

Percutaneous retrieval of malpositioned, kinked and unraveled guide wire under fluoroscopic guidance during central venous cannulation

Gopal Krishan Jalwal, Vanitha Rajagopalan, Ashish Bindra, Girija Prasad Rath, Keshav Goyal, Atin Kumar¹, Shivanand Gamanagatti¹

Departments of Neuroanesthesiology, and ¹Radiology, Jai Prakash Narain Apex Trauma Centre, All India Institute of Medical Sciences, New Delhi, India

Abstract

The placement of central venous catheter using Seldinger's technique, remains a commonly performed procedure with its own risks and benefits. Various complications have been reported with the use of guide wire as well as catheter. We report a unique problem during subclavian vein cannulation due to guidewire malposition which led to its kinking and difficult retrieval requiring removal in fluoroscopy suit. The probable mechanism of guide wire entrapment and possible bedside management of similar problems is described.

Key words: Central venous cannulation, entrapment, fluroscopy, guide wire, prevention, unraveling

Introduction

The placement of central venous catheter using Seldinger's technique, though a commonly performed procedure in the intensive care unit, has its own risks and complications. Various complications have been reported with the use of guide wire as well as catheter. Both malposition and entrapment of guidewire are known to occur during subclavian vein (SCV) cannulation.^[1,2] We report a case of SCV cannulation in which guide wire went to ipsilateral internal jugular vein (I/L IJV) and with subsequent passage of dilator it got kinked and directed to superior vena cava (SVC). The attempts at removal of this guidewire caused its unraveling. Though removal of entrapped guidewire in interventional radiology suite has been described as a possible method, kinks remote

to entry site and its unraveling made the task difficult. As a result, combined transfemoral and subclavian route was used for its retrieval. The preventive measures and treatment of similar problems is discussed.

Case Report

A 35-year-old, 70 kg, 180 cm, male patient with traumatic cervical spine injury was admitted to our intensive care unit with chief complaints of labored breathing and partial loss of power in all four limbs. After securing the airway with a tracheal tube, central venous cannulation was attempted using 7 F20 cm triple lumen catheter (Certofix, Braun, Germany). Under strict aseptic precautions landmarks were identified and right SCV was located infraclavicular at medial 2/3 and lateral 1/3 of the clavicle using introducer needle in single attempt. After confirming good backflow of the blood, guide wire (50 cm with j-tip), was introduced up to 15 cm mark without any resistance. After that tissue dilator was threaded over the guide wire followed by railroad of triple lumen catheter (up to 13 cm) over it, although the line was inserted in single pass but resistance was encountered during removal of guide wire. Gentle traction was applied several times to remove it but all in vain. Bed side chest roentgenogram revealed the guidewire going through right SCV towards SVC but after its entry it took sharp turn and entered IJV on the same side [Figure 1]. With bed side X-ray as a control we tried to remove the

Address for correspondence: Dr. Ashish Bindra,
Department of Neuroanaesthesiology, Jai Prakash Narain Apex Trauma
Centre, All India Institute of Medical Sciences, New Delhi - 110 029, India.
E-mail: dr_ashi2208@yahoo.com

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guide wire, pushing it caused the assembly to move inside the right atrium (arrhythmia elicitation) but attempts at removal resulted in decoiling at the site of insertion. This prevented the applied force from being transmitted to the stuck component. Further attempts at removal of the guidewire were deferred and patient was shifted to intervention radiology suite. The attempts at removal of guidewire by passing a tissue dilator to straighten the kinked portion were not met with success, so through percutaneous right transfemoral venous route a vascular snare was used to pull the guide wire out of IJV [Figure 2]. It was followed by successful railroad of long and large bore tissue dilator from the unraveled to the intact segment of guide wire from the insertion site. The incision at site of insertion was then deepened to remove the kinked portion [Figure 3]. Another guidewire was passed through the same dilator followed by insertion of triple lumen catheter. A post-procedural chest radiograph revealed no evidence of hemothorax or pneumothorax.

Discussion

We present a case of malpositioning, kinking and unraveling of guidewire during SCV cannulation. It seems that at the time of insertion, the guidewire got malpositioned into I/L IJV and the passage of dilator over it caused it to kink and enter SVC on the same side [Figure 1]. Catheter placement into IJV is the most frequent malposition during cannulation of SCV using infraclavicular approach.^[1] In the current case kinking during subsequent passage of dilator was seen which is a rare finding. Various maneuvers like turning the head to ipsilateral (I/P) side, compression of I/P IJV during insertion of the guidewire, keeping the J-tip directed downwards and electrocardiography guidance have been described to prevent it.^[3] The described management for removal of entrapped intravascular foreign body include application of slow gentle traction, surgical exploration or maneuvering in interventional radiology.^[4] In this case the application of traction resulted in unraveling of guidewire making the situation even more problematic. The guidewire used for central venous cannulation is made up of two parts. There is an inner single filament wire core which is surrounded by spiral covering welded to the core filament at both ends. According the testing guideline available (ISO: 11070) the minimum force at break for the guidewire used in central venous access procedure is 5 Newton, which is pretty less. Depending upon the manufacturer's specifications the weld seams of outer covering at both the ends can withstand a pull strength of 17 N (1.73 Kg) before detaching from its core, whereas in the middle section guidewire can withstand a stress of up to 290 N. Guidewire made by B Braun, Germany, used in this case can withstand a force of 24 N.^[5] We feel that application of firm pressure caused the

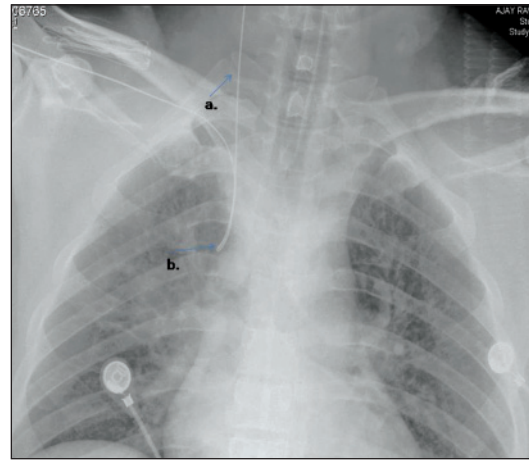


Figure 1: Portable chest X-ray showing looping of the guidewire a. into internal jugular vein b. superior vena cava

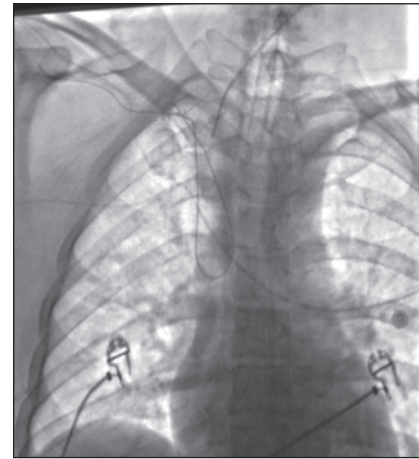


Figure 2: Guidewire dragged from internal jugular in the radiology suit (arrow)

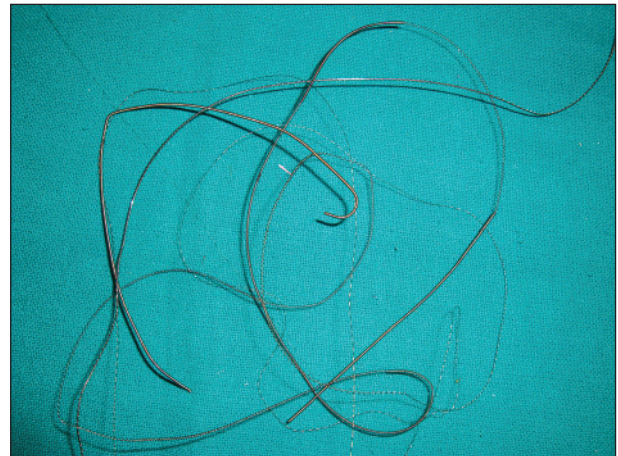


Figure 3: The unraveled guidewire after removal

surrounding coil to unwind (like an overstretched spring); however, the force was insufficient to break the inner filament. This may be the reason why we did not encounter negative consequences like breakage and embolization of the guidewire.

Such guidewire related complications can happen either due to manufacture defect or because of faulty technique. We believe that intention to remove a malpositioned and subsequently kinked guidewire caused its unwinding; fortunately the pressure was inadequate to cause breakage of inner filament and subsequent embolization.

Due to less invasive nature percutaneous removal in interventional radiology suite is a preferred method as compared to open surgical removal so we opted for the former. There are case reports in which fluoroscopy was used for removal of kinked guide wire. However, in these reports periclavicular region was the most common site of kink and the passage of dilator to straighten it was key to success.^[6] We tried using this route but the unique course and kinking remote to the site of insertion required use of transfemoral loop snare to pull it out of IJV. This was followed by manual pulling of the kinked and broken wire towards the site of insertion and passage of wide bore tissue dilator over it and removal. Interventional radiology suite proved to be the safe and effective alternative for removal of the badly struck guidewire.

Hence to conclude, caution should be exercised during placement of guidewire. Do not pull guidewire which is suspected to be kinked. Desperate attempts at removal of struck or kinked guidewire may result in loss of mechanical integrity, unraveling and breakage and possible embolization. Do not thread a dilator over a guidewire which is suspected

to be kinked for some reason. The use of fluoroscopic control in the form of bedside digital radiograph or intervention suit may help in the determination of condition and position of guidewire and should be preferred over to blind attempts at removal. The withdrawal of a kinked guidewire by means of interventional radiology is the procedure of choice.

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