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Cardiovascular Images

# Third-degree atrioventricular block secondary to infiltrative cardiac hemangiosarcoma in a dog<sup>☆</sup>



K.L. Maneval, DVM, E.T. Karlin, DVM\*, L. Dos Santos, DVM, MSc, PhD, K. Priest, DVM, MS

Cummings School of Veterinary Medicine at Tufts University, 200 Westboro Rd, North Grafton, MA 01536, USA

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## KEYWORDS

Conduction disturbance;  
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**Abstract** A nine-year-old male, castrated Pembroke Welsh Corgi presented with a two-month history of lethargy, hyporexia, and occasional vomiting. There was also a two-week history of exercise intolerance; no syncopal episodes were reported. Auscultation revealed bradycardia with an irregular rhythm and otherwise normal heart and lung sounds. Third-degree atrioventricular block was diagnosed. Two-dimensional transthoracic echocardiography revealed a soft tissue structure arising from the atrioventricular junction and interatrial septum. There was scant abdominal effusion. Pacemaker implantation was offered, but the owner elected humane euthanasia due to the unknown prognosis. Necropsy was consistent with cardiac hemangiosarcoma infiltrating the interatrial and interventricular septum.

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<sup>☆</sup> A unique aspect of the Journal of Veterinary Cardiology is the emphasis of additional web-based images permitting the detailing of procedures and diagnostics. These images can be viewed (by those readers with subscription access) by going to <http://www.sciencedirect.com/science/journal/17602734>. The issue to be viewed is clicked and the available PDF and image downloading is available via the Summary Plus link. The supplementary material for a given article appears at the end of the page. Downloading the videos may take several minutes. Readers will require at least Quicktime 7 (available free at <http://www.apple.com/quicktime/download/>) to enjoy the content. Another means to view the material is to go to <http://www.doi.org> and enter the doi number unique to this paper which is indicated at the end of the manuscript.

\* Corresponding author.

E-mail address: [emily.karlin@tufts.edu](mailto:emily.karlin@tufts.edu) (E.T. Karlin).

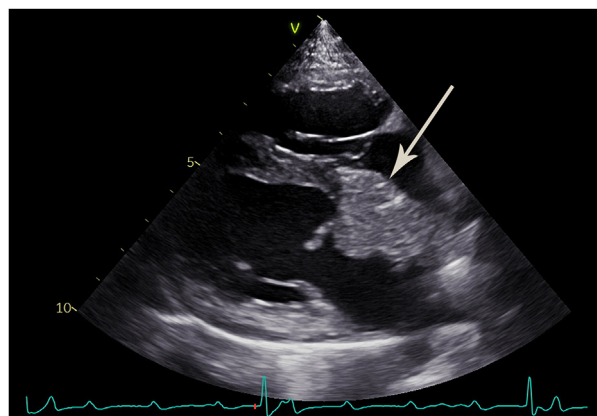
A nine-year-old, 17.6 kg, male, castrated Pembroke Welsh Corgi was evaluated for chronic lethargy, hyporexia, intermittent vomiting, and exercise intolerance. He had been evaluated by his primary care veterinarian one week prior for vomiting, and abdominal radiographs were reported to be normal at that time. The dog did not improve with supportive care and was referred. Physical examination revealed dyspnea and bradycardia with an irregular cardiac rhythm; no other abnormalities were noted. Electrocardiography and transthoracic echocardiography<sup>a</sup> were performed. The dog was diagnosed with third-degree atrioventricular (AV) block and a suspected cardiac mass infiltrating the region of the AV node. Additional diagnostics and permanent pacemaker placement were offered but declined by the owner due to the echocardiographic findings. The dog was euthanized, and a full necropsy was performed.

### Image interpretation

Electrocardiography revealed underlying sinus rhythm with an atrial rate of 150 complexes per minute, persistent third-degree AV block, a variable ventricular escape rate between 20 and 50 complexes per minute (Supplemental Fig. 1A), and frequent long ventricular pauses lasting greater than 10 s (Supplemental Fig. 1B).

Transthoracic two-dimensional echocardiography revealed subjective four-chamber dilation with normal wall thickness and hyperdynamic contractile function. A mixed echogenicity soft-tissue structure was visible, projecting into the left and right atria. It was hyperechoic compared to the surrounding ventricular myocardium and measured approximately 2 × 3 cm. The structure appeared to arise from the region of the AV junction and interatrial septum (Fig. 1; Video 1). No inflow obstruction, infiltration of other cardiac regions, or other structural heart disease was noted. No pleural or pericardial effusion was present; however, there was trace ascites and the hepatic veins were subjectively dilated. Right-sided congestive heart failure resulting from bradycardia was suspected.

A complete necropsy was performed. Grossly, there was an irregularly shaped, well-demarcated, soft, dark red, multinodular mass infiltrating the interatrial and interventricular septum at the level of the AV node (Fig. 2). The mass bulged into both the right and left atria, measuring 1.0 × 1.0 × 0.3 cm



**Figure 1** Two-dimensional transthoracic echocardiogram. Right parasternal four-chamber long-axis view showing a large, irregularly shaped mass visible throughout the interatrial septum, extending into both the right and left atrial cavities (white arrow). A continuous electrocardiogram shows third-degree atrioventricular block.

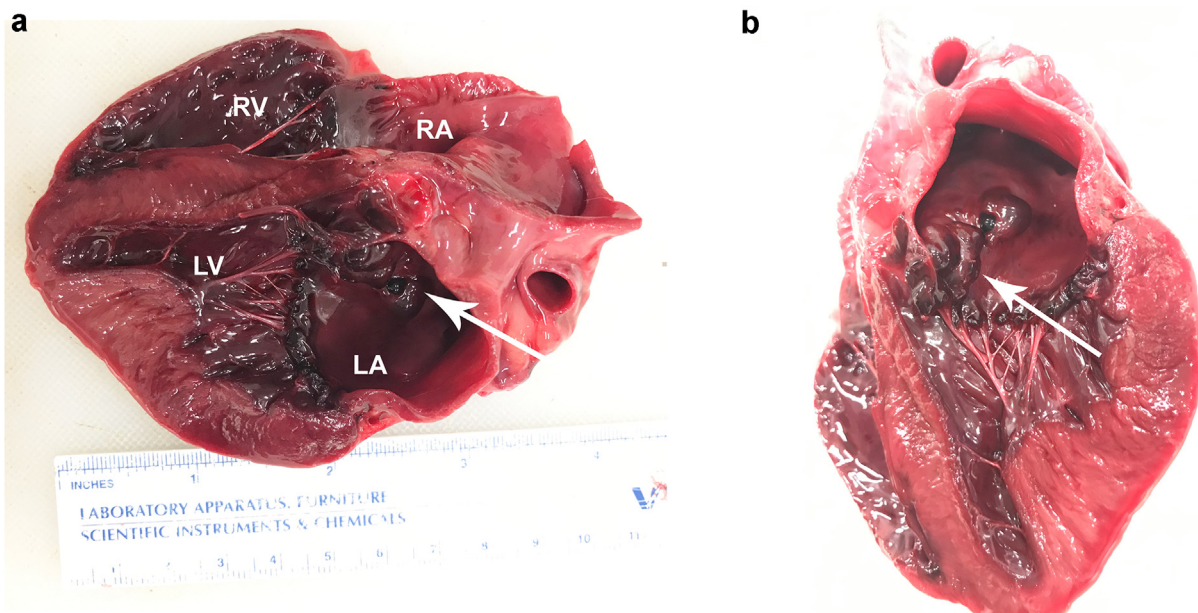
and 1.0 × 0.8 × 0.3 cm, respectively. Additionally, the lungs were diffusely mottled, dark red, and wet, and the liver was 4.8% of body weight (normal = 3%). There was 20 mL of thin, light red, watery abdominal effusion.

Histopathology of the mass revealed scant remaining cardiac myofibers invaded by spindle-shaped neoplastic cells. These neoplastic cells were arranged in indistinct nests, streams, and sheets and formed subtle vascular channels filled with red blood cells. No AV conduction tissue could be identified. Histologic diagnosis was cardiac hemangiosarcoma (HSA) (Fig. 3A and B). There was no other gross or histologic evidence of HSA.

### Discussion

This report describes an unusual presentation of cardiac HSA infiltrating the region of the AV node and causing third-degree AV block in a dog. Cardiac neoplasia is relatively uncommon in dogs [1,2], with HSA being the most frequently identified tumor type. Cardiac HSA most commonly involves the right atrium and right auricular appendage [1]. Other documented locations include the left ventricular walls [3], the interventricular septum [4–8], the left auricle [9], and the heart base [9]. Pericardial effusion, cardiac tamponade, right-sided congestive heart failure, and arrhythmias are the most frequently reported complications associated with these neoplasms [2]. The prognosis for cardiac HSA is poorer than for other cardiac neoplasia. Median survival time without treatment is reported at days, while

<sup>a</sup> Vivid E95 GE Medical Systems, Milwaukee, WI, USA.



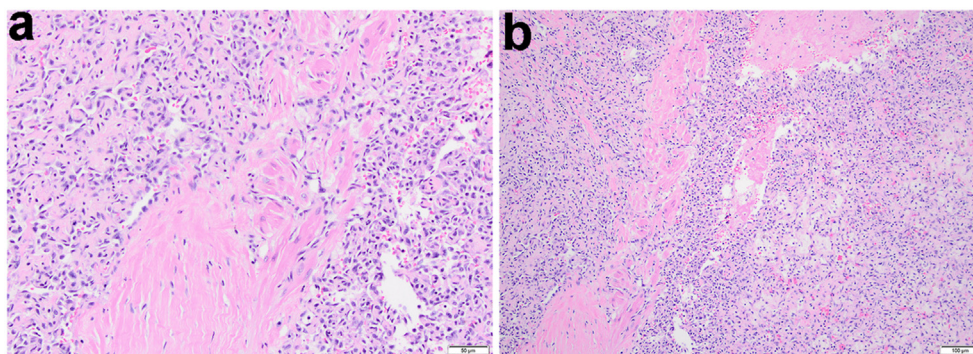
**Figure 2** Gross postmortem images of the heart. (a) Longitudinal section through the heart (four-chamber view). (b) Longitudinal section through the heart focusing on the left face of the interatrial septum. Infiltrating the interatrial and interventricular septum at the level of the atrioventricular node and bulging into the right and left atria is an irregularly shaped, fairly well-demarcated, soft, dark red, multinodular mass (white arrow). LA: left atrium; LV: left ventricle; RA: right atrium; RV: right ventricle.

surgical resection with pericardiectomy typically improves survival time to around three months. The addition of chemotherapy may improve survival time to around six months [1].

Third-degree AV block has been reported to occur secondary to various cardiac tumors infiltrating the region of the AV node, including leiomyoma [10], chemodectoma [11], and lymphoma [12]. Various conduction disturbances have been noted in dogs with HSA [4,7,8,13]. In the present case, we presume that direct infiltration of the tumor within the AV node was responsible for the conduction

disturbance. Immediate pacemaker implantation was recommended but declined by the owner, given the unknown prognosis. The final diagnosis was not made until histopathology revealed cardiac HSA.

This unusual case describes another differential for third-degree AV block in dogs and highlights the importance of a complete echocardiogram as part of the diagnostic evaluation. Although uncommon, neoplasia should be considered as a rule out for cardiac conduction disturbances, and the possibility of aggressive neoplasia such as HSA should be kept in mind. Although many tumors are commonly



**Figure 3** Histopathology of mass stained with hematoxylin and eosin. (a) 20 $\times$  magnification slide. Spindeloid neoplastic cells, invading scant remaining cardiac myofibers in this region, are arranged in indistinct nests, streams, solidly cellular sheets, occasionally wrapping collagen. (b) 10 $\times$  magnification slide of the same region. Neoplastic cells often form variably sized, though subtle vascular channels filled with scant to abundant red blood cells with occasional polymerized fibrin and cellular debris.

associated with specific locations in the heart, the final diagnosis cannot be made based on location alone, as emphasized in this report. Histopathology remains the gold standard for definitive diagnosis.

### Conflict of Interest Statement

The authors do not have any conflicts of interest to disclose.

### Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jvc.2022.05.006>.

Video	
1	Two-dimensional, transthoracic echocardiographic video from the right parasternal four-chamber long axis view. A mass lesion is visualized bulging into the left and right atria. The mass is of mixed echogenicity and extends throughout the interatrial septum to the region of the atrioventricular node. Third degree atrioventricular block is documented on the simultaneous electrocardiogram.

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