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Radiology

Brachiocephalic Vein Aneurysm as a Rare Vascular Entity - A Case Report

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Abstract | **Case Report**

Venous aneurysms are rare vascular abnormalities that pose significant diagnostic and therapeutic challenges. Their low prevalence often leads to exclusion from the differential diagnosis of mediastinal masses, and no standardized management guidelines currently exist. The complexity increases when the affected vessel is the brachiocephalic vein, a structure frequently involved in central venous catheterization and chemotherapy port placement. We report the case of an incidental finding of a brachiocephalic vein aneurysm in an 80-year-old male.

Keywords: Brachiocephalic vein, Aneurysm, Venous anomaly, Mediastinum, Computed tomography.

INTRODUCTION

Aneurysms of the brachiocephalic vein, also referred to as innominate vein aneurysms, are exceedingly rare vascular anomalies with fewer than 50 cases reported in the literature to date [1]. They are typically asymptomatic and most often discovered incidentally during imaging performed for unrelated reasons, such as evaluation of a mediastinal mass or staging of malignancies [2,3]. When symptomatic, they may present with compressive effects, thromboembolism, or, in rare cases, rupture. The etiology remains poorly understood and may include congenital vascular wall weakness, trauma, central venous catheterization, or degenerative changes [1]. Diagnosis relies primarily on cross-sectional imaging—particularly contrast-enhanced computed tomography (CT) or magnetic resonance venography—which can delineate the vascular nature of the lesion and differentiate it from other anterior mediastinal masses [4]. Despite the growing number of reported cases, there are no established guidelines for the management of brachiocephalic vein aneurysms. Treatment strategies range from conservative monitoring to surgical resection or endovascular repair, depending on factors such as aneurysm size, morphology, presence of symptoms, or risk of complications [5,6]. We present the case of an incidental brachiocephalic vein aneurysm discovered in an 80-year-old male, highlighting the diagnostic considerations and management approach in the absence of clinical symptoms or complications.

CASE PRESENTATION

An 80-year-old male with a history of prostate adenocarcinoma under treatment was referred for a thoracoabdominopelvic CT scan as part of routine oncological evaluation. He was clinically stable and asymptomatic, with no history of chest pain, dyspnea, cough, trauma, or prior central venous catheterization, and physical examination was unremarkable. Contrast-enhanced thoracic CT revealed a well-circumscribed saccular dilation of the left brachiocephalic vein measuring 73 × 52 × 51 mm in the anterior mediastinum, with homogeneous enhancement, contrast pooling in the dependent portion, and continuity with the left subclavian vein, consistent with a venous aneurysm of the brachiocephalic vein [Figures 1, 2]. No evidence of thrombosis, mass effect, or compression of adjacent structures was seen. A diagnosis of incidental asymptomatic aneurysm of the left brachiocephalic vein was made, and in the absence of symptoms, thrombus, or compressive complications, a conservative management strategy with periodic clinical and radiological follow-up was adopted. At the time of reporting, the patient remained stable and asymptomatic.

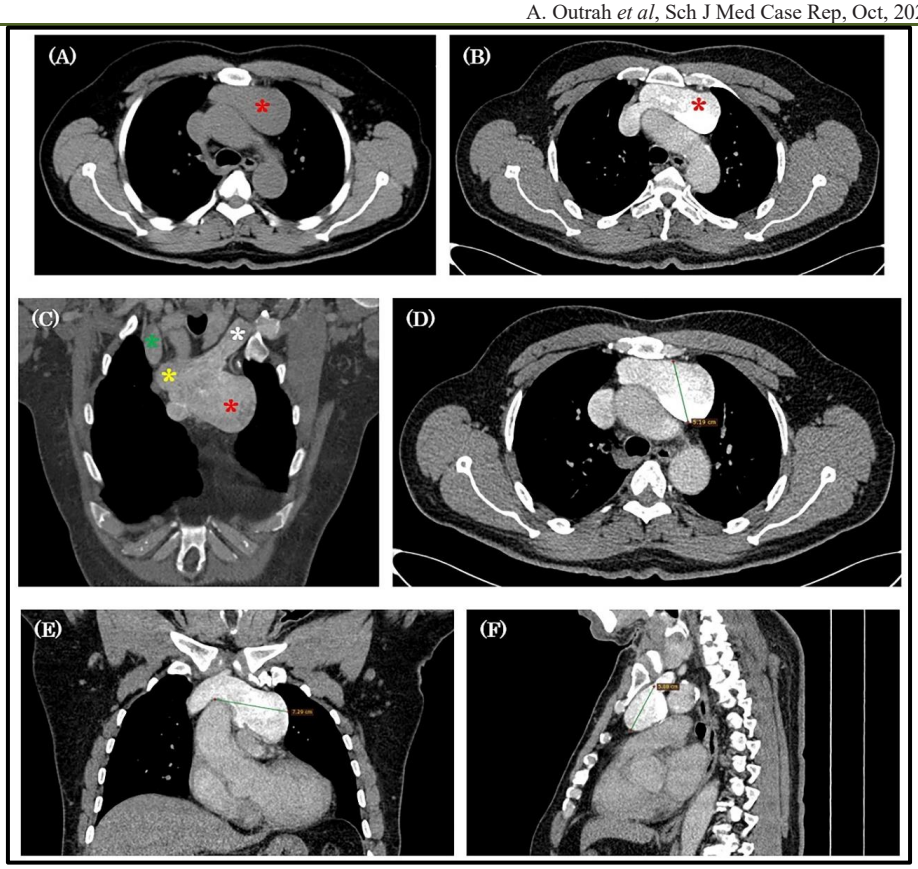

Figure 1: Contrast-enhanced thoracic CT images demonstrating a saccular aneurysm of the left brachiocephalic vein (red asterisk). (A–B) Axial views showing a well-defined, contrast-filled vascular structure located in the anterior mediastinum with pooling of contrast in the most dependent portion of the sac, consistent with gravity-dependent contrast stagnation. (C) Coronal reconstruction showing continuity between the aneurysm (red asterisk), left subclavian vein (white asterisk), the origin of superior vena cava (yellow asterisk), and right brachiocephalic vein confluence (green asterisk). (D-F) Axial, coronal, and sagittal reconstructions with size measurements of the aneurysmal sac

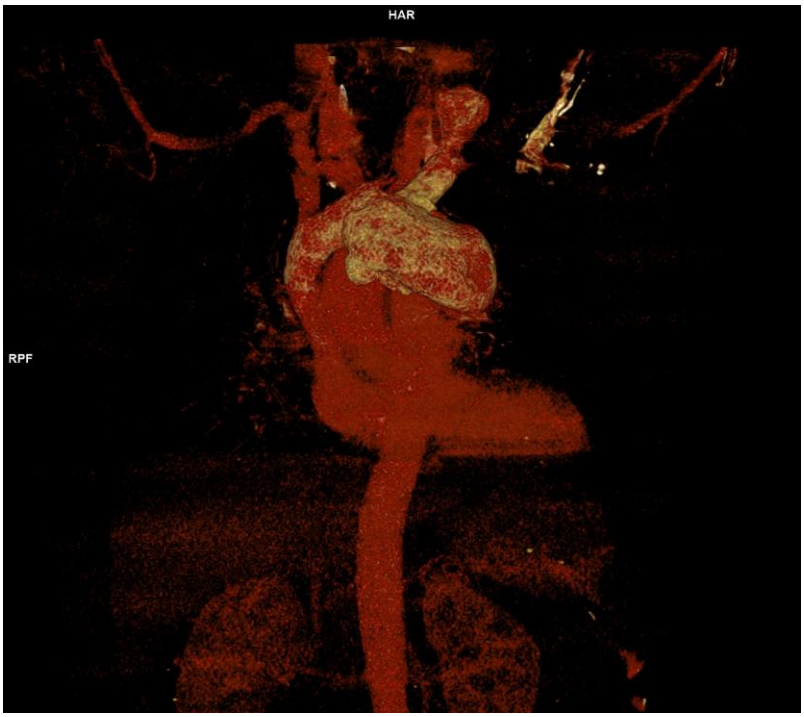

Figure 2: 3D reconstruction of the brachiocephalic vein aneurysm

DISCUSSION

Brachiocephalic vein aneurysms are exceedingly rare vascular abnormalities, with fewer than 50 cases reported in the literature to date [1]. They are most often diagnosed incidentally during imaging performed for unrelated indications, as was the case in our patient. The etiology remains poorly understood but may involve congenital weakness of the venous wall, degenerative changes, trauma, or iatrogenic factors such as prior central venous catheterization. Additionally, some authors have reported associations with congenital conditions, including neurofibromatosis type 1, suggesting a possible underlying structural predisposition [5] [3].

These aneurysms are typically asymptomatic, but complications such as thrombosis, pulmonary embolism, or rupture have been described [1]. In symptomatic cases, patients may present with cough, chest pain, dyspnea, or signs related to mass effect. Imaging modalities such as contrast-enhanced CT or MR venography are essential for diagnosis, as they allow visualization of vascular continuity and enhancement patterns, which help differentiate venous aneurysms from other mediastinal masses like thymomas or lymphadenopathy [4].

The management of brachiocephalic vein aneurysms remains controversial due to their rarity and the absence of established clinical guidelines. Therapeutic decisions are typically based on individual patient factors, including aneurysm size, morphology (saccular vs. fusiform), presence of symptoms or complications, and patient comorbidities [2]. Conservative management is generally favored in asymptomatic patients, especially when the aneurysm is discovered incidentally and lacks high-risk features such as thrombus formation, rapid growth, or compressive symptoms. Surveillance typically includes periodic imaging with contrast-enhanced CT or MR venography to monitor for changes in size or the development of complications. Several authors have reported favorable outcomes with observation alone in stable, asymptomatic cases [1,3]. Surgical intervention is generally reserved for symptomatic patients, those with large or expanding aneurysms, or cases complicated by thrombosis, pulmonary embolism, or risk of rupture. Surgical approaches may include aneurysmectomy with direct venous repair, ligation, or graft interposition. The choice of approach—median sternotomy vs. thoracotomy—depends on the location and extent of the lesion. Successful surgical resections have been reported, often with good long-term outcomes and low recurrence rates [6,7]. Endovascular treatment, such as stent placement or coil embolization, has been described in select cases but remains less commonly employed due to technical challenges and limited long-term data. It may be considered in patients unfit for surgery or in anatomically favorable lesions [5].

In our case, the patient was asymptomatic and the aneurysm showed no signs of thrombosis or mass effect, favoring a conservative management strategy. However, the presence of a venous aneurysm introduced a unique consideration regarding central venous access for chemotherapy. Placement of a port catheter into the affected vein could increase the risk of thrombosis due to low-flow dynamics within the aneurysm. Conversely, catheterization via the contralateral side poses technical challenges, including the risk of catheter migration toward the aneurysmal sac. These practical concerns highlight the need for multidisciplinary planning and individualized decision-making when managing venous aneurysms in patients requiring central access.

This case reinforces the importance of considering venous aneurysms in the differential diagnosis of anterior mediastinal lesions, particularly in elderly patients or those with prior vascular interventions.

CONCLUSION

Brachiocephalic vein aneurysms are rare vascular anomalies that are often diagnosed incidentally and can present unique diagnostic and management challenges. While most cases are asymptomatic and may be safely managed conservatively, careful evaluation is essential to rule out complications such as thrombosis or compression. In patients requiring central venous access, the presence of a venous aneurysm warrants particular attention to procedural planning to avoid iatrogenic risks. This case underscores the importance of including venous aneurysms in the differential diagnosis of mediastinal lesions and highlights the need for individualized, multidisciplinary management strategies.

Conflict of Interest: The authors declare no conflicts of interest.

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