

TEAT SURGERY IN CATTLE

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Introduction

Teat injuries are common in dairy cattle and, compared to other frequently occurring diseases, these injuries often result in premature culling of affected cows. Teat injuries can be divided in 2 categories: external or internal injuries. The external injuries include all types of laceration. The internal injuries include disease of the teat cistern and papillary duct. During this session, the principles of teat reconstruction (laceration repair) will be reviewed. A brief introduction to minimally invasive teat surgery (theloscopy) will be presented.

Classification

Teat lacerations are classified according to the duration from time of trauma, the localization and conformation of the laceration, and the thickness of the lesion (full or partial thickness). Different prognoses are associated with different classifications. It is important to understand the differences between each situation to be able to inform the client accordingly.

Duration:

Teat lacerations are categorized as acute or chronic (more than 12 hours old). Surgical intervention on the teat is best performed during the first 12 hours following the injury. Later, swelling of the teat can be too severe to permit adequate reconstruction of the tissue. These injuries benefit from medical therapy (hydrotherapy and a non-steroidal anti-inflammatory drug (NSAID) before attempting primary closure of the defect (delayed first intention healing). However, with complex lacerations (inverted “Y” or “U”), it is recommended to try primary closure even if the laceration is older than 12 hours. The repair may partially dehisce but the portion that heals will facilitate the surgical revision performed later in the healing process.

Localization and conformation:

Teat lacerations are classified as simple or complex (inverted “Y” or “U”), longitudinal or transverse, and proximal or distal. The orientation of the blood supply of the teat is longitudinal. A transverse laceration results in more damage to the blood supply resulting in more edema, avascular necrosis and dehiscence post-operatively compared with a longitudinal laceration. The more circumference is involved, the worse is the prognosis. Distal injuries involving the streak canal are also regarded as having a poor prognosis. Reconstruction of the streak canal is difficult and can cause partial or complete milk flow obstruction. Injury to the distal end of the teat compromises the defense mechanisms of the quarter against mastitis making the animal at higher risk to develop clinical or subclinical mastitis. Finally, distal injuries may lead to avascular necrosis of the distal end of the teat. Proximal and transverse lacerations are difficult to repair. At this location, the mucosa is difficult to suture and the teat swells more post-operatively.

Thickness

Teat lacerations are classified as being partial thickness (skin to submucosa) or full thickness (skin to mucosa with milk leaking out of the incision). With full thickness lesions, the defense mechanisms of the teat against mastitis are bypassed, increasing the risk of clinical mastitis. Prompt surgical re-construction of the injured tissue is needed to protect the quarter against environmental pathogens. With incomplete lacerations, (when the integrity of the teat cistern has not been compromised), surgical intervention may not be necessary. In that situation, secondary healing by medical management of the wound may be sufficient. However, contraction of the tissue during healing can change the conformation of the teat creating problems during milking.

Pre-operative therapy

All teat laceration surgeries are considered severely contaminated. It is recommended to have the client apply cold hydrotherapy on the injured teat while waiting for the veterinarian. The hydrotherapy helps decrease the inflammation and helps clean the teat for surgery. Prior to surgery, the cow is given a pre-operative dose of antibiotic (procaine penicilline) and a NSAID. The surgery can be performed in lateral or dorsal recumbency. The author prefers lateral recumbency because it decreases bloating on animals that have not been fasted. However, dorsal recumbency decreases the milk contamination improving the view of the surgical field. A clean area that will allow tying the animal's leg and that will provide sufficient lighting is selected.

The mammary gland is shaved, cleaned and scrubbed. A local block is performed with 2% lidocaine HCL. A “V” block or a ring block is performed at the base of the teat. The teat cistern can be infused with lidocaine to anesthetize the mucosa.

Teat reconstruction

A) Surgical materials

A scalpel handle and a #10 or a #15 surgical blade are needed for debridement. A small size metzenbaum is appropriate to trim necrotic or redundant tissue. An Adson or Brown-Adson thumb forceps (better than non-traumatic forceps) is needed for careful manipulation of the tissue. A small size needle holder and a regular size mayo scissor should be part of the teat surgery kit. A teat canula, a syringe and some flushing solution should be available.

Absorbable suture material of size 3.0–4.0 mounted on an atraumatic needle should be available for suturing the mucosa and the subcutaneous layers. Polyglycolic acid (Dexon II) or polyglactin 910 (Vicryl) are frequently used. When delayed healing is suspected or when clinical mastitis is present, a slow absorbable monofilament like polydioxanone (PDS II) may be more appropriate. Non-absorbable monofilament of size 2.0 should be available to close the skin.

In the past, chromic catgut was commonly used in teat surgery. Because of the enzymatic reaction associated with its degradation, this material is not recommended in teat surgery. The synthetic materials listed above are more expensive but they will increase your success rate for teat surgery.

B) Wound debridement

The wound is carefully but aggressively debrided and lavaged. All the necrotic tissue is removed by scraping the tissue with a scalpel blade until viable tissue is exposed (pink and diffuse bleeding of the tissue). The margin of the skin may need to be trimmed using the scalpel blade or scissors.

C) Laceration repair

If involved, the mucosa and the submucosa are first reconstructed. A linear defect is reconstructed using a simple continuous pattern. With complex configurations or transverse laceration, a simple interrupted pattern should be used.

The muscular and subcutaneous layers are closed with a simple continuous pattern. With large skin flaps, it is recommended to place some walking sutures to decrease dead space. However doing so will increase the surgical time, the foreign material, and may compromise the vascularisation of the teat. Care must be taken to place only what is necessary to hold the flap safely.

The skin is carefully apposed using a simple interrupted or cruciate pattern. Care is taken to leave the skin sutures slightly loose because swelling is expected at the surgery site. When severe post-operative edema is suspected (transverse and/or chronic laceration), vertical or horizontal

mattress sutures around or through stenting material (IV drop set) can be used to decrease risk of wound dehiscence. With complex lacerations, a “V” flap will need to be sutured. However, dehiscence of the tip of the flap often occurs. A corner suture or a 3-point buried mattress suture can be placed.

Throughout the procedure, the surgery site is frequently lavaged with saline. Antibiotics can be added to the lavage solution. The author routinely adds Cefazolin (1g/liter) to the flush solution. Hemostasis is performed to avoid formation of mural hematoma that may obstruct the teat cistern during machine milking.

Post-operative care

The wound is protected with a teat bandage and the quarter is treated appropriately for mastitis. NSAID and antimicrobials therapy are continued post-operatively for 3 days. Depending on the severity of the lesion and the structures involved, milking with the machine may or may not be used at the following milking. A larger teat cup is recommended if a machine is used. Hand milking should be avoided since it is associated with wound dehiscence. If the machine is not used, a cannula is introduced carefully at every milking. When the streak canal is involved in the laceration, a cannula with a lid can be left in the streak canal for a few days (no more than 3 days). When the cannula is removed, a natural teat insert (wax implant) can be placed in the streak canal between milking. It will promote the healing of the damage streak canal.

Severe post-operative edema can be treated by applying ice around the teat for a few days. Crushed ice in a rectal sleeve can be placed around the teat. Commercial udder bags can be used to hold the ice in place. Twenty minute applications can be performed several times per day.

The skin sutures are removed no more than 9 days after the surgery. If the sutures are left in place longer, excessive fibrosis and suture tract infection may occur.

Complications

Complications following surgical reconstruction of a teat laceration are wound dehiscence, fistula formation, mural abscess, teat cistern fibrosis and mastitis. If dehiscence occurs or a fistula is formed, the teat should be allowed to heal completely by second intention (4 to 6 weeks) before attempting the surgical revision. A mural abscess can be diagnosed with the ultrasound. If small, it can be removed “en bloc” or it can be lanced and allowed to heal by second intention.

If the mucosa of the teat cistern cannot be closed, fibrosis of the cistern might occur. In this situation, a silicone implant can be placed in the cistern to avoid adhesion formation during the healing of the mucosa. However, the implant can create many problems. They can get dislodged and/or rupture, obstructing the normal milk flow. As a foreign material, they can also promote mastitis. When used, a second surgery is often needed to remove the implant.

Distal transverse laceration involving the streak canal

This type of configuration is difficult to repair and often results in partial dehiscence or in fibrosis of the streak canal. To decrease costs associated with a second surgery following complications, amputation of the distal end of the teat at the level of the laceration, could be performed. In this case, the surgery site is left to heal by second intention. Before amputating the distal end of the teat, it is important to make sure that 2 or 3 mm of normal streak canal is available proximally and that the rosette has not been damaged by the initial trauma. For the first 2 weeks after the amputation, a silicone or a wax insert will have to be maintained in place between milking to avoid scarring in the streak canal. Mechanical milking can be resumed rapidly after the amputation. Complete healing of the teat is achieved within 3 or 4 weeks. A protective bandage should be used in the early post-operative period.

The author has not seen long term complications such as dripping milk and mastitis on the cows that had their distal teat amputated. The cosmetic outcome is good.

Theloscopy

Lesions involving the streak canal or the rosette of Furstenberg are suitable for theloscopic surgery. These lesions create partial milk flow obstructions (slow milker). A final diagnosis is obtained through ultrasound evaluation with the teat end dipped in a plastic cup filled with water. Always compare the affected teat with the contralateral teat to confirm your diagnosis. A streak canal injury carries a worse prognosis than a rosette of Furstenberg injury.

With the cow standing or in lateral recumbency, the teat is prepared for surgery. It is anesthetized and scrubbed. A teat clamp or a rubber band is placed at the base of the teat. A canula is inserted in the teat. Saline is used to clean the teat cistern through the canula. Then, the theloscope is inserted into the teat cistern through the streak canal. The teat is evaluated (severe thelitis is a negative indicator). The telescope is removed and a sharp trocar is inserted into the teat through the streak canal. The trocar is pushed through the lateral teat wall from the inside out. The theloscopic sleeve is slid over the trocar into the teat cistern from the outside in. The trocar is removed and the theloscope is inserted. The distal teat is evaluated. An instrument is inserted

through the streak canal and the obstruction can be resolved. The lateral port is closed with a single interrupted suture (2.0 monofilament non-absorbable suture material). The suture is removed as early as 24 hours after the surgery. Milk from the quarter is passively drained with a canula and mammary antibiotics are infused into the quarter to prevent or treat mastitis. A silicone teat insert is introduced through the streak canal and the teat is bandaged to avoid losing the insert. A 3x3 (3 periods of 3 days without milking the affected quarter) convalescence treatment is started. The treated teat is milked with a cannula every 3 days for 9 days. Between milking, a silicone teat insert is left in place. If mastitis is present, the quarter will have to be milked more often, but only with a teat cannula. No milking with the machine is allowed before day 9. It is important to follow this protocol to increase chances of a successful outcome. Without appropriate rest, the streak canal will heal with excessive granulation tissue that may lead to re-obstruction of the quarter.

A retrospective study evaluating the short term and long term prognosis of theloscopic surgery versus thelotomy for treatment of distal teat obstructions showed that on the 4th milking, the milk flow improved significantly for the theloscopic group. Fewer post-operative manipulations (cutting the sphincter end) were necessary in the theloscopic group. The hospitalization time and convalescence time were also shorter for the theloscopic group. However, no differences were found for the long term prognosis or the frequency of mastitis between both groups.

One retrospective study showed that teats with a distal milk flow obstruction produced approximately 24% of the milk produced by the contralateral teat.²³ One month after removal of the obstruction by theloscopy, milk production of the affected quarter had increased to 73% of the contralateral teat. Six months after the procedure, milk production had increased to 82% of the contralateral quarter. The somatic cell count (SCC) of teats with a distal outflow obstruction was, on average, 2.9 million cells/ml before the theloscopic surgery, 725,000 cells /ml 1 month after the surgery and 426,000 cells /ml 6 months after the surgery. In 67% of the cases, a pathogen was isolated prior to the surgery. In 69% and 61% a pathogen was isolated 1 month and 6 months after the surgery. Those numbers show that mastitis is often associated with distal milk flow obstruction. However, surgical intervention with the help of theloscopy can significantly decrease the SCC of the affected quarter.