

# Guidewire Embolism During Central Venous Catheterization: Options In Management

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## Abstract

**Introduction:** Guidewire embolism during central venous catheterization is a rare iatrogenic complication that can be avoided with adherence to safe standardized insertion techniques.

**Case Report:** We report two cases of guidewire embolism occurring during central venous catheterization. The patients were investigated with chest radiographs and contrast CT scans to determine the location of the in-situ guidewires. In both cases, the embolised guidewires were successfully retrieved using a percutaneous endovascular technique.

**Discussion:** The management of guidewire embolism remains speculative. Extraction of the guidewire via percutaneous endovascular techniques is advised; surgery being reserved for failed percutaneous measures. The management of the in-situ guidewire after failed extraction is controversial; however, long-term anticoagulation and prophylactic antibiotics are appropriate.

**Conclusion:** Most cases of guidewire embolism during central venous catheterization can be safely managed using percutaneous endovascular techniques. Surgical extraction is seldom performed.

## INTRODUCTION

Guidewire embolism remains a rare phenomenon with few reported cases in the literature. We present two cases of guidewire embolism during central venous catheterization highlighting the complications of central venous catheterization and to increase awareness of the invasiveness of this procedure.

## CASE REPORT

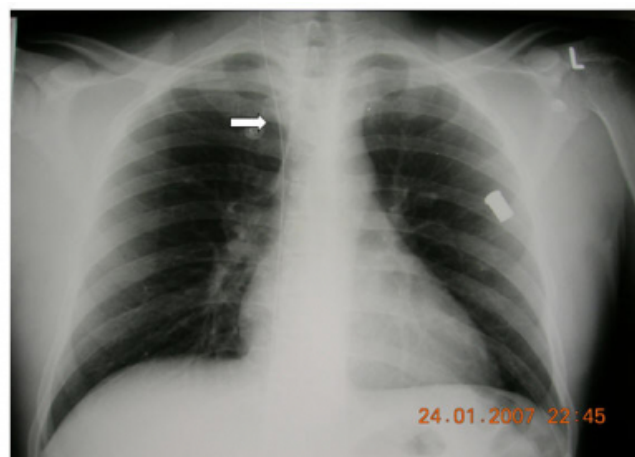
### CASE 1

A 30-year-old patient sustained a Zone-II gunshot neck injury. A central venous line was inserted via the right subclavian vein for fluid administration. Subsequently, the guidewire embolized. The patient remained haemodynamically stable with no immediate complications of an in-situ guidewire. The chest x-ray revealed a fine radio-opaque linear density in the cardiac silhouette (figure 1). A CT angiogram, which was performed to assess for vascular injury from the gunshot injury, revealed the guidewire in the internal jugular vein (figure 2). An unforeseen time delay of several hours resulted in migration of the guidewire to the right external iliac vein. Under fluoroscopy, the right femoral vein was cannulated and the guidewire was easily removed using the gooseneck snare device (figure 3). The patient was stable throughout the

procedure with no subsequent complications.

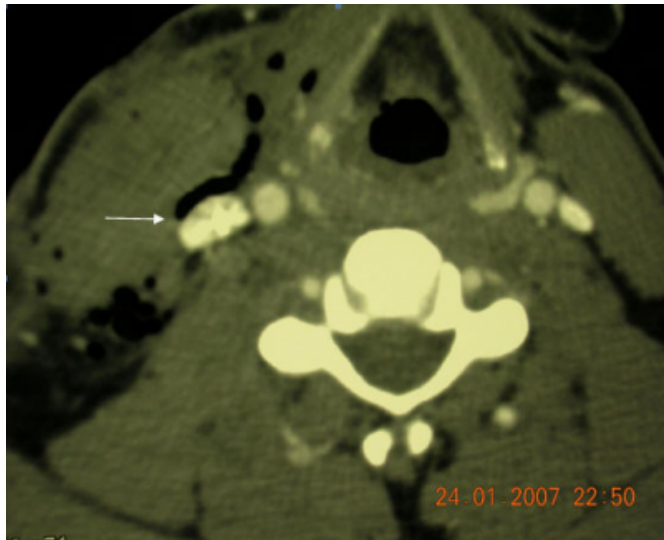
### Figure 1

Thick arrow showing fine radio-opaque density (guidewire) in the cardiac silhouette



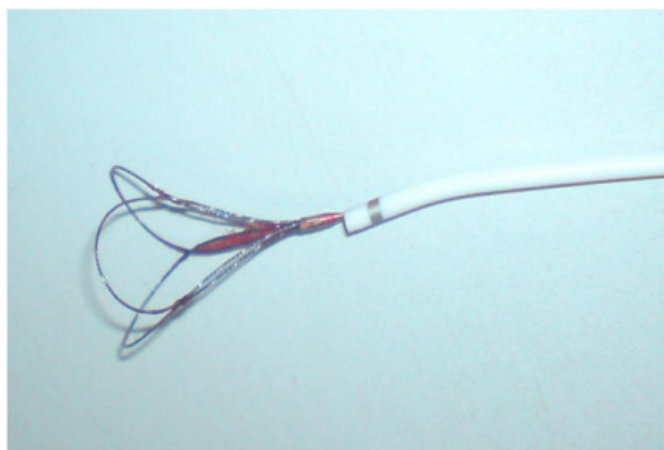
**Figure 2**

Thin arrow showing guidewire visible in right internal jugular vein



**Figure 3**

Gooseneck snare device



### CASE 2

A 31-year-old female, admitted in ICU for management of tetanus following a motor-vehicle accident, had a central venous line inserted via the femoral vein using the Seldinger technique. Subsequently the guidewire embolized. The patient was referred to the vascular unit three weeks later for removal of the guidewire. Reasons for the delay in diagnosis and referral are unknown. The guidewire had migrated from the femoral vein to the inferior vena cava, across the right atrium, superior vena cava and into the right internal jugular vein. The pre-intervention venogram showed no evidence of thrombus associated with the in-situ guidewire. The right common femoral vein was cannulated and the guidewire was easily extracted using the gooseneck snare device. There

were no procedure-related complications.

### DISCUSSION

Guide-wire embolism is rare, occurring approximately twice in several thousand insertions [1]. In case 1, the guidewire embolised due to the inexperience of the operator who had not held firmly on the guidewire during insertion of the catheter and an excessive length of guidewire was introduced. Signs that may suggest an embolised guidewire are: poor venous backflow from the distal lumen of the catheter; resistance to injection via the distal lumen; guidewire visible on a radiograph; and absence of guidewire when inspecting the catheter set [2]. The recommended length of guidewire to be inserted is 18.4cm via the Seldinger technique from the right subclavian vein [3]. An excessive length of guidewire inserted has been associated with embolic complications [4]. The complications of an in-situ guidewire are namely arrhythmia, vascular damage, thrombosis and pulmonary embolism and infection [5].

Guidewire embolism is a preventable complication if simple measures are routinely practiced using the Seldinger technique. These include guidewire inspection before insertion and maintaining a firm grasp on the guidewire, especially when railroading the catheter over the wire. Forcibly introducing the guidewire against resistance may lead to fracture of the guidewire and subsequent embolization. A routine post central line insertion radiograph will confirm the position of the central venous catheter tip and is useful to detect the presence of a guidewire in the central vasculature. Fifty-three percent of the reported cases show a significant delay in establishing the diagnosis. Auweiler et al. suggested that human error and diagnostic failure from poor interpretation of post-central line insertion radiographs were responsible for delaying the diagnosis [6].

The management of guidewire embolism is poorly defined in the literature. We suggest that in the case of a superficial guidewire embolus in which the guidewire can be palpated in the vessel (internal jugular vein/femoral), a venous cutdown can be performed to extract the guidewire. If the guidewire has embolised systemically, a chest x-ray must be performed to determine the position of the guidewire. The use of interventional radiology techniques e.g. Dormia basket, gooseneck snare, endovascular forceps have made percutaneous extraction the most useful method in removing the guidewire [7]. The percutaneous method of extraction was used in sixty-one percent of cases with no reported complications. A literature survey revealed that the

percutaneous method of extraction has few complications and no mortality [8]. Arrhythmia has been reported as a potential complication of this technique. If the procedure is unsuccessful, surgery may be considered. The operative risk of surgery must be weighed against the morbidity and mortality of an in-situ guidewire.

The use of real-time ultrasound or Doppler ultrasound guidance for the placement of IJV and subclavian central venous catheters in adult patients increases the probability of successful catheter placement and reduces the risk of complication. However, due to limited resources, ultrasound may not be available or expertise may be lacking and costs are generally prohibitive [9].

### CONCLUSION

Guidewire embolism represents a rare iatrogenic complication of central venous lines. Percutaneous retrieval of embolized guidewires using the gooseneck snare is safe and eliminates the need for surgical extraction. In cases where an embolised guidewire cannot be safely extracted via percutaneous and surgical methods, prophylactic antibiotics and anticoagulation have been proposed. However, their appropriate dose and duration remains to be determined.

### CONFLICT OF INTEREST

The authors declare no financial interest or any conflict of interest

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### References

1. Kuminsky R: Complications of central venous catheterization. *J Am Coll Surg*; 2007; 205(3): 517.
2. Shummer W, Shummer C, Gaser E, Bartunek R: Loss of guidewire: mishap or blunder? *Br J Anaesth*; 2002; 88(1): 144-146.
3. Andrews RT, Bova A, Venbrux AC: How much guidewire is too much? Direct measurement of the distance from subclavian and internal jugular vein access sites to the superior vena cava-atrial junction during central venous catheter placement. *Crit Care Med*; 2000; 28:138-42.
4. Batra RK, Guleria S, Mandal S: Unusual complication of internal jugular vein cannulation. *Indian Chest Dis Allied Sci*; 2002; 44: 137-9.
5. Narendra,H,Baghavan KR: Guidewire embolism during subclavian vein catheterization by Seldinger technique. *Indian Journal of Critical Care Medicine*;2006;10(4): 257-259.
6. Auweiler M, Kampe S, Zähringer M, Buzello S, von Spiegel T, Buzello W, von Spiegel T, Buzello W, Hekmat K: The human error: delayed diagnosis of intravascular loss of guidewires for central venous catheterization. *J Clin Anaesth*; 2005; 17(7): 562-564.
7. Roye GD, Breazeale EE, Byrnes JP, Rue LW: Management of catheter emboli. *South Med J*; 1996; 89: 714-717.
8. Fisher RG, Ferreyro R: Evaluation of current techniques for non surgical removal of intravascular iatrogenic foreign bodies. *Am J Roentgenol*; 1978; 130: 541-548.
9. Randolph AG, Cook DJ, Gonzales CA, Pribble CG: Ultrasound guidance for placement of central venous catheters: A meta-analysis of the literature. *Crit Care Med*; 1996; 24: 2053-2058.

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