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MANAGEMENT OF UMBILICAL MASSES IN CALVES

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Umbilical masses are commonly encountered by bovine practitioners. An umbilical swelling can indicate the presence of an umbilical hernia, a localized umbilical infection, or an infection extending dorsal via one or more of the intra-abdominal umbilical cord remnants. Selection of an effective and economically appropriate approach depends on accurate identification of the source of the swelling and the structures involved. Effective surgical treatment depends on good pre-planning based on an understanding of the lesions which may be encountered.

Developing a consistent approach to evaluation of a calf with an umbilical mass can help ensure accurate diagnosis. Palpation of the mass in the standing calf is the first, and often only, step necessary for evaluation. Simple hernias in calves are reducible, non-inflammatory lesions. Therefore, the swelling associated with a hernia should be cool, non-painful and lack evidence of drainage. Reduction should allow palpation of a distinct hernial ring in the body wall. Large hernias may be difficult to reduce in the standing calf. If there is any doubt about the reducibility, the calf should be cast in lateral or dorsal recumbency and palpation repeated. If the swelling represents an active infection, the swelling will be non-reducible and will often have the characteristic signs of inflammation. Signs of inflammation may be less evident if the infection is chronic with a thick fibrin capsule or has drained well recently to leave a fibrotic cord, however, the swelling will still be non-reducible. It is important to recognize that umbilical hernias and infections commonly coexist in calves. When both are present, only a portion of the mass will be reducible.

Several options exist for management of simple umbilical hernias. Due to the presence of the omental sling in cattle which isolates the small intestine from the abdominal floor, incarceration of bowel is rarely a concern. The most common viscus found in umbilical hernias in calves is the pylorus of the abomasum, which only rarely becomes adhered or entrapped. Therefore, umbilical hernias rarely require repair for medical reasons. The exception might be very large hernias which may interfere with successful completion of pregnancy in the adult. Small hernias (< 3 inches in diameter) in young calves (< 1 month) will often resolve spontaneously. Use of a belly band can increase the likelihood of resolution without surgery and potentially increase the size of hernia which can be resolved in this manner. Larger hernias or those in older calves will generally require surgical correction if treatment is indicated for economic (sale) or aesthetic (show). Use of externally placed clamps, occasionally used in foals, are not indicated in calves due to the frequency of concurrent, often inapparent, infection in umbilical remnants.

If any portion of the mass is non-reducible, additional steps are necessary to determine the structures involved and assist in selection of appropriate antibiotics. Umbilical infection in calves can present in several forms. If a non-reducible mass is

fluctuant, it is probably an abscess. Aspiration of such a mass is an important diagnostic step to rule out an incarcerated hernia (rare in calves) and to collect a sample of pus for a Gram stain and culture & sensitivity. Several of the organisms isolated from calf umbilical infections, such as *C. pyogenes*, tend to produce thick abscess walls with thick pus. Therefore, aspiration may require at least a 1.5 inch long, 16-gauge needle. If the infection has been open to drain, there may not be an identifiable accumulation of pus to aspirate. Occasionally, natural drainage will result in resolution of the infection, leaving a firm fibrous mass. Unfortunately, naturally occurring drainage sites frequently close before the infection has resolved, resulting in recurrence of infection. By creating a large opening for drainage and keeping the site open, many localized infections can be resolved. Again unfortunately, umbilical infections in calves often extend dorsally into the abdomen via components of the umbilical cord. If this occurs, drainage at the umbilicus is rarely effective in completely resolving the infection. Due to the types of organisms involved and the tendency of infections to develop thick walls, antibiotics alone should not be considered as a reliable treatment option for any infection which has been present for more than 7-10 days.

The intra-abdominal extensions of the umbilical cord include the single umbilical vein, which carries oxygenated blood from the maternal circulation to the fetus; paired umbilical arteries which carry deoxygenated blood from the fetus to the maternal circulation; and the urachus, an extension of the bladder to the umbilicus which carries urinary waste products from the fetus during gestation. These structures normally functionally shut down within minutes of birth in the calf, and deteriorate completely (urachus, most umbilical veins) or atrophy to non-functional fibrous remnants (umbilical arteries, some umbilical veins) over the following weeks. Infection which has ascended one of the umbilical remnants in young calves can often be detected by palpation of the abdomen, much as you would palpate a dog for an intra-abdominal mass. This can be done in the standing calf or with the calf in lateral recumbency. Tranquilization improves the ease of palpation. Palpation of an enlarged stalk extending craniodorsally is diagnostic for an umbilical vein infection. A stalk extending in a caudodorsal direction could be either urachus or one or both of the umbilical arteries. The approach and prognosis for treatment of umbilical artery and urachal remnant infections are similar; therefore, it is generally adequate to determine the direction of any stalk. The presence and extent of intra-abdominal remnant involvement can be further evaluated by ultrasound or radiographs, if available. A more practical approach, based on the frequency of intra-abdominal extension in calves, is to assume that any active infection has the potential to extend into a remnant and proceed accordingly.

Surgery for most umbilical masses can be done very effectively using tranquilizers and a local block. General anesthesia should be considered for calves with very large hernias or intra-abdominal stalks. The calf's body wall is remarkably flexible and even very large hernias can be treated without use of mesh. Pre-operative fasting of 12 (calves < 2 weeks), 24 (2-12 weeks) or 36 hours (older calves) is recommended to ease closure and prevent reflux. Longer periods of fasting may be indicated for very large hernias or intra-abdominal remnant infections. Large fluctuant abscess (>4 inch diameter) should be lanced to drain

for several days before surgery. This can decrease the width of the defect required to remove the mass by 50% or more and reduce the risk of accidental rupture during surgery. If antibiotics have not been initiated to treat an existing infection, a dose should be administered pre-operatively. Ideally antibiotics should be selected based on results of culture and sensitivity. However, ceftiofur, trimethoprim-sulfas and ampicillin have good spectrums against most of the common organisms involved in umbilical infections in calves. Any draining tracts should be oversewn prior to the surgical preparation to prevent contamination of the incision.

Both hernias and infections should be approached by making an elliptical incision around the base of the mass (hernial ring or juncture between the mass and the body wall). The incision should be continued through the subcutaneous tissue to the body wall, taking care to keep the incision within 0.5 cm of the sides of the mass or ring. Vascularization can be extensive, especially if infection is present. An initial small incision (2-3 cm long) should be made through the body wall 0.5 cm lateral to the umbilical ring or mass to avoid entry into an infected umbilical remnant. Before extending the incision through the body wall, the abdomen should be swept with a finger to check for stalks or associated adhesions to local structures. The incision can then be continued around the ring or mass in an elliptical pattern.

If a stalk is present, the next step is to free it from any adhesions. Adhesions are common and isolation of the stalk often requires sharp resection of omentum and even partial resection of adhered abomasum, rumen, or intestine. Once freed, the extent of the stalk should be determined. Umbilical artery infections are usually localized and a distinct end can be identified. A site proximal to the infection should be identified, clamped, ligated and transected, allowing removal of the stalk and attached umbilical tissue. Infections of the urachus may stop distal to the bladder (incomplete) or extend to the bladder (complete). While the lumen of the stalk rarely communicates with the bladder lumen, however, externally the enlargement frequently blends into the apex of the bladder. Incomplete urachal stalks may be managed as for umbilical artery infections. Complete urachal stalks can only be removed safely by resecting the apex of the bladder, followed by an inverting closure of the bladder with an absorbable suture such as vicryl or dexon.

Umbilical vein infections can also be incomplete or extend into the liver. Incomplete stalks are resected as for incomplete urachal stalks. However, partial resection of the liver is not a viable option to free complete stalks in calves. Treatment of complete umbilical vein stalks can be achieved by providing a shorter and more direct portal for drainage. This is done by freeing the stalk from adhesions and pulling the stalk through a separate incision in the cranial right paramedian abdomen immediately ventral to the liver. The stalk is then sewn to the incision and allowed to drain for several weeks with daily flushing. If drainage can be maintained for long enough, the remaining stalk will fibrose and close without further treatment. The body wall should be closed in an appositional pattern using a monofilament, large gauge (#1 or 2) non-absorbable suture material such as nylon or prolene. PDS is also effective but more expensive. The near-far-far-near suture pattern

is probably the best choice for incision under tension. Despite some early popularity for the vest over pants pattern, wound healing studies have shown this pattern to result in early loss of wound strength and it should not be used in closure of the body wall. The remainder of the incision can be closed in a routine manner.