

# Delayed Pseudoaneurysms of Vertebral Artery Post Penetrating Trauma: A Case Report

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## Abstract

**Objective:** Vascular injuries usually present immediately after the penetration, but the delayed onset of vascular symptoms caused by vessel dissection or aneurysm after a traumatic event is extremely rare. Vertebral artery injury is a low-frequency but high-mortality injury. We aim to report evidence of delayed onset of vascular symptoms following penetrating trauma in the neck. **Materials and Methods:** A case report. **Results:** A 19-year-old boy was referred to our hospital and complained of a mass in the right part of his neck (right mandibular angle). He gave a history of penetrating trauma to his neck 2 months ago. The mass was expanding during these 2 months and doesn't respond to antibiotic therapy. In the examination, 3 × 3 cm, firm, nonmobile, and without tenderness and pain mass was palpated in the second level of his neck. Doctors ordered a Doppler sonography in the hospital where a yin-yang pattern was reported. A 36 × 43 × 40 mm heterogeneous, solid, and hypodense area close to C1-C2-C3 with vascular flow was discovered in the right submandibular area after computed tomography (CT)-angiography. The patient was referred to an interventional neurologist for angiography and due to the lack of flow at the distal of the V3 segment, he decided to sacrifice this artery by two coils. **Conclusion:** Penetrating neck injuries are usually asymptomatic, but these injuries are often accompanied by hemorrhage, neurological symptoms, dysphagia, odynophagia, and windpipe. Penetrating lesions of the vertebral artery are rare and very difficult to diagnose. Also, these lesions are challenging for surgeons due to complex anatomy and difficult surgical exposure. So, endovascular treatment was used to treat the patient.

## Keywords

Penetrating Trauma, Delayed Pseudoaneurysms, Vertebral Artery

## 1. Introduction

Cervical artery dissections happen at almost 2.6 per 100,000 per year [1]. Vertebral artery dissections (VADs) cause 15% of all dissections in the neck and 20% of Cerebrovascular accidents (CVA) in patients younger than 45 years old [2]. Tearing of arteries' layers causes aneurysm and dissection which result in hemodynamic insufficiency, thromboembolism, mass effect, and compression of cranial nerves [3]. Some etiologies including trauma, infections, road accidents, physical assault, and spine fractures can lead to vertebral artery dissection and aneurysm. Vascular injuries usually present immediately after the penetration, but the delayed onset of vascular symptoms caused by vessel dissection or aneurysm after a traumatic event is extremely rare [4]. We present a case of a 19-year-old man who was diagnosed with a dissection aneurysm in the V3 segment of the right vertebral artery post-penetrating trauma after 2 months.

## 2. Case Presentation

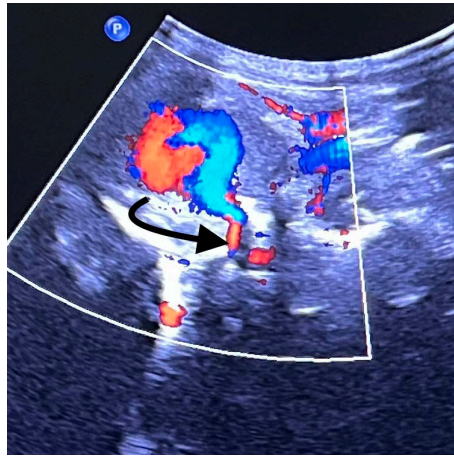
A 19-year-old patient was referred to our hospital and complained of a mass in the right part of his neck (right mandibular angle). He gave a history of penetrating trauma to his neck 2 months ago. He didn't complain of dysphagia, odynophagia, cachexia, and fever. The mass was expanding during these 2 months and didn't respond to antibiotic therapy. In the examination, 3 × 3 cm, firm, nonmobile, and without tenderness and pain mass was palpated in the second level of his neck. Doctors ordered a Doppler sonography in the hospital which a yin-yang pattern was reported (Figure 1).

Also, computed tomography (CT)-angiography was ordered too, which revealed a 36 × 43 × 40 mm heterogeneity, solid and hypodense area in the right submandibular area and close to C1-C2-C3 with vascular flow which showed a thrombotic Pseudoaneurysm (Figure 2 and Figure 3). A neck MRI has been ordered too. The patient underwent brain angiography and a dissecting aneurysm was seen in the V3 segment of the right vertebral artery. The patient was referred to an interventional neurologist for angiography. The neurologist decided to sacrifice this artery by two coils because there was no flow at the distal of the V3 segment.

## 3. Discussion

Penetrating neck injuries usually are asymptomatic, but commonly present with hemorrhage, neurologic symptoms, dysphagia, odynophagia, and trachea issues [5]. Our patient had no symptoms too, and his mass and history of trauma indicated vascular injuries. Penetrating vertebral artery injuries are rare and very difficult to diagnose and because of complex anatomy, difficult surgical exposure are challenging for surgeons [4] [5]. This artery is divided into four segments (V1 - V4) and V2 is frequently injured more than other segments [5].

Due to the anatomy of the neck, the probability of injury to the vertebral



**Figure 1.** Doppler ultrasound demonstrates pseudoaneurysm with characteristic yin-yang sign, pseudoaneurysm neck origin from the vertebral artery is marked (arrow).



**Figure 2.** Coronal fat sat T1w contrast-enhanced MRI shows thrombotic pseudoaneurysm and its connection to the right vertebral artery (arrow).



**Figure 3.** Unqualified CT-angiography shows pseudoaneurysm and bony defect in the right transverse process at the C2 level (arrow).

artery is low, while it is a high-mortality injury [5] [6]. Previous studies revealed that the mortality rate of vertebral artery injuries ranged from 3% to 19% [7]. But, the development of diagnosis and treatment procedures causes a reduction in the mortality rate [6].

Pseudoaneurysms occur as a result of a disruption in the wall of arteries which leaves the blood in surrounding tissue [8]. Pseudoaneurysms of the vertebral artery are very rare, their incidence is less than 1% of all aneurysms, and almost located in the intracranial segment [9]. Pseudoaneurysms of extracranial segments are generally the result of iatrogenic, traumatic, or connective tissue disorder [8].

Patients who were transported to the emergency department because of head or neck traumatic injuries are primarily evaluated by head and neck CT scan without injection and if we suspect a neurovascular injury, a CT-angiography is performed [10].

Because some features are less specific for artery dissection, cerebral angiography is not helpful always for diagnosis. Although, the diagnosis will be definitive by some specific radiographic signs such as intraluminal clot or pseudoaneurysm [11], transcranial Doppler (TCD) is also used in these clinically controversy conditions [11].

Nowadays, because of the development of CT-angiography, the role of conventional angiography has reduced significantly, and CT-angiography has become the first modality for the diagnosis of vertebral artery injuries (VAIs) [11] [12]. The most important advantage of CT-angiography is being noninvasive [5] [10] [15] [12]. Therefore, we ordered a CT-angiography for our patient which revealed a 30 × 40 cm thrombotic pseudoaneurysm.

The management of extracranial vertebral artery aneurysms (EVAA) can be surgical or endovascular based on symptoms [13]. The location and size of giant EVAA can cause local effects such as vascular, nerve, tracheal compression,odynophagia, and dysphagia which lead to surgical treatment [14]. However, our patient had no local effects so both surgical and endovascular treatments could be used.

The surgical technique for the treatment of EVAA is primary ligation, vertebral to internal carotid transposition, vertebral revascularization distal to the aneurysm, and bypass with venous conduit [14] [15]. Because of widely development of endovascular techniques, new approaches for the treatment of aneurysms have been widely invented and used such as embolization with platinum coils, onyx, liquid n-butyl cyanoacrylate, sacrifice, or using stent-grafts based on size, location, or features of the injured artery [9] [13]. Nowadays, endovascular treatment methods which are used are stent-grafts, flow diverters, or double-layer micromesh stents [5] [9] [13]. A multidisciplinary team decides which method to use based on the features of each patient. An interventional neurologist, along with a multidisciplinary team at our hospital, has decided to cure the patient via angiography and remove the artery by two coils.

## Data Availability

The data used to support the findings of the study are available from the corresponding author upon request.

## Ethical Approval

This study was approved by the Ethics Committee of the Hamadan University of Medical Science. This study was conducted in accordance with the Declaration of Helsinki.

## Consent

The patient has given his permission for the publication of this report and the accompanying images.

## The Institution Where Work Was Performed

The Besat Hospital.

## Conflicts of Interest

All authors declare that there is no conflict of interest regarding the publication of this paper.

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