoroscopic guidance depending on the location and size of the foreign body via a gooseneck snare catheter during endovascular snare method by a vascular interventionist. Rarely, the patient must undergo a sternotomy to have the wire removed by a cardiac surgeon.⁶ However, the best way to avoid these consequences is to prevent them. The guidewire can be grasped as soon as it becomes visible through the catheter lumen during catheter advancement and this can be easily achieved by something like a needle-holder. Other factors such as overtired or inattentive physician and inefficient supervision are all preventable even in true emergency conditions. Generally, less than 20 cm is sufficient in adults to advance a guidewire in the vein.³ There should be an instrument count, including the guide wire and a verbal check when the wire is removed with documentation just like an instrument count. It is prudent to emphasize on the guidewire removal in training process, being alarmed of the complications, to look for a removed guidewire, and to check both lumens of the catheter for appropriate flow.⁷ Post-CVC X-rays right after the catheter placement is routine for jugular and subclavian vein insertions and can easily diagnose and reduce the complications. Considering the reports of this error that may occur under staff supervision or by experienced physicians, it is suggested that the situation is a significant human error especially in cases which were missed post-procedure on radiography.⁸ It would be best to design some safer catheter kits, for instance guidewires in bright-color, particularly in femoral insertions that radiography is not necessarily performed.⁹ Finally,

some CVC guidelines have been developed to reduce the complications.¹⁰

Conclusions

Central venous catheters are very helpful in certain situations; however, a retained guidewire is believed to be a preventable potentially-fatal complication. It seems logic to pay special attention to remove the guidewire during training process, performing, or supervising the procedure.

Conflicts of Interest Statement

None declared.

Acknowledgements

The authors would like to kindly thank Mrs. Shabnam Kaviani for her contribution in data collection.

Previous Publication/Presentations

None.

References

1. Weerasuriya N, Indrakumar J, Kamaladasa KV, Hewage UCL. Nosocomial infective endocarditis due to a retained guide wire. *Ceylon Med J* 2002;47:141-142. doi:10.4038/cmj.v47i4.3425
2. Agha RA, Fowler AJ, Saeta A, Barai I, Rajmohan S, Orgill DP. The SCARE statement: consensus-based surgical case report guidelines. *Int J Surg* 2016;34:180-186. doi:10.1016/j.ijssu.2016.08.014
3. Williams TL, Bowdle TA, Winters BD, Pavkovic SD, Szekendi MK. Guidewires unintentionally retained during central venous catheterization. *J Assoc Vasc Access* 2014;19:29-34. doi:10.1016/j.java.2013.12.001
4. Lin YN, Chou JW, Chen YH, Liu CY, Ho CM. A 20-year retained guidewire, should it be removed? *QJM* 2013;106:373-374. doi:10.1093/qjmed/hcs038
5. Reynen K. 14-year follow-up of central embolization by a guide wire. *N Engl J Med* 1993;329:970-971. doi:10.1056/NEJM199309233291319
6. Savage C, Ozkan OS, Walser EM, Wang D, Zwischenberger JB. Percutaneous retrieval of chronic intravascular foreign bodies. *Cardiovasc Intervent Radiol* 2003;26:440-442. doi:10.1007/s00270-003-2674-1
7. Schummer W, Schummer C, Gaser E, Bartunek R. Loss

- of the guide wire: mishap or blunder? *Br J Anaesth* 2002;88:144-146. doi:10.1093/bja/88.1.144
8. Vannucci A, Jeffcoat A, Ifune C, Salinas C, Duncan JR, Wall M. Retained guidewires after intraoperative placement of central venous catheters. *Anesth Analg* 2013;117:102-108. doi:10.1213/ANE.0b013e3182599179
 9. Lum TE, Fairbanks RJ, Pennington EC, Zwemer FL. Profiles in patient safety: misplaced femoral line guide-wire and multiple failures to detect the foreign body on chest radiography. *Acad Emerg Med* 2005;12:658-662. doi:10.1197/j.aem.2005.02.014
 10. Rupp SM, Apfelbaum JL, Blitt C, et al.; American Society of Anesthesiologists Task Force on Central Venous Access. Practice guidelines for central venous access: a report by the American Society of Anesthesiologists Task Force on Central Venous Access. *Anesthesiology* 2012;116:539-573. doi:10.1097/ALN.0b013e31823c9569