

Case Report

Inadvertent catheter placement into the innominate artery successfully repaired with perclose

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ABSTRACT

Inadvertent arterial catheterization during central venous access is an uncommon but potentially catastrophic complication, with reported incidence ranging from 0.1% to 1%, depending on technique and patient factors. Injuries involving non-compressible, large-caliber vessels such as the brachiocephalic (innominate) artery are particularly high risk due to the potential for hemorrhage, stroke, pseudoaneurysm formation, and mediastinal hematoma. Historically, management has favored open surgical repair, especially for supra-aortic trunk injuries; however, this approach carries significant morbidity in elderly and medically complex patients.¹ With advances in endovascular techniques, less invasive strategies including covered stent placement and percutaneous suture-mediated closure devices have emerged as viable alternatives. Recent literature supports the use of suture-mediated closure systems, such as Perclose, in select cases of iatrogenic arterial injury, demonstrating high technical success rates and low complication profiles when appropriate imaging, wire access, and procedural planning are employed.¹ These approaches are particularly advantageous in anatomically challenging or surgically hostile fields. We present a case of inadvertent catheterization of the brachiocephalic artery during tunnelled infusion port placement, successfully managed with percutaneous suture-mediated closure. This case highlights the growing role of minimally invasive techniques in the management of central arterial injuries and underscores the importance of early recognition, detailed imaging evaluation, and multidisciplinary coordination. A review of the literature highlights growing evidence supporting endovascular approaches for inadvertent supra-aortic arterial cannulation. Reported success rates of suture-mediated closure devices range from 90–100% in select patients, with reduced morbidity compared to open repair.¹⁻⁷ This case demonstrates the feasibility, safety, and efficacy of percutaneous closure for innominate artery injury, reinforcing a paradigm shift toward minimally invasive management.

Keywords: Central Venous Catheters, Perclose, Endovascular Repair, Innominate Arter

INTRODUCTION

Central venous catheter (CVC) placement is one of the most frequently performed invasive procedures in hospitalized patients, with over 5 million insertions annually in the United States for chemotherapy, hemodialysis, and critical care monitoring.⁶ Despite routine ultrasound guidance, inadvertent arterial cannulation occurs in 0.1–2 % of procedures, with higher

rates reported in emergent or landmark-guided attempts.⁴

⁶ Large-bore arterial injuries, particularly involving supra-aortic vessels such as the subclavian, carotid, and brachiocephalic (innominate) arteries, are uncommon but carry significant morbidity due to limited compressibility, risk of hemorrhage, pseudoaneurysm formation, stroke, and mediastinal hematoma.^{1,4,5} Historically, open surgical repair was considered the standard for inadvertent supra-aortic arterial cannulation.⁵⁻⁸ Such approaches, often

requiring sternotomy or extensive cervical dissection, provide definitive hemostasis but are associated with high morbidity, including infection, prolonged hospitalization, nerve injury, and perioperative complications, particularly in elderly or medically complex patients.^{1,5,6} Over the past two decades, endovascular strategies have emerged as safe and effective alternatives. Covered stent deployment and balloon tamponade offer rapid hemostasis but may risk branch vessel compromise or thrombosis.^{6,8,9} Percutaneous suture-mediated vascular closure devices (VCDs), such as the Perclose ProGlide, have demonstrated technical success rates of 87–100 % in iatrogenic supra-aortic arterial injuries, including carotid, subclavian, and brachiocephalic arteries, with low complication rates when used with proper imaging guidance and procedural planning.^{1-3,7-9} Current literature indicates that the subclavian artery is most commonly repaired with VCDs, followed by the carotid artery, with brachiocephalic artery closure reported less frequently but demonstrating similar high success in select cases.⁶⁻⁹ These devices allow rapid hemostasis, vessel preservation, and avoidance of open surgery, highlighting a paradigm shift toward minimally invasive management for select supra-aortic arterial injuries. This case illustrates the successful use of percutaneous suture-mediated closure for inadvertent brachiocephalic artery cannulation, contributing to the growing evidence supporting endovascular repair as a first-line strategy in appropriately selected patients.

CASE REPORT

A 72-year-old male with PMHx of HTN, AFIB (not on anticoagulation), CAD, and stage IIIB cecal cancer s/p right hemicolectomy presented for IR guided placement of tunneled infusion port for chemotherapy of malignant neoplasm of colon. On review of imaging post placement, the catheter course appeared more medial than normal. Blood return through the port was noted to be under high pressure and bright red, suggesting arterial placement. Physical exam did not show a hematoma and the patient remained asymptomatic. Fluoroscopy imaging confirmed the catheter tip position in the aorta. CT Angiography of the chest was obtained to define the entry position of the catheter and assess for bleeding or arterio-venous fistula formation. Entry of the port was noted in the brachiocephalic artery at the junction of the right subclavian and right common carotid (Figure 1a and 1b). Vascular surgery was consulted and patient was consented for percutaneous closure of arteriotomy, possible open, with removal of tunneled infusion as well as possible catheter replacement. The right common femoral artery was accessed under ultrasound guidance. A guidewire and catheter were advanced into the aorta. The right subclavian vein was selected. A balloon was available for tamponade if needed. The catheter was palpated and an incision was made over the catheter. Blunt dissection was used to bring the catheter into view. Hemostat was used to control the catheter and the catheter was cut. The distal portion was left in the incised

pocket. The proximal portion was controlled, and a Benston wire was inserted into the catheter down into the ascending aorta. The catheter was slowly pulled over the wire and pressure was held while perclose was brought into the field. Perclose device was deployed and the suture was secured at the brachiocephalic juncture. An angiogram was performed from the femoral access site and no hematoma, extravasation or pseudoaneurysm was noted. Ultrasound confirmed patency of the right internal jugular vein, without hematoma or pseudoaneurysm formation. A new catheter was successfully placed in right internal jugular vein with the tip of the catheter at the cavo-atrial junction. CT Angiogram of Chest post procedure showed a stable right paratracheal mediastinal hematoma.



Figure 1a: Coronal CTA Chest showing inadvertent catheterization of the brachiocephalic artery at the junction of the right subclavian and right common carotid.



Figure 1b: Sagittal CTA Chest showing inadvertent catheterization of the brachiocephalic artery during tunneled infusion port placement

DISCUSSION

Inadvertent arterial cannulation during CVC placement is a rare but potentially catastrophic complication, with reported incidence of 0.1–2 % overall and less than 1% for large-bore injuries involving supra-aortic vessels.^{4,5} Risk factors include emergent placement, challenging anatomy, prior surgery or radiation, and landmark-guided techniques.^{4,8} Open surgical repair has historically been the standard for managing supra-aortic arterial injuries,

particularly for brachiocephalic artery cannulations, due to the risk of hemorrhage, pseudoaneurysm, and stroke.⁶⁻⁸ While definitive, open repair carries substantial morbidity, including sternotomy-related complications, prolonged recovery, and nerve injury, with reported perioperative mortality of 5–15%.^{1,5,6} Endovascular strategies, particularly percutaneous suture-mediated closure devices (VCDs), have emerged as minimally invasive alternatives.^{2-4,6,9} Among reported cases, the subclavian artery is most commonly repaired with VCDs, followed by the carotid artery, and more rarely the brachiocephalic artery.^{1-3,7,9} Current literature review emphasizes the Perclose device as the most frequently reported VCD for supra-aortic arterial closure. Less commonly, Angio-Seal or MynxGrip devices have been used, primarily for subclavian artery injuries.^{3,7,9} Key technical considerations include maintaining wire access through the catheter, fluoroscopic or angiographic confirmation of device deployment, and readiness for balloon tamponade or emergent open conversion.^{2,3,9} Technical success rates across multiple case series and reports range from 87–100%, with minimal complications.^{1-3,6,7} Subclavian artery closures typically exceed 95% success due to favorable anatomy.^{3,7} Carotid artery closures show success rates of 90–95%, with low risk of embolic events when performed under imaging guidance.^{2,3} Brachiocephalic artery closures, though less common, demonstrate 90–100% technical success with avoidance of open sternotomy and preservation of branch vessel patency.^{1,2} Our case demonstrates the safe and effective use of the Perclose ProGlide for an inadvertent brachiocephalic artery injury during tunneled port placement. The procedure achieved rapid hemostasis, preservation of arterial and venous patency, and successful placement of a new catheter, aligning with literature supporting VCDs as a first-line treatment in select patients at high surgical risk or in surgically hostile fields.

CONCLUSION

Inadvertent innominate artery cannulation is rare but potentially life-threatening. Endovascular repair using suture-mediated closure devices offers a safe, minimally invasive alternative to open surgery. This case, together with current literature, highlights a paradigm shift toward minimally invasive management of supra-aortic arterial injuries, with percutaneous suture-mediated closure devices providing a safe, effective, and reproducible alternative to open surgery in appropriately selected patients. Important clinical considerations for practice include early recognition of arterial cannulation to prevent hemorrhage or neurologic sequelae, multidisciplinary coordination between interventional radiology, vascular surgery, and anesthesia to improve safety and outcomes, device readiness and bailout strategies, such as balloon tamponade or open conversion, are essential particularly in large or high-pressure vessels, and follow up imaging such as

angiography or ultrasound is recommended to confirm vessel patency and rule out pseudoaneurysm formation. This case reinforces the growing evidence supporting percutaneous closure as a first-line approach for select supra-aortic arterial injuries.

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