

Ischemic Stroke and Seizure as Complication from Inadvertent Intra-Arterial TPN Infusion: A Case Report

Kurt Sieloff[†]; Benjamin Stewart; Lauren Kett; Craig A. Williamson; Teresa Jacobs

*Kurt Sieloff

Department of Neurology, University of Michigan, USA. Email: kmsielo@med.umich.edu

Abstract

PICC lines are increasingly common in the hospitalized patient. Catheter misplacement is a recognized complication of PICC insertion. This article describes a unique case of stroke accompanied by non-convulsive status epilepticus (NCSE) as a result of total parenteral nutrition (TPN) continuously infusing from a peripherally inserted central catheter (PICC) in a patient's aorta. A 58 year old woman presented to an outside hospital for a small bowel obstruction. A PICC line was placed under ultrasound guidance and confirmatory chest x-ray (CXR) showed "left-sided PICC line terminating in persistent left SVC." Upon arrival at our institution, repeat CXR confirmed this placement. On day two of hospitalization, the patient was initiated on a continuous infusion of TPN. Thirty minutes later, the patient developed severe headache, confusion, and dysphasia. Initial assessment revealed an NIHSS of 4, but no focal motor deficits. Over the next 24 hours, the patient developed obtundation, left-sided hemiparesis, and abnormal movements. CT angiography revealed the PICC line terminating in the aorta. The PICC line was removed. Brain magnetic resonance imaging (MRI) demonstrated multiple foci of restricted diffusion and EEG later revealing NCSE. Further evaluation including transthoracic echocardiography did not reveal any additional cause of stroke. In patients with a confirmatory CXR suggesting unusual or anatomically variant central line positioning, additional modalities should be considered to confirm placement. Clinicians should be aware of arterially infused TPN as a cause of stroke with progressive accumulation of neurological findings.

Keywords

central venous catheter; non-convulsive status epilepticus; seizures; TPN; total parenteral nutrition; PICC; stroke

Introduction

Peripherally Inserted Central Catheters (PICCs) have been associated with a number of potential complications ranging from minor sequelae such as phlebitis (9.7%) at the insertion site to more serious problems such as infection (10%), thromboembolism (2.5%) and catheter misplacement. [1-7] In addition to these relatively common complications, there are a small number of reports in the medical literature describing ischemic stroke as a complication of PICC lines. Petrea and colleagues describe two cases in which ischemic stroke was attributed to paradoxical embolus resulting from clot formation on the venous catheter tip in the setting of atrial septal defect. [8] Other case studies describe stroke seemingly due to inadvertent arterial placement of PICCs or central lines. [9-13] Below we describe a case of stroke in which a PICC placed inadvertently in the aorta, was used to infuse TPN.

Reasons for PICC placement include antibiotic administration (68%), total parenteral nutrition (TPN; 13%) and chemotherapy administration (9%). [1] There have been a number of case reports in which TPN has been implicated in cases of venous thromboembolism due to lipid or crystalline precipitates. However, to our knowledge, this is only the sixth time that arterially infused TPN has been reported. [14-20] In this case, as well as in the cases we reviewed, cerebral ischemia and subsequent severe neurologic sequelae resulted. Of interest, the case of stroke described below did not present with classic stroke symptoms, but rather with encephalopathy followed by non-convulsive status epilepticus.

Case Presentation

A 58 year old right-handed woman with medical history is significant for inflammatory colitis status post total colectomy/ileostomy, migraines, and chronic kidney disease, initially presented to an outside hospital with nausea, vomiting, abdominal pain with CT imaging consistent with a small bowel obstruction (SBO). A PICC line was placed at the outside hospital. Per documentation, ultrasound guidance was used and a confirmatory chest x-ray (CXR) demonstrated “left-sided PICC line terminating in the possible persistent left SVC.”

The patient was subsequently transferred to our tertiary care institution for further management of SBO. CXR was repeated upon arrival with the radiology report noting “left-sided PICC, with tip located in a persistent left superior vena cava” (Figure 1A). On day two of hospitalization, the patient total parenteral nutrition (TPN) was initiated. Thirty minutes after TPN infusion, the patient developed severe headache, confusion, and dysphasia.

An acute stroke code was called. Initial assessment revealed a total NIHSS of 4; although no focal motor deficits were noted. Over the following 24 hours, the patient developed worsening obtundation, left-sided hemiparesis, and abnormal ocular and limb movements concerning; stroke or seizure was suspected. A CT angiogram of the head was performed as part of the stroke work up. During the angiography, the timing of the contrast bolus was such that intra-arterial PICC placement was suspected. Upon repeat CT angiography, the PICC line was noted to be in the aortic arch (Figure 1B). The patient's clinical status continued to decline and she was transferred to the neurological ICU (NICU) where she was intubated and sedated using propofol.

The PICC line was removed by the Vascular Surgery service without complication. EEG monitoring was started and focal seizures originating from the right hemisphere were noted. Phenytoin was started with a loading dose although the patient developed non convulsive status epilepticus. Propofol was restarted and levetiracetam added.

Brain MRI (Figure 2) demonstrated multiple bi-hemispheric punctate foci of restricted diffusion predominantly in the distribution of the right MCA/ACA. Further evaluation, including transthoracic echocardiography (TTE) and head and neck magnetic resonance angiography (MRA), did not demonstrate any additional cause for the strokes.

The patient's propofol was weaned over 24 hours, and her mental status slowly improved. Following extubation, her exam was notable for mild hemi-neglect and left hemiparesis although these deficits gradually resolved over the course of her hospitalization. By one month post event, she had no discernable neurologic deficits on exam.

Discussion

This patient's PICC was misplaced despite the use of ultrasound and multiple x-rays for confirmation. Specifically, the patient's x-rays were misinterpreted as PICC placement in a left sided SVC, an anatomic variant with incidence of 0.3%. [21] While several publications have suggested means to identify central line misplacements- including transduction of vascular pressure waveforms, fluoroscopy and venography- are not standard of care at many institutions, including ours. [22,23] While routine use of additional modalities is may be unnecessary; further radiographic confirmation of line placement should be considered.

Seizures within 24 hours of an embolic stroke is relatively uncommon, with an incidence of about 3%. [24] In a similar patient, accidental infusion of TPN into the innominate artery resulted in generalized tonic-clonic seizures. [13] It seems reasonable that the metabolic insult from intra-arterial TPN, in addition to the ischemic injury caused by fat emboli, would confer a greater tendency towards development of seizure. Though uncommon, this mechanism of injury should be considered inpatients on TPN, with central access, who develop similar symptoms.

In our patient, both the mechanism of injury and resulting clinical course were atypical. The administration of TPN through an inappropriately placed intra-aortic catheter caused rapid neurological deterioration associated with encephalopathy, multiple embolic strokes, and seizures. Her early symptoms consisted of a non-focal encephalopathy confounding initial attempts at diagnosis. This was followed hours later by both focal seizures and non-convulsive status epilepticus. Subsequent MRI imaging confirmed bilateral embolic strokes with predominance in the right ACA/MCA territory, with initial left hemiparesis.

Awareness of the possibility of atypical stroke syndromes in patients with central lines can assist clinicians in the identification of this uncommon, but immediately actionable, stroke etiology.

Figures

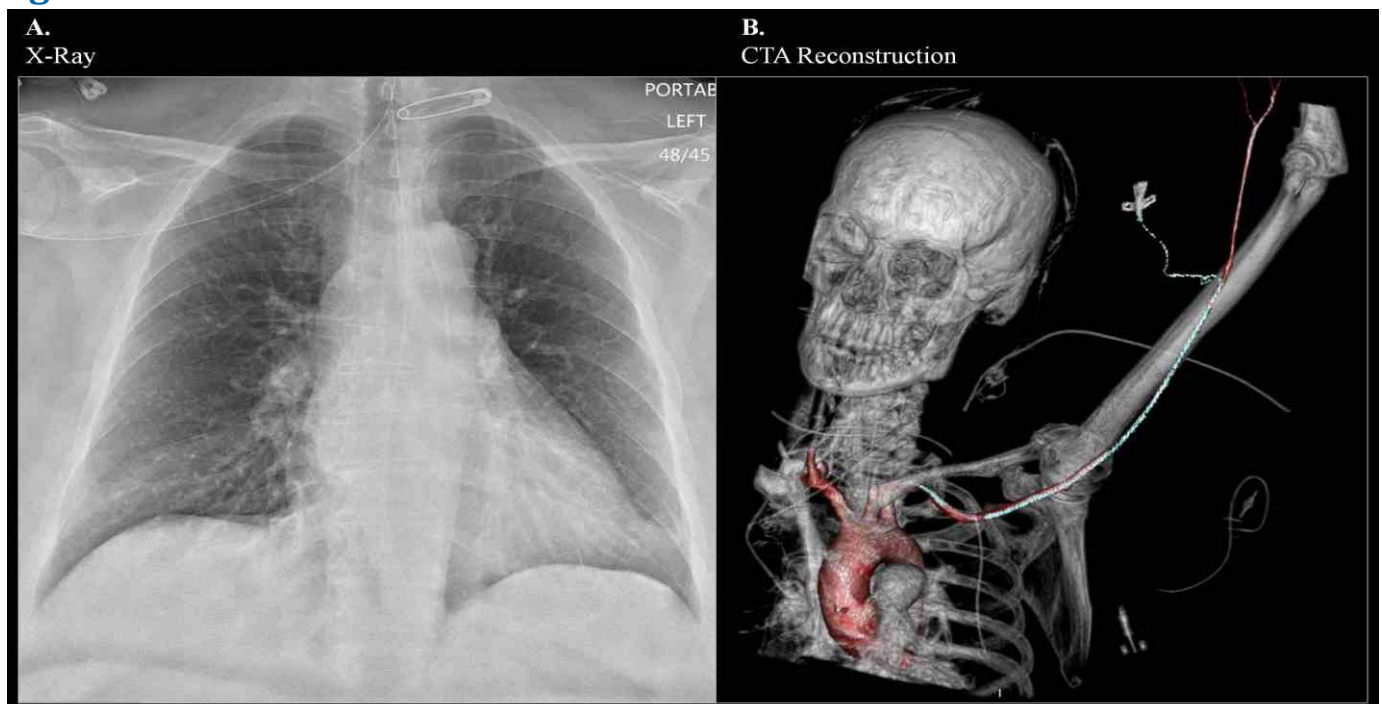


Figure 1. A. Chest x-ray demonstrating PICC line placement B. 3-D reconstruction of thoracic CT angiography demonstrating PICC line placement into the aortic arch.

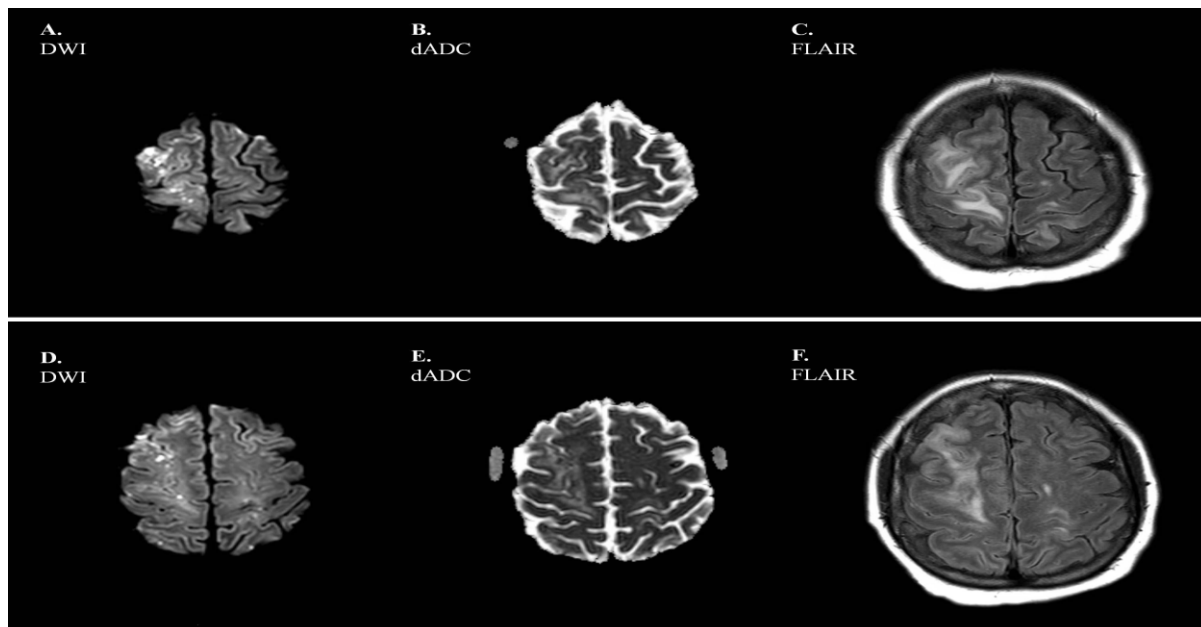


Figure 2. MRI brain demonstrating multi-focal ischemic injury and edema. Images A (DWI), B (dADC), and C (T2-FLAIR) were obtained on an axial plane superior to images D (DWI), E (dADC), and F (T2-FLAIR).

References

1. Leroyer C, Lasheras A, Marie V et al. Prospective follow-up of complications related to peripherally inserted central catheters. *Med Mal Infect* 2013;43(8):350-355.
2. Chopra V, Anand S, Krein S, Chenoweth C, Saint S. Bloodstream Infection, Venous Thrombosis, and Peripherally Inserted Central Catheters: Reappraising the Evidence. *The American Journal of Medicine* 2012;125(8):733-741.
3. Loughran S, Borzatta M. Peripherally inserted central catheters: a report of 2506 catheter days. *Journal of Parenteral and Enteral Nutrition* 1995;19(2):133-136.
4. Guilbert M, Elkouri S, Bracco D et al. Arterial trauma during central venous catheter insertion: Case series, review and proposed algorithm. *Journal of Vascular Surgery* 2008;48(4):918-925.
5. Cowl C, Weinstock J, Al-Jurf A, Ephgrave K, Murray J, Dillon K. Complications and cost associated with parenteral nutrition delivered to hospitalized patients through either subclavian or peripherally-inserted central catheters. *Clinical Nutrition* 2000;19(4):237-243.
6. Szeinbach S, Pauline J, Villa K, Commerford S, Collins A, Seoane-Vazquez E. Evaluating catheter complications and outcomes in patients receiving home parenteral nutrition. *J EvalClinPract* 2014;21(1):153-159.
7. Franklin I, Gilmore C. Placement of a peripherally inserted central catheter into the azygous vein. *J Med RadiatSci* 2015;62(2):160-162.
8. Petrea R, Koyfman F, Pikula A et al. Acute Stroke, Catheter Related Venous Thrombosis, and Paradoxical Cerebral Embolism: Report of Two Cases. *Journal of Neuroimaging* 2011;23(1):111-114. Acute Ischemic Strokes after Central Line Placement. *IJEICM* 2005;8(2).
9. Garg N, Noheria A, McPhail I, Ricotta J. Embolic Strokes After Peripherally Inserted Central Catheter Placement. *Annals of Vascular Surgery* 2010;24(8):1133.e1-1133.e4.
10. Parikh S, Narayanan V. Misplaced peripherally inserted central catheter: an unusual cause of stroke. *Pediatric Neurology* 2004;30(3):210-212.
11. Batsis J, Craici I, Froehling D. Central Venous Catheter Thrombosis Complicated by Paradoxical Embolism in a Patient with Diabetic Ketoacidosis and Respiratory Failure. *Neurocritical Care* 2005;2(2):185-188.

12. Osten M, Horlick E. The ultimate proof of paradoxical embolism and a percutaneous solution. *Cathet Cardiovasc Intervent* 2008;72(6):837-840.
13. Baldwin K, Volchok J. Truncus Bicaroticus and an Aberrant Right Subclavian Artery Contributing to Internal Jugular Venous Line Misplacement into the Carotid Artery. *Vascular* 2009;17(3):161-162.
14. Kitchell C, Balogh K. Pulmonary lipid emboli in association with long-term hyperalimentation. *Human Pathology* 1986;17(1):83-85.
15. Mcnearney T, Bajaj C, Boyars M, Cottingham J, Haque A. Total parenteral nutrition associated crystalline precipitates resulting in pulmonary artery occlusions and alveolar granulomas. *Dig Dis Sci* 2003;48(7):1352-4.
16. Bohlega S, McLean D. Hemiplegia caused by inadvertent intra-carotid infusion of total parenteral nutrition. *Clinical Neurology and Neurosurgery* 1997;99(3):217-219.
17. Lynch J, Shehabi Y. Stroke Caused by inadvertent intra-arterial parenteral nutrition. *Anaesth Intensive Care* 1995;23(3):358-360.
18. Riebau D, Selph J, Jarquin-Valdivia. A Acute Ischemic Strokes after Central Line Placement. *The Internet Journal of Emergency and Intensive Care Medicine*. 2004;8(2).
19. Scholten J, Oostra E, van der Worp H, Spronk P, de Graaff J. Seizures and hemiparesis after subclavian vascular access. *Netherlands Journal of Critical Care* 2004;18(3):21-23.
20. Sherman B, McNamara MP, Shen S. Inadvertent arterial administration of parenteral hyperalimentation solution resulting in generalized seizure activity. *Journal of Parenteral and Enteral Nutrition* 1992;16(3):284-285.
21. Fares W, Birchard K, Yankaskas J. Persistent left superior vena cava identified during central line placement: A case report. *Respiratory Medicine CME* 2011;4(3):141-143.
22. Gibson F, Bodenham A. Misplaced central venous catheters: applied anatomy and practical management. *British Journal of Anaesthesia* 2013;110(3):333-346.
23. McGee D, Gould M. Preventing Complications of Central Venous Catheterization. *New England Journal of Medicine* 2003;348(12):1123-1133.
24. Szaflarski J, Rackley A, Kleindorfer D et al. Incidence of seizures in the acute phase of stroke: A population-based study. *Epilepsia* 2008;49(6):974-981.

Manuscript Information: Received: January 07, 2016; Accepted: March 18, 2016; Published: March 23, 2016

Authors Information: Kurt Sieloff^{1*}; Benjamin Stewart¹; Lauren Kett²; Craig A. Williamson^{1,3}; Teresa Jacobs^{1,3}

¹Department of Neurology, University of Michigan, USA

²University of Michigan Medical School, University of Michigan, USA

³Department of Neurosurgery, University of Michigan, USA

Citation: Sieloff K, Stewart B, Kett L, Williamson CA, Jacobs T. Ischemic stroke and seizure as complication from inadvertent intra-arterial TPN infusion: a case report. *Open J Clin Med Case Rep*. 2016; 1093

Copy right Statement: Content published in the journal follows Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>). © Sieloff K 2016

Journal: Open Journal of Clinical and Medical Case Reports is an international, open access, peer reviewed Journal focusing exclusively on case reports covering all areas of clinical & medical sciences.

Visit the journal website at www.jclinmedcasereports.com

For reprints & other information, contact editorial office at info@jclinmedcasereports.com