



Bovine Surgery for Fistulation of the Rumen and Cannula Placement
BAR DIAMOND™
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PURPOSE

To describe the surgical technique for creating a rumen fistula for the purpose of implanting a 4 inch rumen cannula

PRE-SURGERY CONSIDERATIONS

1. Take animal off feed 24 hours prior to the surgery
2. Surgery may be undertaken in a squeeze chute after washing the chute to remove dirt and dust and allowing it to dry before use
3. The animal is restrained in the chute so that it remains standing and access to the left side (paralumbar fossa and nearby area) of the animal is available through the side of the chute

SUPPLIES REQUIRED

Surgical clippers with #10 blade	Sterilized umbilical tape 1/4 or 3/8 inch
Chlorhexidine Skin Cleanser 4%	Serpentine needle
70% isopropyl alcohol	#3 Vetafil (or similar type non-absorbable suture)
Iodine Solution	Sterile 18 gauge 1 1/2 inch needles
Sterile 30cc syringes	Sterile disposable spinal needles 18 G X 3 1/2 inch
1/2 inch	
Sterile 18G X 5 inch needles	Sterile 20cc syringes
Lidocaine 2% with epinephrine	Hibitane cream
Impervious disposable drape material	Sterile disposable scrub brushes
Scalpel blade #20 or #22	Rumen Cannulas and Stoppers (3 inch and 4 inch)

INSTRUMENT PACK (AUTOCLAVED):

3 pieces of umbilical tape W or 3/8 inch X 18 inches long	
3 serpentine needles	Large tissue thumb forceps no teeth
6 large towel clamps	Large rat tooth thumb forceps
2 triangular cutting needle (new)	Scalpel handle #4
Kelly forceps (1 straight —1 curved)	Large needle drivers suture scissors
2 pair mosquito forceps	Tissue scissors (large)
2 allis tissue forceps	

OTHER RECOMMENDED STERILE MATERIALS

hand towel	gowns for surgeon and assistant
drape (disposable) for cow (5 feet long x width of roll)	drape (disposable) for chute bars

Procedure to insure a properly positioned and circular fistula

1. Clip the paralumbar fossa from the transverse processes to the ventral edge of the flank fold and from the 13th rib to the hip bone
2. Clip the area of injection plus a radius of 2 inches around with a #10 clipper blade.
3. Surgically prepare the site of injections using at least 3 separate scrubs with Chlorhexidine and final prep with alcohol.

4. **Mark the skin with an indelible marker** using a round template the same size of the cannula to be used (1c cannula requires 4 inch or 10.2 centimeter diameter fistula).

Note: It is preferable that this be done before the paravertebral block is performed and the skin relaxes. Template should be same diameter as the center diameter of the cannula or slightly smaller. In the case of thin skinned animals the vertical diameter can be reduced by $\frac{1}{4}$ of an inch (0.5 centimeter) from the lower or ventral edge, this will correct for stretching of the fistula over time.



5. Perform the paravertebral block T13, L1, L2 and L3 using 2% Lidocaine with epinephrine.
6. Ensure that the skin is anesthetized by checking for sensation with a hypodermic needle (at least 15 minutes after the block was performed).
7. Create a blood line in the skin following the indelible marking made in step 4. This blood line will be used as the guide when the skin is removed during surgery. This may be accomplished by scoring the skin with an I8G needle so that the boundaries of the proposed incision are outlined.
Note: Creating the bloodline to follow later will significantly improve the final shape of the fistula and will reduce the likelihood of rumen contents leaking post-operatively.
8. Surgically prepare the paralumbar fossa by utilizing at least 3 scrubs with Hibitane Skin Cleanser.
9. Perform a final scrub with Chlorhexidine followed by an alcohol rinse. Paint the incision site and surrounding clipped area with Povidone iodine solution.

Surgery

1. The surgeon and assistant should do a routine pre-operative scrub and don sterile surgical gowns and surgical gloves.
2. Place a sterile impervious drape over the horizontal bar on the chute and clamp it to itself under the bar to hold it in place. Drape the surgical site with a sterile impervious drape that is towel clamped to the skin to hold it in place. Cut out a portion of the drape to provide an opening to the incision site.
3. A perfectly round skin incision the same diameter as the center diameter of the cannula or slightly smaller is made by following the blood line. Following the



scored skin outline, an incision is made through the skin and the piece of skin is undermined and removed.

4. The incision is continued through the external oblique muscle. Approximately 45% to 65% of the muscle is removed from the incision, leaving a ring of muscle present with a thicker margin of muscle on the ventral edge of the incision. **Note: The amount of muscle removed is less for thin body wall cattle (dairy) and more for thick body wall cattle (beef). The muscle removed would be centered 1/3 from the dorsal edge of the opening and 2/3 from the ventral edge on the center line of the opening.**



5. The incision is continued through the internal oblique and transversus abdominus muscles utilizing blunt dissection to tear the muscle along the direction of its fibers. The transverse abdominal oblique is elevated with a pair of tissue forceps and incised to prevent nicking the rumen.

6. Place stay sutures of umbilical tape through the wall of the exposed rumen by: using the serpentine needle insert one loop of umbilical tape of the exposed rumen tissue, leaving a large enough loop to use as a hand hold. An assistant exteriorizes a portion of the rumen by applying outward traction to the umbilical tape loop. **Note: once the rumen has been penetrated the surgical site, instruments, and surgeon are no longer sterile, although appropriate aseptic techniques should continue to be followed.**



7. With the rumen exteriorized, make a 2 or 3 inch incision through the rumen wall and into the interior. This may be enlarged as needed to allow for complete suturing. Ensure the rumen incision is adequate to prevent excessive stretching of the rumen or bunching of the skin at the fistula edge.



8. Suture the cut edge of the rumen wall to the cut edge of the skin utilizing a continuous pattern and #3 Vetafil. Suture one quarter of the circumference at a time before tying off and starting the next suture pattern. 3-4 continuous sutures should be used rather than one so that if the suture breaks the entire suture line does not come undone. Suturing should begin at the bottom of the incision and progress up both sides with the top being closed last to reduce the likelihood of rumen contents being introduced into the peritoneal cavity. Rinsing of the exposed muscle and skin with sterile saline or lactated Ringer's solution may be performed as needed to keep the body wall clean. Care must be taken to not allow contaminated fluid to enter the peritoneal cavity. A small quantity (5-10 ml) of long-acting penicillin should be spread directly on the muscle layer as it is closed to prevent infection.

9. Clean the incision area with water and Hibitane to remove debris.

10. Insert model 4C (3 inch) rumen cannula.



Antibiotic

Immediately post-surgery, an antibiotic should be administered [e.g., Cefiofur at a dosage of 1 mg/kg (Excenel 1 ml per 50 kg intramuscularly or Excenel RTU 1 ml per 50 kg subcutaneously)].

Analgesia

Immediately post-surgery, an analgesia should be administered (e.g., Banamine at 1 mg/kg intravenously or Anafen (ketoprofen) at 3 mg/kg {1.5mls per 45 kg} intramuscularly).

Cannula Insertion and Removal

1. To prepare cannula for insertion into animal, remove the stopper from the cannula. Reach through the center of the cannula and grasp the inner flange of the cannula and pull it back through the center of the cannula until approximately $\frac{1}{2}$ to $\frac{3}{4}$ of the inner flange is on the outside of the cannula. This will leave $\frac{1}{2}$ to $\frac{1}{4}$ of the inner flange in a “folded” form small enough to clear the fistula. **Note: placement of the cannula in hot water enables easier inversion of the inner flange of the cannula, simplifying the “folding” of the cannula for insertion.**

2. To place the “folded” cannula in the animal, insert the “folded” inner flange through the fistula and push the remaining inner flange back through the cannula center returning the inner flange into position inside the rumen, then place the stopper in the cannula. Mineral oil can be applied to the stopper and center of the cannula to make future removal of the stopper easier.

3. The cannula is removed from the animal by first removing the stopper. A small “dull” screwdriver (not too long) can be used to assist stopper removal and mineral oil is a good lubricant for stoppers. Following removal of the stopper, reach through the center of the cannula and grasp the inner flange of the cannula and pull it back through the center of the cannula until approximately $\frac{1}{2}$ of the inner flange is on the outside of the cannula. Then remove the cannula from the animal.

Post-Operative Care

1. The attending veterinarian should be consulted if an animal has significantly reduced feed or water consumption, body temperature greater than 104° F (40° C), significantly elevated heart or respiratory rates compared to the pre-operative baseline values, unusual restlessness, depression or other signs of abnormal behavior, or if problems with the suture line occur.

2. Wash the fistula and surgery site daily with a very mild bleach solution (1:20) for approximately one week and then every five or six days or as necessary to keep the animal clean.

3. Fly spray containing 0.5% Permethrin or other repellent should be used as needed for control.

4. The surgery site may swell for an area 1-2 inches around the cannula edge. Tissue will become necrotic and an odor may develop — this is not abnormal and the degree of necrosis can be gauged by lifting the edge of the cannula and observing the surgical site. If further examination is desired the animal should be taken to a chute, the cannula removed and the site inspected.

3. Administer Ceftiofur at a dosage of 1 mg/kg (Excenel 1 ml per 50 kg intramuscularly or Excenel RTU 1 ml per 50 kg subcutaneously) once daily for 4 treatments or other antibiotics as recommended by the veterinarian.
 4. Administer analgesia [e.g., Banamine at 1 mg/kg intravenously 1–2 times a day or Anafen (ketoprofen) at the dosage 3 mg/kg (1.5mls per 45 kg) intramuscularly] the day following surgery or alternately 1 to 2 aspirin bolus (240g aspirin/bolus) one to two times daily for 3 to 7 days via the rumen cannula as needed for pain. Analgesia should not be extended without veterinary consultation.
 5. The animal should be evaluated at least daily for 2 days following surgery and then at minimum every 3rd day until sutures are removed on day 14 and the 4 inch cannula introduced. After this, evaluation should be at least weekly.
 6. Approximately 9 days following surgery the 3 inch cannula (model 4C) should be removed and the cannulation site inspected and cleaned. Necrotic tissue may be present and require trimming and removal. The area should be inspected for the presence of fissures. Hibitane cream can be applied to the surgical site and the cannula when it is replaced.
 7. Remove sutures 14 days following the surgery. At this point the 4 inch cannula (models 1C, 2C, 3C, 9C) should be placed in the fistula site unless a number of deep fissures are present. If they are present the 3 inch cannula should be replaced and the site re-inspected in approximately 5 days with consideration to placing the 4 inch cannula.
- When the decision has been made to place the 4 inch cannula, the animal should be administered analgesia for the pain from the stretching of the fistula. Placing of the 4 inch cannula and the plug may require some physical effort to stretch the fistula sufficiently for the cannula to properly seat in the fistula. Initial placement of the plug may be equally difficult and the use of mineral oil is recommended.
9. Following placement of the 4 inch cannula, tissue along the edge of the cannula will start to die due to pressure. This is normal. It is recommended that 7 days following 4 inch cannula placement that the surgery site be cleaned and any necrotic tissue trimmed and removed. The cannulation site should be inspected every seven days until the cannula site has healed with no abnormal tissue.
 10. Name your animal as he/she will become a pet!!!

Sources: Richard J. Hodges DVM & Heather Simpson AHTP 12/22/2005
University of Idaho, Animal Care and Use Committee, 3/2/2006
William S. Cegnar DVM & Gary L. Rohwer, 3/26/2011

See : <http://www.bardiamond.com> for additional information.

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