I. Non-Infectious Lesions of the Teat End and Udder:

- Trauma
- Chemical injury
- Environmental injury
- Milking machine malfunction
- Insect induced

The cow (or her neighbor) stepping on her teat(s) is the most common cause of teat trauma. Secondarily the practitioner will see a rise in Corynebacteria spp., Staph or Strep dysgalactia mastitis. There can be a disproportionate increase in clinical trauma cases due to poor stall construction or bedding. It is important to note that there is a difference between general teat trauma and teat end trauma. Though most trauma is teat end related, general teat trauma usually reflects either a crushing or tearing type wound.

The stepping on of teat tissue is more common in stall barns. Many times the source of the damage is unknown. The healing of traumatized teat tissue is complicated by two tissue characteristics: constant movement and an abundance of elastic connective tissue. Both of these factors can slow the healing process.

Milking teats with these painful lesions can be a challenge. Pain reduces the process of milk let down and these lesions are easily populated with bacteria leading to clinical mastitis. Emphasis on mammary hygiene must be paramount to the healing process. The healing and prognostic capability depends on the period of time prior to trauma discovery/treatment and the severity of the teat or mammary trauma itself. In a milking cow, we are unable to adhere to the principle of “tissue at rest heals best.”
Examples:

- **Good Prognosis**: Superficial lacerations (those lacerations through the skin or the skin and the stroma) of fresh occurrence < 12 hours duration. These lesions should have limited damage to the vascular supply. Closure is generally essential to the success of these lesions if indicated. The occasional lesion can have the tissue flap trimmed away and healing will occur by secondary apposition.

- **Guarded Prognosis**: Superficial or deep lacerations extending into the teat cistern; suture patterns are the key to success. Draining fistulas are a common sequella to suture herniation. Treatments usually require protective bandaging; teat cannulas to remove milk/reduce wound pressure and intramammary/systemic antibiotic therapy. The ability to “rest” the tissue to allow healing is fundamental to success.

- **Poor Prognosis**: Lesions heavily contaminated, > 36 hours duration. Suturing is probably not indicated. However, cleaning with a mild disinfectant and debridement is essential.

Housing factors and cow space are both important factors in teat and mammary trauma. Pastured cattle are less likely to receive claw trauma than confined cattle but more commonly receive barbed wire cuts. Cow and mammary conformation also plays an important role. Some dairies routinely amputate the medial or inside dewclaw to minimize tissue trauma. However in my hands there seems to be no change in the number of new cases.

II. Teat and Udder Lesions of Dairy Cattle

A. Mechanical Trauma
   1. Claw trauma “treads”
   2. Barbed wire
   3. Sharp projections/metal roofing
   4. Mud and rocky debris
   5. Shrubs/branches
   6. Slipping on unstable surfaces

B. Photosensitivity/Sunburn
   1. Sun damaged teats with secondary blisters
   2. Lateral contact surfaces
   3. Photodynamic agents
C. Chemical Irritants
   1. Corrosive agents
   2. Disinfectants/cleaners used at an improper strength/dilution
   3. Contact dermatitis

D. Environmental Freezing/Frost Bite
   - Acute damage
   - Chronic damage
   - Insect induced teat lesions
   - Wet teats going out into the cold wind

E. Excessive Post-Parturient Edema

F. Anatomical breakdown of mammary support apparatus
   - Medial laminae
   - Lateral laminae

G. Chemical injuries
   - Lime and other disinfecting agents on bedding areas
   - Defective teat dip especially prevalent with iodophor based teat dips
   - Improper dilution of teat preparations
   - Hypochlorite teat dips
   - Dodecyl benzene sulfonic acid
   - Chlorhexidine base dips
   - Quaternary ammonium dips

Generally if this is a herd problem as much as 40-50% of the treated teats in the herd will show clinical symptoms of teat tissue discoloration. Iodophors are commonly a problem when they have been frozen and then allowed to rethaw. This can occur either at the dairy or in transit. The solution upon rethawing will separate with the active ingredients rising to the top of the solution and the emollients resting on the bottom layers. The product then acts in an ineffective way causing secondary burns and chronic chapping. The use of undiluted concentrated udder-cleaning agents rather than emollient containing agents can cause severe burns of the mammary and teat tissue. Morbidity can approach 100%. Commonly scabbing and open erosions are noted on the distal teat end.
H. Environmental injuries:

- Teat and mammary chapping associated with lower ambient temperatures and chronic wetness
- Exacerbation of these symptoms is associated with mammary preparation, inappropriate milking techniques, and post-lactation teat cleaning and dipping
- Cracking, chapping, redness and serum exudates are common
- Commonly see secondary mastitis with staph and Strep dysgalactiae, however there is an increased risk from nearly all pathogens
- Insect induced teat lesions; biting flies induce mechanical damage

Freezing and/or frostbite usually induce the teats to become reddened with a secondary scab formation if severe enough. When the scab is removed from the surface, the tissue is usually denuded and the duct will commonly occlude. This will require surgical intervention. If the frostbite was mild many times the tissues ability to self-protect are diminished and focalized secondary tissue destruction occurs. Secondary, dipping will allow a droplet to freeze focally allowing destruction of the teat orifice. In the case of the teat orifice, patency is the key to prognostic success. Dabbing this droplet on days when a wind chill of < 0 degrees Fahrenheit is important and whipping the dip off if turning cows out into the wind can help prevent teat associated chapping and subsequent damage.

I. Milking machine trauma

- Over milking is a very common cause of teat trauma
- Improper automatic take-off settings
- Twisted liners in the shell
- Malfunctioning milk equipment
- Acute and chronic problems occur
- Circulatory problems are very common, edema, purple hemorrhage
- Proper pulsation setting is extremely essential
- Excessive vacuum; we currently recommend 12.5 " Hg for the target average claw vacuum at peak milk flow.
- Too low of vacuum causing liner slips, kicking, self trauma
- Poor or careless milking technique:
  - Poor let down = higher teat end vacuum = more teat end damage
  - Common to see eccymotic hemorrhage and/or teat duct tissue prolapse
J. Breakdown or loss of mammary support apparatus:
- Medial laminae breakdown
- Lateral laminae breakdown
- Predispose to udder edema, teat and udder injuries with concomitant mastitis
- Teat trauma occurring due to self inflicted damage of teats from claws and dewclaws or neighboring cow trauma
- Increased contact with floor, mud, rocks and the environment
- Prompt treatment of udder edema is essential; genetic selection away from poor udder conformation

III. TRAUMATIC LESIONS

A. Hematoma Formation

Hematomas are commonly self-induced from the mechanical process of rising and lying down, fighting and head butting. Also the rupture of the perineal vein during the dry period can lead to extensive blood loss and subsequent hematoma formation. Laceration of the milk vein (subcutaneous abdominal vein) can lead to severe hemorrhage and acute death. These lesions are usually seen in dry cows in the escutcheon region (area below vagina and above the mammary) and in lactating cows they are common cranial to the udder. **Mammary hematomas should be considered a medical emergency!** They will progressively enlarge with acute anemia. Mammary hematomas are commonly confused with seromas and abscesses but lack the heat generation evident with abscesses. Mortality can occur over a time period of 2-7 days. Ultrasound examination would be indicated initially. If at all possible avoid tapping the swelling with a needle or cannula. Two common sequella can occur: introduction of infection and secondary pressure changes may induce severe bleeding.

Treatment:

- Pressure wraps where possible; tissue support is essential
- Confined rest for 1-3 weeks
- CBC and PCV monitoring/ coagulation panels
- Transfusion when PCV is below 14%, the heart rate is > 100, the respiratory rate is
  - 60 breaths per minute
- Udder incision is contraindicated
- Transfusion should be with donor blood negative to BLV and BVD-PI for the lacerated milk vein simple clamping followed by suturing with an absorbable suture material should be adequate.
B. Abscess Formation

Abscess formation is common in mammary tissue or adjacent to the glandular tissue. The common pathogenic organisms are Actinomyces pyogenes and Staphylococcus spp. Milk samples are normally unremarkable. Abscesses are commonly found in both parenchymal and glandular tissue. The tissue is usually painful upon palpation and heat is common noted. Diagnosis is via ultrasound guided fine needle aspirate.

Treatment:
- Conservative treatment is best; natural drainage
- Common sequella of chronic abscesses is chronic antigenic stimuli with secondary glomerulonephritis and bacteremia
- Drainage is indicated
- Mild disinfectants are helpful

C. Teat Spiders

These are caused by the formation of small masses from a combination of milk fat, minerals and tissue sloughed during the dry period. These can block the streak canal. Generally they are removed or broken down with alligator forceps.

D. Black Spot or Black Scab

This lesion is a hyperkeratosis of the teat end. If removal of this tissue occurs, tissue necrosis and fibrotic thickening can occur. This can lead to teat stenosis.

- Faulty milk machine function
- Faulty pulsation
- Poor liner size (too short)
- Over milking
- Excessive vacuum level
- Eversions and vegetative growths can occur

In the early stages of these lesions, there appears to be good healing with the use of antibiotic-corticosteroid administration topically.
E. Teat Injuries

Teat injuries most commonly occur to the papillary duct/streak canal and the sphincter muscles. The most common site of trauma and injury is the teat end itself.

Acute versus chronic lesions:

- Acute symptoms are edema, pain, ecchymotic hemorrhage, inflammation, heat, and poor milk letdown. Common acute lesions would include: streak canal epithelial layer tissue, keratin layer partially everted or inverted, tissue laceration, torn or crushed stroma and mucosa. Pain is common.

- Chronic lesions to the udder and/or teat commonly form fibrosis and granulation tissue. Chronic ulceration is common in some herds secondary to poor milking technique or chemical irritants. Pain is common.

- Subclinical lesions can be seen with poor milking machine function including: increased milking machine vacuum, over milking, under milking, defective milk liners, liner slip and abusive technique.

F. Fistula Formation

- Can be acquired or congenital
- Lacerations or ineffective surgical closure of laceration, full thickness punctures
- Wounds must enter the lumen of the teat cistern
- Chronic mastitis can occur with chronic milk leakage; bacterial populations are easily stimulated in the fistulated environment
- With proximal fistulas commonly the milk machine will not completely evacuate the quarter leading to persistent mastitis
- Chronic traumatic fistulas are commonly circumscribed with fibrotic tissue
- Distal fistulas are hard to repair
- Diagnosis with ultrasound or infusion with new methylene blue stain

Treatment

- Anesthetically block the teat
- Full elliptical incision along the wound margin
- Debride necrotic, purulent and fibrous tissue
- Close in two to three layers as with a teat laceration
- If cow is lactating an indwelling teat cannula is essential to prevent pressure breakdown of the wound suture site; these should be checked daily and changed every 2-3 days
- If possible wait on the repair until the dry period, this allows an adequate healing period

G. Laceration/Punctures and degloving
- Common self trauma, neighbor cow, abrasion with secondary puncture, barbed wire or sharp objects
- Prognosis depends on severity of laceration, tissue necrosis, duration of time to repair, placement of lesion

H. Laceration Type
- Skin only
- Skin and stroma layers
- Skin, stroma and mucosa
- Circumferential
- Vertical
- Horizontal

**Full thickness lacerations and punctures should be treated as a medical emergency!**
- Untreated or poorly treated punctures and lacerations lead to fistula patency
- Mastitis should always be expected from these lesions
- Degloving injuries commonly damage skin or skin and stroma layers usually of the distal teat end
- Teat flap is a normal sequella to partial degloving
- Swelling and pain are common adjunctive to teat lacerations and degloving
- Vertical lacerations consistently have a better prognosis than circumferential or horizontal lacerations
- Treatment options should always include antibiotic treatment, intramammary cannula and pain control
References:


