

Québec/2004 Canada



23^e Congrès mondial de buiatrie • Québec, Canada, 11-16 juillet 2004
23 Congreso Mundial de Buiatria • Québec, Canada, 11-16 de Julio 2004

23rd World Buiatrics Congress • Québec, Canada, July 11-16, 2004
23. Welt-Kongress für Buiatrik • Québec, Canada, 11.-16. Juli 2004

Surgical Diseases of the Neonate

David E Anderson, DVM, MS, DACVS
Head, Food Animal Medicine and Surgery
College of Veterinary Medicine
Ohio State University
Columbus, Ohio 43210

Umbilical Disease

A variety of publications have addressed the development of neonatal bovine physiology and umbilical changes in the early post-partum period.¹⁻⁹ Normal anatomic (embryonic) structures: urachus, paired umbilical arteries, umbilical vein (paired externally), external umbilicus. After rupture of the umbilical cord at birth, the urachus, arteries, and umbilical vein normally retract into the abdomen, thus protecting them from environmental contamination. C-sections have a much greater risk of umbilical infection because of clamping or ligation of the umbilical cord, thus preventing the normal retraction of the umbilical structures. Several publications have addressed the association of umbilical abnormalities with calf morbidity and mortality.¹⁰⁻¹⁴

Umbilical abnormalities have been extensively described in the literature and can be divided into three categories¹⁵⁻³⁹:

Umbilical Infections: There are 5 anatomical types of umbilical infections. Most infections are caused by *Arcanobacterium pyogenes*, *E coli* being the second most commonly isolated bacteria and is the most likely to cause systemic infection and septic polyarthritis. Risk of septicemia is closely associated with ingestion of colostrum. Quantity of immunoglobulin transferred has been correlated with morbidity, mortality, and performance in calves (Table 1). **Urachal sepsis:** The most common structure infected. **Omphalophlebitis** - Infection / inflammation of the umbilical vein. The second most commonly infected structure. **Omphaloarteritis** - Infection / inflammation of the umbilical arteries. The least commonly infected (but this does not mean rare!). **Umbilical Abscess** - Soft tissue abscess of the external umbilicus. Umbilical mass is non-reducible. **Chronic Omphalitis** - Chronic / active umbilical infection. "Navel Ill" refers to septicemia and possibly hematogenous septic polyarthritis ("Joint Ill"). Any of these umbilical infections may lead to this eventually.

Umbilical Hernias: Congenital umbilical hernias are of concern for *heritability* (this has been shown to be true for Holsteins). However, many umbilical hernias are secondary to umbilical sepsis (so cull carefully). Most owners are willing to "tolerate" umbilical hernias as a side effect of genetic pressures for high lactation production or growth rates (the same may be said to be true for cystic ovaries, poor conformation, dystocia, etc..). Because the issue is clouded, most veterinarians perform herniorrhaphy as a service without extensive discussions about

heritability. Hernias are made up of the hernia sac, peritoneum, and may contain peritoneal fluid and viscera. The most common viscera involved in umbilical hernias in cattle is the **abomasum** with or without omentum. Hernias may be small at birth and enlarge with age. These should be differentiated from umbilical sepsis. **Simple (or uncomplicated) hernias** are easily reducible. **Complicated hernias** (incarcerated viscera usually without strangulation, or concurrent infection of umbilical structures) can not be completely reduced. Rarely, the viscera may become locally devitalized and rupture to the outside resulting in an enterocutaneous fistula. Our subjective clinical experience working with cloned dairy calves over the past two years suggests that cloned calves *may* have a greater likelihood of umbilical hernia / infection and that there *may* be a difference in the holding strength of collagen in the ventral abominal wall of clones.

Umbilical Infection with hernia: Umbilical infection may result in weakening of the adjacent abdominal wall and cause an acquired umbilical hernia (or sepsis and hernia may simply occur concurrently). These are usually partially reducible. *Umbilical hernias* may be treated using various techniques. Small hernias may respond to digital irritation of the hernia ring 1 to 2 times daily until closed. "Hernia belts" to maintain reduction of the hernia for a period of time may be successful in small (< 4 cm diameter) hernias. Larger hernias may be treated using hernia clamps or surgical closure. Hernia clamps should be reserved for hernias < 5 cm diameter and you must be absolutely sure that no viscera are adhered to the interior of the sac and no internal umbilical structures are infected. Also, administer a tetanus toxoid vaccine. Surgical closure may be accomplished by inverting the hernia sac, scarifying the hernia ring, and suturing the edges of the ring / sac closed. You must be absolutely sure that no internal umbilical structures are infected and that you do not puncture any viscera with the needle.

Open herniorrhaphy is the treatment of choice for umbilical hernias. This technique ensures that the hernia is removed and permanently closed, no infected umbilical structures are closed within the abdomen, recurrence of the hernia is minimal, and no viscera are entrapped. You must be sure to remove the hernia ring. This part of the abdominal wall is abnormal and should not be used to anchor sutures.

Umbilical infections may be treated medically or surgically. If medical treatment has not resolved or significantly improved the umbilical infection within 5 days, then surgery is probably indicated. If the calf is overtly sick, the umbilicus should probably be removed as soon as the calf is stabilized. The antibiotic of choice for umbilical infections is penicillin (trimethoprim-sulfa, ceftiofur, ampicillin are reasonable choices). Surgical treatment of umbilical infection involves removal of the umbilicus and all infected structures:

Urachus ---> resection of the apex of the bladder.

Omphaloarteritis ---> omphalectomy and artery resection.

Omphalophlebitis: Stops before liver ---> omphalectomy with vein resection
Enters liver ---> umbilical vein marsupialization

Umbilical vein marsupialization has been described as a one-step or two-step procedure. In the *One-step procedure*, a ventral midline celiotomy is performed and the infected umbilical vein isolated. The umbilicus is excised and the umbilical vein sutured closed. A sterile glove may be placed over the stump to prevent abdominal contamination. Then, the umbilical vein is marsupialized through a separate 2 to 4 cm incision in a right paramedian location as close to

the liver as possible to minimize the length of vein to provide drainage. The vein is sutured to the abdominal wall and skin. The celiotomy incision is closed. As the vein infection resolves, granulation tissue contraction closes the defect in the rectus abdominus muscle such that no hernia forms at the incision site. In the *Two-step procedure* a ventral midline celiotomy is performed and the infected umbilical vein isolated (first step). The umbilicus is moved as far cranially in the incision as possible and the umbilical vein sutured to the cranial aspect of the wound. The vein is sutured to the linea alba and skin. The celiotomy incision is closed. As the vein infection resolves, a defect in the linea alba remains as a small hernia. This hernia is closed at a second surgery to repair the small defect (second step).

Abstract

Les problèmes chirurgicaux sont fréquents chez le veau nouveau-né. Les conditions chirurgicales les plus souvent rencontrées sont les atteintes ombilicales et gastro-intestinales. L'emphase de cette conférence sera sur le processus décisionnel pour traiter les conditions de l'ombilic ainsi que la réhabilitation et le pronostic pour ces veaux.

References

1. 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. 1995 Jan 1;206(1):77-82.
2. Lischer CJ, Iselin U, Steiner A.Ultrasonographic diagnosis of urachal cyst in three calves. J Am Vet Med Assoc. 1994 Jun 1;204(11):1801-4.
3. Watson E, Mahaffey MB, Crowell W, Selcer BA, Morris DD, Seginak L.Ultrasonography of the umbilical structures in clinically normal calves. Am J Vet Res. 1994 Jun;55(6):773-80.
4. Kasari TR.Physiologic mechanisms of adaptation in the fetal calf at birth. Vet Clin North Am Food Anim Pract. 1994 Mar;10(1):127-36.
5. Anderson DE, Cornwell D, Anderson LS, St-Jean G, Desrochers A.Comparative analyses of peritoneal fluid from calves and adult cattle.Am J Vet Res. 1995 Aug;56(8):973-6.
6. Lischer CJ, Steiner A.Ultrasonography of the umbilicus in calves. Part 2: Ultrasonography, diagnosis and treatment of umbilical diseases.Schweiz Arch Tierheilkd. 1994;136(6-7):227-41.
7. Lischer CJ, Steiner A.Ultrasonography of umbilical structures in calves. Part I: Ultrasonographic description of umbilical involution in clinically healthy calves. Schweiz Arch Tierheilkd. 1993;135(8):221-30.
8. Steiner A, Fluckiger M, Oertle C, Regi G.Urachal disorders in calves: clinical and sonographic findings, therapy and prognosis. Schweiz Arch Tierheilkd. 1990;132(4):187-95.
9. Flock M. Ultrasonographic diagnosis of inflammation of the umbilical cord structures, persistent urachus and umbilical hernia in calves. Berl Munch Tierarztl Wochenschr. 2003 Jan-Feb;116(1-2):2-11.10. Donovan GA, Dohoo IR, Montgomery DM, Bennett FL.Calf and disease factors affecting growth in female Holstein calves in Florida, USA. Prev Vet Med. 1998 Jan;33(1-4):1-10.

11. Virtala AM, Mechor GD, Grohn YT, Erb HN.Morbidity from nonrespiratory diseases and mortality in dairy heifers during the first three months of life.J Am Vet Med Assoc. 1996 Jun 15;208(12):2043-6.
12. Virtala AM, Mechor GD, Grohn YT, Erb HN.The effect of calfhoo diseases on growth of female dairy calves during the first 3 months of life in New York State. J Dairy Sci. 1996 Jun;79(6):1040-9.
13. Muniz RA, Anziani OS, Ordonez J, Errecalde J, Moreno J, Rew RS.Efficacy of doramectin in the protection of neonatal calves and post-parturient cows against field strikes of *Cochliomyia hominivorax*. Vet Parasitol. 1995 May;58(1-2):155-61.
14. Curtis PE.A knackery survey of calf disease.Vet Rec. 1970 Apr 18;86(16):454-6.
15. Boure L, Foster RA, Palmer M, Hathway A.Use of an endoscopic suturing device for laparoscopic resection of the apex of the bladder and umbilical structures in normal neonatal calves.Vet Surg. 2001 Jul-Aug;30(4):319-26.
16. Lopez MJ, Markel MD.Umbilical artery marsupialization in a calf.Can Vet J. 1996 Mar;37(3):170-1.
17. Lewis CA, Constable PD, Huhn JC, Morin DE.Sedation with xylazine and lumbosacral epidural administration of lidocaine and xylazine for umbilical surgery in calves.J Am Vet Med Assoc. 1999 Jan 1;214(1):89-95.
18. Rings DM.Umbilical hernias, umbilical abscesses, and urachal fistulas. Surgical considerations.Vet Clin North Am Food Anim Pract. 1995 Mar;11(1):137-48.
19. Kumper H.New therapy for acute abomasal tympany in calves. Tierarztl Prax. 1994 Feb;22(1):25-7.
20. Baxter GM, Zamos DT, Mueller PO.Uroperitoneum attributable to ruptured urachus in a yearling bull.J Am Vet Med Assoc. 1992 Feb 15;200(4):517-20.
21. Mee JF.Navel ill.Vet Rec. 1990 Apr 7;126(14):341.
22. Shearer AG.Internal navel abscesses in calves.Vet Rec. 1986 Apr 26;118(17):480-1
23. Hylton WE, Trent AM Congenital urethral obstruction, uroperitoneum, and omphalitis in a calf.. J Am Vet Med Assoc. 1987 Feb 15;190(4):433-4.
24. Brodrick TW. Internal navel abscesses.Vet Rec. 1986 May 31;118(22):620.
25. Mbassa G.Diffuse gangrene of the hindlimb associated with umbilicus infection in a calf.Vet Rec. 1985 Jun 22;116(25):662.
26. Clemente CH Drainage--a possible treatment method in ascending umbilical abscess in calves. Tierarztl Prax. 1985;13(2):159-61
27. Trent AM, Smith DF.Surgical management of umbilical masses with associated umbilical cord remnant infections in calves.J Am Vet Med Assoc. 1984 Dec 15;185(12):1531-4.
28. Fubini SL, Smith DF.Umbilical hernia with abomasal-umbilical fistula in a calf. J Am Vet Med Assoc. 1984 Jun 15;184(12):1510-1
29. Rotimi VO, Duerden BI.The development of the bacterial flora in normal neonates. J Med Microbiol. 1981 Feb;14(1):51-62.
30. Dirksen G, Hofmann W Experiences with surgical treatment of ascending umbilical infections in calf. Tierarztl Prax. 1976;4(2):177-84.
31. Esiutin AV, Girin VA Prevention and treatment of omphalitis in calves. Veterinariia. 1975 Oct;(10):90-2.
32. Mesaric M, Modic T.Strangulation of the small intestine in a cow by a persistent urachal remnant.Vet Rec. 2003 Nov 29;153(22):688-9.

33. Starost MF. Haemophilus somnus isolated from a urachal abscess in a calf. Vet Pathol. 2001 Sep;38(5):547-8.
34. Hassel DM, Tyler JW, Tucker RL, Sondhof AF. Clinical Vignette: Urachal abscess and cystitis in a calf. J Vet Intern Med. 1995 Jul-Aug;9(4):286-8.
35. Hooper RN, Taylor TS. Urinary surgery. Vet Clin North Am Food Anim Pract. 1995 Mar;11(1):95-121.
36. Rijkenhuizen AB, Sickmann HG. Incarcerated umbilical hernia with enterocutaneous fistula in a calf. Tijdschr Diergeneeskd. 1995 Jan 1;120(1):8-10.
37. Hunt RJ, Allen D Jr. Treatment of patent urachus associated with a congenital imperforate urethra in a calf. Cornell Vet. 1989 Apr;79(2):157-60
38. Trent AM, Smith DF. Pollakiuria due to urachal abscesses in two heifers. J Am Vet Med Assoc. 1984 Apr 15;184(8):984-6.
39. Smart ME, Ferguson JG, Vaillancourt D. Sequela to a urachal abscess in a Hereford heifer (a case report). Vet Med Small Anim Clin. 1978 Dec;73(12):1557-8.

Table I. Adapted from Wittum TE, Perino LJ. Passive immune status at postpartum hour 24 and long-term health and performance of calves. American Journal of Veterinary Research 1995;56:1149-1154.

Variable	Odds Ratio for development of "variable" in calves with inadequate IgG (< 800 mg/dl)	Odds Ratio for development of "variable" in calves with inadequate plasma protein (<4.8 g/dl)
Pre-weaning mortality	5.4	
Neonatal morbidity	6.4	
Pre-weaning morbidity	3.2	
Morbidity		3.0
Respiratory tract morbidity		3.1
Weaning weight	16 kg lower weaning weight	
Respiratory disease	0.04 kg loss in daily rate of gain	