



Original Research

Sensitivity and Specificity of Ultrasonographic Evaluation of Small Intestine Wall Thickness in the Diagnosis of Inflammatory Bowel Disease in Horses: a Retrospective Study



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ABSTRACT

In horses, inflammatory bowel disease (IBD) usually determines a chronic wasting syndrome (CWS) which is a highly nonspecific clinical syndrome; therefore, diagnosing IBD often represents a challenge. Little is known about the accuracy of abdominal ultrasonography in horses suspected of IBD: previous studies reported abdominal ultrasonography to be useful in the diagnostic approach for IBD in the equine patient but, to the authors' knowledge, no studies assessed its accuracy. The aim of the present study was to assess sensitivity and specificity of ultrasonographic measurement of small intestine wall thickness in the diagnosis of IBD, using rectal biopsy as a reference standard. Thirty-five horses presented for CWS were retrospectively selected among a clinical population. Assessment of sensitivity, specificity, and receiving operator characteristics curve elaboration were made initially for all the patient population and then repeated including only those horses showing ultrasonographic evidence of diffuse small intestinal wall thickening. When all patients were considered, a 5.7 mm cutoff value was the best compromise between sensitivity (36.8%) and specificity (87.5%). When only those patients with diffuse thickening were considered, a 5 mm cutoff value was the best compromise between sensitivity (50%) and specificity (100%). According to the results obtained, ultrasonography appears to be a specific method for the evaluation of small intestinal wall thickness, and it could be useful in the diagnostic protocol of IBD in horses with CWS.

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1. Introduction

Inflammatory bowel disease (IBD) results from infiltration of the intestinal mucosa and submucosa by abnormal cells, such as inflammatory cells (chronic

inflammatory bowel disease) or neoplastic cells (alimentary lymphoma) [1,2]. Inflammatory bowel disease represents the most common cause of malabsorption in adult horses because IBD-associated pathologic changes impair digestive and absorptive processes. Clinical presentation usually consists of a chronic wasting syndrome (CWS), primarily including chronic weight loss and protein losing enteropathy [3].

Because chronic wasting is a highly nonspecific clinical syndrome, several differential diagnoses should be ruled out. Therefore, diagnosing IBD often represents a challenge,

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and intestinal wall histology is the gold standard currently accepted [4].

Abdominal ultrasonography is a real-time imaging technique that allows noninvasive examination of portions of the abdomen that cannot be evaluated by any other method [5,6]. Additionally, abdominal ultrasonography is capable of detecting increased small intestine wall thickening that is a pathologic feature of IBD [3,4,7,8]. Normally, in horses, the ultrasonographic measurement of small intestinal wall thickness (duodenum and jejunum) reaches up to 3 mm [5,7,9–11]. In human medicine, the accuracy of ultrasonography has been systematically investigated for diagnosing IBD [12–14]. However, there are no similar studies in equine medicine. In horses, some authors reported ultrasonography to be useful in the diagnostic approach for IBD, but its accuracy has been established only for acute intestinal diseases such as large colon torsion or small intestinal strangulating lesions [3,4,15–18]. The aim of the present study was to assess the accuracy (sensitivity and specificity) of ultrasonographic evaluation of increased small intestine wall thickness for the diagnosis of IBD in a clinical population of 35 horses presented for CWS, using histology of the rectal biopsy as a reference standard [19].

2. Materials and Methods

2.1. Inclusion Criteria and Horse Population

The horse population was retrospectively selected among patients referred to the University Veterinary Hospital between 2005 and 2012, according to the following inclusion criteria: history of unexplained CWS; thorough physical examination and complementary diagnostic tests to rule out common causes of CWS other than IBD [20]; availability of multiple ultrasonographic images of the small intestine; and availability of rectal biopsy histology report.

2.2. Ultrasonography

Transcutaneous B-mode abdominal ultrasonography was performed with a Technos MPX ultrasound machine (Esaote, Firenze, Italy), using a 3.5 to 5.0 MHz convex transducer ca430E (Esaote) set at 3.5 MHz with an axial resolution of 0.308 mm. In each patient, ultrasonography was performed by the same qualified operator (E.Z.), 1 day after the admission. The patients were fasted for 12 hours before ultrasonographic examination to facilitate the intestinal tract visualization [21]. The abdomen was thoroughly evaluated, and a variable number of transverse or sagittal ultrasonographic static images, showing one or more small intestinal loops with a clear and distinguishable wall, was recorded [7]. The recorded images were subsequently reevaluated to perform the study. The intestinal wall thickness was measured using the IMSI TurboCAD professional version 10.2 software (IMSI, Novato, CA; Fig. 1). All measurements were carried out by the same operator (S.C.). For each intestinal loop, the wall thickness was measured three times and the mean value and standard deviation were calculated (mean loop thickness, MLT). Thereafter, for each patient, a mean individual thickness (MIT) and standard deviation were calculated, considering all the single MLTs previously obtained.

2.3. Intestinal Wall Histology

According to the accurate review of rectal biopsy histologic reports, all issued by the same laboratory (Abbey Veterinary Services, Devon, UK), each patient was classified as normal or abnormal as listed in Table 1 [19].

2.4. Statistical Analysis

A preliminary evaluation of intraobserver repeatability and interobserver reproducibility of the wall thickness measurement was made. Repeatability was evaluated by

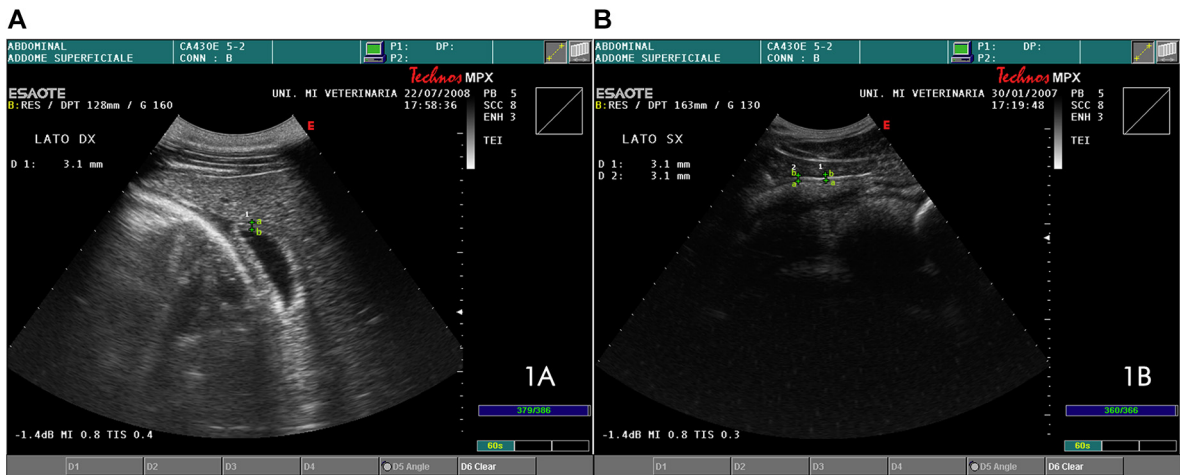


Fig. 1. Ultrasonographic measurement of small intestinal wall thickness. Transverse plane (A) of the duodenum and longitudinal plane (B) of a jejunal loop visualized transabdominally using a 3.5 MHz convex transducer; the measurements were taken from the hyperechoic serosa layer to the inner hyperechoic mucosal surface.

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