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Case Study

Bilateral Rupture of the Palmar Carpal Ligament in a Horse Suffering from Acute Diaphragmatic Hernia

Marco Pepe PhD, Francesca Beccati PhD, Rodolfo Gialletti DVM, Franco Moriconi DVM

Dipartimento di Patologia Diagnostica e Clinica Veterinaria, University of Perugia, School of Veterinary Medicine, Perugia, Italy

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ABSTRACT

A 20-year-old Argentinian gelding was evaluated for sudden weakness, muscular tremors, tachypnea, and reluctance to move. On admission, a mild bilateral hyperextension of the carpi was noticed. On the basis of the clinical, laboratory, and ultrasonographic findings, a diagnosis of diaphragmatic hernia was made. During confinement, the hyperextension of the carpi worsened. Because radiographic examination of both carpi revealed palmar-lateral diastasis of the accessory carpal bone, bilateral rupture of the palmar carpal ligament (PCL) was suspected. Gross pathology confirmed the diaphragmatic hernia and the bilateral rupture of the PCL. Rupture of a PCL in a horse has been previously described, and conformation of the forelimb of that horse was similar to that of the horse in the case described in this article.

1. Introduction

Although diaphragmatic hernia is an uncommon lesion in the horse, it is not exceedingly rare [1-10]. The clinical signs related to diaphragmatic hernia in horses vary greatly; most horses show signs of acute abdominal pain [4,7,11-13], few cases show exercise intolerance [14,15], respiratory compromise and tachypnea [1,3,6,9,10], or have a history of recurrent episodes of colic [2]. Some affected horses may exhibit abnormal body posture, such as crouching down on their hind limbs or adopting an exaggeratedly wide forelimb stance [16].

The palmar carpal ligament (PCL) is the thick palmar fibrous joint capsule, and it is closely attached to the carpal bones and levels up the bone irregularities to form the dorsal wall of the carpal canal [17]. In the literature, primary lesions of the PCL are described briefly as rupture of the ligament associated with traumatic hyperextension injuries of the carpus in a Thoroughbred yearling after jumping a gate [17]. Fractures of palmar aspect of distal radius, proximal and distal rows of carpal bones, and proximal palmar aspect of third metacarpal bone may also involve the PCL.

This report describes an unusual case of bilateral rupture of the PCL in a horse with a diaphragmatic hernia.

2. Case Details

2.1. History

A 20-year-old Argentinian gelding was referred to the Veterinary Teaching Hospital with a 48-hour history of sudden onset of weakness, muscular tremors, and tachypnea. Twenty-four hours before the onset of these signs, the horse was taken on a strenuous trek. The signs were seen for the first time the following day, and included walking with a stilted gait pseudokyphosis, with a tendency to lie down, polydipsia, anuria, and passage of loose feces. A tentative diagnosis of rhabdomyolysis was made by the referring veterinary surgeon, who had administered furosemide (diuren 4%, Teknofarma S.p.A., Torino, Italy; 10 mg/kg IV), lactated Ringer's solution (ACME, Cavriago, Reggio Emilia,

Corresponding author at: Marco Pepe, PhD, Dipartimento di Patologia Diagnostica e Clinica Veterinaria, University of Perugia, Via San Costanzo 4, 06126 Perugia, Italy.
E-mail address: mpepe@unipg.it (M. Pepe).

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Italy; 20 L), and 0.9% (w/v) sodium chloride (ACME, Cavriago, Reggio Emilia, Italy; 10 L) intravenously at the rate of 60 mL/kg/hr, with flunixin meglumine (Fynadine, Intervet Italia, Milano, Italy; 1.1 mg/kg IV); however, no apparent improvement in stiffness and pseudokyphosis was noted.

2.2. Clinical Examination

On admission, although the horse was in good body condition, it showed diffuse sweating and was reluctant to move. It exhibited a pseudokyphotic posture, with a tendency to place all the body weight on the hind limbs in a "dog-sitting" posture or forelimbs in a "camped out" stance; moderate overextension (hyperextension) of both carpi was also noticed (Fig. 1). The oral mucous membranes were congested with a capillary refill time of 2 seconds. The rectal temperature (40.4°C), the heart rate (98 beats/min), and the respiratory rate (60 breaths/min) were elevated; dyspnea and expiratory difficulty were observed. No abnormalities were detected during palpation of the trachea, pharynx, and larynx. A cough reflex could not be elicited on deep laryngeal palpation. During auscultation of the thorax, with and without a rebreathing bag, only increased amplitude of normal respiratory sounds was heard over both hemithoraxes. Borborygmus auscultation was normal. On rectal examination, the feces in the ampulla were loose, and impacted ingesta with mild distension of the pelvic flexure were palpated.

2.3. Laboratory Findings

Complete blood cell count and blood smear, a serum biochemistry profile, arterial blood gas analysis, and urine analysis (catheterized sample) were performed. On blood examination, the packed cell volume and total plasma protein were 48% (reference range [rr]: 32%-48%) and 7.6 g/dL (rr: 4.3-8.1 g/dL), respectively, consistent with mild dehydration. The total white blood cell count was considered to be within the normal range. The chemistry panel showed increased lactate dehydrogenase (844 U/L [rr: 100-400 U/L]), creatinine kinase (224 U/L [rr: 10-55 U/L]), aspartate aminotransferase (599 U/L [rr: 50-240 U/L]), and mild hypochloremia (90 mmol/L [rr: 100-109 mmol/L]). Arterial blood gas analysis showed mild acidemia (pH 7.32 [rr: 7.35-7.45]), with low arterial oxygen tension (PaO_2: 65.1 mm Hg [rr: 90-100]), elevated arterial carbon dioxide tension ($PaCO_2$: 51, 4 mm Hg [rr: 35-45]), and bicarbonates (HCO_3: 33 mEq/L [rr: 24-30]). This was consistent with moderate hypoxemia and respiratory acidosis, with an adaptative response leading to hypochloremic metabolic alkalosis. The urine analysis was normal.

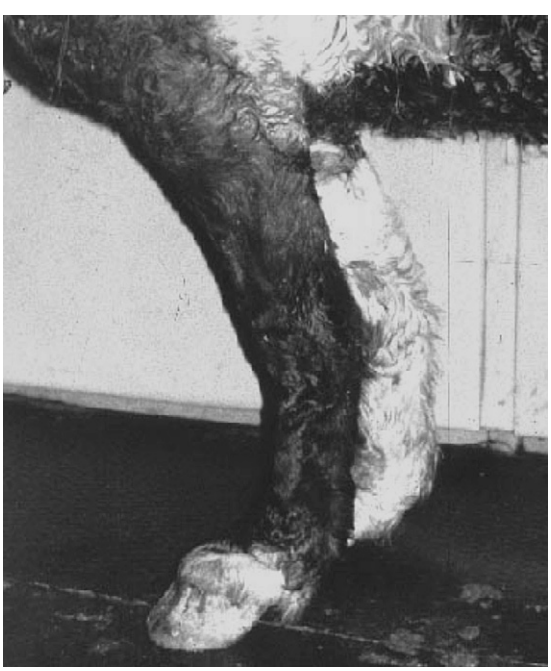

Fig. 1. Photograph of the thoracic limbs obtained at admission. The horse shows mild hyperextension of both carpi.

2.4. Diagnostic Procedures and Treatment

Clinical examination and arterial blood gas analysis suggested that the primary problem involved the lower respiratory tract, even though thoracic auscultation failed to reveal significant abnormalities. It was not possible to carry out radiographic examination of the thorax because of the reluctance of the patient to move into the X-ray room. Initial abdominal ultrasonographic examination revealed a mildly increased amount of peritoneal fluid, and thoracic ultrasonographic findings were considered normal. Owing to the mild dehydration and electrolyte imbalance, a combination of lactated Ringer's solution and 0.9% (w/v) sodium chloride solution was administered intravenously at the rate of 60 mL/kg/hr to correct the dehydration and the electrolyte imbalance. Anti-inflammatory and analgesic therapy was provided with flunixin meglumine (1.1 mg/kg IV q 12 hours). Antimicrobial therapy was initiated with procaine penicillin G (Procacillina, Merial Italia S.p.A., Assago, Milan, Italy) (30,000 U/kg IM q 12 hours) and potentiated sulfonamide (Norodine, Bayer S.p.A., Milano, Italy) (15 mg/kg IV q 12 hours). The horse was maintained on nasal oxygen (100%) insufflation at the rate of 10 L/min throughout the night in the recovery box.

2.5. Follow-Up

Twelve hours after admission, the horse became recumbent on its left side and was reluctant to stand and to walk. Clinically, the horse became more depressed with appreciable breathing difficulty; despite oxygen therapy, the dyspnea and abdominal-type breathing worsened, and nasal flaring was noticed. Ultrasonography of the thorax and abdomen was repeated; a sonogram of the right hemithorax revealed that portion of the right lung overlay a short segment of small intestine, which was imaged dorsal and cranial to the diaphragm, and extended from the 12th to the 9th intercostal space. The diaphragm was considered to be incomplete and fluctuating. When standing, the horse showed severe bilateral hyperextension of the carpi, which worsened with time (Fig. 2). Palpation of each limb individually, with the horse lying on its side, showed an increased range of movement of each accessory carpal bone (ACB) in a lateral direction.