

Right vertebral artery injury as a result of misplaced internal jugular vein catheter withdrawal

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SUMMARY

Central venous cannulation is a common procedure done for various medical indications. The use of the central venous cannula is associated with various immediate complications such as pneumothorax, vascular injury, and arrhythmia. The following is an unusual case of delayed presentation of a right vertebral artery injury due to central venous cannulation which resulted in a posterior circulation stroke. This is a condition that can be difficult to diagnose and has a significant impact on patient's quality of life. Clinicians and radiologists should be alert to this possibility to prevent further morbidity resulting from the iatrogenic injury.

CASE REPORT

A 50-year-old woman was referred from another hospital to a tertiary centre for further management of a misplaced internal jugular catheter. She has a past medical history of advanced chronic kidney disease on peritoneal dialysis, hypertension and heart failure.

She was treated in the other hospital for sepsis, for which an internal jugular catheter was inserted for antibiotics. The procedure was done under ultrasound guidance and there were no immediate complications.

A post procedure chest X-ray showed that the catheter took an abnormal course into the mediastinum. (Fig. 1). This prompted the referring clinician to perform an urgent computer tomographic scan (CT scan).

The CT scan showed that the catheter was not inside the internal jugular vein, but posterior to the right internal jugular vein and carotid artery. The catheter continued to pass posterior to the left brachiocephalic vein and was abutting the arch of the aorta. There was no mediastinal bleeding or significant pericardial effusion.

The patient only arrived in a tertiary hospital on the next working day. She was admitted to intensive care for observation. Her blood pressure and pulse rate was normal without inotropes. She was not on any anticoagulation or antiplatelets. Neurological examination was normal.

She was counselled for removal of the misplaced catheter under general anaesthesia. The catheter was removed in the operating theatre. A transoesophageal echocardiogram 40

minutes post removal of the catheter showed no pericardial effusion. She was extubated and transferred stable back to intensive care for observation. There was no swelling or haematoma of the neck post procedure.

Unfortunately on post-operative day-1, she became drowsy and had unequal pupils (right 3mm and left 4mm). She developed carbon dioxide retention and had to be reintubated and ventilated. A CT brain showed an acute infarct of the right cerebellum, in the territory of the posterior inferior cerebellar artery.

A CT angiogram was performed and showed a puncture at the origin of the right subclavian artery forming a pseudoaneurysm (Fig. 2).

The patient did not make any neurological recovery and required long term ventilation with a tracheostomy. She was eventually transferred back to the referring hospital for stroke rehabilitation and nursing care.

DISCUSSION

Central venous cannulation is a procedure done for indications such as drug infusions, inotropes, parenteral nutrition, or measurement of central venous pressure. Clinicians should be aware of the potential immediate and delayed complications of insertion of a central venous cannula. The immediate complications of interest to the surgeon include vascular injuries, pneumothorax, and cardiac arrhythmias.

Detection of a vertebral artery injury can be particularly challenging, owing to the complex anatomy of the neck and also the difficulty in detecting the actual 'track' that the guidewire or introducer has taken prior to the referral to the surgeon. If a critical vessel is injured during the catheterisation, it may cause a perforation, arteriovenous fistula, or dissection.

Inamasu et al., wrote a review article in 2005 which highlighted the difficulties of treating a vertebral artery injury due to its deep location and delayed presentation. Many cases also go unreported and it is uncertain how many patients who had a significant injury which healed conservatively. Most of the patients were treated with either endovascular intervention or open surgery.¹

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Fig. 1: Chest X-ray showing position of misplaced catheter.



Fig. 2: CT angiogram with 3D reconstruction showing dissection of the vertebral artery and pseudoaneurysm formation.

This case presented with a unique challenge to the surgeon as the vertebral artery injury presented two days later after the initial injury. The injury was not detected on the initial CT scan as a full CT angiogram was not done. The most likely hypothesis is that there was a puncture of the subclavian artery which was not apparent due to the compression from the catheter. During the removal procedure a pseudoaneurysm formed and shunted blood away from the true lumen of the right vertebral artery. Unfortunately, she did not have sufficient collateral blood supply and developed a stroke.

Tasopoulou et al., also reported a similar case in 2018 where an elderly patient presented with a stroke three days after a central venous cannulation. She was treated endovascularly with a good outcome.²

In this case the initial CT scan was not able to make a definite diagnosis of the vertebral artery injury. The best imaging modality is currently unknown. Some authors have suggested invasive angiography, CT angiography, MRI angiography or a combination of the above.

As the vertebral artery is located deep in the neck, it would not present with frank bleeding and would be difficult to recognize. In this case, this injury was not suspected and the imaging was inadequate – highlighting the diagnostic challenges. If in doubt of the position of the catheter, there should be a low threshold to perform an CT angiogram or MRI to determine the actual position of the catheter.

Whether the stroke could have been prevented is debatable. In the originating hospital the catheter was inserted by a medical officer using ultrasound guidance. Maruyama et al

recommends that needles be inserted at 45° to the skin up to a depth of 15.0-21.5mm.³ However, this is a highly subjective method with results that will differ based on operator experience. Another approach to this case would be open exploration and dissection of the neck to repair the vertebral artery, possibly even performing a subclavian-vertebral artery bypass if a direct repair is not possible. This is a complex surgery which requires a high level of surgical expertise, and would still carry a high stroke risk due to the long duration of the procedure.

The role of endovascular stent graft placement may be the best treatment for iatrogenic arterial injuries.⁴ The treatment of iatrogenic vascular injury is different from the treatment of a traumatic vascular injury. The patient is usually older and more ill (thus requiring the central line). The location of the injury can be deep and hard to access, which favours the use of an endovascular stent graft rather than open surgery.

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