

Clinical Reports



Herniation of the abdominal wall in pregnant mares

R. Reid Hanson, DVM, and Rory J. Todhunter, BVSc, MS

RUPTURE OF THE prepubic tendon in domestic animals is often associated with hydroallantois, twins, excessive edema of the ventral portion of the abdomen, or trauma.¹ The condition is most common in older draft horse mares but has been reported in other breeds.¹⁻³ This condition is less common in cattle because of the presence of a subpubic tendon.^{1,4} Abdominal wall hernias clinically resemble rupture of the prepubic tendon and must be differentiated from the latter, because rupture of the prepubic tendon is frequently not repairable. Four pregnant mares had acute abdominal wall herniation and were examined for rupture of the prepubic tendon.

Case 1—A 910-kg, 12-year-old Belgian mare near term had an abdominal wall herniation of 3 days' duration (Fig 1). The mare had been purchased 5 months earlier. The owners were unaware that she had been bred, therefore, the exact length of gestation was unknown. The first day the herniation was noticed, the mare was bright and alert but preferred to lie in sternal recumbency. The vital signs were normal, and the foal was alive. During the ensuing 3 days before hospitalization, the mare exhibited more pain and the herniation enlarged.

Physical examination revealed an anxious mare with abdominal pain. The rectal temperature was 38.4 C, heart rate was 104 beats/min, and respiratory rate was 18 breaths/min. The capillary refill time (CRT) was 2 seconds and the mucous membranes were pale. The PCV was 37% with total solids of 7.9 g/dl. The abdomen was large laterally and ventrally. Edema was present ventrally and in the right ventrolateral body wall. Bilateral abdominal wall defects (approx 40 cm by 60 cm) were palpable at the level of the stifles. What was thought to be large intestine could be palpated just under the skin on the left side. Rectal examination revealed a firm cervix and a live fetus. Bilateral ventral deviation of the



Fig 1—Severe abdominal wall deviation and edema in mare 1. Notice normal appearance of tuber ischii and tailhead.

abdominal wall was seen cranial to the symphysis of the pubis. Udder development was not present.

Flunixin meglumine^a (0.5 mg/kg of body weight) was given iv. The mare exhibited more abdominal pain as the abdominal hernia enlarged and the ventral edema worsened. Because of her deteriorating condition, poor prognosis, and uncertain foaling date, the mare was euthanatized.

Postmortem examination revealed that the apex and body of the cecum had herniated through a rent of the aponeuroses of the right *transversus abdominis* and *obliquus internus abdominis* muscles (Fig 2). The *rectus abdominis* and *obliquus externus abdominis* muscles and prepubic tendon were intact. Extensive hemorrhage, edema, and cellulitis were present bilaterally in the abdominal muscles and subcutaneous tissue (Fig 3), extending from the pelvic inlet to the xyphoid and dorsally two thirds up the body wall. A 68.2-kg female fetus near term was located within a normal uterus.

From the department of Clinical Sciences, New York State College of Veterinary Medicine, Cornell University, Ithaca, NY 14853. Dr. Hanson's present address is Department of Surgical Sciences, Box J-116, J. Hillis Miller Health Center, College of Veterinary Medicine, University of Florida, Gainesville, FL 32610.
Florida Agricultural Experiment Journal Series No. 7286.

^aSchering Corp, Kenilworth, NJ.

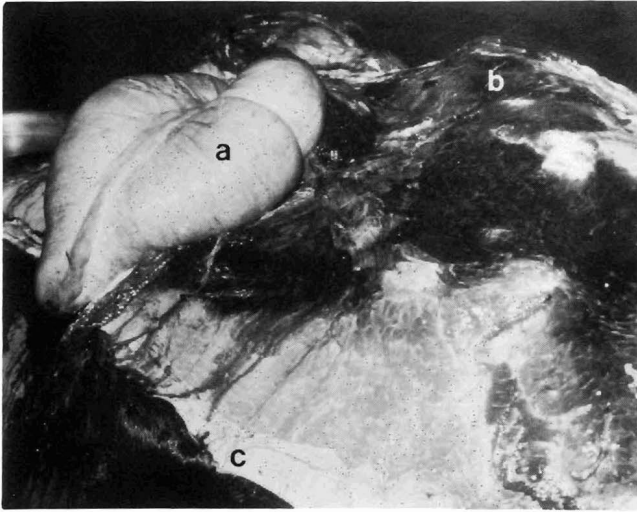


Fig 2—With mare 1 in left lateral recumbency, the apex and body of the cecum (a) were herniated through a rent in the aponeuroses of the right transversus abdominis and obliquus internus abdominis muscles. 18th rib (b), ventral midline (c).

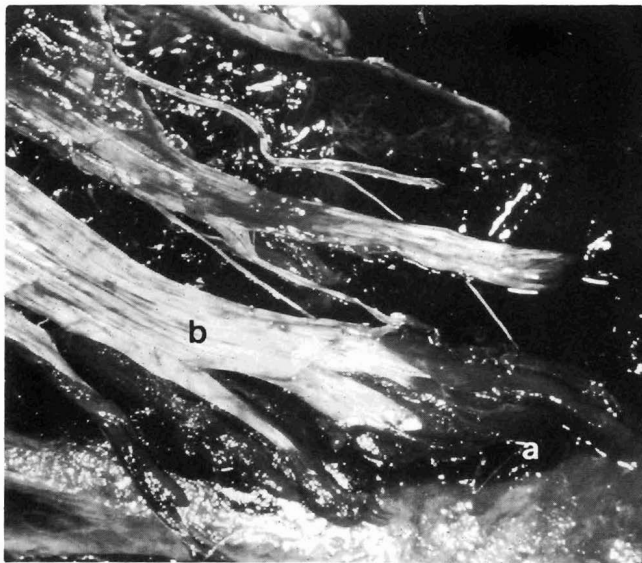


Fig 3—Subcutaneous edema (a) and tearing of the right obliquus internus abdominis aponeurosis (b) in mare 1.

Case 2—A 590-kg, 8-year-old Standardbred mare had a history of depression, gradual abdominal enlargement, and anorexia of 7 days' duration. Twenty-four hours before hospitalization, the abdominal enlargement worsened and the mare began to have signs of abdominal pain. The mare was 270 days pregnant when examined and had delivered 3 foals without complication.

On admission, the mare was reluctant to stand. The rectal temperature was 37.1 C, heart rate was 68 beats/min, and respiratory rate was 36 breaths/min. The mucous membranes were pink and the CRT was one second. The abdomen was distended, and extended laterally and ventrally. Rectal examination revealed a large fluid-filled uterus. The ventral abdominal wall could not be palpated cranial to the pubis. External palpation of the abdomen revealed crepitation of the ventral abdominal wall. Hydro-

allantois with rupture of the prepubic tendon was diagnosed. The mare was euthanatized because of the deteriorating condition and poor prognosis for recovery and reproductive performance.

Postmortem examination revealed that the apex and body of the cecum and the pelvic flexure were herniated through a rent in the right caudal lateral wall, just cranial to the pubis (Fig 4). The right rectus abdominis muscle and right lamina externa of the rectus abdominis were torn from the prepubic tendon. Hydroallantois was present. An arthrogryptic fetus weighing 24 kg with a crown-rump length of 86 cm was present.

Case 3—A 523-kg, 14-year-old Quarter Horse mare had abdominal distention of 72 hours' duration. The mare had abdominal pain 10 hours before she was hospitalized. Rectal examination 6 hours before hospitalization revealed small intestinal distention. The mare had not responded to analgesic therapy.

Physical examination revealed anxiety, abdominal pain, and sweating. The heart rate was 96 beats/min with a respiratory rate of 30 breaths/min. The mare was approximately 10% dehydrated. The mucous membranes were pale pink and the CRT was 3 seconds. The abdomen was severely distended, especially in the left lower quadrant. Pain could not be induced by external palpation of the abdomen. A fetus was ballotable through the abdominal wall. On rectal examination, distended loops of small intestine and subcutaneous edema were palpated within the inguinal area. The peritoneal fluid was a transudate (300 nucleated cells/ μ l, with a total protein of 1.6 g/dl).

A diagnosis of a ruptured prepubic tendon with secondary small intestinal obstruction was made. The mare was euthanatized because of a poor prognosis for recovery and uncertain foaling date.

Postmortem examination revealed a distal loop of the jejunum trapped between the broad ligament and the wing of the ilium, resulting in distention of the proximal portion of the jejunum. Serosal and mucosal

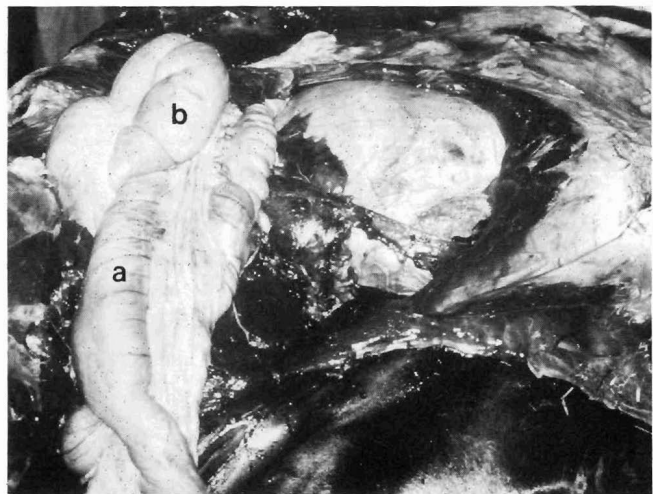


Fig 4—With mare 2 in left lateral recumbency, the pelvic flexure (a) and body of the cecum (b) were herniated through the right rectus abdominis and rectus abdominis lamina externa (the right limb had been dissected free).

surfaces were dark purple, consistent with ischemia. The right obliquus externus abdominis muscle had a hemorrhagic rent approximately 16 cm long at its aponeurosis. Other hemorrhagic rents were present in the left (6 cm by 15 cm) and right (4 cm by 10 cm) rectus abdominis muscles, near their insertion on the prepubic tendon. The obliquus internus abdominis and transversus abdominis muscles were intact. Edema was present in all the abdominal muscles within the ventral abdomen. The uterus contained approximately 50 L of clear, straw-colored fluid. Focally, extensive placentitis and a 9.5-kg male fetus with a crown-rump length of 58 cm were present.

Case 4—A 795-kg, 21-year-old Percheron mare had a 15-cm diameter swelling just cranial to the right flank. The rectal temperature was 39.2 C, heart rate was 80 beats/min, and respiratory rate was 32 breaths/min. Moderate ventral edema was present cranial to the udder. External palpation of the abdomen elicited pain, and the mare was reluctant to walk. Eight hours after examination, the swelling had increased to 30 cm in diameter. A ventral deviation of the abdominal wall cranial to the symphysis of the pubis was found on rectal examination. A ruptured prepubic tendon was diagnosed.

Application of an abdominal support bandage and administration of flunixin meglumine (0.5 mg/kg) IV did not improve the mare's condition. Parturition was induced the following day. A normal amount of allantoic fluid was present, and a dead foal was delivered. A right ventral hernia (25 cm diameter) remained after parturition. Although the mare was clinically normal for 6 months after admission, she was found dead in her stall after an apparently violent colic episode.

In the horse, the tunic flava abdominis with the obliquus externus abdominis, obliquus internus abdominis, transversus abdominis, and rectus abdominis muscles form the supporting layers of the abdomen. The prepubic tendon serves as the tendon of insertion of the rectus abdominis muscles and also has insertions from the lamina externa of the rectus abdominis, gracillis, and pectineus muscles. The lamina externa of the rectus abdominis muscles insert cranially into the linea alba and caudally into 2 layers; one onto the tuber coxae and prepubic tendon, and the second passing onto the medial surface of the thigh where it blends with the femoral fascia. The prepubic tendon attaches to the cranial borders of the pubis including the iliopubic eminences. It is a strong, thick sheet of fibrous tissue with concave lateral borders that extend obliquely caudally and dorsally. The sagittal angle that the tendon forms with the pelvic floor varies between species and can be up to 90 degrees. Fibers of the caudal prepubic tendon extend in a transverse direction from one iliopubic eminence to the other. The rectus abdominis muscles join with the prepubic tendon in the median plane. Gracillis muscles insert cranially on the prepubic tendon and many fibers of the pectineus muscles arise from the prepubic tendon.⁵

Rupture of the prepubic tendon must be distin-

guished from displacement of the rectus abdominis muscles and/or lateral supporting structures of the abdominal wall. Because of the many structures that insert on the prepubic tendon, all support of the ventral and lateral abdominal wall is lost when it ruptures. With displacement of the rectus abdominis muscles and/or obliquus muscles (ie, disarticulation from the prepubic tendon), all support of the abdomen is not lost because other structures that insert on the prepubic tendon are intact. Mares with abdominal wall herniation have a progressive enlargement of the abdomen over several days. Ventral edema of the abdominal wall is usually present, and progresses and worsens daily. External palpation of the hernia can be difficult because of edema and increased gradual thickness of the abdominal wall. Pain was exhibited by mares 1, 2, and 3 because of muscular inflammation and visceral incarceration. Clinical signs can be interpreted as colic and are a major reason for hospitalization. The abdominal wall edema was not severe in mare 3 and could have been confused with a normally distended abdomen secondary to hydroallantois.

Mares that have a ruptured prepubic tendon exhibit abdominal pain and have progressive ventral abdominal wall edema.^{2,6} They have a stiff gait and prefer not to lie down.¹ The mammae are stretched ventrad and cranial on the abdominal wall after rupture. A sawhorse stance is observed, with elevation of the tailhead and ischial tuberosities. Lordosis occurs because the ruptured prepubic tendon can not maintain the pelvis in its proper relationship to the spine.¹ All cases involve pregnant mares.^{2,6} Sudden death has been described after rupture of the prepubic tendon.⁶

Antemortem diagnosis of the specific abdominal wall lesions was difficult. The ventral deviation of the abdomen and associated edema in these mares indicated rupture of the prepubic tendon from the pubis with corresponding loss of all abdominal wall support. In mare 1, an abdominal wall hernia was externally palpable and thought to be secondary to a ruptured prepubic tendon. Enlargement of the uterus hampered rectal palpation in mares 2 and 3 and was believed to be a contributing factor in the development of the suspected prepubic tendon rupture.

Rupture of the prepubic tendon from its insertion onto the pubis had not occurred in the 3 mares examined at necropsy. In mares 2 and 3, displacement of the rectus abdominis muscles from the prepubic tendon also was accompanied by lesions within the right lateral body wall. Abdominal wall lesions are seen most commonly on the left side in the mare.¹ In the present cases, lesions were more common on the right. However, in mares 2 and 3, the severity of the displacement of the rectus abdominis muscles did not correspond to the severity of the lateral body wall lesions. Mare 1 had severe lateral body wall lesions with no displacement of the rectus abdominis muscles.

An abdominal wall defect should be considered in aged pregnant mares with a history of colic. These patients are uncomfortable and prefer to lie down.

They do not strongly resist walking. Elevation of the tailhead or ischial tuberosities is not present. During rectal examination, the caudal abdominal floor should be palpated for evidence of herniation or displacement of the abdominal wall cranial to the pubis.

Gravid patients with progressive abdominal wall herniation should have parturition induced when they are stabilized, to avoid irreversible damage to the body wall.⁷ Removal of the fetus via induction of parturition will also allow reevaluation of the abdominal wall and gastrointestinal tract. After induction of parturition in mare 4, the abdomen regained its normal appearance except for the presence of a smaller hernia. Physical examination after induction of parturition and comparison with that in the previous 3 cases indicated that the initial lesion was not a prepubic tendon rupture but a lateral body wall defect.

Fetal age should be estimated (by examination per rectum, ultrasonic determination of fetal heart rate), and induction of parturition may be an alternative consideration for saving the foal. However, transabdominal ultrasonic examination may be unfruitful in mares with a greatly thickened abdominal wall. Foaling should always be assisted because of the inability of the abdominal muscles to contract strongly and equally to force the fetus into the pelvic inlet. Laminitis, retained placenta, septic metritis, and shock can be severe complications after expulsion of a fetus with hydroallantois.^{1,2,6,7}

After the predisposing cause of the abdominal hernia is removed, the mare should be evaluated further. If entrapment of intestine is present, surgi-

cal intervention may be necessary. Entrapment of viscus may be an additional source of pain. If entrapment of intestine is not present, confinement to a boxstall with restricted exercise accompanied by an abdominal support wrap and analgesics are indicated.^{1,3} The lesion can be evaluated when the edema of the body wall has regressed. Low bulk, pelleted feeds, or grass should be given.^{1,3} Hernial repair may be attempted at a later date. Rebreeding of the mare is not recommended.^{1,6}

Causes of herniation of the abdominal wall in these mares appeared to be similar to those for prepubic tendon rupture (hydroallantois, trauma, twins, and fetal giants).¹ The abdominal wall is predisposed to herniation by the increased weight of the gravid uterus on the abdominal floor and possible degenerative changes from the edema in aged mares. The damage is severe enough to resemble damage in mares with prepubic tendon rupture.

1. Roberts SJ. Rupture of the prepubic tendon or prepubic desmorrhaxis of pregnancy. In: Roberts SJ, ed. *Veterinary obstetrics and genital diseases*. 2nd ed. Ann Arbor, Mich: Edwards Brothers Inc, 1971;184-186.

2. Adams SP. Rupture of the prepubic tendon in a horse. *Equine Pract* 1979;1:17-19.

3. Roberts SJ. Abortion and other diseases of gestation in mares. In: Morrow DA, ed. *Current therapy in theriogenology*. Philadelphia: WB Saunders Co, 1980;746-753.

4. Keown GH. The abdominal wall. In: Oehme FW, Prier JE, eds. *Textbook of large animal surgery*. Baltimore: Williams & Wilkins Co, 1974;146-179.

5. Sisson S, Grossman JD. Abdominal fascia and muscles. In: Getty R, ed. *The anatomy of the domestic animals*. 5th ed. Vol. 1. Philadelphia: WB Saunders Co, 1975;407-412.

6. Jackson PGG. Rupture of the prepubic tendon in a Shire mare. *Vet Rec* 1982;3:38.

7. Koterba, AM. Respiratory distress in a premature foal secondary to hydrops allantois and placentitis. *Compend Contin Educ Pract Vet* 1983;5:S121-S125.