SOP 4.13 Caesarean in the Cow (Bovine)

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Purpose

(1) The objective of this standard operating procedure is to provide guidance to the Charles Sturt University staff on:
   a. performing a bovine Caesarean in practical classes or research.
   b. delivering a (preferably live) calf as atraumatically as possible and having a healthy cow to nurture the calf.

Scope

(2) This procedure applies to any person who is involved in AEC approved projects involving delivery of calves via caesarean operation in calving cows.
(3) All researchers and teaching staff using animals for scientific purposes must be competent. For definition of competency refer to Charles Sturt University's Policy on 'Animal Care Competency Training and Assessment'

Details of procedure

Pre-surgery

(4) On the day prior to the Caesarean a competent person must palpate the cows to confirm pregnancy. Once confirmation of pregnancy is complete keep the heifer/cow in the yards overnight controlling feed and water intake to ensure the rumen and bladder are not full to avoid damage to them during surgery.
(5) Cows should be monitored and if any cow proceeds into stage II of parturition overnight or early morning they should be allowed to calve naturally, and no surgery performed on that cow during the practicals. Typically, corticosteroids (10-50 mg dexamethasone) are administered intramuscularly (IM) within 24 hours of anticipated surgery to assist in enhancing maturation of the fetus.

Surgery

(6) Restrain the heifer/cow in a crush, or sedate and use ropes to prevent excessive movement. Check to ensure correct ID of the heifer/cow and reconfirm that she is pregnant. Keep the heifer/cow standing if possible. If sedation is necessary, appropriate pharmaceuticals should be used in accordance with the guidance of specialist anaesthetists and may include the use of Acepromazine (0.03-0.11 mg/kg IM). The left flank approach can still be performed in the recumbent animal; however, it is physically more demanding on the obstetrician. Consider using the paramedian approach in the recumbent animal.
(7) Clip the left paralumbar fossa, and/or shave using a razor or #22 scalpel blade and soapy water.

(8) Administer local anaesthesia to the area using an inverted 'L', or paravertebral block technique. A line-block technique is least desirable due to an increased possibility of wound dehiscence, and the inability to quickly extend the skin incision beyond the anaesthetic line if necessary, during the procedure. Pain relief in the form of a NSAID may be given here, such as Metacam (0.5mg/kg SC).

(9) Administer preoperative antibiotics. Procaine penicillin at 40mg/kg IM is the drug of choice for parenteral administration in most situations. This might be followed up with 20-30mg/kg once or twice daily post-operation - if deemed necessary (in consultation with pharmacology and/or medicine/buiatric experts.) The choice and use of antibiotics is dependent on the clinician responsible for the procedure at the time.

(10) Administer an epidural anaesthetic to decrease perineal sensation, and to help reduce the Ferguson reflex (typically 1-5mL 2% lignocaine). The Ferguson reflex induces uterine contraction, resulting in abdominal muscle contraction, when the cervix is stretched or manipulated. The resultant straining can cause the rumen or other abdominal organs to prolapse through the flank incision making manipulation and incision of the uterus difficult.

(11) If deemed necessary, administer up to 0.3 mg clenbuterol (Planipart®) intramuscularly, or intravenously, if necessary, to reduce uterine tone and make uterine manipulations easier.

(12) Aseptically prepare the surgery site with surgical scrub, and/or alcohol and/or disinfectant combinations. Check the local anaesthetic has taken effect by carefully assessing skin sensation.

(13) The surgeon should wear sterile gloves, gown and mask; however, this routine is sometimes difficult to follow in the field. Minimal requirements are that the surgeons' hands and arms should be thoroughly scrubbed up to the level of the mid upper arm.

(14) Using a #22, or alternative appropriate, scalpel blade, incise the skin, external abdominal oblique and internal abdominal oblique muscles, and transverse abdominal muscles. It is important to identify each layer as it is cut to ensure the peritoneal lining isn't incised prematurely, risking inadvertent damage to adjacent abdominal organs such as the rumen. Haemostasis is not commonly required during entry into the abdomen but may be applied if desired/as necessary.

(15) Incise the peritoneal lining by inserting scissor tips through a small incision made with a blade, or a stab incision with closed scissors. Slide the partially opened blades (push-cut) dorsally, then ventrally. Make sure the peritoneal lining is opened for the full length of the incision to ensure there is adequate room to remove the calf. Insert one or both arms into the abdomen, pushing the rumen cranially in the process. Identify the uterus by tracing forward from the cervix or palpating the fetus within it. Identify a fetal extremity, such as a hock or metatarsus within the uterus and gently enclose it with one or both hands. Pulling smoothly but firmly, manipulate the extremity within the uterus up to the incision, and if possible, exteriorise it. Note that this part of the procedure may take considerable effort and

perseverance, particularly if the calf is lying with all extremities pointing to the right-hand side of the heifer/cow. In some cases, it may not be possible to get the uterus close to the incision, making it necessary to incise the uterus while it is still within the abdominal cavity. In these situations, heifer/cow survival rates are still high, provided the calf is alive and quickly removed, allowing the uterine incision to be fully exteriorised, if possible, before too much fetal fluid and debris is discharged into the abdomen.

(16) Incise the uterus longitudinally along the greater curvature of the gravid horn. Make the incision as far cranial as possible. This makes suturing easier later on. Ensure the incision is long enough to allow the calf to be extracted without tearing the uterus. Keep the scalpel blade/scissors handy so the incision can be extended during delivery if necessary. Avoid cutting caruncles/placentomes where possible.

(17) Once the uterus is incised, reach inside and grasp an extremity of the calf. Sometimes it is necessary to apply sterile chains/ropes to the limbs to assist with traction. Pull the calf up and out, and leave with an assistant to dry, keep warm and take it up to the mother for grooming. Double check the uterus for presence of another calf before commencing uterine closure. Obtain and maintain a firm grasp of the uterus, ensuring the incision is completely exteriorised. If an assistant is available, suturing is made easier if the uterus is grasped above and below the incision, with the incision in a vertical position. Trim off fetal membranes that fall outside of the uterus and return the remainder into the uterus unless they come away easily.

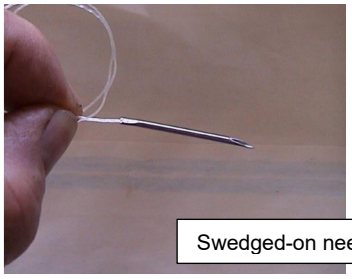
(18) Measure out metric 7 (# 3) (or other appropriate suture material) absorbable suture material that is approximately three times the length of the uterine incision. Commencing from the caudal (cervical) end of the incision, use a Utrecht (modified Cushing) suture to close the uterus by inverting the edges. Although one suture line is effective in securing a tight closure in ideal circumstances, it is common to insert a second layer to ensure a leak-proof seal. The second layer might not be necessary if the first layer has been done well. This is arguably the most important closure. If this suture line leaks or dehisces, the risk of post-operative death is high.

(19) Check the incision for integrity. Clean the uterus with sterile saline, Hartmanns solution, water for injection or dilute iodine, and replace into the abdomen. The abdomen may be lavaged with saline, or infused with antibiotics at this stage if excessive contamination has occurred.

(20) Suture the peritoneal lining and transverse abdominus muscle in the one line. The peritoneal lining is not a strength layer, but its closure assists in reducing adhesions. A forward, interlocking mattress suture using metric 7 chromic cat-gut, or metric 5 vicryl (or appropriate absorbable suture) can be used. Suture the two abdominal oblique muscles in the second line. There are several different surgical techniques for abdominal muscle closure, but the ventral abdomen especially must be securely sutured. Some obstetricians infuse antibiotics into the muscle of the incision site at this time if contamination has been high. The attending clinician should guide the students as to which is likely to be the appropriate abdominal muscle closure.

(21) Suture the skin using Extra Heavy, or Special Vetafil, or alternative appropriate suture material. Attention to needle handling will reduce the occurrence of bent needles. For a half-curved cutting needle, push the needle through the skin with needle holders grasping close

to the tip. Pull the needle through the skin with needle holders grasping on the straight portion of the needle. A home-made “swedged –on” needle is also a good option to ensure the needle is sharp. A continuous pattern as shown above may be used provided at least the lower 4 to 10 centimetres is closed with an interrupted or cruciate suture pattern to allow them to be removed should drainage become necessary. Extra time requirement is the only reason why an interrupted pattern would not be used for the complete closure.



Swedged-on needle

(22) Routine post-operative care should be administered including cleaning of blood from the site, possibly the application of fly repellent and the administration of 10-50 IU oxytocin IM or IV. Petroleum jelly might be applied ventral to the wound to assist in removing any post-surgical discharge. Administering an appropriate dose of PGF2α (Estromil or Lutalyse) will ensure the CL of pregnancy is lysed and might assist with fetal membrane removal.

(23) Calves should be allowed to suck from their mothers immediately once standing and sucking and should also be fed artificial colostrum to ensure antibodies have been passed on.

Post-Surgery

(24) Cows and their calves should be returned to pasture immediately following the surgery, or appropriate pen areas to ensure the welfare of the calves and the dams. Cows and their calf should be brought into the yards for monitoring twice daily post-surgery for 2-3 days and once daily for up to 2 weeks. Cows should be administered systemic antibiotics, as deemed necessary, or as a precaution to help prevent any possible infection. Typically, if surgery is aseptic and complications are minimal, systemic antibiotics post-surgery will not be necessary. Cow and calf should have their temperature, heart rate and respiration rate monitored twice a day for 2-3 days and be kept in a paddock close by, for visual monitoring throughout the day. Students can be involved in caring for both the cow and calf post-surgery, to help ensure that the calf is suckling, and that calves with diarrhoea, or other afflictions, are treated appropriately.

Drugs, chemicals, or biological agents

(25) This is listed above:

a. Pre-surgery: corticosteroids (10-50mg dexamethasone IM)
b. Sedation: Acepromazine (0.03-0.11 mg/kg IM)
c. Analgesia - Metacam (0.5mg/kg SC) q. 72hrs, flunixin 1mg/kg and/or other appropriate NSAID, Lignocaine as an epidural and local anaesthesia
d. Antimicrobials- Procaine penicillin at 40mg/kg BID
e. Other: 0.3 mg clenbuterol (Planipart) intramuscularly, or intravenously

Impact of procedure on wellbeing of animals

(26) There is a significant potential to cause pain and distress in animals when submitting them to major abdominal surgery. This can be significantly minimised and mitigated by having supervisors and surgeons who are skilled and experienced in such procedures. Impeccable surgical technique, timing, and attention to detail that is closely followed up for at least a week post-surgery is used to minimise the effects.

(27) The purpose of this practical is to teach the skills and knowledge to final year veterinary students so as they can perform important surgeries to university and private animals alike, increasing the wellbeing and comfort of the animals they work on. The students should be actively helped, guided, and supervised by a team of expert surgeons, clinical practitioners, theriogenologists and anaesthetists to enable the animals to be provided with the gold standard treatment to reduce pain and increase wellbeing. T

(28) The animals need to be provided with pain relief, protection from the elements, ample good quality feed and water and need to be monitored by students and clinicians for 3-7 days but this could be up to 10 days in some animals (if required).

(29) The process of performing a caesarean section in a cow is an entry-level professional skill for veterinarians. They will often be called upon to perform this procedure on cattle in facilities ranging from state-of-the-art, to almost non-existent. They will also have to be able to perform this procedure while exposed to inclement weather. New graduates therefore need to feel confident in the procedure so that they can perform it effectively despite being exposed to many potential external distractions. In addition, the left-flank surgical approach to the abdomen performed in the practical is suitable for other surgical procedures in cattle such as rumenotomy, and correction of left displacement of the abomasum. Thus, the patient preparation, anaesthesia, abdominal entry, and abdominal closure portions of this procedure all provide skills required for other commonly utilised surgical procedures in cattle.

Animal care

(30) Animals should receive the utmost care prior, during and after the surgical procedures. The cows should be well fed, have access to shelter and clean water and be kept in herd groups to prevent stress. They need to be monitored and treated as necessary post surgery. Newborn calves should receive active warming, oxygen, therapeutics and stimulation post-delivery. They then need to be fed colostrum within a 2-3 hours of birth and should be allowed access to their mothers as soon as they are ready.

(31) Cows need to be monitored twice daily by a qualified clinician for a minimum of 2-3 days post-surgery for signs of infection or pain. Calves also need to be monitored twice daily for a minimum of three days post-surgery, and once daily for 3-5 days after that to ensure they are progressing normally. Systems need to be in place to provide supplementary milk, and/or veterinary assistance as required.

Pain relief

(32) In conjunction with the university veterinary anaesthetists, pharmacologists and buiatricians, appropriate and recent analgesic principles and pharmaceuticals will need to be administered to the animals. These are likely to include:

a. Local and regional anaesthesia (lignocaine- mandatory.)
b. Antimicrobials to prevent pain associated with infectious inflammation.
c. Non-steroidal anti-inflammatory drugs- NSAID's Prior to the surgery, all animals will be provided with appropriate preoperative antibiotics.
d. Regional anaesthesia of the surgical site (paravertebral and/or inverted L block) and epidural anaesthesia.

(33) After surgery, all animals need pain relief (flunixin 1mg/kg, meloxicam and/or other appropriate NSAID), and continued antibiotics if this is deemed appropriate according to surgical risk, pharmacokinetics, pharmacodynamics, other risk factors, and principles of antibiotic stewardship.

Reuse and repeated use

(34) Animals should not be used for more than one elective caesarean.

Qualifications, experience or training necessary to perform this procedure

(35) Demonstrator: Graduate veterinarian, registered as a veterinarian in Australia, with appropriate clinical and surgical skills and experience
(36) Student: Should be at least in fourth year of BVSc study or third year DVM study

Record requirements

(37) All animals are required to be recorded on surgical and daily monitoring sheets.

Associated documentation (including pictures if available)

(38) Nil.

Glossary

(39) None required.

References and relevant links

(40) https://www.dpi.nsw.gov.au/animals-and-livestock/animal-welfare/animal-care-and-welfare/livestock/livestock-files/national-model-codes-of-practice-for-the-welfare-of-livestock
(41) https://www.dpi.nsw.gov.au/animals-and-livestock/animal-welfare