

# Meckel's diverticulum as a cause of colic: 2 cases with different morphological features

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Oorspronkelijk artikel

## SUMMARY

Persistent Meckel's diverticulum is an uncommon embryonic developmental anomaly of the distal small intestine created by a portion of the vitelline duct adjacent to intestine that remains patent. This portion can form a diverticulum (Meckel's diverticulum) or a fibrous band, called vitelloumbilical band, and can be associated with colic after local impaction or strangulation of the small intestine around the remnant. This report describes two cases of Meckel's diverticulum with different morphological features in older horses. This congenital disorder should be considered as a reason for abdominal pain, even in the older horse, and should be included in the differential diagnosis of acute abdominal pain and recurrent moderate colic.

## SAMENVATTING

**Meckel's diverticulum als oorzaak van koliek: twee gevallen met verschillende morfologische kenmerken**

*Een persistent Meckel's diverticulum is een ongewone embryologische ontwikkelingsstoornis van het distale eind van de dunne darm. Het wordt veroorzaakt door het patent blijven van het vitelliene kanaal dicht bij de dunne darm. Dit deel kan een diverticulum (Meckel's diverticulum) of een fibreuze band vormen, zogenaamd vitelloumbilicale band, en kan geassocieerd zijn met koliek door lokale obstructie of strangulatie van de dunne darm rondom het overblijfsel. Dit artikel beschrijft twee gevallen van Meckel's diverticulum met twee verschillende uitingen in oudere paarden. Deze congenitale afwijking moet*

*gezien worden als een reden voor abdominale pijn, zelfs in het oudere paard, en moet worden opgenomen in de differentiaaldiagnose van acute maar ook van milde recidiverende koliek.*

## INTRODUCTION

Persistent Meckel's diverticulum (MD) is an uncommon embryonic developmental anomaly of the distal small intestine (3) created by a portion of the vitelline duct adjacent to the intestine. This vitelline duct or omphalomesenteric duct allows communication between the yolk sac and the primitive gut and usually disappears in the first trimester of pregnancy. In rare cases, remnants of this duct remain patent and create a tube between the intestine and the umbilicus (3). In these instances, the intestinal content can pass from the ileum to the umbilical area (17). More commonly, only the portion of the vitelline duct adjacent to the intestine remains patent and creates a diverticulum, known as MD (3). In other cases, a fibrous ligament or vitelloumbilical band remains between the intestine or the diverticulum and attaches to the umbilicus. Mesodiverticular bands are another congenital anomaly associated with remnants of the vitelline structures, and specifically the vitelline artery. The band forms a fold of mesentery that usually originates from the mesenteric vein and passes to the antimesenteric side of the intestine. The defect formed by the fold and the normal mesentery is prone to herniation, causing strangulation of the intestine (3).

Apart from a more recent case report from Barakzai et al. (2) describing two cases of strangulated colic involving a MD, reports on MD are scarce and rather old. There are more reports on mesodiverticular bands in association with strangulated small intestine colic (1, 4, 5, 10). This report describes two cases of MD with different morphological features in older horses.

## CASE DESCRIPTIONS

between 2003 and 2007, two horses diagnosed with a MD were presented to the Equine Clinic of the Veterinary Teaching Hospital of University of Liege, Belgium. Both horses were referred for an episode of acute, violent colic not responsive to analgesics. The first horse was presented within 4 hours, and the second within 2 hours of colic onset. The first horse was an 8-year-old Halfbred gelding weighing 673 kg; the second was a 9-year-old Standardbred gelding weighing 480 kg. They were both regularly dewormed and had a normal body condition. Both owners reported the horses to have a history of recurrent colic that resolved spontaneously or after minor medical

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intervention. Parameters of the clinical examination and blood values of both horses are listed in Table 1.

In view of the clinical symptoms, the horses were referred for surgery. An emergency celiotomy by a classic ventral midline approach was performed under isoflurane in oxygen anaesthesia. The first horse had a diverticulum approximately 30 cm long and 10 cm wide in the region of the jejunum-ileum junction. The diverticulum was filled with hard alimentary content that created an obstruction extending proximally into the jejunum. An enterotomy was performed at the site of the diverticulum to remove the impacted content of the proximal small intestine, after which an end-to-end jejunum-ileum anastomosis was performed in two layers (one continuous, one Lembert pattern). In the second horse, 1 m of jejunum was found to be wrapped around the base of the diverticulum located at the jejunum-ileum junction and attached by a fibrous band of about 6 cm to the umbilicus (Figure 1). The band was transected at the level of the umbilicus and the piece of strangulated intestine was removed (Figure 2) using an

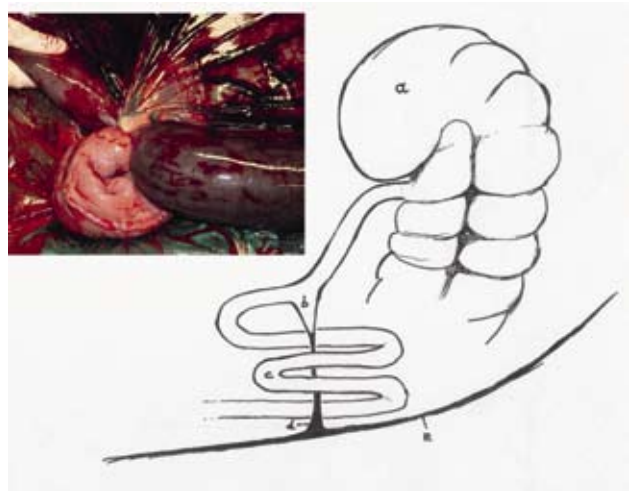


Figure 1: Top left: picture of the strangulated gut during surgery (horse 2). Schematic description of the way the jejunum (c) was wrapped around the vitelloumbilical band (d) originating from the Meckel's diverticulum (b). (a) caecum; (e) abdominal wall

Parameter	Horse 1	Horse 2
Heart rate <i>bpm</i>	56	60
Respiratory rate <i>rpm</i>	20	28
Rectal Temperature $^{\circ}\text{C}$	37.4	37.6
CRT <i>seconds</i>	<2	<2
Mucosa	Pink	Pink
Borborygmus	Diminished lower quadrants Absent upper left quadrant	Diminished in all quadrants
Abdominal distension	Absent	Absent
Rectal palpation	Distended small intestinal loops	Distended small intestinal loops
Reflux	2L alimentary Non spontaneous	2L alimentary Non spontaneous
Abdominoscentesis	Not retrieved	Orange to red slightly opaque liquid
Ultrasonography	Circular distended small intestinal loops without motility	Circular distended small intestinal loops without motility
PCV $\%$	40	35
WBC $\times 10^9/\text{L}$	10.6	7.7
$\text{Na}^+$ <i>mmol/l</i>	143.6	140.3
$\text{K}^+$ <i>mmol/l</i>	3.30	3.25
$\text{Cl}^-$ <i>mmol/l</i>	103.6	103.1
Total Protein <i>g/dl</i>	7.3	7
BE <i>mmol/l</i>	-4.2	8.7
pH	-	7.429
$\text{PCO}_2$ <i>mmHg</i>	-	53.2
$\text{HCO}_3^-$ <i>mmol/l</i>	-	34.4

Table 1: Clinical parameters of both horses.

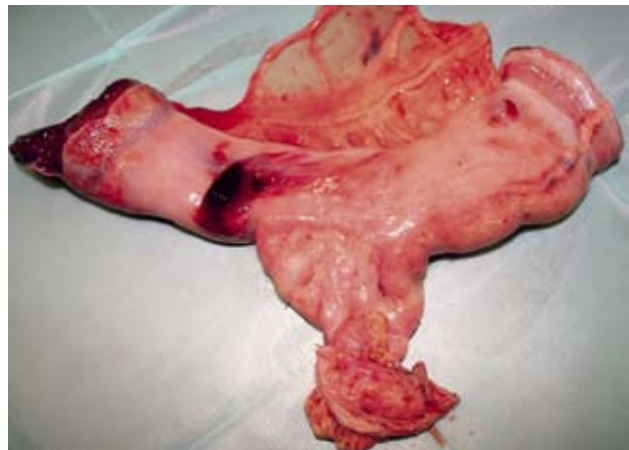


Figure 2: Picture of the isolated part of ileum containing the Meckel's diverticulum from horse 2.

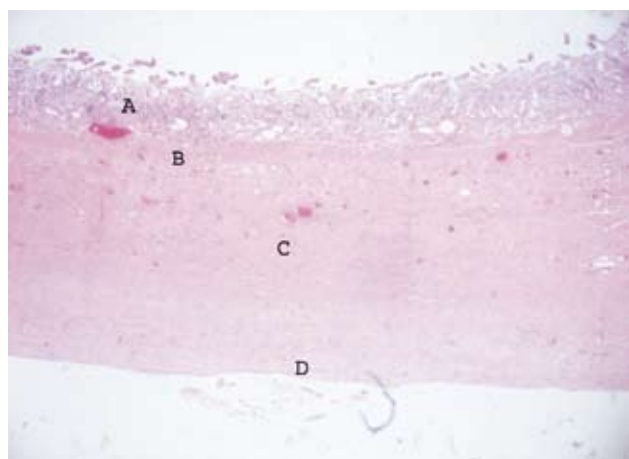


Figure 3: Histopathology (H&E, 40x) of a section of the diverticulum showing the presence of (A) mucosa; (B) submucosa; (C) some submucosal muscular and (D) serosal layer but no presence of longitudinal or circular muscular layers as in normal ileum.

end-to-end jejunio-ileal anastomosis in two layers (one continuous and one Lembert pattern).

Histopathology of the resected sample, taken at the level of the diverticulum, from the second horse revealed a mucosal lineage similar to that of the ileum, and a submucosal and serosal layer including some submucosal muscular tissue (Figure 3 and 4). However, unlike the normal ileal structure, the diverticulum did not have a muscle layer.

Unfortunately, both horses were euthanized shortly after the intervention. The first one sustained a tibial fracture during recovery, and the second was euthanized because of the recurrence of severe colic and the reluctance of the owner to continue treatment.

#### DISCUSSION

Although the clinical appearance of both horses was similar, the features of the MD were different. Approximately 4-6% of humans with MD are symptomatic and their presentation can be quite variable (14, 15), ranging from peritonitis, intestinal obstruction, umbilical discharge, intussusceptions or intestinal perforation (9, 12, 13, 18). However, the most prevalent symptoms in humans are episodes of rectal bleeding or melena (14, 15). Most reports concerning equine species describe colic associated with small intestine obstruction or strangulation in conjunction with MD (1, 2, 5-8). As far as the authors are aware, MD has not been associated with episodes of melena in horses. In this case report, blood was not seen macroscopically, but faecal tests for occult blood were not performed.

In a recent review of 71 cases of MD in humans, the age of the patients ranged from 2 days to 14 years (14, 15) and others have reported a mean age of 10 years (19). Like human patients, horses with MD are relatively young, with a median age of 18 months (2). Both horses in this report, however, were much older, 8 and 9 years, respectively. As clearly illustrated by a case report of chronic pelvic pain in a 36-year-old woman (13), MD can be a cause of recurrent

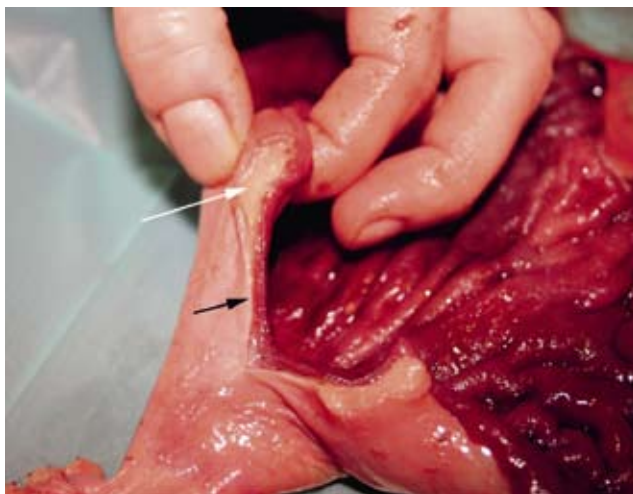


Figure 4: Focus on the diverticulum, which was transected at the level of the black arrow. The white arrow points at the normal ileum showing the clear difference between the thick muscular layer in the ileum (white arrow) and the absence of it in the diverticulum (black arrow).

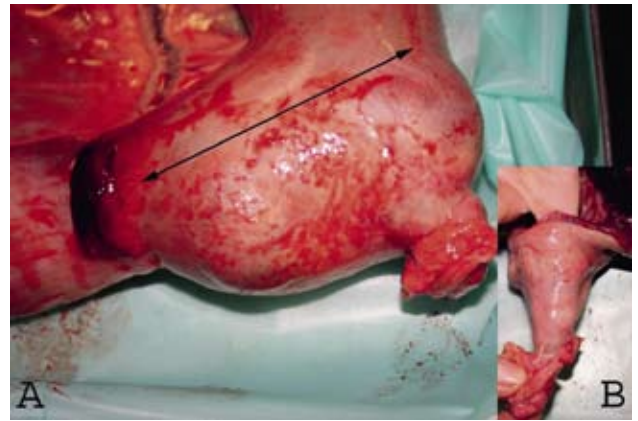


Figure 5: Picture illustrating the cone shaped form of the diverticulum. (A) Filled with intestinal content during surgery (the arrow shows the width of the Meckel's diverticulum); (B) Isolated Meckel's diverticulum with introduced fingertip illustrating cone shaped structure.

abdominal pain. Both horses in this report had a history of moderate recurrent colic, possibly caused by repeated impaction and / or partial self-resolving strangulation of the small intestine at the site of the diverticulum. MD should therefore be included in the differential diagnosis of not only acute but also recurrent colic, even in the older horse.

MD is a rare finding in domestic animals and has been reported mainly in pigs, horses, and occasionally in ruminants (3, 20). Little information about the exact incidence of MD in horses is available. The largest post-mortem review was conducted at Kentucky University and found a prevalence of 0.03% in about 15,000 horses (16). In humans on the other hand, this portion of the duct seems to persist in approximately 2-3% of the population (14, 19), making it the most prevalent congenital anomaly of the gastrointestinal tract. Amongst the 1008 horses admitted for acute abdominal colic at the Equine teaching hospital of Liege between 2003 and 2007, only 2 were found to have MD at surgery (celiotomy or laparoscopy) or post-mortem examination. These findings confirm the rarity of the clinical diagnosis of this congenital disorder in horses with colic. Menezes et al. (14) reported that MD in humans is a diagnostic challenge, and this developmental anomaly is probably also overlooked in horses with recurrent colic. In the so-called Meckel's scan, Tc99 sodium pertechnetate scintigraphy is used in human medicine to detect MD. A prerequisite for this technique is the presence of ectopic gastric mucosa, which is present at the level of the diverticulum in 45% to 80% of human cases (14). Neither in this report nor in other reports of horses in which histological studies were performed was gastric mucosa found at the level of the MD, which suggests that scintigraphy is unsuitable for the detection of the anomaly in horses.

Compared with swine, in which the diverticulum usually occurs as a finger-like tube of 5-30 cm and of the same diameter as the ileum, in horses it mostly takes the form of a cone shaped sac about 5-10 cm in diameter (3, 4), as seen in the second horse (fig 5). Usually, the diverticu-

lum is about 10-15 cm long, but it can reach 35 cm (16). Classically, the diverticulum is located at the antimesenteric border of the jejunum or ileum, about 40-120 cm from the ileocaecal junction (4). In some cases a persistent vitelline or omphalomesenteric duct forms a fibrous band or so-called vitelloumbilical band between the diverticulum and the umbilicus (3, 6, 11), as found in our second case (Figure 1 and 2). About 1 m of jejunum proximal to the diverticulum had looped itself around this fibrous cord (Figure 1).

The histological structure of the diverticulum is not different from that of the ileum (3). However, histopathology of portions of the diverticulum of our second case revealed the absence of a circular or longitudinal muscular layer. This could be a predisposing factor for the development of impaction. Normal mucosa gets replaced by a stratified squamous epithelium in chronically impacted diverticulae (2). Unfortunately, histopathology was not performed in our first case. In humans, apart from the ectopic gastric mucosa described above, ectopic pancreatic tissue is a common histological finding in MD (14). To date, this has not been reported in horses or ruminants.

These horses with MD had a similar clinical presentation and history of recurrent colic, but different morphological features. Even in older horses, this congenital disorder should be considered as a cause of acute abdominal pain and should be included in the differential diagnosis of recurrent moderate colic.

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