**Endovascular Repair of Inadvertent Vertebral Artery Puncture Using a Percutaneous Closure Device: A Rare Case Report**

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ABSTRACT

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| Introduction: Central venous catheter insertion can lead to inadvertent major vessel injury, which is a rare complication for which covered stents are an effective solution for major vascular injuries requiring immediate hemostasis, especially when direct surgery is complicated by underlying medical or anatomical conditions.The aim of the present study was to report the technical success in the correction of inadvertent hemodialysis catheter injury in the right subclavian artery using an endovascular procedure with Perclose Proglide® devices. Case Presentation: We report on the case of a 54-year-old patient, with a previous diagnosis of transverse myelitis and bladder neoplasia. In preparation for the procedure, a 7Fr central venous catheter (CVC) one was implanted and in evolution hematoma was observed in the cervical region. A Doppler ultrasound was performed in bed and a central venous catheter was visualized in the right subclavian arteries, and arteriography was chosen for better endovascular investigation with the possibility of treatment. The option was endovascular treatment, which was successfuland a better option than conventional surgery. Conclusion: The catheter was removed followed by occlusion using a percutaneous closure device (Perclose ProGlide®), with angiographic control without contrast extravasation and with occlusion of the right vertebral artery at the origin. |

*Keywords:* Percutaneous therapy, endovascular arterial, percutaneous closure device, endovascular treatment

1. INTRODUCTION

Central venous catheter insertion can lead to inadvertent major vessel injury, which is a rare complication for which covered stents are an effective solution for major vascular injuries requiring immediate hemostasis, especially when direct surgery is complicated by underlying medical or anatomical conditions1. Study suggests that balloon occlusion testing is recommended when planning treatment for iatrogenic and other types of subclavian artery injuries2. Study used a covered stent implanted in the affected segment of the subclavian artery, which resulted in the occlusion of the origin of the vertebral artery to obtain a secure proximal seal3.

Among other complications, catheter-related infections are a widespread problem that increases morbidity and mortality in intensive care unit (ICU) patients and treatment costs4. Another study reports that surgical repair of the subclavian artery remains challenging and one of the options in a male patient undergoing hemodialysis who developed a pseudoaneurysm of the artery subclavian artery after placement of a central venous catheter at the bedside achieved hemostasis of the pseudoaneurysm using a microcatheter5.

Removal of a catheter inadvertently placed in the subclavian artery can lead to substantial bleeding and one option was percutaneous closure of the subclavian artery using three Perclose Proglide® devices with balloon tamponade in the proximal part of the subclavian artery 6,7. The aim of the present study was to report the technical success in the correction of inadvertent hemodialysis catheter injury in the right subclavian artery using an endovascular procedure with Perclose Proglide® devices

2. Case PresentatiON

 We report on the case of a 54-year-old patient, with a previous diagnosis of transverse myelitis and bladder neoplasia, who underwent transurethral bladder resection in 2021. He was hospitalized due to obstructive pyelonephritis and underwent nephrostomy and percutaneous nephrolithotomy. In preparation for the procedure, a 7Fr central venous catheter (CVC) was implanted in the right cervical spine. Upon admission to the intensive care unit (ICU) in the postoperative period, the patient was intubated and on mechanical ventilation, with flow in a pulsatile and retrograde catheter, with vasoactive drug, and hematoma in the cervical region. A Doppler ultrasound was performed in bed and a central venous catheter was visualized in the right subclavian arteries, and arteriography was chosen for better endovascular investigation with the possibility of treatment. In the hemodynamics sector, retrograde puncture of the right radial arteries was performed with passage of a 0.035” hydrophilic guide wire and a Simmons curve 2 catheter with angiography of the supra-aortic trunks: patent vertebral arteries, with preserved cerebral flow and formation of vertebrobasilar circulation, common, internal and external carotid arteries without patent bilaterally, significant stenoses. Identifying the insertion of the catheter in the V1 segment of the right vertebral artery close to the insertion with subclavian arteries. Passage of a rigid hydrophilic guide wire 0.035”x260cm via medial CVC and positioning in the descending aorta. No contrast extravasation was seen in the topography of the catheter insertion. The catheter was removed followed by occlusion using a percutaneous closure device (Perclose ProGlide®), with angiographic control without contrast extravasation and with occlusion of the right vertebral artery at the origin. In the first postoperative period, the patient was found extubated, without vasoactive drugs, without neurological deficit and ultrasound control with occlusion of the right vertebral artery, without active bleeding or pseudoaneurysm.

 **In summary, this report presents a more recent option in the approach to**

**vertebral artery injuries using a percutaneous closure device (Perclose ProGlide®) that has shown to be safe in this approach. Although these injuries are rare and with few reports in the literature, they constitute a surgical challenge in their approach and the endovascular procedure in a reference center can be useful.**

**3. DISCUSSION**

Deep venous access is a common practice in the hospital environment. Although relatively safe, it is subject to complications, even with ultrasound guidance, which include infection, hemothorax, pneumothorax, and hematoma. Iatrogenic injuries to the subclavian artery and its branches are rare complications, associated with worrying morbidity and mortality.

There are few reports in the literature of iatrogenic injury to the vertebral artery due to its anatomy, and the most common complications are arteriovenous fistulas and pseudoaneurysms. The present study reports the technical success in correcting an inadvertent hemodialysis catheter injury in the right subclavian artery by means of an endovascular procedure with Perclose Proglide® devices.

Guilbert et al. describe an algorithm for cannulation in arterial trauma due to CVC insertion after reviewing 13 cases. The algorithm suggests keeping the catheter in place if ≥7Fr. If the area is easily accessible, consider open surgical exploration; otherwise, evaluate treatment with a covered stent or percutaneous closure device. Endovascular treatment appears to be a safe alternative for the treatment of arterial injuries that are difficult to expose surgically, such as those located below or behind the clavicle.

Amaral et al. and Yamamoto et al. state that unilateral occlusion of the vertebral artery is a common practice for the treatment of these injuries. When the contralateral artery is patent, there is usually good tolerance. After arterial repair, an immediate neurological evaluation should be performed, even if elective intervention is postponed, with imaging tests to exclude arterial complications. Cases in which the contralateral vertebral artery does not supply the posterior inferior cerebellar artery on the side of the injury may develop Wallenberg syndrome.

4. Conclusion

 The case above demonstrates an example with a satisfactory result of endovascular therapy, in a patient with multiple comorbidities and who evolved without neurological deficits and without local complications.

Consent

The consent term was signed by a familiar patient.

Ethical approval

The study was approving ethical committee Faculdade de Medicina de Sao Jose do Rio Preto#5.012.332

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

The authors hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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