



CASE REPORT

Percutaneous Management of Inadvertent Subclavian Artery Central Line Insertion Using Angioseal Vascular Closure Device

Abdulaziz Almat'hami, MD^{1*}, Abdulwahed Alruhaimi, MD¹, Ali Rajeh, MD², Hatim Alobaidi, MD¹, Sultan Alammari, MD¹, Hassan Alshehri MD¹, Othman Alshehri, MD¹, Nayef Alqahtani, MD¹, Ahmed Al Mutairi¹, Faisal Alahmari, MD¹



¹Division of Interventional Radiology, Medical Imaging Department, Prince Sultan Military Medical City, Saudi Arabia

²Division of Interventional Radiology, Medical Imaging Department, King Abdul Aziz Medical City (National Guard), Saudi Arabia

*Corresponding author: Abdulaziz Almat'hami, MD, Division of Interventional Radiology, Medical Imaging Department, Prince Sultan Military Medical City, Riyadh, Saudi Arabia

Abstract

Arterial misplacement of the venous central line catheter is not an uncommon early complication which carries devastating and fetal consequences. We report a case in which the patient condition command the use of closure device over other surgical and endovascular options and with successful hemostasis. Stroke is a rare complication encountered in our case due to the misplaced central line.

Case Report

This is a 90-years-old lady known diabetic and hypertensive, who presented to emergency room with signs and symptoms of septic shock on top of pneumonia and urinary tract infection. The primary assessment mandates a central venous access for rapid Intravenous hydration and antibiotics treatment.

At the emergency room, a 7-Fr Triple-lumen central line was inserted utilizing a right sub clavicular approach and using the anatomical landmarks technique.

The doctors have noticed an arterial blood back flow and they suspected an arterial puncture. This was confirmed on chest X-ray. The line was secured in place and labeled not for use. The patient developed Right posterior cerebral artery territory stroke few hours later confirmed by CT brain and CT angiogram of the head and neck. a consensus meeting was set including Vascular surgery, Interventional radiology and intensive care unit

for the possible management measures Immediately, the vascular surgeon was consulted, and he advised to keep the line in place, labeled "not for use", and to set a plan for removal. Few hours later, the patient level of consciousness was deteriorated with drop of her Glasgow Coma Scale (GCS). urgent CT-brain was performed showing an acute right posterior cerebral artery (PCA) stroke. MRangiogram of head and neck showed right PCA, right superior cerebellar artery (SCA) territories sub-acute infarctions, with confirmation of the misplaced central line into the right subclavian artery.

The catheter tip noted within the Right Brachiocephalic artery with no associated thrombus around it and the entry site was just distal to the ostium of right internal mammary artery (RIMA) and opposing the origin of the right vertebral artery. The right vertebral artery was dominant with mild atherosclerosis at its origin. The tract distance from skin entry to the artery puncture site was approximately 8 cm. There was no other vascular injury, extravasations or hematoma. Then, IR team was consulted for endovascular line removal and arterial repair.

Giving the patient condition, and the site of arterial puncture, the plan for treatment was using a percutaneous closure device (Angioseal®) and was based on consensus between the vascular surgeon,



Citation: Almat'hami A, Alruhaimi A, Rajeh A, Alobaidi H, Alammari S, et al. (2022) Percutaneous Management of Inadvertent Subclavian Artery Central Line Insertion Using Angioseal Vascular Closure Device. Int J Radiol Imaging Technol 8:094. doi.org/10.23937/2572-3235.1510094

Accepted: July 05, 2022; **Published:** July 07, 2022

Copyright: © 2022 Almat'hami A, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited



Figure 1: A right brachiocephalic artery angiogram before line removal showing the misplaced line (white star) with its entry point (small white arrow) at the proximal right subclavian artery. Note the proximity to the right internal mammary artery (white arrowhead) and the dominant right vertebral artery (black arrow).



Figure 2: A right brachiocephalic artery angiogram after line removal and successful application of AngioSeal vascular closure device. The distal right subclavian artery (white star) and the dominant right vertebral artery (black arrow) are widely patent with no active bleeding. Also, note the mass effect over the proximal right internal mammary artery (white arrowhead) by the external collagen plug component.

an intensive care unit (ICU) doctor, and interventional radiologist.

Additional to the AngioSeal, 8 mm and 10 mm balloons were made available and ready if needed. An informed consent was obtained from the patient family.

The right neck, chest wall, and both groins were prepped and draped in a sterile fashion inside the interventional radiology suit.

The Right common femoral artery access was obtained, and angiogram of right brachiocephalic artery was performed (Figure 1). The entry point of the misplaced catheter is noted just proximal to RIMA and patent right subclavian, right vertebral, and RIMA.

There was no extravasations.

A 0.035 Amplatz® guidewire was introduced through the pre-existing right subclavian artery line, followed by removal of the line over the guidewire. Then, a 6Fr AngioSeal® vascular closure device was introduced over the guidewire. Satisfactory hemostasis was achieved immediately.

Angiogram confirmed no vascular injury, or contrast extravasations. The right subclavian, right vertebral, and RIMA arteries were patent.

Final angiogram after 5 min confirm the successful hemostasis of the injury site without any complication (Figure 2).

Our patient was transported to the recovery room and later to the ICU.

Patient extubated and complete her hospital course and discharged after three weeks.

Discussion

Arterial misplacement of the central line catheter is a well-known early complication with a reported incidence of 3.7% [1,2]. However, using a real-time ultrasound guidance showed a significant reduced risk of failure. Commonly reported complication of central line misplacement include arterial puncture, hematoma which can expand and obstruct the airway, pneumothorax, and hemothorax [3]. Other less common complications are pseudoaneurysm [1], arteriovenous fistula [4], and stroke due to intra-arterial thrombus [5].

To our knowledge stroke resulting from a subclavian arterial puncture is rare and only four cases have been reported [5-8].

The anatomical course of right subclavian artery and the proximal and deep arteriotomy site would not allow it for effective compression. Nevertheless, “pull and pressure technique” yield a devastating results [4]. A covered stent would be an attractive option [9]; however, it would occlude the vertebral artery and the open surgical repair with thoracotomy carries out a high morbidity and mortality rates in a such very ill patient.

The Angioseal device is designed to provide rapid and safe hemostasis after femoral artery puncture. It relies on a small collagen plug on the outer arterial wall held against the puncture site by a small collagen footplate inside the artery.

The off-label use of Angioseal vascular closure device (Figure 3) in inadvertently catheterized subclavian arteries has been reported previously, where satisfactory hemostasis was achieved [1,4,9-12]. It is recommended for use if the length of the track from the puncture site to skin entry is less than 8cm and after 8Fr catheter insertion but has been used successfully with 10Fr arteriotomy [9]. Other endovascular management include Suture mediated closure device [9,13], Balloon tamponade, Gradual Sheath downsizing and tract embolization on the outer-lumen side of the subclavian artery have been reported [9].

Conclusion

Inadvertent arterial puncture during central line placement is not an uncommon complication which carries devastating and fetal consequences. Once the arterial puncture is confirmed, it should be in situ and not used. Further imaging is recommended to assess the injury with prompt vascular surgeon and interventional radiology consultations to plan for management. Stroke is a rare complication encountered in our case; only four cases reported. Our case is unique in presenting which command the use of closure device over other surgical and endovascular options. The Angioseal closure device is licensed for use in femoral arteriotomy however, it provided successful hemostasis of the subclavian artery puncture in our patient.

Conflicts of Interest

None.



Figure 3: A digital photograph during the application of angioseal vascular closure device. Note the infraclavicular skin entry point (white arrow).

References

- Nicholson T, Ettles D, Robinson G (2004) Managing inadvertent arterial catheterization during central venous access procedures. *Cardiovasc Intervent Radiol* 27: 21-25.
- Silberzweig JE, Sacks D, Khorsandi AS, Bakal CW (2003) Reporting standards for central venous access. *J Vasc and Interv Radiol* 14: S443-S452.
- Rabindranath KS, Kumar E, Shail R, Vaux EC (2011) Ultrasound use for the placement of haemodialysis catheters. *Cochrane Database Syst Rev*.
- Guilbert M-C, Elkouri S, Bracco D, Corriveau MM, Beaudoin N, et al. (2008) Arterial trauma during central venous catheter insertion: Case series, review and proposed algorithm. *J Vasc Surg* 48: 918-925.
- Jahromi BS, Tummala RP, Levy EI (2009) Inadvertent subclavian artery catheter placement complicated by stroke: Endovascular management and review. *Catheter Cardiovasc Interv* 73: 706-711.
- Fennell SJ, Benton C (1977) Cortical blindness following unintended catheterization of the subclavian artery. *J Pediatr* 90: 491.
- Wang RC, Katz SE, Lubow M (2000) Visual loss and central venous catheterization: Cortical blindness and hemianopsia after inadvertent subclavian artery entry. *J Neuroophthalmol* 20: 32-34.
- Parikh S, Narayanan V (2004) Misplaced peripherally inserted central catheter: An unusual cause of stroke. *Pediatr Neurol* 30: 210-212.
- Abi-Jaoudeh N, Turba UC, Arslan B, Hagspiel KD, Angle JF, et al. (2009) Management of subclavian arterial injuries following inadvertent arterial puncture during central venous catheter placement. *J Vasc Interv Radiol* 20: 396-402.
- Szkup PL (2012) A minimally invasive technique for closing an iatrogenic subclavian artery cannulation using the angio-seal closure device: Two case reports. *J Med Case Reports* 6: 82.
- Cohen JE, Moshe Gomori J, Anner H, Itshayek E (2014) Inadvertent subclavian artery cannulation treated by percutaneous closure. *J Clin Neurosci* 21: 1973-1975.
- Ananthakrishnan G, White RD, Bhat R, Chakraverty S (2012) Inadvertent subclavian artery cannulation: Endovascular repair using a collagen closure device-report of two cases and review of the literature. *Case Rep Vasc Med* 2012: 150343.
- Park TK, Yang JH, Choi S-H (2016) Endovascular repair using suture-mediated closure devices and balloon tamponade following inadvertent subclavian artery catheterization with large-caliber hemodialysis catheter. *Korean Circ J* 46: 584-587.