

A Case of Guide Wire Trouble Using Safe Guide®

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Abstract

We experienced a case of guide wire trouble when using Safe Guide®. The left internal jugular vein was punctured using a 22-gauge Safe Guide® needle. A guide wire was introduced from the hub into the needle after verifying the reflux of dark red colored blood. Then insertion of a dilator was attempted. However, a strong resistance was encountered and the dilator could not be advanced. Extravascular placement of the guide wire was suspected and withdrawal of the guide wire was attempted without success. Plain chest X-ray and CT scan images revealed a guide wire sharply bent at a location adjacent to the site of insertion on the left side of the neck. The internal jugular vein had been penetrated and the guide wire was located in the carotid artery. The tip of the guide wire reached the ascending aortic artery. The guide wire was retrieved under radiographic monitoring by a radiologist. This case was attributed to poor fixation of the needle and reckless dilator manipulation with an inadequate skin and subcutaneous incision. Violent manipulation should be avoided when using Safe Guide® because the guide wire is thin and not particularly firm.

Introduction

Safe Guide® is a central venous puncture kit with a 22-gauge pilot-needle and introducer. The possibility of the occurrence of complications may be reduced

because guide wire insertion can be accomplished with a single puncture. However, the fact that the guide wire is not particularly firm is regarded as a disadvantage. We experienced a case in which the guide wire was bent under the skin and its removal was inhibited.

Case report

A 73-year-old female was scheduled for a Mile's operation with intraoperative radiation. A 22-gauge Safe Guide® needle was introduced into the left internal jugular vein by the central approach. After verifying the reflux of dark red colored blood, 26 cm of a 0.018 inch (0.46 mm) guide wire was introduced from the hub. Introduction of the guide wire was smooth and the needle was removed. Strong resistance was encountered when inserting the dilator after making skin and subcutaneous incisions. Given that the dilator could not be inserted even after several attempts, extravascular placement of the guide wire was suspected. Withdrawal of the guide wire was then attempted. With 10 cm of the guide wire still remaining inside, however, a strong resistance was encountered. A plain chest radiogram indicated that the guide wire was bent once at a location adjacent to the site of insertion with the tip reaching as far as the base of the aortic artery (Fig 1). The course of the guide wire suggested that it had inadvertently been placed outside the vein. However, it was not possible to verify whether the wire was in the artery or mediastinum. Forceful withdrawal of the guide wire was abandoned and surgery was continued and CT scan images of the neck and chest X-ray were obtained after intraoperative radiation. Cervical CT scan images

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revealed that the guide wire was sharply bent at a location adjacent to the site of insertion on the left side of the neck (Fig 2; left). A subcutaneous hematoma was also identified at this location. The next slice indicated that the guide wire entered the carotid artery after penetrating the left internal jugular vein. The internal jugular vein was completely overlying the carotid artery (Fig 2; middle). The tip of the guide

wire reached the ascending aorta (Fig 2; right).

A radiologist was requested to remove the guide wire after the surgery was completed.

The guide wire was moved to the descending aorta by a catheter introduced from the femoral artery. The guide wire was captured with a snare catheter (Fig 3;). The bending of the guide wire and resulting strong resistance within subcutaneous tissue caused the guide

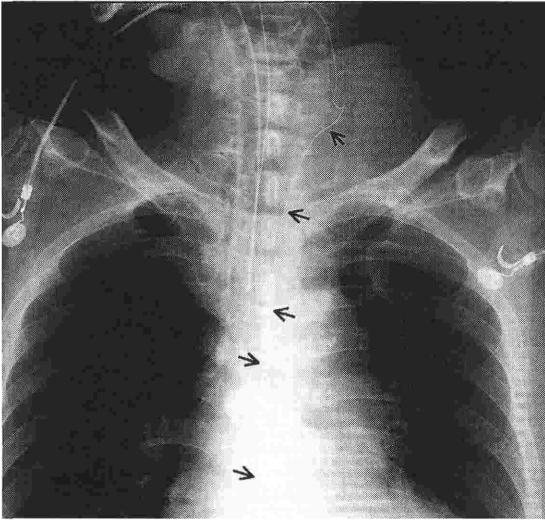


Fig 1. Plain Chest Radiogram

The guide wire was bent at a location adjacent to the site of insertion. The tip seems to have reached the base of the aortic artery. The course of the guide wire suggested that the wire was inadvertently placed outside the vein. It was not possible to verify whether the wire was in the artery or mediastinum.

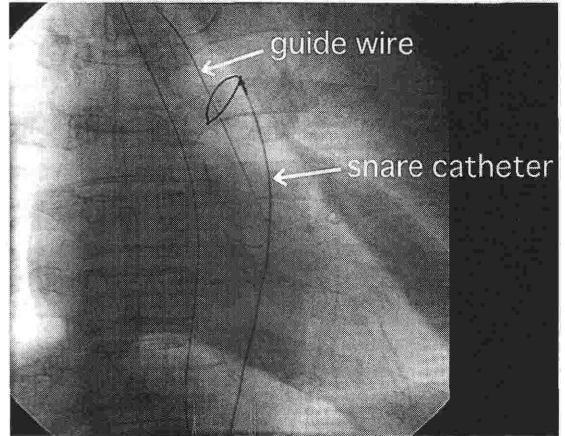


Fig 3. Arterial Angiography

The guide wire was moved to the descending aorta using a catheter introduced from a femoral artery. After the guide wire was captured with a snare catheter, an anesthesiologist made an incision in the skin at the site of insertion to cut the wire under the skin. The remaining portion of the guide wire was removed and retrieved through the femoral artery.

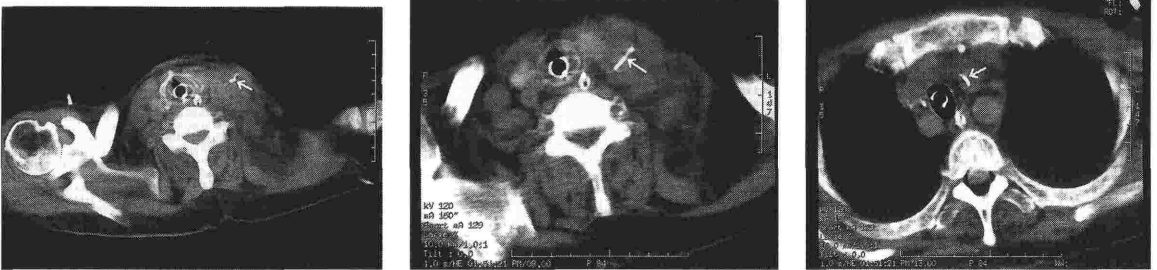


Fig 2. Cervical CT Scan Images

Cervical CT scan images revealed that the guide wire was sharply bent at a location adjacent to its insertion on the left side of the neck (Figure 2: left). A subcutaneous hematoma was also identified at this location. The next slice indicated that the guide wire had entered the carotid artery after penetrating the left internal jugular vein. The internal jugular vein was completely overlying the carotid artery (Figure 2; middle). The tip of the guide wire had reached the ascending aorta (Figure 2: right).

wire to escape from the snare catheter several times. After several attempts using the snare catheter, the anesthesiologist made an incision in the skin at the insertion site to cut the wire under the skin. The remaining portion of the guide wire was removed and retrieved it through the femoral artery. The absence of damage to the left carotid artery was confirmed radiographically after removing the guide wire using a contrast medium.

Discussion

In general, central venous catheterization is started by a puncture using a 22- or 23-gauge needle followed by cannulation using a 16- to 18-gauge venous needle. However, a substantial force is necessary to puncture the skin when introducing the outer sheath of a venous catheter. This may lead to an inadvertent arterial puncture. On the other hand, a thick guide wire that facilitates catheter insertion can be introduced once cannulation is accomplished.

Safe Guide® allows vascular catheterization with a single puncture requiring limited puncture force^{1,2}. However, some experience is necessary to enable fixation of the needle. There are several reports of extravascular placement of the guide wire caused by inadequate fixation. One study reported a 4% incidence rate³. The guide wire cannot be advanced if placed outside a blood vessel. However, as in this case, the guide wire can be advanced if it is introduced into an artery.

Wide variations exist in the relationship between the anatomic position of the internal jugular vein and the carotid artery. According to our study, the internal jugular vein is lateral and superficial and the carotid artery is medial and deep. In most cases, the internal jugular vein and the carotid artery overlap each other approximately half way, and approximately 5% overlap completely⁴ (Fig 4).

Gordon, et al. identified 5 patterns and reported that complete overlapping of the internal jugular vein and carotid artery was found in as many as 22.5% of their subjects. This figure exceeds our finding⁵.

In the present case, CT scan images indicated that the internal jugular vein and carotid artery overlapped

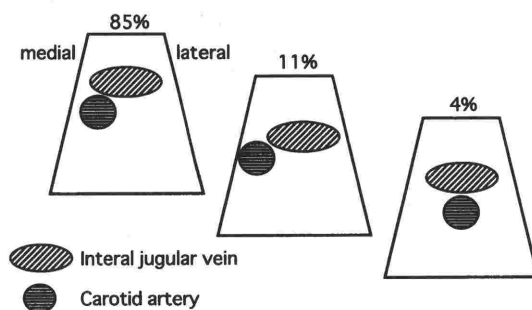


Fig 4. Anatomic Relationship of the Internal Jugular Vein and Carotid Artery

The internal jugular vein is lateral and superficial and the carotid artery is medial and deep. In 85% of the cases, the internal jugular vein and the carotid artery overlap each other approximately half way. In addition, approximately 5% overlap completely. Gordon, et al. reported that complete overlapping of the internal jugular vein and carotid artery was found in as 22.5% of the subjects.

completely. Initially, the needle tip may have been located inside the internal jugular vein. However, the tip probably advanced, penetrated the posterior wall and entered the carotid artery because of an inadequate fixation of the needle.

Problems related to the guide wire are not infrequent because a 0.018 inch guide wire used with a 22-gauge Safe Guide® is only approximately half as thick as a commonly used guide wire.

From our department, Saitoh, et al.⁶ reported that catheterization via the subclavian vein using a 22-gauge Safe Guide® introduced from a site medial to the midclavicular line. Catheter placement was unsuccessful in some cases despite a proper intravascular insertion of the guide wire because the space between the clavicle and first rib was narrow.

Hasegawa, et al.⁷ presented a detailed study on guide wire troubles associated with the 22-gauge Safe Guide®. A 0.018 inch guide wire is not particularly firm and its core may break allowing the spring wrapped around the wire to become detached if used forcefully. The guide wire may be bent in several percent of the cases due to an inadequate fixation of the needle even after reflux of blood is observed. In some cases, a guide wire introduced from the hub can

neither be advanced nor withdrawn. In 6% of the cases, the guide wire is bent during inserting the dilator. This occurs when the skin and subcutaneous incision are inadequate. Usually, this problem is resolved by slightly withdrawing the bent portion of the guide wire back into dilator and making an adequate incision. If the dilator is forcefully introduced, however, the wire may be bent easily and fixed subcutaneously. In such a case, a forceful withdrawal of the guide wire should be avoided. A resolution should be planned after verifying the position of the guide wire using plain chest radiograms and CT scan images. In addition, the authors hope that the manufacturer will develop an improved guide wire that is not easily bent or hooked to the tip of the needle.

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