

Management of an Extracranial Carotid Artery Pseudoaneurysm from Penetrating Neck Trauma

K R Hassler, B J Halgas, M R Matthews, M J Heilbron, K N Foster

Citation

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Abstract

Purpose: Extracranial carotid artery aneurysm (ECAA) is overall a rare clinical entity. Etiologic factors contributing to aneurysms are atherosclerosis (38%) and trauma as a less common factor (11%)¹. Trauma as a cause for ECAA is associated with pseudoaneurysm development and is typically described following blunt injury². Most become symptomatic with varying degrees of either cerebral ischemia (36%) or the development of a pulsatile mass (33%)¹. Surgical repair is indicated as conservative management has poor clinical outcomes³. We present a case of traumatic penetrating ECAA (saccular type) with a delayed presentation, successfully managed with open repair.

Summary: A 65-year-old male with a past medical history of a gunshot wound (GSW) to the right neck who was managed non-operatively in Mexico presented approximately 10 years later with left sided neurologic changes and a right pulsatile cervical neck mass. Head computed tomography (CT) images revealed multiple old right sided cerebral infarcts. With his antecedent history of trauma, the pulsatile mass in the right neck, and the findings on head CT, a vascular surgery consult was obtained. The vascular surgery team felt that this was a saccular pseudoaneurysm secondary to the old penetrating GSW to the neck. Interventional radiology performed a formal 2-D planar angiogram which revealed a saccular pseudoaneurysm from the medial aspect of the right common carotid artery. Management consisted of open surgical repair with carotid artery pseudoaneurysm plication and patch angioplasty. Short interval follow-up revealed no new neurologic deficits.

Conclusion: Open surgical approach for ECAA remains an equivalent management option when compared to more expensive endovascular options. We present a case of open carotid artery aneurysm repair that could likely be managed with an endovascular approach by larger and resource laden institutions. We would propose that open repair is a relevant option, especially in smaller community-based hospitals and in the underserved patient populations.

INTRODUCTION

Extracranial carotid artery aneurysm (ECAA) is a rare clinical entity. Etiologic factors contributing to aneurysms are atherosclerosis (38%) and less commonly, trauma (11%)¹. Trauma as a cause of ECAA is associated with pseudoaneurysm development and is typically described following blunt injury². The majority become symptomatic with varying degrees of either cerebral ischemia (36%) or the development of a pulsatile mass (33%)¹. It is well-described in the literature that rupture is an uncommon complication³, and that when diagnosed, surgical repair is indicated since conservative management has been shown to have poor clinical outcomes⁴. No current guidelines are available for open versus an endovascular approach.

We present a case of traumatic penetrating extracranial

carotid artery pseudoaneurysm (saccular type) with a delayed presentation successfully managed with open repair.

CASE PRESENTATION

A 65-year-old Mexican male with a past medical history significant for hypertension and a GSW to the neck ten years prior, presented to the Maricopa Integrated Health System Emergency Department with complaints of progressive left sided weakness. He was brought in by his daughter who requested evaluation, of his worsening neurologic symptoms. On presentation, he was afebrile and hemodynamically stable with a heart rate of 84, respiratory rate of 20, and SaO₂ of 98% on room air. He was noted to be hypertensive with a blood pressure of 156 / 95 mmHg. Neurologic examination revealed a GCS of 15 with left upper and lower extremity motor deficits of 4/5 compared

with his right upper and lower extremity, weak left grip and a shuffling left foot with ambulation. Sensation was intact throughout and he was noted to have slurred speech per the Spanish interpreter. Peripheral vascular examination revealed normal distal pulses and capillary refill less than 2 seconds in all four extremities. Additionally, old, well-healed scars were noted on his right anterior neck and right posterolateral neck, with an underlying pulsatile mass.

His work-up for his neurologic symptoms initially consisted of a non-contrast computerized tomography (CT) scan of his brain. CT images (Figure 1) revealed multiple, old, right-sided cerebral infarcts. With his antecedent history of trauma, the pulsatile mass in the neck, and the CT findings, a vascular surgery consult was obtained. The vascular surgery team felt that the pulsatile mass represented an aneurysm secondary to the old GSW to the neck. Interventional radiology performed a formal 2-D digital subtraction angiogram (Figure 2) which revealed a saccular aneurysm from the medial aspect of the right common carotid artery (Figure 3).

Figure 1

CT brain images showing multiple old right cerebral infarcts.

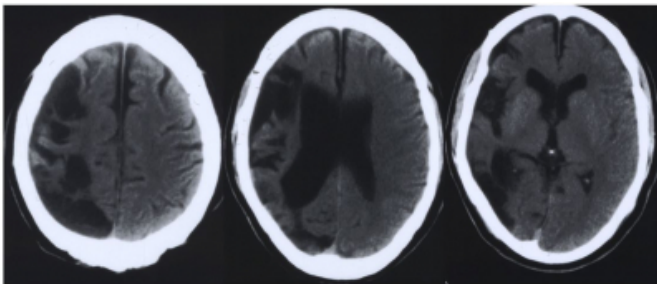


Figure 2

Angiogram images (2-D digital subtraction) showing a medial saccular aneurysm of the right common carotid artery.

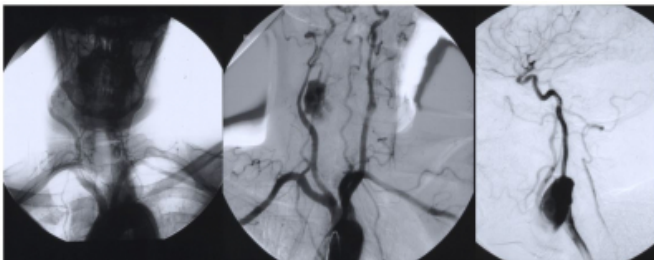
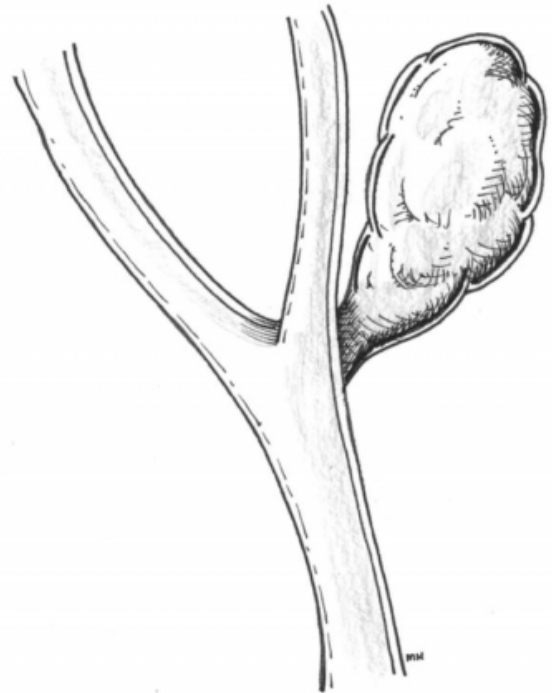


Figure 3

Illustration of right common carotid pseudoaneurysm.

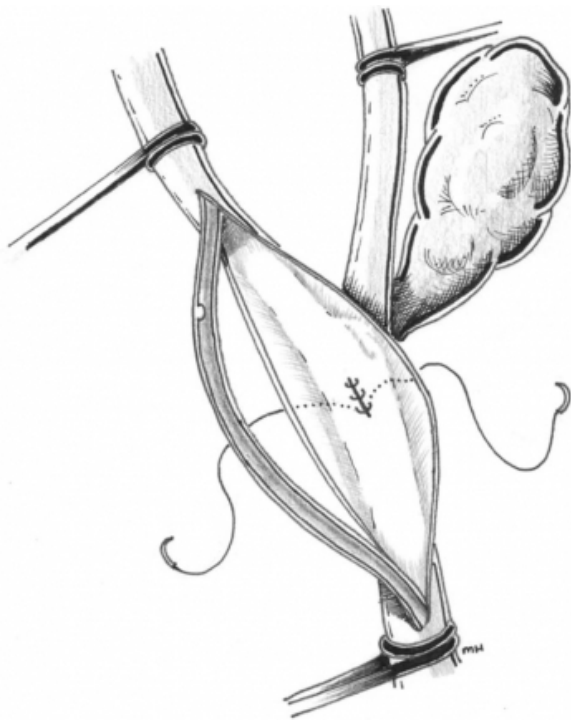


Operative Course:

The patient remained hemodynamically stable throughout the entire case. The patient underwent standard exposure of the right carotid artery and the carotid artery was opened anterolaterally after proximal and distal control. A Bard shunt (Bard Peripheral Vascular, Inc., Tempe, AZ) was inserted for arterial bypass. No EEG was used during the operation. With the shunt in place, the carotid artery was circumferential exposed and the saccular aneurysm, which was ligated and divided. The aneurysm was entered and no additional inflow sources were noted (Figure 4).

Figure 4

Illustration of the opened right carotid artery with shunt in place and with intraluminal closure of pseudoaneurysmal intimal defect.



A 30cc clot burden was easily removed. After irrigating the sac, it was left open. The orifice of the now-ligated neck of the aneurysm was addressed from the inside of the artery, closing it with interrupted, 6-0 Prolene suture (Ethicon, Cincinnati, OH). Patch angioplasty, to close the carotid arteriotomy was completed using bovine pericardium (Synovis Life Technologies, Saint Paul, MN) and running 6-0 Prolene suture. The cervical incision was closed in layers without a drain. The patient's estimated blood loss was approximately 100 cc's and the patient was taken to the recovery room; no new neurologic deficits were noted on emergence from anesthesia. The patient remained on intravenous heparin (Fresenius, Lake Zurich, IL) until post-operative number three and transitioned to oral aspirin (McKesson Packaging, Concord, North Carolina) and clopidogrel (Accord Health Care, Rockford, IL). He was discharged home on post-operative day number four.

At clinic follow-up the patient was stable neurologically with no new deficits. The incision was noted to be healing well without signs of infection. Unfortunately, he was subsequently lost to follow-up

DISCUSSION

Extracranial carotid artery aneurysm (ECAA) is a rare

complication accounting for 0.4-4% of all peripheral artery aneurysms⁵. Initial treatment was described in the early 1800's as proximal ligation of the ECAA but was fraught with high rates of stroke and mortality⁵. In 1956, Dimtza described the first resection and reconstruction of the aneurysmal artery that subsequently became the standard of care due to lower rates of complication^{5,6}. This method of resection and patch angioplasty was later reviewed by DeBakey et al. at a single institution over 21 years and was found to have an 11% postoperative complication rate⁷.

In the current literature, the debate regarding standard of care for treatment options continues. With the widespread adoption of endovascular surgery there is a number of case reports and case series showing equivalent outcomes to open repair^{5,8,9,10,11}. These studies report that both open and endovascular approach are acceptable options with overall similar results^{9,10}. While there are no strict guidelines for treatment, the choice for approach is based upon surgeon experience and individual patient characteristics. Trans-carotid artery revascularization (TCAR) is the latest endovascular development utilizing a reverse flow system minimizing even further the chance for an embolic cerebrovascular accident.

We present a rare case of penetrating neck trauma with subsequent symptomatic ECAA treated with an open approach. The literature is robust with blunt traumatic injuries as the etiologic cause of ECAA. Our case is unique in that it is a delayed presentation of a symptomatic ECAA from penetrating trauma. Open repair was elected by the operating surgeon, as at the time of the intervention, the endovascular approach was not readily available at the community-based hospital. Further complicating the patient's course was that he was uninsured, therefore, limiting his options for transfer to a facility with endovascular capabilities. Open repair has been the standard of care for ECAA since the mid-1900's, however, there is growing data that support the use of endovascular repair. A number of endovascular techniques have been described, from covered stents to bare metal stent with aneurysmal embolization through the stent struts,. Specifically, the endovascular approach is very advantageous in anatomically inaccessible areas such as in a hostile neck, including those status post trauma (penetrating or blunt), a re-operated field or a radiated area.

Finally, patients with zone II extracranial carotid artery aneurysm are treated with open surgery given the ease of access with lateral retraction of the sternocleidomastoid

muscle¹². Zones I and III are much more challenging to access. An endovascular approach via peripheral arterial percutaneous access allows for occlusion or stenting across the area of injury, especially when the injury is isolated to the extracranial carotid artery¹³.

With quickly evolving surgical technology, the use of endovascular repair is becoming a more viable option. An open repair continues to be a relevant option, especially in a smaller community-based hospitals and in the underserved/uninsured patient population. Upon review this is a unique description of a successful open repair for an ECAA from a penetrating injury delayed for over 10 years.

CONCLUSION

Open surgical repair for ECAA remains a viable equivalent option despite the underlying etiologic cause. Endovascular approach may not be readily accessible for all patients; therefore, an open surgical approach to ECAA continues to be relevant.

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Author Information

Kenneth R. Hassler, DO

Surgical Resident, Department of Surgery, Maricopa Integrated Health System
Phoenix, Arizona

Barret J. Halgas, MD, (Capt)

Surgical Resident, Department of Surgery, William Beaumont Army Medical Center
El Paso, Texas

Marc R. Matthews, MD, FACS

Surgical Attending, The Arizona Burn Center
Phoenix, Arizona

Maurico J. Heilbron, MD, FACS

Surgical Attending, St. Mary Medical Center
Long Beach, California

Kevin N. Foster, MD, MBA, FACS

Director, The Arizona Burn Center
Phoenix, Arizona