

# Case Report – Surgical Management of a Complicated Umbilical Abscess with Multiple Jejunal Adhesions in a 12-week-old Holstein Heifer

**Eli H. S. Hendrickson, DVM<sup>1</sup>; Christopher B. Riley, BSc, BVSc, MSc, PhD, Diplomate, ACVS<sup>2</sup>**

<sup>1</sup>*Department of Clinical and Populations Sciences, College of Veterinary Medicine, University of Minnesota, 225 Veterinary Medical Center, 1365 Gortner Avenue, St. Paul, MN 55108*

<sup>2</sup>*Department of Health Management, Atlantic Veterinary College, University of Prince Edward Island, 550 University Ave, Charlottetown, PE C0A 4P3, Canada*

## Abstract

A 9.9 lb (4.5 kg) urachal abscess involving the umbilical arteries was diagnosed in a 12-week-old Holstein heifer. The urinary bladder wall was adhered to the mass, in addition to multiple adhesions of the jejunum, which were associated with incomplete extramural obstruction. Adhesiolysis was completed. One section of partially obstructed jejunum was resected and a side-to-side anastomosis performed. Recovery from surgery was uneventful.

## Résumé

On a diagnostiqué un abcès de l'ouraque de 4.5 kg (9.9 lbs) impliquant les artères ombilicales chez une génisse Holstein de 12 semaines. La paroi de la vessie urinaire était accolée à l'excroissance et il y avait de multiples adhésions au jéjunum associées avec une obstruction extramurale incomplète. L'adhésiolyse était complétée. Une section du jéjunum partiellement obstruée a été excisée et une anastomose d'un côté à l'autre a été faite. La récupération s'est déroulée sans problème.

## Introduction

Infection of umbilical remnants, most frequently involving the urachus, is common in calves.<sup>1,15</sup> Calves affected with omphalitis often suffer from poor performance and are predisposed to pneumonia, peritonitis, bacteremia, septicemia or joint infections.<sup>1,10,12</sup> Compromise of urinary bladder function is also reported as a complication of urachal infection in cattle.<sup>4,10,12</sup> Affected animals often exhibit stranguria and pollakiuria.

Few reports were found in the literature that describe adhesions with subsequent small intestine obstruction as a sequela of urachal infection in the bovine.<sup>5,9,12</sup> This report describes successful treatment of a calf with multiple intestinal adhesions to a massive urachal abscess.

## History

A 12-week-old Holstein heifer was presented to the Atlantic Veterinary College with complaints of decreased fecal output, stranguria, and a progressively enlarging umbilical mass of a few days' duration. The owner reported the navel swelling was initially a small, soft, reducible and non-painful umbilical hernia. There was no history of anorexia. The calf was reportedly healthy prior to this problem.

Prior to admission to the teaching hospital, the owner had withheld feed from the calf and offered only a small amount of water for 12-16 hours in anticipation of surgery.

## Clinical Findings

When examined, the calf appeared slightly underweight (213 lb; 97 kg), estimated to weigh 10% less than the herd average. The calf was bright, alert and responsive. The rectal temperature was 103.1°F (39.5°C), heart rate was 108 bpm and the respiration rate was 54 rpm. Rumen contractions were weak, with one contraction every 1.5 minutes. There was no appreciable abdominal distention. Externally, the calf had an approximately 4-inch-wide by 6-inch-deep by 8-inch-long (10.2 x 15.2 x 20.3 cm) umbilical mass. The mass was firm, warm, slightly fluctuant, non-reducible and painful on palpation. There was no drainage. During examination, the



calf passed scant amounts of pasty feces. There were no abnormal findings on routine hematogram or serum biochemistry profile.

Differential diagnoses included umbilical abscess, infection of umbilical cord remnants, or complicated umbilical hernia with incarceration of omentum, abomasum or small intestine. Based on recent changes in the appearance of the umbilicus, the short history of decreased fecal output, straining to urinate and owner concerns, an open herniorrhaphy was performed on the day of admission.

### Surgical and Therapeutic Management

Following sedation with 0.023 mg/lb (0.05 mg/kg) of xylazine HCl<sup>a</sup> administered IV, general anesthesia was induced and maintained with 2% isoflurane via a nasotracheal tube. The calf was positioned in dorsal recumbency. Routine clipping and aseptic preparation of the surgical site were performed.

An elliptical skin incision was made around the umbilical defect, and dissection continued down to the rectus abdominis muscle and the linea alba. The abdominal cavity was entered lateral to the mass, through a stab incision large enough to admit one digit for intra-abdominal palpation. The incision was extended to encircle the body wall attachments of the mass. Care was taken to avoid perforation of the urachal attachment of the mass. The mass was adhered to the peritoneum and greater omentum, and required extensive blunt and sharp dissection to be freed from the surrounding tissues. The mass filled the caudoventral region of the abdomen and was firmly attached to the apex and ventral wall of the urinary bladder. Exteriorization of the distal jejunum was restricted by four mature adhesions to the mass. One of the intestinal adhesions was markedly thickened (1.2-inch-wide by 0.4-inch-deep by 2.8-inch-long; 3.0 x 1.0 x 7.0 cm), resulting in partial extramural occlusion (Figure 1). Separation of the bowel adhesions was performed by sharp dissection. For the three non-obstructed sections, the cut edges of serosa were apposed in two layers of 2-0 monofilament polyglyconate suture (Maxon)<sup>b</sup> in a Cushing pattern. The bowel with extramural occlusion was isolated for later resection. Each thickened umbilical artery was isolated, double ligated with 2-0 Maxon, and transected. A small amount of purulent material was found within the stump of the left artery. It was isolated, ligated and resected more caudally. The cranial 2 inches (5.0 cm) of the apex of the bladder (~ 4 inches in diameter; 10.2 cm) was resected after placement of two Carmalt forceps across the bladder wall perpendicular to the apex. The urachal mass was then removed from the abdomen, and the defect in the bladder wall was closed using a Parker-Kerr oversew, oversewn with a Cushing pattern using 2-0 Maxon suture.

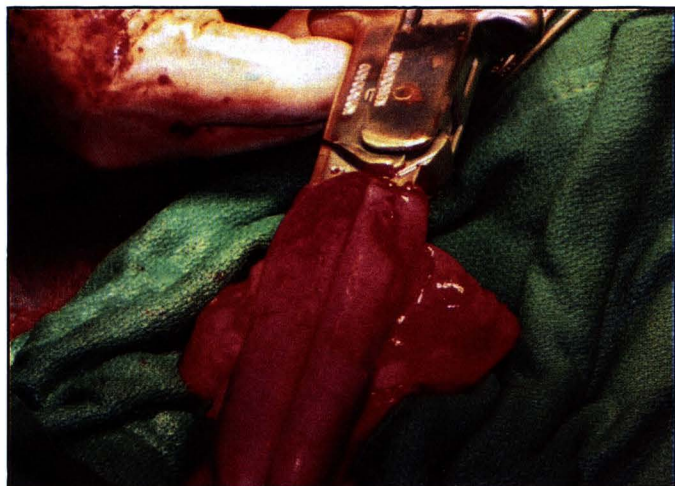


**Figure 1.** a: Extra-abdominal portion of the mass, b: Intra-abdominal portion of the mass, arrow: point of jejunal adhesion.

Two stay sutures of 2-0 monofilament polydioxanone suture (PDS II)<sup>c</sup> were placed on the antimesenteric border, 4 inches (10.0 cm) to either side of the partially occluded jejunum. The jejunum was then apposed for an antiperistaltic, side-to-side anastomosis. Two enterotomy incisions approximately 0.4 inches (1.0 cm) long were made in each part of the bowel to allow one application of a gastrointestinal anastomosis instrument (GIA 90<sup>d</sup>; Figure 2). Staple lines were oversewn in a Cushing pattern with 2-0 PDS II suture material. Carmalt forceps were placed across the two bowel lumena approximately 0.8 inches (2.0 cm) cranially and caudally to the obstructed portion. The lumena were then sealed with one application of a staple instrument (TA 90)<sup>e</sup>, and the redundant bowel was resected with a #10 scalpel blade. The staple line was oversewn with 2-0 PDS II in a Cushing pattern. The two enterotomy incisions were closed in a double Cushing pattern with 2-0 PDS II suture. The mesenteric defects and the rent in the omentum were closed in a simple continuous pattern using 2-0 PDS II and 0 Maxon, respectively. The peritoneum and internal and external rectus sheaths were closed in a simple interrupted pattern using number 2 braided polyglactin 910 suture (Vicryl).<sup>f</sup> Subcutaneous tissues were closed in two layers in a simple continuous pattern with 2-0 Maxon. The skin was closed using stainless steel staples (Appose ULC).<sup>g</sup> The calf recovered uneventfully from anesthesia. The final diagnosis was a massive urachal abscess with adhesion to the bladder wall, and multiple adhesions of the small intestine, one of which resulted in partial extramural obstruction.

Postoperative management included administration of sodium penicillin G,<sup>h</sup> 10,000 IU/lb (22,000 IU/kg) body weight (BW), IV, QID for two days; ketoprofen,<sup>i</sup> 1.4 mg/lb (3.0 mg/kg) BW, IV, SID for three days; and NaCl infusion 36.4 ml/lb (80 ml/kg) /24 hours, IV, for 24





**Figure 2.** Side-to-side anastomoses performed by means of a GIA 90 stapling device.

hours. Ceftiofur sodium<sup>j</sup> was added to the antibiotic treatment after 24 hours at 1.8 mg/lb (4.0 mg/kg) BW, IV, BID for two days, then 0.9 mg/lb (2.0 mg/kg) BW, IM, BID, for four days.

The urachal mass weighed 9.9 lb (4.5 kg). It contained a large amount of purulent material. Sterile swabs were taken for aerobic and anaerobic bacterial cultures. The cultures identified a heavy growth of *Escherichia coli* sensitive to ceftiofur and trimethoprim-sulfamethoxazole, and heavy growth of *Proteus vulgaris* sensitive to ceftiofur, tetracycline, streptomycin and trimethoprim-sulfamethoxazole.

The calf defecated small amounts of soft feces two hours after surgery. Mild gut sounds were detected after 12 hours, and rumen contractions were 1/minute within 24 hours following surgery. Small amounts of hay and pelleted grain soaked in water were offered 18 hours after surgery, and gradually increased to a normal amount (2.0% of BW/day of grain, free choice hay) over three days. The calf was discharged five days after hospital admission.

On examination 15 days after discharge, the calf was afebrile. It was eating well with normal urinary and fecal output. The skin staples were removed, the incision was not swollen and there was no drainage. The calf has matured, and 18 months after surgery is still doing well. No postoperative complications have been noted by the owner.

### Discussion

Calves with umbilical infections are usually unthrifty, have decreased growth rates, and may have concurrent infectious diseases.<sup>1</sup> The calf in this report was slightly smaller than her herd mates.

Despite the large size of the urachal abscess, this calf showed clinical signs of illness for only a short time

prior to admission. There was no indication of infection on the hematogram obtained following admission. A complete blood count with signs of hyperfibrinogenemia, hyperproteinemia, neutrophil-lymphocyte reversal and mild anaemia, would normally have been suspected with this condition.<sup>1</sup> Urinalysis would have been prudent, given the history of stranguria and potential risk of secondary cystitis or pyelonephritis as a sequela to urachal infection.<sup>4</sup> However, the calf expressed no signs of stranguria or pollakiuria post-operatively.

*Arcanobacterium pyogenes*, *Escherichia coli*, *Proteus* spp and *Enterococcus* sp are the bacteria most commonly isolated from bovine umbilical infections.<sup>15</sup> Penicillin is an effective treatment for anaerobic infections, such as those caused by *A. pyogenes*, but is generally considered ineffective for treatment of infections caused by *E. coli* and *Proteus* spp. The sole use of penicillin intra-operatively, and for 18 hours post-operatively, as administered in this case, was not ideal. Broader spectrum of coverage is warranted in cases where umbilical infection is suspected.

There were mature and extensive adhesions of the omentum and the small bowel to the abscess wall, but no other signs of enteritis or peritonitis which may have caused the adhesions. Urachal abscesses in calves with concurrent intestinal adhesions and subsequent obstructions are uncommon, and previous reports in the literature have not described these extensively. Naylor and Bailey<sup>9</sup> briefly reported this as a complication in one calf less than eight days of age. Shearer<sup>12</sup> described a 12-month-old calf with an internal umbilical abscess that was considered inoperable because of the size of the abscess and the presence of multiple adhesions.<sup>12</sup> One report documented a calf with abscessation of one umbilical artery, adhesions of the omentum and subsequent incarceration and strangulation of small intestine.<sup>5</sup> Incarceration, adhesion or entrapment of small intestine due to persistent umbilical remnants in adult cows have also been reported.<sup>2,3,7</sup>

Ideally, the authors would have had a more precise diagnosis of the structures involved in the umbilical mass prior to surgery. Ultrasonography has been reported as a useful diagnostic tool for identifying infections of umbilical remnants, and is recommended for patients with potential for internalized abscesses.<sup>10,13</sup> However, it has not been as useful for defining intra-abdominal adhesions.<sup>13</sup> In this case, pre-operative ultrasonographic examination may have revealed the extensive nature of the abscess, and prepared clinicians and the owner for the more complicated surgery.

Stapling devices are commonly used in intestinal resection and anastomoses in the equine, and have been well described.<sup>8</sup> A comparison of stapled and hand-sewn anastomosis techniques of the equine small intestine found the use of intestinal stapling devices an equiva-



lent method compared to a hand-sewn, end-to-end anastomosis technique. A possible decrease in duration of post-operative ileus with a stapled, side-to-side technique was reported.<sup>11</sup> Anastomosis of small intestine using stapling devices has also been reported in the bovine, and reduced the overall surgery time by 15% when compared to a hand-sewn technique.<sup>14</sup> Iselin and Steiner<sup>6</sup> reported the successful use of a biofragmentable anastomosis ring in an end-to-end anastomosis of the jejunum in a calf. They reported a 69% reduction of the luminal diameter of the anastomosis site. They concluded that in young cattle the stapling technique is superior, because unlike the anastomosis ring, healing of stapled suture lines does not result in fibrous tissue formation that subsequently prevents the anastomosis site from growing normally.

### Conclusion

Calves may present with large, internalized abscesses without showing chronic signs of unthriftiness or disease. Urachal abscesses in calves can be associated with adhesions, causing obstruction of the small intestines. In this case, a stapling technique was used to successfully perform a small intestinal anastomosis.

### Sources and Manufacturers

<sup>a</sup>Rompun; Bayer Inc., Toronto, Ontario, Canada

<sup>b</sup>Maxon; Sherwood Davis and Geck, Bedford, Nova Scotia, Canada

<sup>c</sup>PDS II; Ethicon Inc, Somerville, New Jersey, USA

<sup>d</sup>GIA Premium™ 90; Autosuture Canada, Ville St-Laurent, Quebec, Canada

<sup>e</sup>TA Premium™ 90-4.8; Autosuture Canada, Ville St-Laurent, Quebec, Canada

<sup>f</sup>Vicryl; Ethicon Inc, Somerville, New Jersey, USA

<sup>g</sup>Appose\*ULC Disposable Skin Stapler with Auto Release 35W; Davis and Geck, American Cyanamid Company, Wayne, New Jersey, USA

<sup>h</sup>Sodium Penicillin G; Novopharm, Toronto, Ontario, Canada

<sup>i</sup>Anafen; Merial Canada Inc., Baie D'urfé, Quebec, Canada

<sup>j</sup>Excenel; Pharmacia Animal Health, Orangeville, Ontario, Canada

### References

1. Baxter GM: Umbilical masses in calves: Diagnosis, treatment, and complications. *Compend Cont Ed Pract Vet (Food Animal)* 11:505-513, 1989.
2. Baxter GM, Darien BJ, Wallace CE: Persistent urachal remnant causing intestinal obstruction in a cow. *J Am Vet Med Assoc* 191:555-558, 1987.
3. Ducharme NG, Smith DF, Koch DB: Small intestinal obstruction caused by a persistent round ligament of the liver in a cow. *J Am Vet Med Assoc* 180:1234-1236, 1982.
4. Hassel DM, Tyler JW, Tucker RL, Sondhof AF: Clinical Vignette: Urachal abscess and cystitis in a calf. *J Vet Intern Med* 9:286-288, 1995.
5. Hylton WE, Rousseaux CG: Intestinal strangulation associated with omphaloarteritis in a calf. *J Am Vet Med Assoc* 186:1099, 1985.
6. Iselin U, Steiner A: End-to-end anastomosis of the jejunum by use of a biofragmentable anastomosis ring in a calf. *J Am Vet Med Assoc* 202 (7) 1123-1125, 1993.
7. Koch DB, Robertson JT, Donawick WJ: Small intestinal obstruction due to persistent vitellolumbical band in a cow. *J Am Vet Med Assoc* 173:197-199, 1978.
8. Mueller PO, Allen D: Instrumentation and techniques in equine gastrointestinal surgery. *Vet Clin North Am Equine Pract* 12(2): 207-233, 1996.
9. Naylor JM, Bailey JV: A retrospective study of 51 cases of abdominal problems in the calf: Etiology, diagnosis and prognosis. *Can Vet J* 28:657-662, 1987.
10. Rings DM: Umbilical hernias, umbilical abscesses and urachal fistulas, surgical considerations. *Vet Clin North Am Food Anim Pract* 11:137-147, 1995.
11. Semevolos SA, Ducharme NG, Hackett RP: Clinical assessment and outcome of three techniques for jejunal resection and anastomosis in horses: 59 cases (1989-2000). *J Am Vet Med Assoc* 220(2):215-218, 2002.
12. Shearer AG: Internal navel abscesses in calves. *Vet Rec* 118:480-481, 1986.
13. Staller GS, Tulleners EP, Reef VB, Spencer PA: Concordance of ultrasonographic and physical findings in cattle with an umbilical mass or suspected to have infection of the umbilical cord remnants: 32 cases (1987-1989). *J Am Vet Med Assoc* 206:77-78, 1995.
14. Steiner A, Waldvogel A, Wicki P, Schwalbach B, Lang M: Comparison of staple and Gambee techniques for enterotomy closure in the normal bovine jejunum. *Zentralbl Veterinarmed A* 39:193-203, 1992.
15. Trent AM, Smith DF: Surgical management of umbilical masses with associated umbilical cord remnant infections in calves. *J Am Vet Med Assoc* 185:1531-1534, 1984.