Modified abaxial approach for resection of the distal sesamoid (navicular) bone and distal interphalangeal joint of cattle while preserving the digital flexor tendons

Sarel R van Amstel BVSc, DipMedVet, MMedVet, DACVIM, Ricardo Videla DVM, MS, DACVIM, David E Anderson DVM, MS, DACVS.

Department of Large Animal Clinical Studies, College of Veterinary Medicine, The University of Tennessee, 2407 River drive, Knoxville, TN 37996, USA

E-mail address: svanamst@utk.edu

Phone: 865-7558245

KEYWORDS

Septic distal interphalangeal (DIP) joint; navicular bone; joint resection; navicular bone resection.

KEY POINTS

- Modification of reported abaxial approaches
- Approach facilitates both resection of the navicular bone and DIP joint
- Allows better access and visualization of articular surfaces
- Removal of the navicular bone which is often involved in the septic process
- Preservation of the digital flexor tendons
- Prevents hyperextension of the toe
- Should not be used in presence of confirmed septic tenosynovitis

INTRODUCTION

Facilitated ankylosis through surgical resection of the distal interphalangeal (DIP) joint in cases of septic inflammation is the preferred method of treatment in cases intended for long-term retention in a herd for production purposes. \(^1\), \(^2\), \(^3\), \(^4\). Reported methods for resection of the DIP joint include proximal, solar, bulbar and abaxial approaches \(^5\), \(^6\), \(^7\), \(^8\). The proximal approach is used when pathological changes are limited to the DIP joint without involvement of the digital flexor tendons or tendon sheath and as such prevents hyperextension of the toe, which is a common complication with the solar and bulbar approaches. The solar and bulbar approaches are primarily indicated in the presence of a septic tenosynovitis as they provide access to both the superficial and deep flexor tendons as well as the navicular bone after removal of which access is also gained to the DIP joint \(^5\), \(^6\). The major disadvantage of both the solar and bulbar approach is permanent hyperextension of the toe with displacement of the weight-bearing surface more towards the heel \(^6\). Disruption of the bulbar and solar tissues and structures is unnecessary in cattle where the infection is limited to the DIP joint and navicular bone. The proximal and abaxial approaches provide access to the DIP joint without compromise of the flexor tendons or tendon sheaths thus preventing hyperextension of the toe \(^7\). Two methods
to gain access to the DIP joint via the abaxial wall has been reported. However, the main disadvantage of both these approaches through the abaxial wall is that the joint is difficult to assess for debridement and the navicular bone cannot be accessed for resection. A modification of the abaxial approach allowing better access to the joint and navicular bone for the purpose of resection is described here.

This modified abaxial approach is suitable where septic inflammation of the distal interphalangeal joint and navicular bone are caused by lesions entering through the interdigital space such as foot rot or traumatic penetrating lesions of the foot in the area of the coronary band. It is less suitable for lesions of the sole such as sole ulcer, which often results in septic tenosynovitis. Advantages of this approach include good access and visual control for complete resection of both the DIP joint and navicular bone. In addition, it preserves the flexor tendons and tendon sheath without extension of the disease to these structures thus also preventing hyperextension of the toe.

PROCEDURE

The animal is placed in lateral recumbency with the abaxial wall of the affected claw uppermost. After thoroughly cleaning the foot an orthopedic block is placed on the opposite claw in order to alleviate weight bearing on the affected side. Next local regional intravenous anesthesia in conjunction with an antibiotic, is administered below a tourniquet placed just above the dewclaws. An
approximately 2x2-cm window is cut into the abaxial wall of the affected claw 0.5cm cranial to the abaxial groove and immediately below the coronary band until blood is seeping through the full lengths of each of the cuts. This can be done with the aid of a Dremel™ tool with a circular diamond disc and the cuts deepened with a #10 scalpel blade with handle attached until bone is reached. Using a periosteal elevator, the incised section of the wall, corium and subcutaneous tissue are elevated and cut to expose the underlying bone. Alternatively, with the aid of a grinder, the horn of the wall is thinned immediately in front of the abaxial groove and below the coronary band. Next, the DIP joint space is identified by pushing a 16g needle through the thinned wall 0.5cm in front of the abaxial wall and just below the coronary band. Using the needle as a guide a 2x2cm window is cut and the remaining part of the wall, corium and subcutaneous tissue removed to expose the joint space. Using a small periosteal elevator the articulation between the navicular bone and the caudal articular surface of P2 as well as the articular surface of the DIP joint are exposed. In some instances, the window in the abaxial wall has to be enlarged in order to achieve this. Both the proximal suspensory ligament as well as the impar ligament connecting the navicular bone to P3 are transected. Maintaining the integrity of the deep flexor tendon and its insertion to P3 is important thus separation of the caudal and medial attachments of the navicular bone to the retinaculum, as well as the distal cruciate ligament, has to be done with
Once freed, the navicular bone can be removed by grabbing it with a towel clamp and lifting it through the opening while cutting any residual attachments. The cavity is then flushed with 0.9% saline and inspected for any remaining bone fragments. This allows good access and visualization of the caudal articular surface of P2 as well as the articular surface of the DIP joint. Using a 3/8 drill bit, the articular surface of the joint is debrided by moving the drill from side to side. Placement and angle of the drill is facilitated by removal of the navicular bone. Depending on the extent of the chondral and subchondral osteolysis, total resection of the joint may not be required. Where total resection is required the drill should be angled such that it will emerge through the dorsal hoof wall just below the coronary band, axial or abaxial to the extensor process of P3. Using a bone curette, the joint is further debrided in order to remove all remaining chondral and subchondral bone followed by flushing the space with a 0.1% povidone-iodine solution. A Penrose drain is placed to maintain patency and allow drainage. Penicillin-soaked gauze is packed into the cavity and for the purpose of hemostasis the foot was covered with a well-padded tight bandage. Post-operative radiographs are usually not justified because of the extra time necessary to restrain the animal, cost and good visualization and effective resection of the joint.

Post-operatively the cavity is flushed daily for 5-7 days with 0.01% povidone-iodine after regional IV anesthesia with 20ml 2% lidocaine including an antibiotic.
For this purpose lincomycin 1-3mg/kg or potassium penicillin 1million units can be used in conjunction with systemic antibiotics such as oxytetracycline (Vetrimycin™ 100) IV at 10mg/kg bodyweight once a day for 5 days. In addition, flunixin meglumine (Banamine® Merck Animal Health) IV at 2.2 mg/kg is given once a day for 5 days followed by meloxicam (Meloxicam tablets 15mg, Allivet®) at 0.5mg/kg orally once day for 2 weeks. After a week postoperatively granulation tissue will begin to fill the cavity with very little exudate present. At this stage a fiberglass cast (3M Vetcast™ Plus, 7,6 cm) is placed to below the hock incorporating the whole foot, including the orthopedic block. Immobilization promotes healing, helps in pain control and limits the amount of new bone formation 8. The animal is either kept a stall or confined open area for 4-6 weeks. The cast is removed and the block replaced if necessary after 4-6 weeks. However unless there are further complications present lameness should be minimal or absent at this stage. Follow up radiographs should show progressive ankylosis of the joint after 6 weeks and complete ankylosis of the same joint after 2 years done by CT scan after the animal was culled for a different problem..

REFERENCES


