

Intermittent ventricular preexcitation in a Rottweiler with renal insufficiency and suspected lymphoma – Case report

Pré-excitação ventricular intermitente em um Rottweiler com insuficiência renal e suspeita de linfoma – Relato de caso

Preexcitación ventricular intermitente en un rottweiler con insuficiencia renal y sospecha de linfoma - Reporte de caso

Received: 11/11/2025 | Revised: 11/18/2025 | Accepted: 11/19/2025 | Published: 11/21/2025

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Abstract

This research aimed to report the clinical, laboratory, electrocardiography, and image findings from an 8-year-old male Rottweiler with ventricular preexcitation. A qualitative, descriptive investigation of the specific type of clinical case report in the veterinary field was carried out. Blood tests revealed renal insufficiency, classified as chronic kidney disease (CKD), IRIS stage-3. The electrocardiography demonstrated sinus rhythm and intermittent ventricular preexcitation. Echocardiographic findings were within the normal reference range. The thoracic radiographs indicated pulmonary nodules and significant pleural effusion. A few days after cardiology evaluation, the patient died, raising clinical suspicion of pulmonary lymphoma.

Keywords: Ventricular preexcitation; Wolff-Parkinson-White pattern; Accessory pathway; Lymphoma; Dog.

Resumo

O objetivo deste relato é descrever os achados clínicos, laboratoriais, eletrocardiográficos e de imagem de um cão da raça Rottweiler, macho, de 8 anos de idade, com pré-excitação ventricular. Foi realizada uma investigação qualitativa e descritiva do tipo específico de relato de caso clínico na área veterinária. Os exames laboratoriais revelaram insuficiência renal, classificada como doença renal crônica (DRC), estágio-3 segundo a IRIS. O eletrocardiograma demonstrou ritmo sinusal e pré-excitação ventricular intermitente. Os achados ecocardiográficos estavam dentro dos valores de referência normais. As radiografias torácicas indicaram presença de nódulos pulmonares e efusão pleural

significativa. Poucos dias após a avaliação cardiológica, o paciente veio a óbito, levantando suspeita clínica de linfoma pulmonar.

Palavras-chave: Pré-excitação ventricular; Padrão de Wolff-Parkinson-White; Via acessória; Linfoma; Cão.

Resumen

El objetivo de este reporte es describir los hallazgos clínicos, de laboratorio, electrocardiográficos y de imagen de un perro Rottweiler macho de 8 años de edad con preexcitación ventricular. Se llevó a cabo una investigación cualitativa y descriptiva sobre el tipo específico de informe de caso clínico en el ámbito veterinario. Los análisis de sangre revelaron insuficiencia renal, clasificada como enfermedad renal crónica (ERC), estadio-3 según la IRIS. El electrocardiograma mostró ritmo sinusal y preexcitación ventricular intermitente. Los hallazgos ecocardiográficos se encontraban dentro de los valores de referencia normales. Las radiografías torácicas indicaron la presencia de nódulos pulmonares y un derrame pleural significativo. Pocos días después de la evaluación cardiológica, el paciente falleció, lo que generó sospecha clínica de linfoma pulmonar.

Palabras clave: Preexcitación ventricular; Patrón de Wolff-Parkinson-White; Vía accesoria; Linfoma; Perro.

1. Introduction

Ventricular preexcitation (VP) is a specific electrocardiographic entity in which the electrical impulse generated from sinus node or atrium activates prematurely part of the ventricular myocardium, through an accessory atrioventricular pathway (AP), bypassing the normal delay at the atrioventricular node. In this condition, the ventricle is activated by two wave fronts: the normal and the anomalous, generating a hybrid QRS complex that is a fusion beat between the normal and the preexcited. The QRS morphology depends on the contribution of each of the both wave fronts and of the portion of activated myocardial tissue (Goldwasser, 2009; Tilley L.P., & Smith Jr. F.W.K., 2016; Oliveira P., 2018).

The accessory atrioventricular pathway (AP) consists of a bundle of working myocardial cells (Kent fibers) that directly connects the atrium to the ventricle. These muscular band was first described in human hearts by Stanley Kent more than one century ago (Kent, 1893), and is considered a remnant tissue from the development of the atrioventricular fibroskeleton (Melis, Beijerink & Santilli, 2024). Therefore, AP is a congenital anomaly that involves the existence of one or more extra circuits capable to conduct the electrical impulse rapidly from atrium to ventricle (Chhabra, Amandeep & Benham, 2023; Almeida et al., 2024).

According to the veterinary literature, several cases of VP have been identified in different dog breeds, with Labrador Retrievers, Golden Retrievers and Boxers mostly affected by the anomaly (Atkins et al., 1995; Wright et al., 2018; Belachsen et al., 2021; Melis, Beijerink and Santilli et al., 2018; Santilli, 2024).

The clinical significance of VPs directly depends on the severity and frequency of arrhythmias mediated by the AP (Tilley & Smith Jr., 2016). When VP is accompanied by clinical signs, it constitutes the Wolff-Parkinson-White Syndrome (WPW), while in the absence episodes of tachyarrhythmia episodes, it is best called Wolff-Parkinson-White pattern, or simply ventricular preexcitation (Chou, 1991).

Wolff-Parkinson-White is a rare anomaly in humans, occurring in 0.1~0.3% of people (Kim and Knight, 2017). Among dogs it is very uncommon, and most cases appear as an isolated condition or are associated with congenital and acquired cardiac diseases, such as Ebstein anomaly, degenerative mitral valve disease (Tilley, 1985; Almeida et al., 2024) and dilated cardiomyopathy (Tilley, 1985). In domestic cats, was found in cases of hypertrophic cardiomyopathy (Hill & Tilley, 1985).

In canine medicine, according the seminal study from University of Pennsylvania, one case of VP was identified among 3000 dogs (prevalence of 0.33/1000, or 0.033%), and constituted the first identification of the syndrome in veterinary medicine (Patterson et al, 1961). Five decades later, at Nandini Veterinary Hospital, in Gujarat, India (Varshney et al., 2013), one case was found among 20.000 private-owned dogs (prevalence 0.05/1000). Aside from these, a limited number of other

publications on VP appeared in the veterinary literature (Hill & Tilley 1985; Nahas et al. 1998); Santilli et al. 2018; Belachsen et al., 2021; Melis, Beijerink & Santilli 2024; Almeida et al., 2024).

This research aimed to report the clinical, laboratory, electrocardiography, and image findings from an 8-year-old male Rottweiler with ventricular preexcitation. Blood tests revealed renal insufficiency, classified as chronic kidney disease (CKD), IRIS stage-3. The electrocardiography demonstrated sinus rhythm and intermittent ventricular preexcitation. Echocardiographic findings were within the normal reference range. The thoracic radiographs indicated pulmonary nodules and significant pleural effusion. A few days after cardiology evaluation, the patient died, raising clinical suspicion of pulmonary lymphoma.

2. Methodology

A descriptive-qualitative methodology (Pereira et al., 2018), was employed in this study, detailing the clinical history, electrocardiography and imaging findings from a canine patient clinically suspected heart failure.

On thoracic radiography was used the Digital Direct Radiograph System Metron-DVM 7.20 (Epona Tech LCc, Creston, CA 93432). The X-Ray included both the dorsoventral and right lateral projections.

Echocardiography was performed using the Esaote My Lab X-5 Ultrasound System (Esaote S. p.A. Geneva, Italy), following methodology of Boon (1988) for echocardiographic examination.

For electrocardiography was employed the Digital Computed Electrocardiography System InCardio® (InPulse Animal Health, Florianópolis-Brazil). The patient was gently restrained in right lateral recumbency for five minutes of ECG recording, without using sedation. Limb leads (I, II and III), unipolar augmented limb leads (aVR, aVL, aVF) and precordial leads V1, V2 and V3, were recorded at a speed of 50 mm/sec. and 10 mm=1mV.

For blood examination was employed a specific automated analyzer in a veterinary commercial laboratory.

This study followed the ethical criteria of veterinary medicine with respect to animals and the environment.

3. Case Description

An eight-year-old male Rottweiler was referred evaluation for hyporexia, weight loss, cough, dyspnea, and exercise intolerance, leading the clinician to suspect heart failure.

On physical examination, the heart rhythm was regular, at 140 bpm. Systolic blood pressure was 130 mmHg and cardiac auscultation demonstrated no abnormalities. The pulmonary auscultation revealed muffled sounds ventrally on the thorax.

4. Results

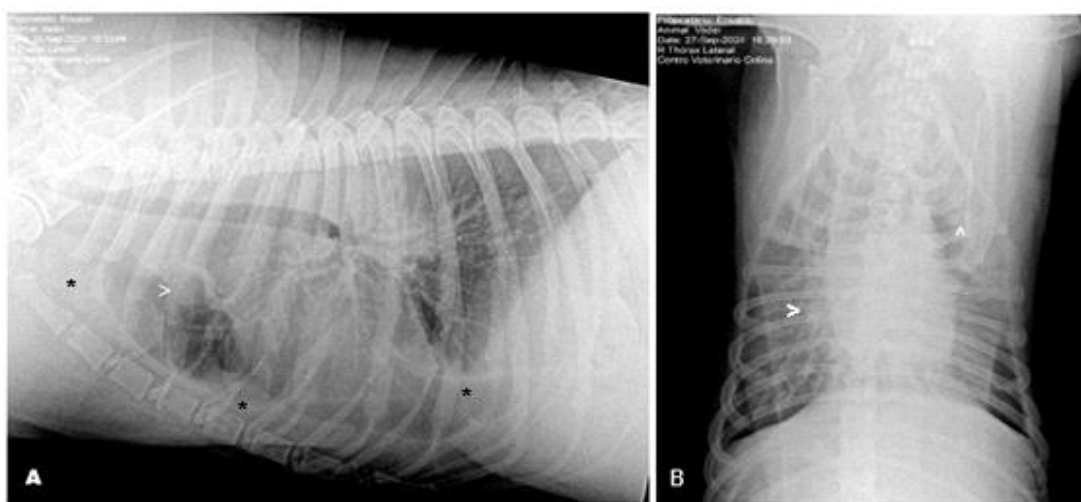
The electrocardiogram showed regular rhythm, and mean heart rate 146 bpm. The P waves presented positivity in leads II, III and aVF, which is consistent with sinus in origin. Called attention the presence of intermittent groups of QRS with morphology of ventricular preexcitation, characterized by short P-R interval, conspicuous delta waves prolonged QRS duration and secondary repolarization change (Figure 1). The echocardiogram was within the normal reference range, during sinus rhythm (Lombard, 1984).

Figure 1 - Digital computed electrocardiogram.



Note preexcited QRS complexes in the first three beats (black dots), while in the subsequent QRS the electrical impulses were normally conducted. Source: Authors.

Figure 2 - Right lateral (A) and dorsoventral (B) radiographs.



Digital X-ray showing pleural effusion (*) and pulmonary nodules (>). Source: Authors.

The haemogram demonstrated normocytic, normochromic anemia, monocytosis, and thrombocytopenia (Table 1), while the blood chemistry presented moderate azotemia classified as IRIS stage-3 (Table 2).

Table 1 - Blood examination.

Haemogram	Results	Reference range *
Red Blood Cells (x106 cells/ μ L)	3.74	5.5-8.5
Hemoglobin (g/dL)	8.1	12-18
Haemathocrit (%)	23,6	37-55
MGV (fL)	63	60-77
MCHC (g/dL)	34	32.0 - 37.0
White Blood Cells (cells/ μ L)	15.570	6.000 - 17.00

Banded neutrophil (cells/ μ L)	0	0 - 300
Basophils	0	0
Lymphocytes (cells/ μ L)	2.647	1.000 - 4.800
Monocytes (cells/ μ L)	1.245	150 - 850
Eosinophils (cells/ μ L)	156	0- 1500
Segmented (cells/ μ L)	11.522	3.000 – 11.100
Platelets (units/ μ L)	21.900	175- 500.000

*Klaassen, J. K. (1999). Reference values in veterinary medicine. *Laboratory medicine*, 30(3).

Table 2 - Blood chemistry.

Analytes	Results	Reference range**
Creatinine (mg/dL)	3.68	0.5 – 1.4
Urea (mg/dL)	120.5	14 - 36
Plasmatic protein (g/dL)	4.84	5-7.4

** IRIS stage-3 classification (moderate azotemia).

5. Discussion

The patient's electrocardiogram showed groups of QRS complexes with two different morphologies, i.e., moments of ventricular preexcitation and moments of normal atrioventricular conduction, demonstrating intermittent ventricular preexcitation.

According to the veterinary literature, ventricular preexcitation, if manifested, can be continuous or intermittently. In the last condition, it can develop episodes of unpredictable behavior (Romito et al, 2019).

So, is crucial to recognize the features of intermittent ventricular pre-excitation, because the patient is prone to suffer serious tachyarrhythmias, necessitating prompt treatment.

No, as documented in this case report, the patient presented the intermittent form of preexcitation, thus making crucial a correct and timely diagnosis, which is challenging for the clinician.

The preexcited QRS pattern on the patient's ECG was consistent with right-sided atrioventricular bypass, since the QRS complex in V1 was <1 and in V2 and V3 was >1, the mean ventricular axis in the frontal plane was between +60 and +90, which is the most common AP location in the dog (Santilli et al., 2007; Perego et al., 2023).

The abnormal findings in our patient (i.e., anemia, thrombocytopenia, lymphopenia, evidence of pleural effusion and pulmonary nodules) are in line with findings from other author's description of canine lymphoma (Gavazza et al., 2009; Geyer N. E. et al. 2010).

6. Conclusion

This case report is documented the occurrence of intermittent ventricular preexcitation in a Rottweiler with renal insufficiency and suspected intrathoracic lymphoma.

References

Almeida, G. L. G. de; Almeida, M. B. de; Santos, A. C. M. dos; Mattos Ângela V. de; Ballot, S.; Lopes, A. (2024). Double trouble: first-degree atrioventricular block and concealed ventricular preexcitation. *Research, Society and Development*. 13(12), e205131247905. DOI: 10.33448/rsd-v13i12.47905.

- Atkins C.E., Kanter R., Wright K., Saba Z., Baty C., Swanson C., Bai S., & Keene B.W., (1995). Orthodromic reciprocating tachycardia and heart failure in a dog with a concealed posteroseptal accessory pathway. *Journal of Veterinary Internal Medicine*, 9(1), 43-49.
- Belachsen, O., et al. (2021). Segmental septal dyskinesia associated with an accessory pathway and preexcitation in two Golden Retriever dogs. *Journal of Veterinary Cardiology* 36, 6-11.
- Boon, J. A. (1998). The echocardiographic examination. In: *Manual of Veterinary Echocardiography*. Ed. William & Wilkins, Maryland, USA. 35-150.
- Chhabra L., Goyal, A. & Benham, M.D. (2023). Wolff-Parkinson-White Syndrome. *StatPearls* [Internet]. StatPearls Publishing; 2024.
- Chou, T. (1991). Wolff-Parkinson-White Syndrome and Its Variants. *Electrocardiography in Clinical Practice*. WB Saunders Company. Philadelphia, 429-456.
- Gavazza, A., Sacchini, F., Lubas, G. *et al.* (2009). Clinical, laboratory, diagnostic and prognostic aspects of canine lymphoma: a retrospective study. *Comp. Clin. Pathol.* 18, 291–299 <https://doi.org/10.1007/s00580-008-0799-y>.
- Geyer N. E. et al. (2010). Radiographic appearance of confirmed pulmonary lymphoma in cats and dogs. *Veterinary Radiology & Ultrasound*, 51(4), 2010, pp 386–390.
- Goldwasser, G. (2009). Syndrome de Wolff-Parkinson-White e Lown-Gannong-Levine. In: *Eletrocardiograma Orientado Para o Clínico*. (3rd.ed.), pp: 289-300. Rubio Editora. Rio de Janeiro. ISBN978-85-7771-045-4.
- Hill, JD (1968). Electrocardiogram in dogs with standardized body and limb positions. *Journal of Electrocardiology*, 1(2), 175–182. Doi: 0.1016/s0022-0736(68)80025-1.
- Hill, B.L. & Tilley, L.P. (1985). Ventricular preexcitation in seven dogs and nine cats. *Journal of the American Veterinary Medical Association* 187(10), 1026-1031.
- IRIS Staging of CKD 2023. Available at <https://www.iris-kidney.com/iris-guidelines-1>.
- Kent, A. F. (1893). Researches on the structure and function of the mammalian heart. *J Physiol.* 14, i2–254.
- Kim S. and Knight B. P. (2017). Long-term risk of Wolff-Parkinson-White pattern and syndrome. *Trends in Cardiovascular Medicine*. 260–268. <http://dx.doi.org/10.1016/j.tcm.2016.12.001> 1050-1738.
- Klaassen, J. K. (1999). Reference values in veterinary medicine. *Laboratory Medicine*, 30(3). 194-197.
- Lombard C.W. (1984). Normal values of the canine M-mode echocardiogram. *American Journal of Veterinary Research* 45, 2015-2018.
- Melis, C., Beijerink, N., & Santilli, R. (2024). Spontaneous pre-excited supraventricular tachycardia in a Labrador Retriever. *Journal of Veterinary Cardiology*, 54: 57-62.
- Nahas, K., Hanton, G., Lodola, A., Rabemampianina, Y., & Sacre-Salem, B. (1998). Type B Ventricular Preexcitation with Abnormal Contraction of the Ventricular Septum in a Dog. *Journal of the American Association for Laboratory Animal Science*, 37(5), 78-81.
- Oliveira, P. (2018). Junctional Rhythms. In: Willis R., Oliveira P. and Mavropoulos A. (Eds.). *Electrocardiography*.
- Guide to Canine and Feline Electrocardiography. Wiley Blackwell. Philadelphia, 146-167.
- Patterson, D. F., Detweiler, K., Hubben, K., & Botts, R. P. (1961). Spontaneous abnormal cardiac arrhythmias and conduction disturbances in the dog (a clinical and pathologic study of 3.000 dogs). *American Journal of Veterinary Research* (22), 355–369.
- Pereira, A. S. et al. (2018). Metodologia da pesquisa científica. [free e-book]. Editora UAB/NTE/UFSM.
- Perego, M. et al. (2023). Electrocardiographic patterns of ventricular pre-excitation in dogs with right-sided accessory pathways. *Vet Res Communications* 47, 1393–1403.
- Rodrigues et al. (2017). Metastatic T-cell lymphoma of unknown primary origin in a dog (*Canis lupus familiaris*). *Acta Veterinaria Brasilica* 11,: 137-144.
- Romito, G. et al (2019). Preexcitation alternans in a dog. *Journal of Veterinary Cardiology* (24):1-6.
- Santilli, R.A. et al. (2007). Anatomic distribution and electrophysiologic properties of accessory atrioventricular pathways in dogs. *Journal of the American Veterinary Association*, 231(3), 393-398.
- Santilli, R.A. et al. (2018). Radiofrequency catheter ablation of accessory pathways in the dog: the Italian experience. *Journal of Veterinary Cardiology* (5), 384-397.
- Scherlag, B.J. et al. (1993). Radiofrequency ablation of a concealed accessory pathway as treatment of incessant supraventricular tachycardia in a dog. *Journal of the American Veterinary Medical Association* 203(8), 1147-1152.
- Spodick, D. H. (2007). Wolff-Parkinson-White ECG with Normal PR Interval. *The American Heart Hospital Journal*, 5(4), 257–257. doi:10.1111/j.1541-9215.2007.06081.x.
- Tilley, L.P. (1985). Ventricular pre-excitation and the Wolff-Parkinson-White syndrome. In: *Essentials of canine and feline electrocardiography: interpretation and treatment*. Second edition. Lea and Fibiger, Philadelphia, USA, 176-177.

- Tilley, L.P. & Smith Jr., F.W.K. (2016). Chapter 3: Electrocardiography in: Manual of Canine and Feline Cardiology, 49-775. Elsevier. St Louis. Missouri, 62-71.
- Varshney, J.P. et al. (2013). Prospective Study of Cardiac Arrhythmias. A survey of 20,000 canines. *Intas Polivet* 14(1), 129-136.
- Wright, K.N. et al. (2018). Atrioventricular accessory pathways in 89 dogs: clinical features and outcome after radiofrequency catheter ablation. *Journal of Veterinary Internal Medicine*, 32(5), 1517-1529.