

Pseudoaneurism of the common carotid artery due to penetrating trauma: Conventional treatment

Pseudoaneurisma da artéria carótida comum por trauma penetrante: Tratamento convencional

**Pseudoaneurismo de la arteria carótida común por traumatismo penetrante: Tratamiento
convencional**

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Abstract

Introduction: Pseudoaneurysm is one of the main complications of vascular neck trauma and it has been historically underestimated because patients with non-catastrophic injuries may not show symptoms until several years after the trauma, but it can result in catastrophic sequelae. **Objective:** The objective of this article is to present a case report on pseudoaneurysm of the common carotid artery due to penetrating trauma. **Case report:** Male patient, 22 years old with left common carotid artery pseudoaneurysm due to gunshot two years before. He presented progressive left-sided cervical mass and previous history of two cerebrovascular accidents, resulting in right hemiparesis and dysarthria sequelae. The patient was submitted to open surgical repair and was discharged on the fourth day postoperative in good condition. **Conclusion:** Our patient was young and had an easily accessible lesion, therefore, we felt that the most durable approach would be open surgical reconstruction with excellent immediate result.

Keywords: Aneurysm; Carotid artery injuries; Vascular system injuries; Therapeutics.

Resumo

Introdução: O pseudoaneurisma é uma das principais complicações do trauma vascular cervical e tem sido historicamente subestimado porque pacientes com lesões não catastróficas podem não apresentar sintomas até vários anos após o trauma, mas pode resultar em sequelas catastróficas. **Objetivo:** O objetivo deste artigo é apresentar um relato de caso de um pseudoaneurisma de artéria carótida comum por trauma penetrante. **Relato de caso:** Paciente do sexo masculino, 22 anos, com pseudoaneurisma de artéria carótida comum esquerda por arma de fogo há dois anos. Apresentava massa cervical esquerda progressiva e história prévia de dois acidentes vasculares cerebrais, resultando em hemiparesia direita e sequelas de disartria. O paciente foi submetido à correção cirúrgica aberta e recebeu alta no quarto dia de pós-operatório em boas condições. **Conclusão:** Nosso paciente era jovem e apresentava lesão de fácil acesso, portanto achamos que a abordagem mais duradoura seria a reconstrução cirúrgica aberta com excelente resultado imediato.

Palavras-chave: Aneurisma; Lesões da artéria carótida; Lesões do sistema vascular; Terapêutica.

Resumen

Introducción: El pseudoaneurisma es una de las principales complicaciones del traumatismo vascular del cuello y ha sido históricamente subestimado porque los pacientes con lesiones no catastróficas pueden no presentar síntomas hasta varios años después del traumatismo, pero puede resultar en secuelas catastróficas. **Objetivo:** El objetivo de este

artículo es presentar el reporte de un caso de pseudoaneurisma de la arteria carótida común causado por un traumatismo penetrante. Reporte de caso: Paciente masculino de 22 años con pseudoaneurisma de arteria carótida común izquierda por arma de fuego dos años antes. Presentó masa cervical progresiva izquierda y antecedentes de dos accidentes cerebrovasculares, resultando en hemiparesia derecha y secuelas de disartria. El paciente fue sometido a reparación quirúrgica abierta y fue dado de alta al cuarto día del postoperatorio en buenas condiciones. Conclusión: Nuestro paciente era joven y tenía una lesión de fácil acceso, por lo que consideramos que el abordaje más duradero sería la reconstrucción quirúrgica abierta con excelente resultado inmediato.

Palabras clave: Aneurisma; Lesiones de la arteria carótida; Lesiones del sistema vascular; Terapéutica.

1. Introduction

Vascular trauma at cervical region is a major challenge for vascular surgeons due to its complex anatomy and numerous important structures in a small space, where even minimal bleeding in this area can often lead to compromised airway and death. Therefore, traumatic injury to the carotid or vertebral arteries can result in catastrophic hemorrhage as well as ischemic consequences (Velimana et al., 2021).

One of the main complications of this type of injury is pseudoaneurysm, which is defined as a loss of continuity in the arterial wall, leading to hemorrhage contained by adjacent structures, forming an aneurysmal sac (Santos Junior et al., 2011). Patients presenting with this condition can exhibit various symptoms, with the most common being pulsatile cervical mass, compression of adjacent structures, bleeding or neurological symptoms (Levin et al., 2012). However, these injuries have been historically underestimated because patients with non-catastrophic injuries may not show symptoms until several years after the trauma (Velimana et al., 2021).

Open surgical intervention has been the treatment of choice for years, but endovascular therapy has also proven to be effective with similar post-operative outcomes and less invasiveness (Kraemer and Zhou, 2019; Serna et al., 2021), becoming the current trend. Therefore, further research is still needed to guide the optimal therapy, particularly as treatment modalities continue to evolve.

2. Methodology

This is a qualitative case report study (Merchán-Haman & Tauil, 2021; Toassi & Petri, 2021; Pereira et al, 2018; Estrela, 2018; Yin, 2015). According to Pereira et al. (2018), a case study or report is a special kind of research in which we concentrate or focus in a phenomenon which is described in a maximum detail possible for the moment.

The patient in the present study were studied according to the precepts of the Helsinki Declaration and the Nuremberg Code, respecting the Research Standards Involving Human Beings (Res. 466/12) of the National Health Council, after approval by the Ethics Council. In addition to, the commitment made by the researchers about the confidentiality of the data used, based on the Data Usage Commitment Term and signature by the research subject of the Terms of Free and Informed Consent.

3. Case Report

Male patient, 22 years old, was admitted to Abelardo Santos' Regional Hospital due to progressive left-sided cervical mass and previous history of two cerebrovascular accidents, the most recent one in 2022, resulting in right hemiparesis and dysarthria sequelae.

He denied any previous comorbidities but reported history of trauma at the left cervical region due to gunshot in June 2021.

The patient underwent chest and cervical angiotomography, which revealed a pseudoaneurysm with mural thrombus in the left common carotid artery, measuring 27x24mm (Figure 1) and was also submitted to venous mapping using Doppler ultrasound, however, no autologous veins suitable for grafting were identified.

Figure 1 - Cervical angiotomography.



Source: Authors. Legend: PSA: Pseudoaneurysm. RCCA: Right common carotid artery. RJV: Right Jugular Vein. Left jugular vein was not identified.

Given this condition, open surgical treatment with prosthesis was chosen and performed under general anesthesia. An oblique incision of approximately 10 cm was made on the anterior border of the left sternocleidomastoid muscle. Dissection through planes and isolation of the common, internal, and external carotid arteries were performed. Subsequently, a bolus of 5,000 IU of heparin was administered for systemic anticoagulation.

After opening and clearing the aneurysmal sac, an extensive laceration of the posterior wall of the LCCA (Figure 2) was identified, therefore simple arteriosynthesis was impossible.

Figure 2 - Laceration of the posterior wall of the LCCA.



Source: Authors.

Due to difficulty in dissecting the aneurysmal sac, which was extensively adhered to adjacent structures over two-year period, a *shunt* was created between the common carotid artery and the internal carotid artery using a size 6 gastric probe (Figure 3). This was followed by proximal and distal clamping of the left common carotid artery (LCCA), internal carotid artery (ICA), and external carotid artery (ECA).

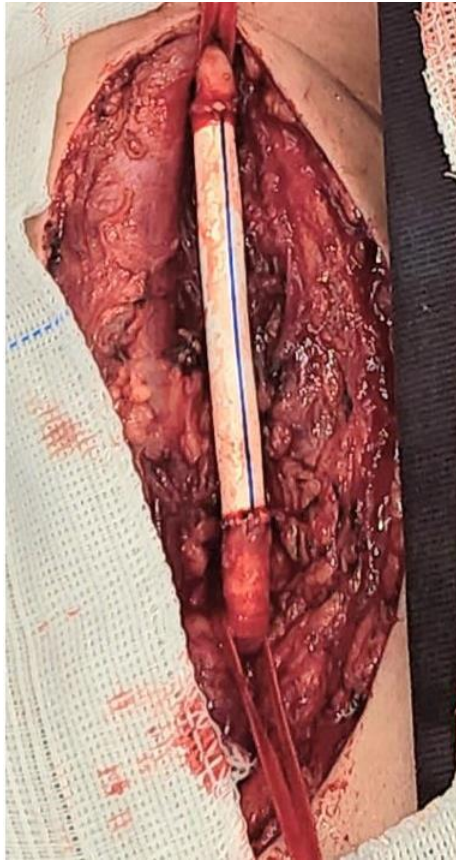
Figure 3 - Shunt between left common carotid artery (LCCA) and internal carotid artery.



Legend: A- proximal extremity of LCCA; B- Distal extremity of LCCA. Source: Authors.

Then, it was necessary to resect the compromised segment and subsequently perform an end-to-end anastomosis using a 6x50mm polytetrafluoroethylene (PTFE) prosthesis (Figure 4), successfully restoring arterial flow without any complications.

Figure 4 - Aspect after reconstruction with Dacron prosthesis.



Source: Authors.

The patient was discharged on the fourth day postoperative in good condition, without new neurological deficits or episodes of bleeding. Platelet antiaggregant medication was prescribed for home use.

4. Discussion

Pseudoaneurysms represent vascular injuries involving the media and adventitial layers of the vessel wall. Pseudoaneurysms of the cervical carotid or vertebral artery can result in cerebral ischemia via thromboembolism or flow-limiting mass effect (Velimana et al, 2021 e Gulla et al, 2020). Thus, our own patient suffered this complication.

According to Zhong et al (2022) the most common etiology of carotid pseudoaneurysm are trauma, followed by had iatrogenic injuries and spontaneous PSA. The incidence of carotid arterial injury in penetrating neck trauma is 11 to 13%. The CCA is the most commonly injured (73%), followed by the ICA (22%) and the ECA (5%) (Asensio et al, 2011).

It is important to notice that patients may be initially asymptomatic or experience varied symptoms; the most common presenting complaint is of a neck mass. The natural history of these lesions is not well defined, but the obvious concern is for rupture or embolism (Levin et al, 2012). Therefore, early diagnosis is also important.

The radiological exam of choice in diagnostic investigation of PSA mentioned in the literature is digital arteriography, however, carotid ultrasonography, a noninvasive, cost-effective, and radiation-free method, is currently the first-line imaging modality for screening carotid artery PSA. Doppler ultrasonography (USG) can help distinguish a PSA from an aneurysm and/or other cervical mass, demonstrating an echogenic swirling flow in the lumen and “to-and-fro” waveform at the neck (Abu-yousef et al, 1988). However, multi detector row computed tomography angiography (MDCTA) is also non invasive, rapid and reliable exam; wich offers a rapid means of evaluating the vasculature of the head and neck with excellent detail in

identifying site and nature of the lesion providing all the anatomical information necessary for surgical planning (Madhuripan et al, 2017 e Wang et al, 2021). Besides that, it has the advantage of not being operator dependent, unlike USG, therefore it is an important tool for PSA diagnosis and intervention.

Treatment options include observation alone, surgical repair, endovascular interventions, and combined therapy. Endovascular repair of carotid pseudoaneurysms has taken the form of three treatments over the last decade: covered stenting, bare metal stenting, and bare metal stenting with adjunctive coiling. All three have had success with treating carotid pseudoaneurysms (Maximilian et al, 2019, Spannos et al, 2016 e Lu et al, 2019). However, at this case report, surgical repair was performed.

The first surgical treatment of an extracranial CCA was performed by Sir Astley Cooper in 1808, however, currently the choice between endovascular or surgical repair depends on the nature and location of the lesion and patient factors, such as age, medical and surgical comorbidities (Hoffman et al, 2022). Our patient was young and had an easily accessible lesion at cervical zone 2, and according to Brazilian guidelines on diagnosis and management of traumatic vascular injuries (2023), a cervicotomy remains the preferred option for injuries with less complex surgical access, such as carotid injuries in cervical zone 2, therefore, like others authors before us (Santos Junior et al, 2011 e Levin et al, 2012), we felt that the most durable and beneficial approach would be surgical reconstruction, despite being more invasive.

5. Conclusion

Neck injuries must be evaluated by trained professionals and, if necessary, carotid pseudoaneurysms must be treated as quickly as possible. There is still a lack of literature regarding the best method to be used for this treatment, however, in this report, conventional surgery was chosen, taking into account the anatomical characteristics of the injury and the demographic characteristics of the patient in question. This option was considered appropriate, given that no complications or neurological deficits were identified postoperatively. More studies is necessary about the best method to be used for carotid pseudoaneurysms in order to avoid clinical complications, deaths or serious sequelae.

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