

Surgical Diseases and Techniques of the Digit

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KEYWORDS

- Surgery • Cattle • Digit • Lameness • Resection
- Amputation • Septic arthritis

Claw diseases in cattle are common under field conditions. Sole ulcer, sole abscess, foot-rot, digital dermatitis, and interdigital dermatitis are frequently diagnosed and treated by owners, foot trimmers, and veterinarians. Surgical digital diseases include vertical cracks, septic arthritis of the distal and proximal interphalangeal joints, tenosynovitis and flexor tendon necrosis, pedal osteomyelitis, interdigital hyperplasia, phalangeal luxation, distal phalanx fracture, and degenerative joint diseases of the coffin joint. Most digital surgical conditions are manageable in field conditions. However, some postoperative care is more demanding and, therefore, prevents some veterinarians from performing such techniques in field conditions. Even if most techniques are easy to perform, nevertheless surgical decision making, perioperative treatment, and pain management are more challenging than the technique itself. Knowledge and understanding of the digital anatomy is essential before performing surgeries. Readers are referred to anatomy textbooks and other book chapters for more information on this topic.¹⁻³

RESTRAIN, ANESTHESIA, AND PREPARATION

Most of the following procedures can be performed with the animal standing in a trimming chute. However, if the dorsal aspect of the foot has to be dissected, then this procedure would be easier to perform with the animal in lateral recumbency. Diseases and surgical interventions of the foot are painful. Adequate analgesia and anesthesia

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are essential for patient comfort and surgeon comfort, as well as for improving surgical manipulations. Anesthetic procedures frequently used for foot surgery are intravenous lidocaine under tourniquet and the 4-point digital block.

Surgical instruments needed for digit surgery are basic. Specific instruments to debride infected joints or to perform joint amputation will be pointed out for the different procedures discussed. However, it is important to mention that orthopedic-grade surgical instruments are not necessary in field conditions.

If necessary, a block can be glued to the sound claw with polymethylmethacrylate (PMMA) before extensive debridement and the surgical preparation. Surgical preparation should be performed as with any other surgery, being sure to clean the interdigital cleft. The nonaffected digit can be covered with a latex glove if the dirt is difficult to remove, or if it is necessary to cover a wooden block. While the animal is standing in a trimming chute, a large plastic bag can be attached on each side of the back of the chute to avoid urination and defecation on the surgical site.

DISTAL INTERPHALANGEAL JOINT INFECTION

Sepsis of the distal interphalangeal (DIP) joint is caused mainly by extension of sole diseases, such as sole abscesses and white-line disease. A penetrating foreign body in the interdigital space or foot-rot is also often implicated in sepsis of the DIP joint. In dairy cattle, the origin of DIP sepsis is most likely sole ulcers, while in beef cattle the cause is often unknown. The distal sesamoid bone and its bursa, the tendinous portion of the deep digital flexor (DDF) muscle, the tendon sheath of the DDF muscle, and the superficial digital flexor muscles are in close relationship and solar infection can rapidly spread to these structures. The history of affected cattle is often typical: they have history of chronic lameness being treated unsuccessfully for foot-rot or sole ulcer. Severity of the lameness is quite variable, depending of the extent of infection and the chronicity of the disease.

The hallmarks of DIP infection are a swollen and painful coronary band with a draining tract, either at the proximal aspect of the coronary band or under the sole (**Fig. 1**). A swollen heel suggests infection of the distal sesamoid bone and its bursa and the digital cushion pad, and a fistula tract may be present at the heel skin junction (**Fig. 2**). Cattle with deep sepsis of the digit show sign of pain when the heel is palpated or the digit is extended. The tendinous portion of the DDF tendon might rupture if the necrotic process is severe, and the digit affected will tilt upward (**Fig. 3**).



Fig. 1. Holstein adult cow suffering of a chronic infected sole ulcer. The coronary band and the heel are swollen.



Fig. 2. Holstein adult cow with a swollen heel and an enlarged pastern.

Radiographic evaluation of the DIP joint is helpful to determine the extent and duration of the process. Usually the lesions are not subtle because of the chronicity of the infection. Radiographic views of a DIP joint with chronic septic arthritis show an increased joint space because of subchondral bone lysis (Fig. 4). Distal and proximal periosteal proliferation is present. The distal sesamoid bone may show lysis of its articular surface or may be destroyed completely. The proximal interphalangeal (PIP) joint might also be involved in the process. If a fistula tract is present, communication with the DIP joint is confirmed with the insertion of a sterile probe into the tract. Recently, ultrasonography was investigated as a diagnostic method for DIP joint sepsis. When compared with the partner sound claw, the dorsal pouch of the infected DIP joint was larger. With a linear probe applied longitudinally on the dorsal aspect of the digit, it was determined that the infected joint had a dorsal pouch greater than 6 mm.⁴

Acute septic arthritis of the DIP joint is rare but possible. Athrocentesis is indicated, and synovial fluid may be submitted for cytologic examination and bacterial culture. Treatment consists of systemic and local antibiotics and thorough joint lavage with



Fig. 3. Adult Charolais bull presented for chronic lameness of the left hind limb. The lateral digit of the left foot is tilted upward, indicating a rupture of the deep flexor tendon. The bull was diagnosed with sepsis of the DIP joint.



Fig. 4. Radiographic image of a distal right foot. This dorsoplantar view shows swelling of the lateral digit (*white arrow*) and subchondral bone lysis of the distal interphalangeal joint.

14-gauge, 5-cm needles inserted dorsoproximal to the coronary band, axial or abaxial to the tendinous portion of the extensor muscle, and with an angle of 60° to the coronary band. Lavage of the joint is performed until the synovial fluid is clear and without fibrin clots. Arthrotomy should be considered if fibrin is abundant and lavage difficult.

Chronic presentation of septic arthritis of the DIP joint is a more common situation. Conservative treatment with systemic antibiotics and a wooden block on the sound claw is often ineffective. Surgery is the treatment of choice to provide debridement and drainage of the DIP joint. The two surgical options are digit amputation and joint resection.

DIGIT AMPUTATION

Digit amputation has been used successfully to treat pedal osteitis, luxation or fracture of the distal phalanx, deep sepsis of the digit, and septic arthritis of the DIP or PIP joint. The advantages are that it is a rapid and inexpensive procedure, all the infected tissues are resected, and cattle usually return rapidly to their previous level of production.⁵⁻⁷ The disadvantages are that the expected production life might be reduced, heavy animals are reported to do poorly, and the cosmetic result is poor. The production life of cattle that have a digit amputated depends on which digit was removed, the weight of the animal, and the type of housing. Production longevity of cattle after digit amputation ranges between 10 and 27 months.^{6,8,9} Cattle weighing more than 680 kg that have a digit amputated will have a short production life.⁶ Recently, Starke showed that no significant difference was found in survival time between digit amputation (27.2 months) and joint resection (21.2 months) in bulls.⁹ However, the survival time in dairy cattle affected by DIP joint sepsis and treated by amputation was 13.5 months, compared with 10.9 months for the joint resection group, but the results were not statistically significant.¹⁰ Bicalho and colleagues compared amputation and arthrodesis of the DIP joint in a control study on lactating cows.¹¹ The failure rate—defined as culled in less than 60 days of milking after the surgery—was 44.9%, compared with 0% for the arthrodesis group. Yield milk production

was higher for cattle that underwent arthrodesis, compared with the amputation group. They concluded that arthrodesis should be favored.

The site of amputation should be chosen based on the extent of the infection. Digit amputation through the distal aspect of the proximal phalanx is the most common technique. It is a rapid and simple procedure and usually provides a wide resection and effective drainage of the affected digit and the flexor tendon sheath. The wound is further away from the ground, compared with a low amputation preventing ulceration. However, a low amputation will provide more digital stability because the interdigital cruciate ligament is preserved. Desarticulation or amputation through the joint is an easy technique to do in field situation.¹¹ If the cartilage of the phalanx is left intact after disarticulation, coverage by granulation tissue might be delayed and cyst-like lesions might form as well.¹²

The distal limb is prepared surgically and intravenous regional anesthesia is administered. The interdigital skin is incised to the level of the PIP joint or the very distal aspect of the proximal phalanx axially. A gigli wire is inserted in the interdigital space with an angle of 45° to the proximal digit abaxially (**Fig. 5**). An assistant can hold the digit to provide more stability when the cut is performed. The cut should go through the distal portion of the proximal phalanx. The interdigital fat and all remaining necrotic tissues are removed. Digital vessels are ligatured with absorbable suture as needed. The wound is lavaged and dried. A semioclusive layer is applied on the distal portion of the proximal phalanx, multiple layers of gauze are put over it and it is then wrapped with adhesive bandage. The bandage is changed 24 hours after the surgery and then changed again every 4 to 5 days, as needed. Ideally, bandages are continued until the surface of the bone is covered with granulation tissue. A broad spectrum, systemic antibiotic is administered for 5 to 10 days after the surgery. It should be remembered that antibiotics will never replace good surgical principals and adequate postoperative hygiene. Bulls can return to breeding 3 to 4 months after the surgery.

A skin flap could be preserved to cover the stump by continuing the interdigital incision distal and abaxial at the palmar and dorsal aspect of the digit and along the proximal aspect of the coronary band.¹² Although this technique provides a superior



Fig. 5. An amputation through the proximal phalanx is performed with the animal on lateral recumbency. The gigli wire is at 45° and crossed to allow a better cut.

cosmetic result and decreases subsequent care of the stump, it may prevent adequate drainage and extension of the infection. This technique is recommended for a nonseptic process of the digit (pedal fracture, digit luxation) or distal sepsis without extensive soft tissue infection (pedal osteitis). If a skin flap is elected in the presence of infection, the distal portion of the incision should be left opened for drainage (**Fig. 6**).

RESECTION OF THE DIP JOINT

The techniques for resection of the DIP joint differ by surgical approach. Choice of a technique should be based on the anatomic structure infected and the location of existing draining tracts. Intact ligaments and tendons should be preserved, when possible, to keep the affected digit stable during the ankylosis process. However, if necrotic tendinitis and tendon sheath septis are present, then extensive surgical exposure might be necessary to debride and control the infection of the foot. Inadequate examination and diagnosis will either delay healing or the animal will not respond to treatment. The advantages and disadvantages of resection of the DIP joint compared with digit amputation are that cattle have discussed in the digit amputation.

Resection of the DIP Joint: Solar Approach

The purpose of the resection is to provide drainage, debriding the necrotizing tissue, and removing the articular cartilage favoring ankylosis. The surgery is performed under sedation and intravenous regional anesthesia or regional nerve block. Cattle are restrained in a foot-trimming chute or in lateral recumbency with the affected leg uppermost. The plantar or palmar portion of the sole and the heel should be pared away until the sole can be indented easily. In severe and extensive infection of the DIP joint originating from a solar lesion, the distal sesamoid bone and the joint can be felt through the wound and the sole already can be indented easily. The distal limb is

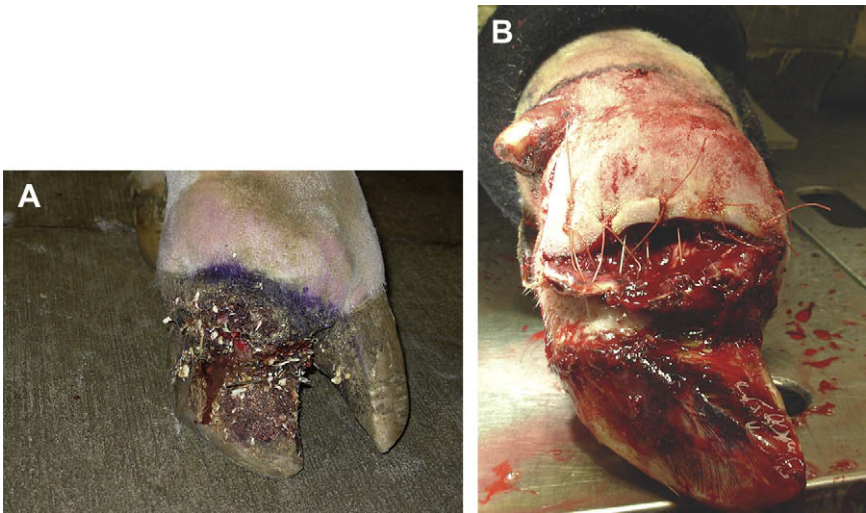


Fig. 6. (A) Animal presented with a severe chronic laceration of the lateral digit. The laceration was infected and communicating with the DIP joint. (B) The digit was amputated and a flap of skin re-covered the proximal digit but the distal portion of the incision was left open for drainage.

prepared surgically. An elliptical incision is made around the necrotic area at the sole and heel junction. The width of the incision should be close to the axial and abaxial white line. The proximal portion of the elliptical incision is joined just before crossing the coronary band, avoiding cutting a wedge of it. Depending of the extent of infection, the elliptical incision is extended proximally as far as needed. The incision can be extended proximal to the accessory digit by making the incision on the axial side of the accessory digits.^{3,12,13} The tendinous portion of DDF muscle is cut from its insertion on the distal phalanx and resected proximally up to 2 cm to 3 cm or more if necrotic. The distal sesamoid bone is then exposed. If the sesamoid bone is necrotic, it can be easily removed with a rongeur. If not, the two collateral ligaments and the distal ligaments are resected with a scalpel blade. The DIP joint should be exposed at this point (**Fig. 7**). All necrotic tissue should be removed to speed up healing. Debridement of the joint from the solar wound can be performed with a curette, a hoof knife, or with a 5-mm to 13-mm drill bit. The drill exits through the dorsal wall, 1-cm distal to the coronary band (**Fig. 8**). Some authors prefer to exit proximal to the coronary band.¹⁴ Wherever the drill bit exits, the coronary band must be avoided to prevent compromising future horn production. Even after the joint is drilled, necrotic tissue might still be present, so it has to be curetted thoroughly. Copious lavage is performed with isotonic solution. If the tendon sheath or the tendinous portion of the superficial digital flexor muscle is infected and necrotic, the incision can be extended 2 cm to 3 cm proximally to the accessory digit, allowing debridement and drainage (**Fig. 9**).

A wooden block is glued with PMMA on the healthy digit of the affected limb. The wound is bandaged and lavage is performed every other day, if possible. It is the authors' opinion that the infected digit should not be wired to the parent digit for immobilization purposes. By attaching the digits, the infected digit will be constantly moving, increasing the pain because of the movement and delaying the ankylosis process. Systemic antibiotics are given for 10 to 14 days, depending on adjacent soft tissue infection. Nonsteroidal anti-inflammatory drugs are given as needed for the first few days postoperatively.

Kostlin and Nuss¹⁵ has reported a success rate of 85% for 281 cattle with this technique. This technique provides good visualization of the DIP joint, excellent drainage, and a good long-term prognosis. Variations of the solar approach are described in the literature. Some techniques are more invasive, with deep dissection of the plantar or

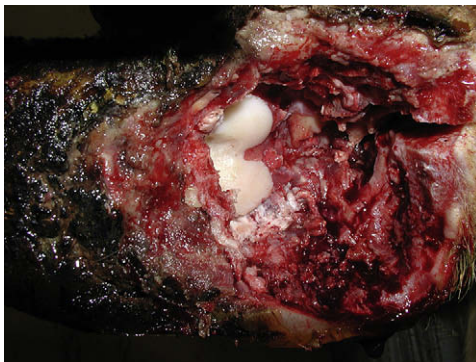


Fig. 7. Solar view of a digit undergoing DIP joint resection. The distal sesamoid bone was resected exposing the DIP joint. The plantar aspect of the distal condyles of the middle phalanx are seen through the wound.



Fig. 8. Resection was performed by solar approach. A hole from the exit site of the drill bit is seen on the dorsal wall just distal to the coronary band.

palmar aspect of the digit, while other techniques consist only of providing drainage of the joint by drilling a hole through the joint. The extent of the infection should determine the technique to be used.

Resection of the DIP Joint: Bulbar Approach

This variation has been reported by Greenough.⁵ The bulbar approach consists of a horizontal incision around the circumference of the heel 1-cm distal to the skin horn junction. A wedge of hypodermic tissue and tendon is resected, providing visualization of the distal sesamoid bone. The sesamoid bone is resected, as described before, and the digit is extended to provide a good visualization of the DIP joint (**Fig. 10**). After debridement and lavage of the joint, the incision can be sutured and bandaged. A wooden block is applied with PMMA on the healthy digit of the affected limb. This technique provides better visualization of the DIP joint without invading the tendon sheath when it is not necessary. Recently, Bicalho and colleagues described a modification of the technique where the incision is proximal to the coronary band.¹⁶ If the deep digital flexor tendon is necrotic and the tendon sheath infected, then a second incision is made over the tendon through the tendon sheath, proximally to the accessory digits. First, the distal portion of the deep digital flexor tendon is pushed



Fig. 9. Plantar view of a foot that underwent DIP joint resection and extensive tendon resection. This picture was taken 3 weeks postoperatively.



Fig. 10. Palmar approach of the DIP joint. Resection was performed to treat degenerative joint disease of the DIP joint on a 6-month-old Holstein heifer. In that particular case, the incision was made proximal to the coronary band. The tendon of the deep digital flexor tendon is about to be cut to get access to the DIP joint.

proximally in to the tendon sheath, then it is grabbed and pulled by the proximal incision. After joint resection, a drain could be passed through the incisions and attached on the abaxial aspect of the digit and the proximal incision is sutured (**Fig. 11**). Affected cattle were very lame for 2 weeks, but were sound within five months.¹⁶

The authors have been using the bulbar approach for resection of the DIP joint in nonseptic processes (degenerative joint disease of the DIP joint and laceration), avoiding disruption of the intact solar surface and decreasing chance of infection.¹⁴

RESECTION OF THE DIP BY ABAXIAL APPROACH

In this technique, an orthopedic drill with a 6-mm to 12-mm drill bit is used to create a tunnel through the abaxial hoof wall at the level of the DIP joint. The drill is passed through the DIP joint and exited through the dorsoaxial interdigital space distal to the coronary band.¹⁷ The entry site for the drill bit is estimated as the intersection of two imaginary lines, one drawn parallel to the coronary band approximately one-third the distance from the coronary band to the sole and the other line drawn perpendicular



Fig. 11. A fenestrated plastic tubing was inserted through the entry holes made by the drill bit.

to the coronary band, approximately half of the distance from the heel bulb to the dorsal hoof wall. This approach is easy to perform, but the exit site of the drill bit is difficult to control, especially if the animal is not well restrained. Debridement of the cartilage and necrotic bone also is difficult to assess. The defect in the hoof wall remains open to facilitate drainage, thus the hoof wall is weakened by this technique. The authors have not observed specific hoof wall complications of this technique, but cattle should be confined to a small area with excellent footing during the early stages of healing.

Recently, Zulauf and colleagues¹⁸ proposed an alternative to this method. They performed a precise abaxial hoof wall excision using a fine rotating burr. A hoof wall segment measuring approximately 15 mm by 40 mm was removed and the proximal margin of the defect was approximately 1-cm distal to the coronary band. This technique provides a relatively large, rectangular hoof wall defect through which to access the DIP joint. Although access to the joint is superior to the previously described technique, the defect size is substantial.

PROXIMAL INTERPHALANGEAL JOINT INFECTION

Septic arthritis of the PIP joint is secondary to a direct trauma, adjacent infection, or systemic infection in young animals (**Fig. 12**).¹⁹ Affected animals are very lame and a fistula tract with necrotic tissue is often observed at the abaxial aspect of the pastern joint away from the coronary band. Diagnosis is based on physical examination, probing the lesion, or radiographic imaging of the digit. This condition should be treated surgically with extensive debridement of the joint or amputation.

Choice of surgical technique is based on the extent of the infection. If infection is limited to the PIP joint, resection of the joint should be favored. However, if the flexor tendon sheath and DIP joint are also infected, then high amputation has to be considered. Abaxial existing wound or draining tract is used to access the joint. Arthrotomies should always be performed on the abaxial or dorsal aspect to avoid tendons and major blood vessels (**Fig. 13**). The joint is easily debrided with a curette until hard bone can be felt. The joint is lavaged as needed for a few days and the wound protected from environmental contamination until the arthrotomy sites are filled with sound granulation tissues (**Fig. 14**). The prognosis is considered good.¹⁹



Fig. 12. PIP joint sepsis. A draining tract is observed on the abaxial aspect of the lateral digit at the pastern level. The digit is swollen.



Fig. 13. This adult cow was suffering from PIP joint sepsis. Joint resection is performed with an abaxial approach.

PEDAL OSTEOMYELITIS

Pedal osteomyelitis is defined as a septic process of the distal phalanx. The infection originates from a solar trauma (such as puncture wound or severe abrasion at the toe) extension of an existing infection around the distal phalanx. The incidence could be high in feedlot cattle on a concrete floor. Cattle recently placed in a feedlot will fight around a feed bunk and their hind digits will slip on the concrete floor, causing severe abrasion at the toe region and secondary infection. Over-trimming with a grinding disc is also a cause of apical necrosis, as described by Kofler (**Fig. 15**).²⁰

A preoperative radiograph is helpful to evaluate the extent of the infection. The DIP joint and the flexor tendon sheath should be examined. The surgical approach is based on the adjacent structure involved. The sole, infected corium and the distal phalanx are debrided with a curette and rongeur until sound hard bone is felt. A detached claw wall from the corium should not be left in place and subtotal resection is often necessary to provide better healing and improve walking (**Fig. 16**). Hoof nippers can



Fig. 14. Radiographic view of a foot (dorsoplantar view). The animal was treated surgically for a PIP sepsis 1 year ago. The PIP joint of the medial digit is ankylosed. Although a joint space can still be seen, the joint was immobile and the animal perfectly sound.



Fig. 15. Severe apical necrosis of both digit of a hind limb. Subtotal resection of the claws have to be performed to control the osteomyelitis of the distal phalanx.

be used to cut the affected apical portion of the claw.³ Lavage is performed and the wound is bandaged. A wooden block is applied on the healthy digit of the affected limb. Bandaging and lavage should be continued until the infection is controlled and granulation tissue covers the distal phalanx.

The DIP joint can become infected by bacterial translocation. The infected joint can be either resected or amputated. The approach for joint resection might differ, depending of the location of the pedal lesion.

INTERDIGITAL HYPERPLASIA

Interdigital hyperplasia is a proliferative reaction of the interdigital skin. Excessive outward spreading of the digits, secondary to an underdeveloped ligamentous structure, overstretches the interdigital skin and causes hyperplasia.²¹ Interdigital hyperplasia may be hereditary in Hereford and Fresian breeds. Males are more often affected than females.²² Interdigital necrobacillosis and interdigital and digital dermatitis



Fig. 16. This heifer was treated for severe pedal osteomyelitis. Two-thirds of the distal phalanx were resected. A wooden block was unnecessary because the affected digit was already elevated.

have been implicated in the etiology of interdigital hyperplasia.²³ Recently, Holzhauer and colleagues²⁴ reported the evolution of digital dermatitis lesions in an endemically affected dairy herd. Digital dermatitis lesions were present in all cows diagnosed with interdigital hyperplasia.

Cattle affected with interdigital hyperplasia may be moderately to severely lame. The lesion is malodorous if associated with digital dermatitis or if secondary infection is present. The proliferative mass is hairless, ulcerated secondary to pressure trauma, and foreign materials may be present between the mass and the axial border of the digits. The protruding growth itself is not painful; however, the animal will react to successive flexion, abduction, and extension of the digits. The hyperplasia is typically present at the dorsal aspect of the interdigital space along the coronary band (**Fig. 17**). In some animals the lesion is off to the coronary band. In the authors' experience, these lesions are less troublesome than the axially centered overgrowth. Often adjacent, even emerging from the axial coronary band, their anatomic situation preclude resection because of possible invasion of the DIP joint. The hind limbs are affected most often, and the lesions can be found on one limb or all four limbs. Although heritability of this disease is controversial, young bulls affected with interdigital hyperplasia should be carefully examined to find the cause.

En bloc resection of the growth can be performed easily in a field situation. Surgery is better performed with the animal on lateral recumbency because of easier access to the dorsal aspect of the interdigital cleft where the mass is larger. Anesthesia is achieved either by 4-point digital block, intravenous lidocaine under tourniquet, or simply interdigital infiltration of lidocaine. If the interdigital injection is favored, the needle should be inserted proximal and dorsal to the mass. If en bloc resection is chosen, an Allis or LaHey tissue forcep is used to hold the corn (**Fig. 18**). A wedge-shaped excision is made on each side of the mass through the interdigital skin. All hyperplastic tissues should be removed because of possible recurrence. If full thickness is achieved, the interdigital fat will protrude from the incision. The interdigital fat should be removed to avoid its interposition between the skin edges and delay healing. Hemorrhage is controlled and a bandage is applied. The toes are wired together by drilling two holes through the hoof wall at the point of the toes to facilitate healing. The bandage is left in place for 5 days and the animal is kept in a small clean stall. If infection is present, broad-spectrum systemic antibiotics should be administered for a period of 3 to 5 days peri-operatively. The bandage can be removed after 5 days, and then another bandage is applied and left in place for 5 days, if necessary.



Fig. 17. Interdigital hyperplasia of the right hind foot. The growth is protruding dorsally.



Fig. 18. The hyperplasia is grasp with a LaHey forceps to help the dissection. The interdigital fat can be seen underneath the growth.

VERTICAL FISSURES

Vertical fissures or sandcracks are linear and longitudinal defects of the dorsal claw wall. It is more common in beef breeds, with a prevalence up to 28%.^{25,26} The front lateral digits are more commonly affected. The etiology of the fissures is unknown, although it is more common in older cattle. Fracture toughness and percentage of dehydration of the horn do not seem to affect vertical fissure formation.^{27,28} The width of the fissure gradually increases as the animal get older, if not treated.²⁶

In some cattle, the corion is exposed through the fissure, making the animal lame. When clinical signs are associated fissures, surgical debridement is advised. This can be done with the curve of a hoof knife or a motorized burr. Debridement should be done with care so as not to further traumatize the sensitive laminae. A 1-cm bar or triangle (1 cm at the base) may be used to make grooves at the end of the crack to redistribute the force and prevent further extension of the crack. Suture of the crack with wire also prevents the extension of the crack and decreases the pain engendered by movement of the wall on the sensitive laminae (**Fig. 19**). Holes are drilled 0.5-cm to 1-cm apart along the crack and an interrupted suture with wire or umbilical tape can be used. If the dermis is not infected, PMMA can be applied to fill the defect and the sutures are tied subsequently. In some cases, wire cannot be thread through the



Fig. 19. After debridement of the vertical crack, wires are placed, the defect is filled with PMMA, and before it sets the wires are tightened.

damage hoof wall. Then, PMMA alone can be applied. If sensitive laminae are exposed or infection is present, PMMA application should be delayed until infection is controlled and the exposed laminae are covered with keratinized tissue. In severe cases, a wooden block should be applied on the healthy digit and the animal allowed to rest in a stall. The prognosis is good to excellent if the sensitive laminae are not infected. Supplemental dietary biotin was studied in a clinical trial on Hereford beef cows. Biotin (10 mg per head per day) in a free choice mineral supplement decreases the prevalence of vertical fissure of 50% over an 18-month period.²⁹

SUMMARY

With a good knowledge of the anatomy of the foot and basic surgical instruments, digit surgery can be performed in a field situation. Sepsis of the DIP and PIP joint should be treated surgically because conservative treatment is often ineffective. Most of the diseases described in this article are chronic, and the animal has often been suffering for a while. Perioperative analgesia is very important to alleviate the pain of such animals. All procedures should be performed under local or regional anesthesia.

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