CASE REPORT

Stuck guidewire due to soft tissue imposition: a rare complication of central line catheter placement

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SUMMARY

Central venous catheter (CVC) placement is a commonly done procedure but is associated with a few complications, and guidewire-related complications are one of them. In our case after induction of general anaesthesia, we planned to insert a CVC in the right internal jugular vein under ultrasound guidance. After the insertion of the introducer needle, when we tried to insert the guidewire, it got stuck and was neither moving forward nor in a backward direction. Too much force was not applied to remove the guidewire as it might have caused shearing of the guidewire and further complicated the picture. This problem was solved by simultaneous withdrawal of guidewire along with the needle, and on examination we found soft tissue debris lodged within the lumen which was preventing the guidewire movement in both directions. So, it is suggested that guidewire should be removed along with needle as a single unit if it is required.

BACKGROUND

Central venous catheter (CVC) placement is an integral part of the practice of an anaesthesiologist and intensivist, in the operating room, intensive care unit and emergency department. Although it is a commonly performed procedure, there are certain risks adherent to it. Commonly observed complications include arterial puncture, haematoma and pneumothorax.¹ Complications associated with the use of guidewire include cardiac arrhythmias, conduction defects, venous perforation, cardiac chamber rupture, kinking, knotting and breakage of guidewire.² Few instances of failure of advancement of guidewire due to various reasons have also been reported.^{3,4} Ultrasound has almost replaced the blind technique for CVC insertion as it is associated with a higher success rate and fewer complications. However, even with ultrasound guidance, complication does occur.⁵ A clinician must be aware of these complications to recognise and correct it at an early stage so that morbidity and mortality can be prevented. We report a difficult CVC placement in which guidewire got stuck after the introducer needle placement because of soft tissue impaction.

CASE PRESENTATION

A 50-year-old male patient scheduled for excision of cervicomedullary junction tumour (C1–C6 level) in which CVC insertion was planned. The patient arrived in the operation room, and general anaesthesia was induced with propofol, fentanyl

and rocuronium. His trachea was secured with an 8.5 mm internal diameter endotracheal tube, and he was put on mechanical ventilation. The CVC was flushed with saline in all three ports and was prepared for cannulation. The patient was positioned in the Trendelenburg position and the head was slightly tilted to the left side. After proper painting with 2% povidone-iodine solution and draping, ultrasound-guided cannulation of the right internal jugular vein (IJV) was attempted. Subsequently, the introducer needle was inserted. Good backflow of blood was present, and the guidewire was introduced, but there was a hindrance while threading the guidewire after about 7 cm. The guidewire could not be further introduced inside; so we avoided to push it further and decided to withdraw. Unfortunately, the guidewire seemed to be stuck and neither could it be pushed forward nor withdrawn. Even after multiple attempts to withdraw the guidewire with gentle traction, we failed to remove it.

During the withdrawal process, only gentle traction, and not too much force, was applied to prevent shearing of the guidewire and subsequent embolisation. Finally, it was decided to withdraw the needle and guidewire as a single unit, and we were successful in doing so. After removing the guidewire and introducer needle simultaneously (out of the body of the patient), we placed it on a draped table and tried to remove the guidewire which was still stuck in the lumen of the introducer needle (figure 1). Ultimately, after applying a substantial amount of force and with repeated attempts, we were able to separate the needle from the guidewire. On examination, we found a small piece of soft tissue debris lodged between the introducer needle and the guidewire, and it was also protruding out from the distal opening of the needle (figure 2). Later on, a new CVC was placed in the right IJV under ultrasound guidance without any difficulty.

OUTCOME AND FOLLOW-UP

Afterwards, the surgery proceeded uneventfully, and the patient had no postoperative complications during the follow-up period and was discharged.

DISCUSSION

CVC insertion can be done either using the landmark method or under ultrasound guidance. Ultrasound increases the success rate and decreases complication compared with the landmark method.

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Figure 1 Guidewire stuck in the lumen of the introducer needle.

CVC insertion is a frequently performed procedure and is associated with potential complications including arterial puncture, haematoma formation, pneumothorax and some guidewire-related complications. Guidewire-related complications are not uncommon, and they may be associated with significant morbidity and mortality. Most of the complications related to guidewire are due to its excessive length of insertion and excessive force applied to thread the guidewire. In our case, after the successful insertion of the needle, the guidewire got entrapped after approximately 7 cm of insertion, and we were unable to either advance it or withdraw it. So, there was a complete arrest of the guidewire. Various manoeuvres are described in the literature to withdraw the guidewire in such a situation which can be tried if required but they have their own limitations.^{6,7} Using too much force to withdraw the guidewire would have damaged the vessel lumen and the guidewire, and caused a catastrophe. Finally, we had to remove the guidewire and the introducer needle simultaneously as a single unit, in which we were successful. Dobson and Clarke also suggested this technique of removal of both the needle and the guidewire in such sticky guidewire situation.⁸

After the needle insertion when the guidewire is being inserted, there is a chance of displacement of the needle from the vein, and this may be the probable cause of failure of advancing

Figure 2 A piece of soft tissue debris lodged between the needle and the guidewire.

Box 1 Precautions to prevent guidewire-related complications

- ▶ Careful selection of catheter insertion site is important. Try to avoid the site with abnormal anatomy and the site where other intravascular devices are already present.
- ▶ J-tipped end of the guidewire should be inserted first in the needle.
- ▶ Before insertion of the guidewire with the dominant hand, hold the needle firmly with the non-dominant hand so that needle tip is not displaced from the lumen of the vein.
- ▶ Guidewire should be advanced in a smooth fashion, and there should be no resistance. Never apply too much force while inserting the guidewire.
- ▶ While inserting the guidewire, try to see the ECG change on the monitor. If ECG changes are absent, always suspect malpositioning.
- ▶ If resistance is encountered during the movement of the guidewire, we should stop there and try to take out the guidewire.
- ▶ Always try to remove the guidewire along with the needle as a single unit, to prevent shearing and damage to the guidewire.
- ▶ Always confirm the proper (within vein) placement of the guidewire both in short axis and long axis with the help of ultrasound.
- ▶ Hold the proximal end of the guidewire while inserting the dilator and the catheter to prevent intravascular loss of guidewire.
- ▶ Examine the guidewire after its removal to rule out any structural damage.

the guidewire in the forward direction. Failure of advancement of guidewire can also be caused by IJV valve as suggested by Tadokoro *et al.*⁴

Whenever an operator encounters difficulties during the passage of the guidewire through the needle, it is a common practice to withdraw and remove the guidewire keeping the needle stationary. This is done in anticipation that the needle can be placed correctly within the vein with slight adjustment after the removal of the guidewire. The guidewire is made up of a core filament and a spiral cover, and it fits snugly with the needle. So, there is a possibility that tissue debris can enter into the space between the needle and the guidewire leading to stuck guidewire as it happened in our case. A similar case of guidewire impaction caused by soft tissue is also described by Choudhury *et al.*³ If the guidewire is withdrawn through the needle, there is a potential of lodgement of tissue debris within the needle lumen causing the guidewire to jam. And there is also a possibility of damage to the guidewire due to the sharp bevel of the needle.

It is a common practice during the ultrasound-guided CVC insertion that ultrasound probe is put aside as soon as there is aspiration of blood in the introducer needle and after that guidewire is being inserted without ultrasound, so in such situation if we encounter resistance for the advancement of guidewire we never know what is the exact reason for that. Hence, we want to suggest that guidewire confirmation within the vein should also be performed with ultrasound before dilation and catheter placement to prevent inadvertent arterial catheterisation. Additionally, as an option, if we have the facility of an assistant who can hold the probe, guidewire advancement through the needle can also be done under ultrasound guidance. Intrathoracic complications

Learning points

- ▶ During central venous catheter insertion after the confirmation that the introducer needle is within the vein, it should be grasped firmly before insertion of the guidewire to prevent displacement of the needle tip out of the lumen of the vein.
- ▶ Subsequently, the guidewire should pass smoothly and excessive force should not be used.
- ▶ Clinicians should be aware of this uncommon occurrence of guidewire arrest, and gentle simultaneous removal of the introducer needle–guidewire assembly is the best management in such situations.

related to guidewire such as pneumothorax can also be detected easily by thoracic ultrasound. In case of pneumothorax, lung sliding will be absent and in M-mode of ultrasound, we can find the 'barcode sign' instead of normal 'seashore sign'. However, it is important to note that the entire spectrum of inadvertent intrathoracic complications including improper guidewire placement may not be immediately detectable by ultrasound scanning during the placement of the CVC, but rather can develop over several minutes to hours. Hence, a high index of suspicion for the occurrence of these complications even after the placement of the catheter is extremely important.

Some of the important considerations for the prevention of guidewire-associated complications are listed in [box 1](#). Hence, in this case, we would like to highlight a rare scenario of soft tissue debris in the lumen of the introducer needle which caused entrapment of the guidewire.

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