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Case Report

Investigation of ventricular pre-excitation electrocardiographic pattern in two horses: clinical presentation and potential causes

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Abstract Two horses referred to the Unitat Equina, Fundació Hospital Clínic Veterinari, Universitat Autònoma de Barcelona, for unrelated clinical problems, and with no previous history of cardiac disease exhibited an intermittent ventricular pre-excitation electrocardiographic pattern during hospitalization. Both animals showed decreased plasma total and ionized magnesium concentrations, but no other relevant electrolyte disturbances were detected. Altered interventricular septal motion associated with ventricular pre-excitation beats (VPBs) was detected on M-mode echocardiography in both horses. The likely localization of an accessory pathway (AP) was identified in case 2 using pulsed-wave tissue Doppler imaging in the left anterior paraseptal location. Decreased frequency of the VPB was observed with long-term magnesium supplementation and restoration of plasma magnesium

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concentrations. The presence of ventricular pre-excitation electrocardiographic pattern was attributed to higher sensitivity of the AP to hypomagnesemia in both cases.

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List of abbreviations

AP	accessory pathway
ECG	electrocardiogram
iMg	ionized magnesium
PW-TDI	pulsed-wave tissue Doppler image
RP	refractory period
TDI	tissue Doppler image
TMg	total magnesium
VPB	ventricular pre-excitation beats
WPW	Wolff–Parkinson–White syndrome

Case 1

A 5-year-old french saddle gelding was referred to Unitat Equina, Fundació Hospital Clínic Veterinari, Universitat Autònoma de Barcelona, for surgical colic. During the post-operative period, the horse had intermittent fever and, on day 11, suddenly collapsed in the stall. At that point, the horse was presented with tachycardia (58 bpm), tachypnea (28 bpm), low PCV (16%), and decreased total plasma magnesium concentration (TMg = 0.59 mmol/L, reference value 0.7–1 mmol/L) [1], with normal plasma ionized calcium concentration. On resting electrocardiogram (ECG), abnormal morphology of QRS complexes was detected with a short PR interval (Fig. 1A; Table 1) and occasional normal beats (sinus rhythm with ventricular pre-excitation beats). Subsequently, the ECG was continuously monitored using a telemetric system.^d

Intravenous magnesium sulfate^e and oral magnesium sulfate heptahydrate (0.2 g/kg q 8 h), oral propranolol^f (0.5 mg/kg q 8 h) and intravenous lidocaine^g infusion (bolus of 1.3 mg/kg followed by 0.05 mg/kg/h) were administered to normalize plasma magnesium concentration and cardiac

conduction. During treatment, normal beats were occasionally identified on the ECG, but sustained mild sinus tachycardia remained (Fig. 1B). On M-mode echocardiography,^h abnormal septal movement was identified during mechanical systole when the ventricular pre-excitation pattern was present (Fig. 2A). Plasma cardiac troponin I concentration was normal (<0.03 ng/mL, reference values <0.2 ng/mL) [2]. With this echocardiographic information and after observing persistent short PR intervals during a 24-h continuous ECG recording, a definitive electrocardiographic diagnosis of intermittent ventricular pre-excitation pattern was reached. The clinical condition of the horse improved, but at discharge after 20 days, the animal maintained mild sinus tachycardia (48 beats per minute) with all QRS complexes conducted through the accessory pathway (AP), and still had low plasma TMgⁱ concentration (0.6 mmol/L) and decreased urinary magnesium fractional excretion (9.82%, reference interval 15–35%) [3]. The horse was treated at the livery yard with oral magnesium sulfate heptahydrate (0.2 g/kg/day).

One month after being discharged and under oral magnesium supplementation, the horse was re-examined and had normal plasma TMg concentration and normal magnesium urinary fractional excretion. The heart rate was lower (36 bpm), and no alterations were detected on ECG recording (Table 1) or echocardiography at rest (Fig. 2B).

Case 2

A 6-year-old endurance Arabian mare was admitted to Unitat Equina, Fundació Hospital Clínic Veterinari, Universitat Autònoma de Barcelona, due to a lacerating wound of the left hind limb involving the digital flexor tendons. On cardiac auscultation, no abnormalities were audible other than a louder first heart sound. An ECG obtained before surgery revealed alternation between normal and ventricular pre-excitation beats (VPB);

^d Televet®100 - Telemetric ECG & Holter, Kruse, Marslev, Germany

^e Sulfate magnesium Lavoisier® 15%, Paris, France

^f Sumial® 40 mg AstraZeneca, Madrid, Spain

^g Laocaine® 20 mg/ml Intervet Schering-Plough animal health (MSD Animal Health, Kenilworth, NJ, USA.)

^h Mylab 70 Xvision® Esaote España, Barcelona, Spain

ⁱ Catlyst, Idexx laboratories, Inc, Netherlands

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