

Clinical tips: C-section

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Abstract

A C-section is a surgery that can be performed in the field to resolve difficult dystocias. When used early in the calving process, it is possible to obtain positive results, including a live calf and a reproductively sound cow. Tips for maximizing success during these sometimes challenging procedures will be covered.

Key words: C-section, cesarean, dystocia, surgery

Preoperative Considerations

The heifer or cow should have, at minimum, an obstetrical examination performed prior to electing a C-section. This is important to not only determine the presentation of the calf, but also to potentially determine fetal viability. Cattle that have obviously emphysematous feti should not be considered surgical candidates unless a fetotomy is not possible.

Anesthesia

There are several options available for intra-operative analgesia for flank approaches, including the line block, reverse 7 block, proximal paravertebral nerve block, and distal paravertebral nerve block. The author prefers to perform the paravertebral nerve blocks, as they provide anesthesia to the entire flank region without the presence of lidocaine in the surgical field by blocking spinal nerves T13, L1, and L2. They also allow for extension of the incision without additional lidocaine.

The technique for the proximal paravertebral nerve block is as follows. This block is performed 1-2 cm off midline, starting in line with the cranial edge of the transverse process of L1. Using a 14g 1-inch (2.5 cm) needle as a trocar, insert a 5-inch (12.7 cm) 18g spinal needle until the transverse process is encountered, then walk the needle off the cranial edge. Advance the needle until the transverse ligament and fascia are penetrated (a “pop” will be felt). At this point, inject 10 to 15 mL 2% lidocaine. Withdraw 1 to 2 cm and inject another 10 to 15 mL lidocaine. Inject 2 to 3 mL lidocaine as you are removing needle. Repeat this 2 times (for a total of 3 injections), walking off the cranial edges of L2 and L3 for the second and third injection.^{2,7}

Advantages of the proximal paravertebral nerve block include the relatively small amount of lidocaine required for the large area anesthetized and lack of edema in the surgical field. Disadvantages of this technique include scoliosis, the

potential for moderate ataxia, and the potential to penetrate large blood vessels or spinal canal if placement is incorrect.²

The technique for the distal paravertebral nerve block utilizes the transverse processes of L1, L2, and L4 as landmarks. These can be identified by counting backwards from L5, which is the last palpable transverse process. For this technique, use an 18g 1.5-inch (3.8 cm) needle. The needle is placed parallel to the transverse process, as if it is going to penetrate directly into the cartilaginous tip of the transverse process. The needle is then moved dorsally over the transverse process and 10 to 20 mL injected dorsal to process. Without removing the needle from the skin, it is moved ventral to the transverse process. The edge of the process can be felt with the needle as this occurs to ensure proper placement. The injection is then repeated ventrally.^{2,7}

Advantages of the distal paravertebral nerve block include the use of common-sized needles, lack of scoliosis and ataxia, and minimal to no risk of penetrating large vessels or nerves. Disadvantages of this block include the fact that it is difficult in fat cattle (and impossible using common-sized needles) and that variable position of nerves may lead to incomplete or inadequate anesthesia. Due to their anatomy, this block is more easily performed on dairy cattle than beef cattle. In fat beef cattle, longer needles, such as spinal needles, are required to perform this nerve block.^{2,6,7}

The author prefers to perform standing C-sections using no sedation and a local block if the cow's personality allows it. If sedation is necessary, the author prefers the following combinations.

- Xylazine: 0.009-0.010 mg/lb (0.02-0.03 mg/kg) IV
0.018-0.027 mg/lb (0.04-0.06 mg/kg) IM
- “Ket Stun”: 0.005 mg/lb (0.01 mg/kg) butorphanol,
0.009 mg/lb (0.02 mg/kg) xylazine, 0.018-0.045 mg/
lb (0.04-0.1 mg/kg) ketamine IV
- Acepromazine: 0.014-0.02 (0.03-0.05 mg/kg) IV or
IM

These dosages can be adjusted higher or lower based on the personality of the cow, and may be increased if recumbency is desired. If the calf is alive, consider the effect of the sedative on the calf prior to administration.^{2,6,7}

Surgical Approach

Standing: In most cows, C-section can be performed standing with the use of local or regional anesthesia. The author prefers the standing approach for ease of accessing and exteriorizing the uterus.¹⁰ However, the approach chosen depends on personal preference, available facilities, tem-

perament of cow, and condition of calf. Clinicians should be familiar with several approaches and be willing to be flexible for different situations.

The left flank oblique approach is the author's preferred approach, with exceptions being if the calf is known to be in the right horn or if the left side of the animal is inaccessible due to the available facilities.¹⁰

The skin incision runs from approximately 4 inches (10 cm) below the lumbar transverse processes and 2 to 4 inches (5 to 10 cm) cranial to the tuber coxae in a cranioventral direction. The incision is generally 12 to 18 inches (30 to 45 cm) in length. The subcutaneous tissues, the m. obliquus abdominis externus and m. obliquus abdominis internus are incised one by one with the scalpel. The m. transversus abdominis is cut with scissors. The peritoneum is lifted with forceps and penetrated with scissors to avoid accidental penetration of any underlying gastrointestinal structures. At this point, the abdomen is open and the pregnant horn can be identified and accessed.^{5,6,7} For calves in anterior dorsosacral (normal) presentation, the calf may present with its back or its hind limbs towards the incision. At this point, grasp the hock of the nearest hind limb to bring the uterus to the incision. Using 2 hands to grasp the point of the hock with 1 and the toes of the calf with the other allows for the easiest manipulation and helps to prevent perforation of the uterus.⁵ Once the uterus is brought up to the incision, it can be "locked" into the incision by exteriorizing the hock and toes. In cases where exteriorization is difficult, the body wall incision may be extended. This often makes exteriorization easier. Additionally, administration of a tocolytic drug, such as epinephrine, can make manipulation of the uterus within the abdomen much easier.^{6,7} The author prefers to use 5 mL of epinephrine per cow administered intramuscularly approximately 2 to 5 minutes before the effect is desired.

With a calf in posterior (backwards) presentation, there are several modifications to the approach. This situation is much more difficult because the uterus cannot be exteriorized and "locked" in the incision. After opening the abdomen, the head and forelimbs should be located and 1 forelimb should be grasped through the uterine wall, taking care not to perforate the uterine wall.⁵ The uterus can then be brought up closer to the incision site. The author prefers to use a letter opener to incise the uterus for backwards calves, as this helps prevent inadvertent damage to surrounding gastrointestinal structures or the calf. Once an incision in the uterus has been made, 1 of the forelimbs should be exteriorized, followed by the head, and then the second forelimb. Exteriorizing the calf in this order will prevent the head from falling back and potentially tearing the uterus when the calf is being extracted.⁵ Once the calf is out, the uterus is closed using a 2-layer inverting pattern. The first layer can be a simple continuous, and the second layer should be an inverting pattern.^{5,6,7} The author prefers the Utrecht or cushioning patterns using #2 monofilament absorbable suture such as PDS. Braided suture such as Vicryl

is not recommended, as it often tears the bovine uterus. The uterus should be lavaged following closure to remove any blood clots.

Closure of the muscle layers or linea should be performed using absorbable suture (#2 or #3) such as PDS/Vicryl. Chromic gut is commonly used in the field and is appropriate for flank approaches only. Gut should never be used in ventral incisions. The author closes flank incisions in 3 layers, with peritoneum and transversus abdominis being the first layer, internal and external abdominal obliques being the second layer, and the skin being the third layer. The skin is closed using a non-absorbable suture in size 2 or 3 such as vetafil, fluoromid, or braunamid.^{5,6,7}

Recumbent Approaches

Ventral midline: This approach is most useful for cesarean section, particularly in the case of an emphysematous fetus. The cow should be tipped slightly towards the surgeon to allow easier access to the uterus and drainage of contaminated fluids. The author recommends packing off the abdomen prior to opening the uterus to prevent/reduce contamination.¹⁰

Flank/ Low flank: This approach is useful for accessing the uterus in cattle that are recumbent or that are put into lateral or semi-sternal recumbency for surgery.¹⁰

Post-Operative Care

Antimicrobial administration is recommended following C-section in cattle, as it is considered a clean contaminated procedure due to the presence of bacteria in the fetal fluid, particularly if the amniotic sac has been broken prior to surgery. The main population of bacteria have been reported to be gram (+) anaerobic bacteria.⁸ Because of this, the author prefers penicillin as the antibiotic of choice. Duration of therapy is dependent on the level of contamination encountered in the procedure. The author also routinely administers flunixin meglumine at 1 mg/lb (2.2 mg/kg) IV and makes sure the animal is current on clostridial vaccination. Sutures should be removed in 10 to 14 days.

Complications

Complications of C-section in cattle include decreased future fertility, peritonitis, incisional complications, and mortality. In beef cattle, fertility rates of approximately 75% have been reported following C-section, and with cow mortality rates of <7%. In dairy cattle, maternal death rates of 2 to 10% have been reported, with minor effects on future reproductive ability.^{1,4}

Incisional complications are most likely to occur in animals with a longer duration of labor prior to surgery, contaminated uterine fluid, and animals in which the uterus was incompletely or not exteriorized.⁹

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