

Teat Procedures

Teat blocks

Xylazine hydrochloride (Rompun) is a useful means of restraining the cow in lateral recumbency for teat surgery. Many surgeons prefer positioning the cow in dorsal recumbency for teat procedures. Butorphanol (0.5 mg/kg) may be added for very fractious animals. For topical anesthesia, 2% lidocaine (not procaine) should be used. Epinephrine should not be used with the local anesthetic. Epidural anesthesia is an effective alternative for teat surgery.

To control hemorrhage and milk flow, a rubber tourniquet may be applied to the base of the teat. Doyen forceps clamped across the base of the teat can also be used successfully. When lacerations involve the base of the teat, suturing must be performed without the benefit of a tourniquet.

Ring Block of the Teat Base (Figure 3-12)

General Considerations

- Perhaps the most commonly used anesthetic technique under field conditions
- All teat surgeries should be preceded by adequate removal of udder hair.
- If possible, perform elective teat surgery early in the day and with adequate milk supply available.

Materials

- 0.25- to 0.5-inch, 22- to 24-gauge needles
- 5- to 10-ml plastic syringes
- 2% lidocaine (epinephrine optional)

Preinfusion Procedures

- Standing restraint is preferred.
- IV sedation or analgesia is indicated.
- Apply a tail tie to keep the tail from the surgical area. The tail may be anchored to the leg
- Rear leg restraint (a hock twitch) is optional or a tail jack effectively controls kicking.
- Thoroughly cleanse the surgical area with an iodophor scrub.

Technique

- Encircle the base of the teat with an infusion of several milliliters of 2% lidocaine into both the skin and the deeper musculature.
- Allow a minimum of 5 minutes for anesthesia.

Inverted V Block Over the Surgical Area (Figure 3-13)

General Considerations

- Used primarily when the teat lesion is specific.
- Perhaps more readily applied than a ring block because it usually does not involve infusing the medial aspect of the teat.

Materials

- Same as for the ring block

Preinfusion Procedures

- Same as for the ring block

Technique

- Perform a field block infusion of both the skin and musculature in an inverted V pattern dorsal to the teat defect.
- Be careful to infuse the lidocaine in normal non-inflammatory tissue, far enough from the teat defect.
- Allow a minimum of 5 minutes for anesthesia.

Teat Cistern Infusion (Figure 3-14)

General Considerations

- Recommended for surgical conditions that involve only mucous membranes (e.g., polyps).
- Will not desensitize musculature or skin
- Use 2% lidocaine (without epinephrine), which anesthetizes intact mucous membranes on contact.

Materials

- Heavy rubber band or other suitable device to be used as a tourniquet
- Sterile teat tube
- 2% lidocaine (without epinephrine)
- 10- to 20-ml syringe

Preinfusion Procedures

- Same as for the ring block and inverted V block

Technique

- Place a tourniquet on the base of the teat. Apply adequate tension to prevent leakage between the udder and teat cisterns.
- Remove milk from teat cistern.
- Thoroughly cleanse the teat orifice with alcohol or iodophor solution.
- Insert a sterile teat tube via the streak canal.
- Infuse approximately 10 ml of 2% lidocaine (or enough to fill teat cistern).
- Remove the teat tube.
- Allow approximately 5 minutes for anesthesia.
- Milk out the 2% lidocaine.
- Perform surgery
- Remove the tourniquet.

Vascular (Local) Infusion

General Considerations

- A recently described technique
- All tissues of the teat will be desensitized.
- Success of this technique may be limited because of the need for adequate teat size and environmental conditions conducive to optimal blood circulation (warm weather).

Preinfusion Procedures

- Same as for the ring block

Materials

- Tourniquet (heavy rubber band preferred)
- 0.25- to 0.5-inch, 22- to 24-gauge needle
- 5- to 10-ml plastic syringe
- 2% lidocaine (without epinephrine)

Technique

- Place a tourniquet on the base of the teat (to provide marked tension).
- Allow adequate time for venous engorgement (venous plexus) just distal to tourniquet. A needle puncture and slight aspiration can determine the IV status.

- Infuse approximately 3 to 5 ml of 2% lidocaine IV (into the venous plexus).
- Anesthesia will occur in several minutes.
- Perform surgery
- Remove the tourniquet.

Effectiveness

- The technique will not be effective if a teat lesion (e.g., laceration of the teat wall) interferes with normal circulation.
- The technique should be applied only when surgical procedures can be achieved in a short time (e.g., teat orifice surgery)

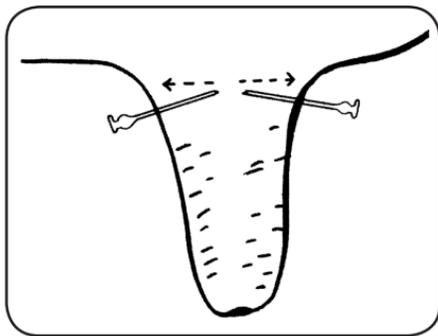


FIGURE 3-12. Ring block of the bovine teat.

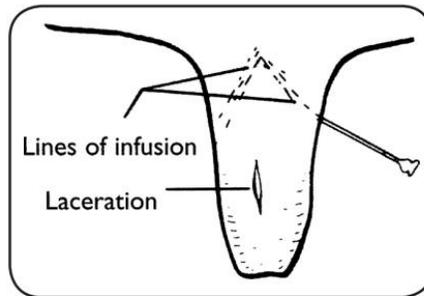


FIGURE 3-13. Inverted V teat anesthesia in the cow.

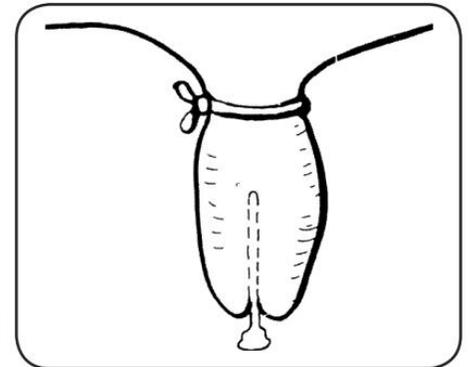


FIGURE 3-14. Teat cistern infusion technique for anesthesia of the mucous membranes.

Chronic Teat Fistula Repair

General Considerations

- The condition is commonly a sequela to teat laceration involving the teat cistern.
- It may be congenital or a sequela of supernumerary teat removal.
- Incomplete healing after open teat surgery may also be a factor.
- The ideal time to repair fistulas is during the dry period.
- Milk and associated intra-cistern milk pressure should be minimal or nil during this period.

Nonsurgical Treatment: Cauterization

- Use local applications of carbolic acid or butter of antimony.
- Inject minute quantities of iodine around the fistula.
- Electrocautery may be attempted for stimulation of a tissue reaction (closure) of the fistula.
- Prognosis for success of cauterization is guarded to unfavourable if the fistula is well developed and surrounded by significant scar tissue.

Restraint

- Standing restraint is recommended because it eliminates the possibility of further teat and udder trauma associated with casting.
- Lateral or semilateral recumbency on a tilted surgical table is recommended for intensive teat surgery.
- Tail restraint, a halter plus nose lead, and anti-kicking equipment may be useful in certain cases.
- A chute with positive rear leg restraint is recommended.
- Do not over-restrain cows.

Presurgical Procedures

- Administer IV sedation or analgesia as needed.
- Thoroughly cleanse the teat and surrounding udder.
- If a tail jack is not necessary for restraint, place a tail rope to prevent wound contamination.
- Consider placing a rubber band or rubber tubing at the base of the teat for hemostasis.
- Carefully examine the fistula, and develop a plan to repair it.

Anesthesia

- A local ring block with 2% lidocaine is generally effective.

Surgical Technique

- Make elliptic incisions around the fistula. • Include all scar tissue
- Continue incising into the teat cistern
- The suturing technique is identical to that used in open teat surgery and for deep lacerations.
- To close the teat mucosal layer, it may be necessary to dissect the mucosa free from the underlying tissue.
- In many cases, only tissue glue and skin staples or sutures are necessary. When skin sutures are used, synthetic nonabsorbable suture material and a swaged on cutting needle are recommended.

Postoperative Care

- Prophylaxis of mastitis (e.g., systemic injections of antibiotic) is recommended.
- Remove skin sutures or staples in 10 to 14 days.
- If surgery is of an emergency nature during lactation, use of a plastic drainage tubes is recommended for the first 3 to 5 days after surgery.

Amputation of the Udder or Portions of the Udder

- Historically, amputation of a portion of the udder was recommended as a surgical treatment of gangrenous mastitis.
- Amputation is now uncommon because of the tendency for marked hemorrhage, shock, and death.
- Because of the large number of cows per herd and the lack of sufficient time and labor to provide adequate postoperative care, these animals are often euthanized or marketed if they will pass federal inspection for human consumption.
- Ligation of udder vasculature with subsequent sloughing of affected quarters has generally supplanted surgical amputation.

Amputation due to disease

Indicated in severe purulent or gangrenous mastitis of one quarter to permit drainage, also following irreversible teat damage.

Technique

- analgesia of teat base and application of good restraint
- place Burdizzo® at junction of middle and distal thirds of teat, amputate with scalpel distal to jaws
- retain teat lumen by continuous sutures in wall (skin to mucosa) using interlocking mattress suture to maintain drainage

Haemorrhage is usually slight.

Quarter will eventually dry off because of secondary infection and mastitis.

Amputation due to injury

Teat amputation may also be indicated in cows with severe teat damage where reconstructive surgery and return to normal function cannot be expected, e.g. loss of distal portion of teat, or long, oblique or transverse tears into teat canal. Amputation and closure of teat sinus is only successful in the absence of infection.

Technique

- amputation site is 1–2 cm distal to udder-teat junction
- transect teat by scalpel, resecting the mucous membrane 1 cm below the cut surface
- invert mucosa by continuous suture in submucosa (see Figure 5.4)
- insert horizontal mattress sutures to close musculature and appose skin edges with simple sutures or metal clips (Michel)
- infuse antibiotics into the quarter before final sutures are placed. In gangrenous mastitis, following teat amputation at the junction with udder, a cruciate incision is made into udder skin to permit optimal drainage and exposure to atmosphere to inhibit anaerobes. Irrigation with dilute H₂O₂ is useful.

Discussion

Meticulous care to details of technique is vital in surgical repair of severe traumatic teat lesions. A multiplicity of suture patterns illustrates the unsatisfactory results obtained in certain hands, but this is more likely to be a result of deficiencies and breakdowns in basic surgical principles, than to any defect in the suture configuration itself. Dedicated aftercare by stockman and veterinarian is of major importance for success.

Aftercare of teat surgery includes passive milk drainage for ten days, frequency depending on yield, intramammary antimicrobials every second day, a clean environment for wound and cow, and removal of sutures about day eleven. Apart from wound breakdown and local infection, mastitis remains the major hazard, and up to 40% of teat-traumatised cows are culled for mastitis within, or at the end of, that particular lactation.

Ligation of Udder Vasculature (Figure 17-6)

General Considerations

- Ligation of vessels supplying the udder allow sloughing a portion of the udder.
- This technique is less traumatic than surgical amputation, with minimal stress on the patient.
- It eliminates further absorption of toxins from gangrenous tissue via the bloodstream.
- Vascular ligation requires minimal time and effort.
- Although gangrenous mastitis is often confined to an individual quarter of the udder, ligation involves vessels supplying blood to half the udder (right or left half). From an anatomic standpoint, it is impractical to attempt vascular ligation of an individual quarter.
- Vasculature involved:
 - External pudendal artery and vein (greatest importance)
 - Subcutaneous abdominal vein
 - Perineal artery and vein (optional)
- Field veterinarians report a greater than 50% recovery rate when treating gangrenous mastitis. The mortality rate is usually high for untreated cases.

- Recovering patients frequently start eating 12 hours after ligation.
- Tissue slough is expected in 10 days to 3 weeks.
- Commonly, the cow may be marketed in 4 to 6 weeks or when adequate healing has occurred.

Restraint

- Restrain the patient in lateral recumbency, with the gangrenous tissue situated dorsally. Lift the rear leg and extend it posteriorly for greater exposure of the udder.

Presurgical Procedures

- Communicate the following points with the client:
 - Characterized as a salvage procedure
 - Timeline for sloughing and salvage
 - Pathogenesis of avascular necrosis, including the negative aspects of drainage, odour, and likely infestation with flies and maggots if completed during fly season.
 - Prognosis and cost
- Administer marked IV sedation or analgesia.
- Withhold feed and water to decrease the possibility of bloat.
- Remove hair over the inguinal area (the dorsal portion of the udder) and the subcutaneous abdominal veins (milk veins).
- Prepare the incision sites for sterile surgery.
 - The perineal artery and vein are located dorsal to the udder attachment, about halfway between the udder and vulva and slightly paramedian.

Anesthesia

- Consider high caudal epidural anesthesia
 - If a high caudal epidural is given, restrain the patient's rear legs in an anterior position postoperatively.
- General anesthesia is an option.
- Local anesthesia infused at the incision site is an option.

Surgical Technique

External Pudendal Artery and Vein

- Make a 10 to 15 cm (4 to 6 inch) longitudinal incision parallel and about 2 to 3 cm (1 inch) dorsal to the base of the udder at the junction of the forequarters and rear quarters.
 - Make the incision through the skin only.
- Bluntly dissect and isolate the external pudendal artery and vein, which can be traced entering the inguinal canal.
 - Recognize that the external pudendal artery divides into the anterior and posterior mammary arteries. Make sure that you are proximal to the bifurcation.
 - Apply a double ligature to the combined artery and vein with 1/8-inch cotton tape. Leave 2 to 3 cm (1 inch) between the two ligatures. Apply marked tension to the ligatures, and tie with a surgeon's knot.
- Suturing the skin incision is optional in light of the expected sloughing of the udder.

Subcutaneous Abdominal Veins

- Without making a skin incision and isolating the vein, place a double ligature on the vein and surrounding skin just cranial to the dorsally positioned forequarter.
 - Use a full-curved cutting needle and 1/8-inch cotton tape.
 - Space the ligatures 1 inch apart.

- Apply marked tension to the ligatures and tie with a surgeon's knot.

Perineal Artery and Vein

- Ligating the perineal artery and vein is optional; ligating these vessels is of minor importance compared with ligating the pudendal artery and vein and the subcutaneous abdominal vein.
- Approach through a vertical skin incision via blunt dissection.
- Apply double ligatures with medium-sized synthetic nonabsorbable suture material to the combined artery and vein.
- Suturing of the skin is suggested but optional.

Postoperative Care

- Administer supportive treatment:
 - Systemic antibiotics
 - Antihistamines
 - Fluid therapy as indicated
 - Steroids
- Allow restricted exercise until the patient's appetite returns.
- Provide normal nutrition; pasture grazing is advised.
- Control flies in the summer months.
- Beware of contaminating the environment with bacteria.

An Alternative to Ligating Udder Vessels

General Considerations

- The external pudendal artery and vein are ligated intraabdominally via a copotomy (vaginal wall) incision.
 - Ligations are performed with the cow in standing restraint. The subcutaneous abdominal vein and the perineal artery and vein are also ligated with the cow in standing restraint.
 - The pudendal artery and vein are ligated via a vaginal incision.
 - The total procedure is performed with minimal stress to the animal, which is usually weak and toxic.
- Disadvantages (compared with ligation with the patient in lateral recumbency restraint):
 - The surgeon must have adequate knowledge of the internal anatomic structure of the inguinal and pelvic region and be able to recognize organs and tissue via palpation.
 - The surgeon must be able to insert ligations properly and, when ligating the pudendal artery and vein, be able to tie knots blindly.

Restraint

- Use good standing restraint (e.g., a head gate) and secure the tail to the side of the cow and away from the vulva.

Presurgical Procedures

- Administer slight to moderate IV sedation or analgesia
- With a No. 10 clipper head, remove hair from a 10 to 15 cm (4 to 6 inch) area over the subcutaneous abdominal vein and just cranial to the forequarter to be sloughed. Also remove hair from the dorsal attachment of the targeted portion of udder to the vulva. Surgically prepare the skin of both areas.
- Thoroughly flush the vaginal canal with an iodophor solution and several liters of warm water. A stomach pump and hose are suggested for this procedure. Completely remove the solution before

making the vaginal incision.

Anesthesia

- Administer a low caudal epidural with 2% lidocaine. The low caudal epidural will desensitize the perineal skin area.
- Administer a field block of 2% lidocaine in a 7 to 8 cm (3 inch) horizontal area just dorsal to the subcutaneous abdominal vein and cranial to the forequarter to be sloughed.

Surgical Technique

- Use elbow-length sterile rubber gloves along with sterile instruments and suture material. Aseptic surgery (e.g., draping and gowning) is unwarranted.
- Make a stab incision into the vaginal wall with a No. 11 Bard-Parker scalpel blade (held between your thumb and forefinger).
 - Make the incision dorsally and laterally to the cervix at the 10-o'clock or 1-o'clock position on the side to be ligated.
- Enlarge the incision by placing your fingers into it and alternately spreading and forcing your fingers craniolaterally (off the edge of the wing of the ileum) until your hand enters the peritoneal cavity. Your hand should be free of any tissue. The external pudendal vessels can be readily palpated as they enter the internal abdominal inguinal ring.
- Retract your hand from the peritoneal cavity.
- Thread about 2 M (2 yards) of 2 to 3 mm (1/8-inch) cotton (umbilical) suture tape onto a fully curved 4-inch cutting needle to create a complete double strand with a net length of 1 M (1 yard).
- Cradle and shield the needle in your hand. Carry it via the vaginal incision to the internal inguinal ring while you hold the ends of the suture outside the vulva.
- Direct the needle laterally just dorsal to the inguinal ring. Take a 1 to 3 cm (0.5 to 1 inch) bite of abdominal wall lateral to the pudendal vessels. This bite, which should include the pudendal artery and vein, is not deep but is adequate for suture stabilization. Take care not to lacerate the vessels with the cutting edge of the needle.
- Bring the needle out of the abdominal cavity, thereby exposing both ends of the material. Remove the needle from the suture strands either by cutting the two strands (leaving a double strand for the ligature) or by pulling one strand free from the abdominal cavity and eye of the needle. You may use either a single or a double strand for ligatures.
- Start the surgeon's knot (triple throw) outside the vulva. While you hold one end of the suture strand(s) under moderate tension outside the vulva, slide the knot via the vaginal incision to the pudendal vessels. Apply marked tension to the suture strands.
 - Thoroughly palpate the ligature to determine whether placement is proper, and tension is adequate.
- Carry the scalpel blade intraabdominally between your thumb and forefinger. While you apply tension on the suture strands from outside the vulva, transect the suture ends about 2.3 cm (1 inch) distal to the knot.
- A second ligature, about 2 to 3 cm (1 inch) dorsal to the knot, placed similarly to the first suture, will enhance disruption of circulation to half of the udder.
- The vaginal incision requires no further treatment or suturing. Healing commonly occurs in 24 to 48 hours without complications.
- The subcutaneous abdominal vein is ligated with the cow in standing restraint. Double ligatures of cotton tape are placed similarly to those placed with the patient in lateral recumbency. The perineal artery and vein are also ligated similarly.

Postoperative Care

- Administer supportive treatment, which comprises:
 - Systemic antibiotics
 - Antihistamines
 - Fluid therapy as indicated
 - Steroids
 - Analgesics
- Allow restricted exercise until the patient's appetite returns.
- Provide normal nutrition; pasture grazing is advised.
- Control flies in the summer months
- Beware of contaminating the environment with bacteria.

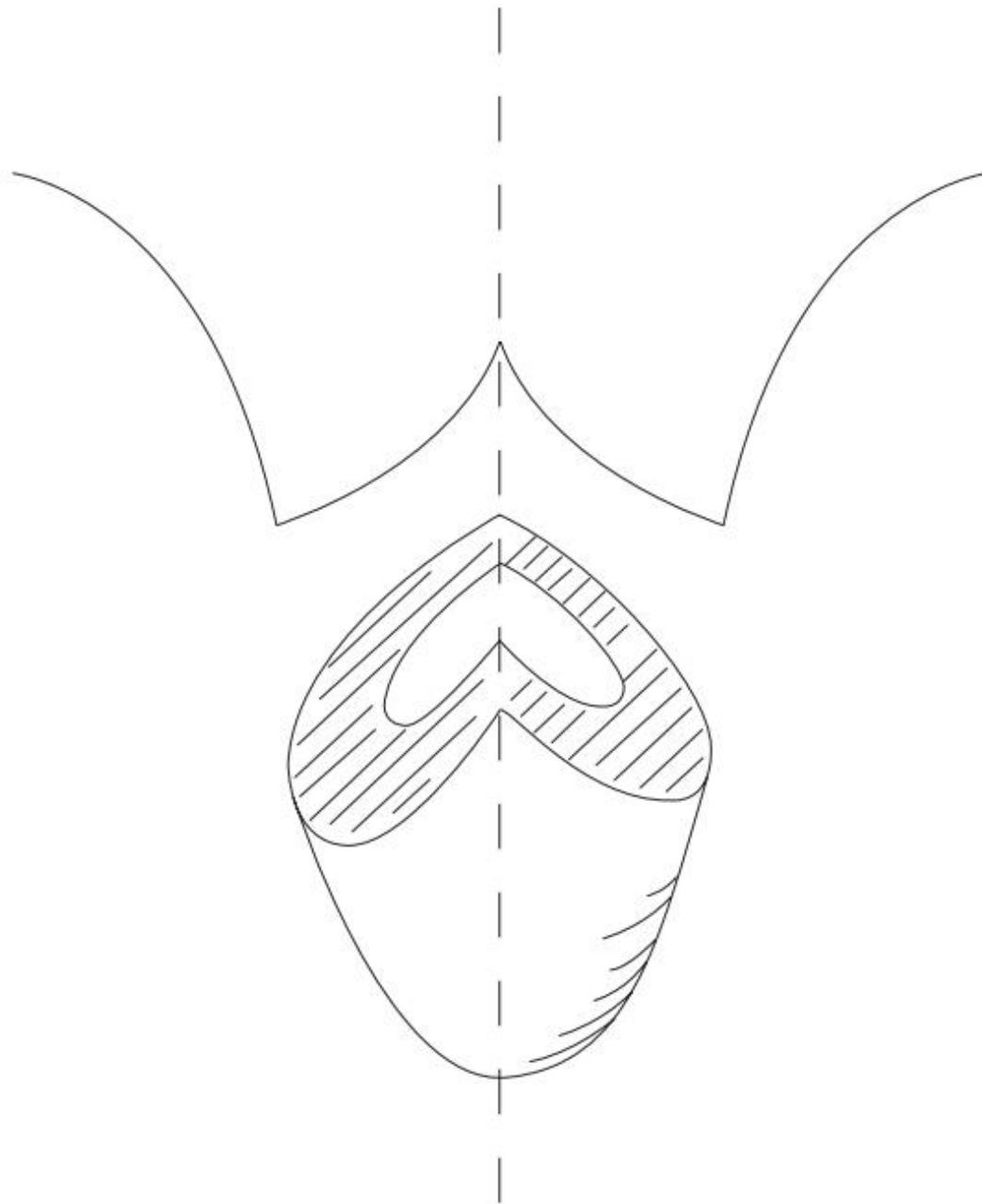


Figure 5.4 Teat amputation with primary closure: cut surfaces for closed teat amputation.

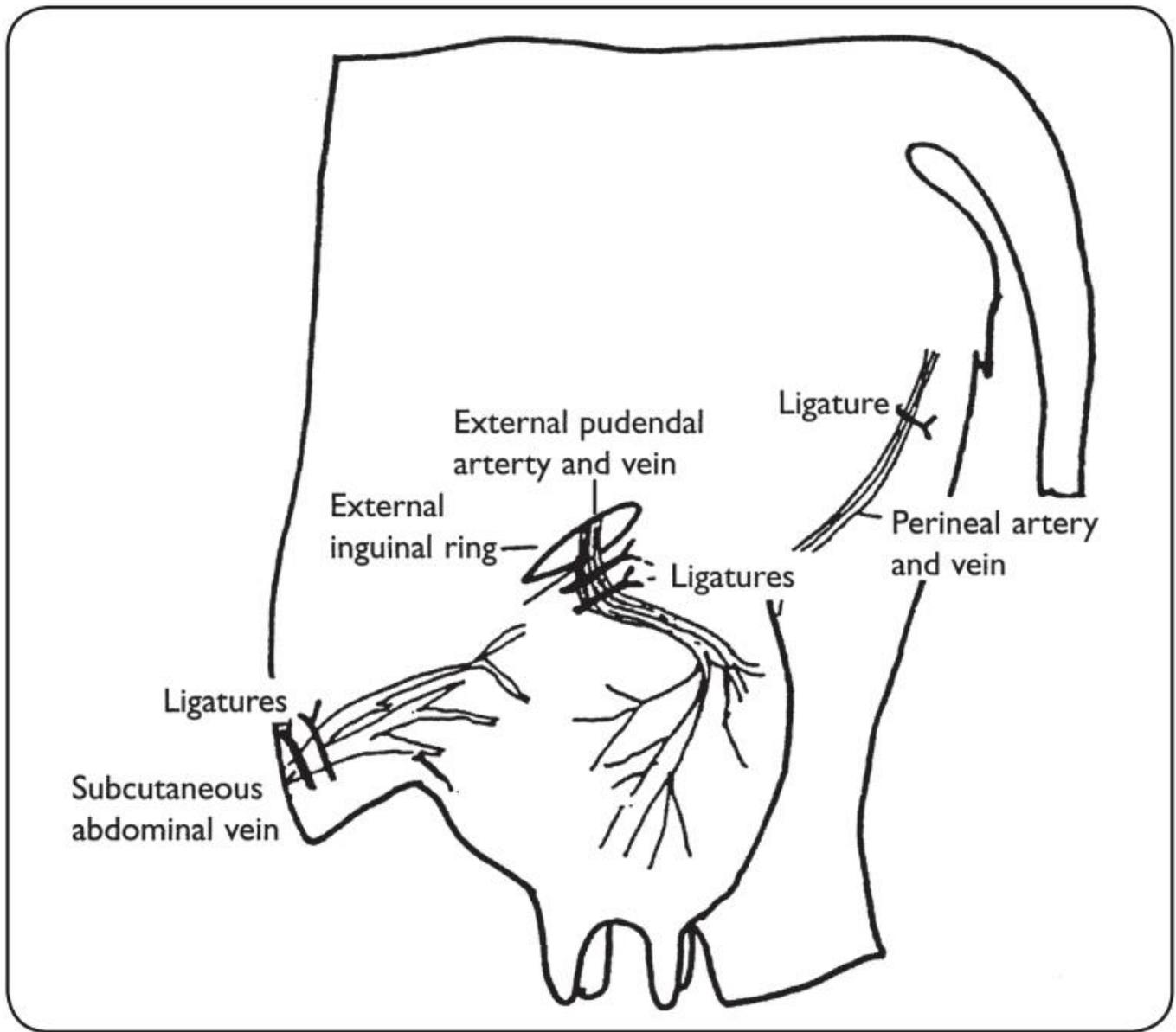


FIGURE 17-6. Ligation of the vessels of the udder (a prelude to sloughing of the udder).