Journal of Surgical Techniques and Procedures

Case Report
Published: 16 Jan, 2019

Impending Rupture Pseudo Aneurysm of V2 of Vertebral Artery: A Successful Hybrid Approach and Outcome. A Vascular Surgeon View

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Abstract

Extra cranial Vertebral Artery (VA) aneurysms are very uncommon accounting for 0.5% of all aneurysms; they generally affect the most mobile segment, the V3 segment, followed by the V1 segment. Here we report the successful ligation of a symptomatic impending rupture of extra cranial second part right vertebral artery (V2) pseudo aneurysm in a 35-years-old male and highlighting the treatment options in emergency situations for extra cranial VA injuries.

Keywords: Aneurysm; Cerebral revascularization; Pseudoaneurysm; Vertebral artery

Introduction

Unruptured extra cranial vertebral artery (VA) aneurysms are uncommon and have rarely been described with treatment options. Vertebral artery aneurysms are rare clinical findings, representing 1% of supra-aortic aneurysms, and the most common cause of Extracranial Vertebral Artery Aneurysms (EVAA) is penetrating neck trauma, but they can also occur secondary to dissection, atherosclerosis, infection, collagen vascular diseases, and inherited connective tissue disorders. The rupture of an EVAA can lead to catastrophic bleeding and pose diagnostic and therapeutic challenge. Extra cranial VA aneurysms are very uncommon accounting for 0.5% of all aneurysms; they generally affect the most mobile segment, the V3 segment, followed by the V1 segment. However, extra cranial carotid or vertebral artery aneurysms are increasingly recognized as a cause of ischemic strokes, especially in young patients who are less than 45-year-old and accounts for approximately 25 percent of total such cases [1].

Case Study

Here we report the successful control and ligation of a symptomatic impending rupture of extra cranial right VA pseudo aneurysm and highlighting the treatment options for extra cranial VA aneurysms. A 35-years-old male, with no history of hypertension, diabetes, nonsmoker was presented at our emergency department with a stab injury of his neck on the right side and a large pulsating hematoma with bruit on auscultation, the mass reached 10 cm × 7.8 cm by Color Doppler Ultrasound that showed the aneurysm presented with swirling flow and decreased linear flow velocity. C.T angiography confirmed the presence of extra cranial pseudo aneurysm involving the 2nd part of right VA, measuring10 cm × 7.5 cm. C.T angiography indicated an intact Circle of Willis without any stenosis of cervical arteries. The left VA was of normal caliber and the bilateral vertebral arteries were dominant in the vertebrobasilar system [1]. The patient was resuscitated with full laboratory investigations, biochemistry tests that were within normal values. Chest radiography, electrocardiography were all normal and neurological evaluation was free, there was no manifestations of cerebral or vertebrobasilar insufficiency. About 24 hours later the swelling was obviously reached its maximum in all dimensions and the patient suffered severe pain and headache with overlying skin was severely ecchymotic, bluish in color with thinning of the aneurysm overlying skin. Urgent interference was decided. In this case, the following treatment plans were considered for management of the current situation, Coil embolization of the aneurysm along with stent placement. Stent graft without coiling, isolation of aneurysm and transposition of VA end- to-side to common carotid artery, Excision of aneurysm and autogenous interposition graft, Subclavian or carotid to vertebral bypass and ligation of aneurysm, Excision of aneurysm and prosthesis interposition graft vertebral artery ligation [2-4]. We agreed that the first option would be the proximal control of the VA1 in such urgent condition because other options as end

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Received Date: *21 Dec 2018*
Accepted Date: *11 Jan 2019*
Published Date: *16 Jan 2019*

Citation:
Mowafy K, Soliman M. Impending Rupture Pseudo Aneurysm of V2 of Vertebral Artery: A Successful Hybrid Approach and Outcome. A Vascular Surgeon View. J Surg Tech Proced. 2019; 3(1): 1022.

luminal treatment such as covered stent or end luminal occlusion were not applicable due to the tortuosity of the proximal segment of right VA Moreover, stenting or coiling may have the incidence of embolic ischemic stroke, so that it was preferable to ligate the VA V1 and V3 leaving the aneurysm excluded to thrombosed. Preoperative CT Angiography demonstrated that the right VA pseudo aneurysm is closely located to the second part.

Procedure

We choose the hybrid operating room where a temporary balloon (3F) occlusion and control was implemented. Under local anesthesia a right brachial artery access sheath (4F) was inserted, where a 0.14 terumo wire was used to cannulated right vertebral artery guided by a vertebral catheter (4F) and The balloon was inflated where a successful proximal flow arrest was achieved, and fortunately the affected vertebral artery was not dominant, that encouraged us to go for surgical exclusion. The VA V2 segment extends classically in and between the transverse processes from C6 to C2. Hence the direct transposition of VA end-to-side to common carotid artery maybe difficult due to anatomical issue…….. Exposure of V2 of the vertebral artery is still a surgical challenge, and in presence of such impending rupture pseudo aneurysm, it was logic in such situation to go for proximal and distal control of V1 and V3 bypassing the V2 segment, and the goal of the current treatment was to control rupture and bleeding. Surgical exposure of the Vertebral Artery V1 and V3 segments was planned in the hybrid operating room for the surgical management Exposure of the V1 segment was obtained through a small transverse (4 cm) supraclavicular approach, dissection downward guided by pulsation of the subclavian artery, and it was encircled by vessel loop, and vertebral artery was identified as it emerge from the first part of the subclavian artery, and feeling of the inflated balloon guided us to reach the V1 part in very short time, and it was ligated. Intraoperative duplex showed retrograde filling of the sac from the more distal V3 part. The VA V3 segment extends from the C2 transverse foramen to the Dura mater of the foramen magnum. It initially courses vertically between the C2 and C1 transverse foramens, then runs horizontally over the atlas groove, and finally obliquely upwards before piercing the Dura mater. Exposure of the VA V3 segment was done through an antero-lateral approach by passing medial to ster-nomastoid muscle. Once the spinal accessory nerve is identified, it was retracted anteriorly, the lavatory scapulae and underlying splenius cervices muscles are readily identified in the posterior wound a 2 cm segment of vertebral artery is accessible in this interspace. After exposure and protection of the spinal accessory nerve, the C1 transverse process is identified below and in front of the mastoid tip. The small muscles that insert on it are cut to expose the C1-C2 portion. The inferior aspect of the horizontal portion is safely separated from the atlas groove by elevating the sub periosteal plane and the superior aspect is freed by a cut a few millimeters above the VA on the occipital condyle. Complete DE roofing of the C1 transverse foramen is achieved by resecting the bone while leaving intact the sub periosteal plane. The VA could be identified and dissected, ligated. Venous bleedings during the dissection from periosteal sheath tearing could be controlled by direct pressure and local oxidized cellulose sheets. Closure of the wounds was done after ensuring absence of any flow signals inside the aneurysmal sac. Our patient postoperative period was smooth, free of any signs or symptoms of focal neurological ischemic insult or vertebrobasilar insufficiency. He was discharged 72 hours postoperatively, and strict follow up revealed diminished size of the organized hematoma and free neurological condition.

Discussion

The natural course of cerebral aneurysms is highly associated with the size, specific location and shape of the aneurysm. True aneurysm is defined as a dilatation of three arterial layers. The etiology of true aneurysms consists of atherosclerotic degeneration, collagen vascular disorders and fibro muscular dysplasia. However, false aneurysm, also known as pseudo aneurysm, which may caused by trauma or iatrogenic injury, is a vascular abnormality that is limited by external fibrous tissue or thrombus rather than true vessel wall [5]. Extra cranial VA aneurysms are generally caused by traumatic factors, which include penetrating or blunt injury, abnormal cervical rotation, cervical subluxation or fracture and iatrogenic injury. Furthermore, hypertension, atherosclerosis, syphilis and rheumatoid arthritis may be associated with extra cranial VA aneurysms. Genetic disorders such as Ehlers-Danlos syndrome, Marfan's syndrome and Neurofibromatosis Type-1 (NF-1) are considered as inherited pathogenic factors of extra cranial VA aneurysms [6]. Wouter I. Schievink and David G. Piepgras summarized cases of extra cranial vertebral artery aneurysms associated with NF-1. Among which, cases of unruptured aneurysms showed typical symptoms such as radiculopathy, neck pain and neck mass, while 10 cases of ruptured aneurysm presented with cervical hematoma, hypotension, dyspnea, respiratory failure and even hem thorax which indicated a very poor prognosis [7]. Sishir Rao et al., [8] reported a case of extra cranial vertebral artery aneurysm with spinal subarachnoid hemorrhage due to vasculitis in Behcet's disease. Furthermore, Reyes et al., [9] presented the first case of iatrogenic extra cranial VA pseudo aneurysm, which was treated by direct repair. Garg et al., [10] suggested the patients with pseudo aneurysms or neurological events must be treated regardless of size, While the patients with fusiform aneurysms should undergo repair surgery when the diameter is 150% or larger than the normal size. The treatment includes ligation, isolation, balloon embolization, onyx embolization; stent assisted coiling embolization and resection.

Conclusion

In urgent situation as regard vertebral artery injuries or rupture aneurysm, an endovascular cannulation under local anesthesia was an excellent first step procedure as it gave us a diagnostic, and therapeutic value in such urgent vertebral artery traumatic injuries and extra cranial VA scarifying surgery can be well tolerated in young age, with attention to the other vertebral artery in presence of complete circle of Willis.

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