

Acute Ischemic Strokes after Central Line Placement

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Citation

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Abstract

Objective: To describe an uncommon complication of cervical central venous catheter insertion.

Design: Case report.

Setting: A major academic medical center.

Patient: A 53-year-old female transferred to our institution with several acute cerebral infarcts in the anterior and posterior cerebral circulations after inadvertent central line placement into her right vertebral artery, with the length of the catheter in the aortic arch.

Interventions: Surgical removal of intravascular catheter.
Measurements and Main Results: Good clinical outcome.

Conclusions: A complication of cervical venous catheter insertion can be inadvertent vertebral artery cannulation with subsequent ischemic strokes.

Institutional Review Board: approved as case report
IRB040265

CASE REPORT

A 53-year-old female was admitted to an outside hospital for cachexia and gastroparesis following partial gastrectomy for severe gastric ulcerative disease. Management required placement of a triple-lumen central line (TLC) for total parenteral nutrition (TPN). Initial attempts at placing a right subclavian vein were unsuccessful. Subsequently, a right cervical TLC was placed and TPN was initiated. Few minutes thereafter, the patient developed weakness in her left upper extremity, which quickly progressed to complete left hemiparesis and hypesthesia. Over the next several hours, her weakness improved, but she continued to have numbness in the left hand. A non-contrasted head CT showed no evidence of intracranial hemorrhage. She was started on clopidogrel and transferred to our hospital for further evaluation.

Upon arrival, magnetic resonance imaging (MRI) and angiography (MRA) of the head were obtained which

showed multiple areas of acute infarctions in the right cerebellar hemisphere, right and left occipital lobes, throughout the right middle cerebral artery territory, and a small infarct in a distal left middle cerebral artery branch. There was no evidence of hemorrhage. The intracranial MRA was normal. A transthoracic echocardiogram (TTE) demonstrated no cardioembolic source of emboli. However, no color Doppler or microbubble study to evaluate for the presence of a right-to-left shunt was performed. As a right-to-left shunt was in consideration as a source of the strokes, microbubble-contrasted TCD was done. Due to her poor peripheral venous access, the microbubble solution (9 cc normal saline and 1 cc air mixed via a 3-way stopcock) was injected into the right cervical TLC. The left MCA was interrogated without difficulty via the left middle temporal ultrasound window. The study was markedly positive immediately (<3 cardiac cycles) after injection (Figure 1), leading to the suspicion of an arterial location of the TLC. A blood gas sample confirmed arterial blood. TPN was stopped. A chest x-ray (Figure 2) was obtained that showed an unusual course of the TLC. A CT angiogram of the neck

demonstrated that the TLC tracked lateral and posterior to the right internal jugular vein without puncturing it, and went on to enter the right vertebral artery, the tip was positioned in the aortic arch. The patient underwent right neck exploration with direct removal of the TLC and proximal thrombectomy with right vertebral artery primary repair. Following surgery, the patient's neurological status continued to improve. No other clinical evidence of ischemia or embolism was found.

Figure 1

Figure 1: TCD with microbubble injection of the RMCA demonstrating the early occurrence of a curtain effect. Arrow is the point of microbubble injection into the TLC.

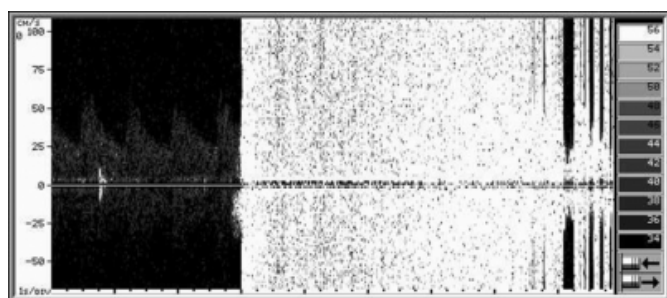


Figure 2

Figure 2: A. Anterior-posterior chest X-ray demonstrating the aberrant course of the right central line catheter, placed in the right vertebral artery extending into the aortic arch.



DISCUSSION

Central venous catheterizations are an important tool in the management of the critically ill, allowing for monitoring, fluid administration, parenteral feeding, and other therapeutic and diagnostic interventions. Reported complications include venous air embolism, vascular erosions, and catheter related infections with or without subsequent septicemia. Anatomic structures surrounding the most common sites of venous access pose potential hazards for misplacement. Notable among these pneumothorax.^{1 2}

Cerebral infarction is a rare complication of central venous line access. One retrospective review³ of 4487 IJV line insertion attempts using landmark techniques found that 5.9% were associated with carotid artery injury.

As was a concern with this patient, correctly inserted venous catheter devices can result in a stroke in the setting of a patent foramen ovale (PFO). In one such case, the diagnosis was confirmed by transesophageal echocardiogram showing both the PFO and a thrombus attached to the tip of the access catheter.^{4 5} Other reported cerebrovascular complication of cervical venous cannulation include: cerebral hematoma⁶, carotid cannulation with TPN infusion and strokes⁷, posterior circulation strokes from inadvertent vertebral artery catheter migration during subclavian artery cannulation^{8 9}, carotid-jugular fistula^{10 11}. Some authors have described vertebral artery pseudoaneurysms^{12 13}, with one patient presenting with stridor and dysphagia after an attempted subclavian vein catheterization.¹⁴ Another report describes a postmortem case of massive postoperative vertebrobasilar territory stroke following internal jugular vein cannulation due to inadvertent vertebral artery injury.¹⁵

We believe that in our patient the aortic arch position of the catheter contributed to the anterior circulation cerebral infarcts by embolization of thrombus formed around the TLC, but we can not exclude that the TPN infusate may, by itself, induced the ischemic lesions. Due to its fat content the TPN is capable of generating arterial obstruction leading to cerebral infarcts, or to induce acute encephalopathy.⁷

The performance of TCD with microbubbles via the TLC helped suspect the misplaced catheter. TCD with microbubbles studies that are strongly positive and that occur immediately (under 3 cardiac cycles) after injection should be clues that the access port is arterial rather than venous, or that a proximal large right-to-left shunt is present. No reported neurological complications have been described

in patients undergoing microbubble injection for right-to-left shunts evaluation, even in the context of large arterio-venous communications¹⁶. Our patient did not have any neurological symptoms or signs associated to the microbubbles injection into the arterially placed central catheter.

Several publications have suggested means to prevent central line misplacements, such as: by transduction of vascular pressure waveforms¹¹, determination of blood gases prior to dilation of the vessel, and by real-time ultrasound guidance¹⁷. Less commonly, fluoroscopy and venography are used¹⁸. We have accomplished similar results in assuring venous placement of TLCs by injecting a small amount of saline with air into the vessel prior to vein dilation, while visualizing the transit of the air bubbles via the right side of the heart while performing subcostal echocardiography (unpublished data).

Once a central line has been placed, a chest x-ray should be obtained to determine the position of the catheter, including its depth¹⁹.

CONCLUSION

This case illustrates a complication of inadvertent catheterization of the right vertebral artery while attempting to place a cervical central venous line, which resulted in multiple anterior and posterior cerebral circulations embolic infarcts.

Complications during central line placement are a reality that we always aim to reduce, but occur in a small percentage of patients. Possible complications from central venous catheterizations must be considered before and after any central line insertion, including acute ischemic strokes.

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