Cardiovascular Images

Unilateral external jugular vein aneurysm in a dog☆

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Abstract An 11-month-old Staffordshire Bull Terrier was referred with a two-month history of fluctuating unilateral jugular groove swelling, which appeared to enlarge after exercise. There was no history of trauma. Multimodal imaging findings (using transdermal and transesophageal ultrasound and dual phase computed tomography angiography) were consistent with large, saccular, left jugular vein aneurysm, running parallel to the left carotid artery. There did not appear to be any arteriovenous communication present. There were no cardiac abnormalities found on echocardiography. Following surgical excision, histopathological analysis supported the clinical suspicion of a congenital external jugular venous aneurysm. © 2022 Elsevier B.V. All rights reserved.

An 11-month-old Staffordshire Bull Terrier was referred to the Queen’s Veterinary School Hospital to investigate a clinically asymptomatic, soft, fluctuating, non-pulsatile, non-painful unilateral swelling in the left jugular groove, which became more prominent as the head was lowered and after

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exercise. There was no history of trauma (e.g., barbed collar, prior venipuncture or other); the swelling was suddenly noticed two months prior to referral and had enlarged during this period.

**Image interpretation**

Cervical transdermal and transesophageal ultrasonography revealed a large, aneurysmal dilation of the left external jugular vein with a large amount of spontaneous echo contrast but no thrombus was seen (Fig. 1, Video 1). The dilation was accuated and extended towards the thoracic inlet, with no evidence of an arteriovenous malformation/communication. There was insufficiency of the jugular vein valve most distal to the aneurysm with ‘to-and-fro’ blood flow within the aneurysm (Videos 2A, 2B).

Supplementary video related to this article can be found at https://doi.org/10.1016/j.jvc.2022.01.006

Due to the location and dimension of the aneurysm, and the large amount of spontaneous echo contrast detected, antithrombotic treatment was initiated (clopidogrel 2 mg/kg PO q24h) and surgical excision occurred three weeks after initial diagnosis. The aneurysm and left subclavian vein were ligated and excised under general anesthesia in dorsal recumbency. The surgery went without complication. At follow-up six weeks post-surgery, the dog was clinically well and there was no cervical swelling. But a cervical transdermal ultrasonography showed the presence of a thrombus attached to the wall of the remanent left external jugular vein, distal to where the vein had been ligated. A repeated CTA and thrombolytic treatment options were discussed with the client but declined. Aspirin (1 mg/kg PO every other day) was initiated alongside clopidogrel at the dose stated above. Following this, the dog was lost to follow-up.

Histopathological examination of the excised tissue revealed an expanded venous structure consistent with that of a venous aneurysm (Fig. 4).

**Discussion**

Cervical venous aneurysms are rare vascular anomalies in humans [1] and have only been scarcely reported in dogs [2–4]. In the case described herein, we used advanced and multimodality imaging to better characterize the jugular vein aneurysm and plan surgical approach.

In humans, venous aneurysms may be classified on the basis of etiology as primary or secondary [3,5]. The etiology of primary venous aneurysms is unknown, but there is speculation that congenital weakness or degenerative changes in the venous...
wall due to a connective tissue disorder or local inflammatory process may result in aneurysm formation [3]. Histologically aneurysms can be classified as true aneurysms where all three layers of the normal vessel wall are present, but there is histopathological wall thinning [6] or pseudoaneurysms, which lack all three layers, and may be formed as a result of trauma [7,8]. Histologically, our presented case had marked luminal dilation with an undulant three-layered vascular wall that lacked reactive endothelium or luminal fibrin depositions. Additionally, no internal or external laminae were seen with the Van Gieson stain. These histological findings meet the criteria of a true venous aneurysm rather than the result of ongoing intravascular thrombosis due to vascular dilation with a three-layered full-thickness blood vessel wall; no internal or external elastic laminae as would be expected in elastic arteries, and lack of any thromboses within the excised vessel lumen. A theory for the etiology of a congenital aneurysm is the thinning of the elastic and muscular layers of the venous wall resulting in weakening of the vessel wall [4]. Venous aneurysms may also occur secondary to other congenital venous anomalies such as arteriovenous fistula, venous hypoplasia, ectopia or agenesis, or be acquired secondary to trauma, neoplasia, or surgical intervention [3]. In the case herein reported, the exact etiology could not be determined, however, given the young age of the patient and no history of cervical trauma, congenital malformation was suspected.

Aneurysms of the venous system are usually asymptomatic in people [1,7,9]. However, deep venous thrombosis or pulmonary thromboembolism...
have been reported to occur [1, 3, 4, 7, 9, 10]. Clinical characteristics of a jugular aneurysm in humans are a non-painful, soft, non-pulsatile swelling which enlarges with breath holding [11]. Interestingly, in the case here described the swelling increased with cervical ventroflexion or after more vigorous physical activity, which could potentially be due to the increase in venous return/pressure.

Non-invasive diagnostic imaging techniques are recommended for definitive diagnosis. Ultrasonography is the most commonly used tool for easy and safe diagnosis of venous aneurysms [5–7], whereas CTA allows detailed anatomical evaluation of the aneurysm’s anatomical borders and association to adjacent structures which is more informative for preoperative planning [5, 11]. An arterial phase would be useful to assess any direct communication with adjacent arteries, when excluding an arteriovenous fistula.

The risk of cervical venous aneurysms expanding, rupturing, or resulting in thromboembolic complications seems to be minimal in humans [1, 6]; however, pulmonary thromboembolism secondary to this type of venous malformation has been reported [9]. Considering the presence of spontaneous echo contrast in our case and that the patient was an active young dog, the risk of pulmonary thromboembolism or rupture guided the decision for surgical excision.

In this case report, we have described the presentation, diagnostic approach, and management for a dog presenting with an external jugular vein aneurysm. To the best of the author’s knowledge, this is the first report to combine the use of cervical and transesophageal ultrasonography and CTA for the diagnosis of an external jugular vein aneurysm in a dog.

**Supplementary data**

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jvc.2022.01.001.

| Video | Description |
|-------|-------------|
| Video 1 | Transdermal cervical ultrasound of the aneurysm showing a large amount of spontaneous echo contrast |
| Video 2A | Transdermal cervical ultrasound showing insufficiency of the jugular vein valve most distal to the aneurysm with ‘to-and-fro’ blood flow within the aneurysm |
| Video 2B | Transdermal cervical ultrasound with color flow Doppler interrogation of the aneurysm jugular vein valve showing the to-and-fro movement of blood within the aneurysm |
| Video 3 | Venous phase three-dimensional computed tomography reconstruction of the aneurysm from right lateral, proceeding to ventral then left lateral approach |
| Video 4 | Venous phase three-dimensional computed tomography reconstruction of the aneurysm from ventral, rotating anticlockwise 360° |
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