FALLACY OF CLINICAL CONFIRMATORY SIGNS IN INTERNAL JUGULAR CATHETERISATION: A CASE REPORT

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SUMMARY

Repeatedly catheterising the internal jugular vein percutaneously through the same site, between the heads of the sternomastoid, resulted in soft tissue cleavage planes. The catheter entered the pleural cavity from the superior vena cava, a site remote from the percutaneous entry.

The internal jugular line can be misplaced in spite of respiratory fluctuation, free flow, and reflux with the container lowered below cardiac level. Radiological confirmation is mandatory.

INTRODUCTION

Internal jugular catheterisation was first described by England *et. al.*, in 1969. Anaesthetists prefer this because of: the constant surface markings of the related anatomical structures; accessibility from the head end; direct short course from the internal jugular into the vena cava.

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In the posterior approach for internal jugular venepuncture, the needle is introduced at the junction of the middle and lower thirds of the sternomastoid's lateral border and advanced towards the suprasternal notch. In the anterior approach, the needle inserted on the medial border of the muscle at the midpoint is directed towards the ipsilateral nipple. Boulanger's approach is the medial border of the muscle, at the level of the superior border of the thyroid cartilage, directed inferiorly and laterally.[1]

The central approach, discussed here, has more than a 90% success rate.[2]

CASE HISTORY

A 24-year-old victim of a traffic accident was anaesthetised for a laparotomy for ruptured liver, torn inferior vena cava and intra-abdominal haemorrhage. A chest tube drained his right-sided haemopneumothorax. Massive transfusion was via the peripheral veins. A central venous line was required. Catheterisation was reattempted through the same site where unsuccessful attempts had been made to catheterise the internal jugular (central approach).

The landmark was the apex of the triangle at the base of the neck, formed by the heads of the sternomastoid. The internal jugular vein was located with a 1½" 22G needle on a saline-loaded syringe, directed laterally from the apex, at an angle of about 35^{o} to the horizontal plane. It was replaced with a 5cm, 14G needle. Having

established reflux blood flow the catheter (32 cm) with the stilette was threaded through the needle and the needle withdrawn; subsequently the stilette was withdrawn. The catheter connected to a manometric column and an infusion which flowed freely. Lowering the bottle caused retrograde blood flow. The manometric oscillation synchronised with the respiratory movement.

On the right thoracotomy, the blood in the costovertebral gutter was coming from a middle lobe laceration. The catheter tip entering through a hole in the wall of the superior vena cava lay in this gutter. Surgery proceeded after catheter extraction.

DISCUSSION

The transmitted ventilator pulsation caused the manometric column to oscillate; the retrograde flow came from the costovertebral gutter and the free flow went into the same place.

Recannulation through the same site had caused the needle to go through the cleavage planes in the soft tissue (tunnel) caused earlier. The haemopneumothorax would not alter the landmarks, but the relative positions of the vena cava and subclavian vessels could have been altered. The sternomastoid borders were less delineated due to the relaxation.

The 7cm long superior vena cava starts at the lower border of the right first costal cartilage. From the apex of the sternomastoid triangle to the beginning of the superior vena cava, it is about 10cm. It is impossible to transfix the superior vena cava, from the apex, with this 5cm long needle. Had the patient been in the Trendelenburg position to engorge the veins, only the engorged subclavian vein would have got damaged. The catheter had entered the pleural cavity through a puncture in the superior vena caval wall. The percutaneous entry was remote at the apex of the triangle. The needle could not have caused this puncture. The orifice would have been larger and perhaps even the wall could have been lacerated. Probably the catheter (with the stilette splinting it) worked its way through the superior vena caval wall; either there was weakness of the wall or the catheter tip was relatively firm.

PROCEDURE TO MINIMISE COMPLICATIONS

Avoiding re-attempts through the same spot prevents 'tunnelling'.

Assessment of the softness of the catheter material is important. With relatively rigid materials (teflon/nylon), vein perforation may occur, which should be suspected if blood reflux is absent.

The conscious patient's landmarks are demonstrated by lifting the head and tensing the sternomastoid. Under general anaesthesia, due to difficult delineation of the borders, the landmarks become less obvious and this demands caution.

The side with an obvious pathology like pneumothorax, or a potential one like the presence of fractured ribs or clavicle, should be avoided.

A horizontal supine position will keep the lungs away from the thoracic inlet, reducing chances of puncture of the lung and even transfixion of the veins. A Trendelenberg position to engorge the veins, though tempting, is unsafe. The right cannulation is safer because of the lower right dome and there is no thoracic duct on the right side to get damaged.[2]

Entry into the vein is safer at the end of passive expiration, when the lungs are not expanded up to the thoracic inlet.

As the catheter is advanced, if the patient is breathing spontaneously and breathholding occurs or expires, the catheter may curl up or find its way into another tributary. On spontaneous respiration, advancing the catheter during inspiration will draw it into the vena cava because of the negative intrathoracic pressure. On controlled respiration, advancing it during the inspiratory phase may cause it to curl up, or go into another tributary whereas the end-expiratory phase is the ideal time.

A fluid challenge without tangible rise of blood pressure makes extravenous positioning of the catheter suspect.

A radiological confirmation of the catheter position is mandatory.

CONCLUSION

Carotid artery puncture, brachial plexus damage, Horner's syndrome, thoracic duct injury are reported complications of internal jugular venepuncture. Though uncommon with this technique, Cook reported tension pneumothorax after internal jugular venepuncture and general anaesthesia.[3] Instances of hydrothorax and cardiac tamponade have occurred. Transfixion of the superior vena cava has not been reported.

REFERENCES

[1] Boulanger M, *et. al.* Une Nouvelle voie D'aboro de la veine jugulare interne. *Canadian Anaes Soc Journal* 1976; 23 : 609.

[2] Kaplan Joel A. *Haemodynamic monitoring, cardiac anaesthesia.* New York: Grune & Stratton Inc., 1979.

[3] Cook T L, Dueker C W. Tension pneumothorax following internal jugular cannulation and general anaesthesia. *Anaesthesiology* 1976; 45 : 554–555.