

Québec/2004 Canada



23^e Congrès mondial de buiatrie • Québec, Canada, 11-16 juillet 2004
23 Congreso Mundial de Buiatria • Québec, Canada, 11-16 de Julio 2004

23rd World Buiatrics Congress • Québec, Canada, July 11-16, 2004
23. Welt-Kongress für Buiatrik • Québec, Canada, 11.-16. Juli 2004

Surgery of the bovine digits

Karl Nuss, Dr. med. vet., Dipl ECVS, PD, Department of Food Animals (Prof. U. Braun),
Vetsuisse Faculty, University of Zuerich, Switzerland

Introduction

Lameness has an enormous impact on the welfare, production performance and fertility of dairy cows. The prevalence of lameness can be calculated between 20.6 % and 30.2 % in a lactation (26). Diseases of the foot account for more than 90 % of all cases of lameness. Complicated claw diseases develop when the corium and subcutis barrier is overwhelmed and deeper structures are affected. The clinical diagnosis is confirmed by means of nerve blocks, synoviocentesis, radiography, ultrasonography and, less frequently, computer tomography. Intravenous regional anaesthesia or a proximal nerve block at the proximal part of the metacarpus/metatarsus are used for surgery. Treatment options for deep infections are digital salvage techniques (resections) and removal of the affected digit (amputation).

Resections of the tissue in the bulb area and of the distal interphalangeal joint

Infections in the retro-articular area, in many cases originating from an ulcer of the sole or a white line disease, are usually operatively approached from the pastern region. The infected tissue is removed via a vertical incision on the plantar side, stretching from the dewclaw to the sole ulcer area (27). The tendon sheath is opened along the length of the incision. This allows the subsequent removal of the deep digital flexor tendon, the podotrochlear bursa and the distal sesamoid bone under visual control. The approach via a window in the sole, or via a horizontal incision in the bulbs (5, 9, 11) makes resection more difficult and involves a greater risk of unintentionally contaminating more proximal tissue. The distal sesamoid bone is removed with a scalpel and a sharp periosteal elevator, it can be split into two parts with a chisel, or pared out with a rongeur (4). If the synovia shows signs of infection or the joint cartilage is damaged, the pedal joint should be resected. Ankylosis of the joint provides a better degree of long term stabilisation. First, the tuberculum flexorium is curetted thoroughly to remove the site of the primary infection and to ensure good distal drainage of the wound. Thereafter, a channel of approximately 1.5 centimetre in diameter is drilled through the distal interphalangeal joint (1, 13).

If the origin of infection is located in the interdigital space, the infected area can be drilled out via the same approach. The technique can be also used to preserve the claw after an open fracture of the distal phalanx, which is usually characterized by an axial fragment and communication with the joint (19). In such a case, the smaller fragment is extracted, and the joint facets of the medial phalanx and the remaining distal phalanx are removed with a drill. After this joint resection procedure, the weight bearing should be improved by 10-12 days, and

come back to normal after 2-3 weeks. The wound is nearly covered with horn after 8 weeks and complete ankylosis of the joint should occur after 7-12 months.

If the infection of the joint is not originating from a sole ulcer, it can be opened for curettage from a dorsal and abaxial approach. However, these approaches allow a less clear view of the site of infection and post operative treatment is labour intensive and prolonged. The animals show lameness for up to four months after surgery (3). Another method, the abaxial fenestration by excising part of the abaxial claw wall, provides a good view of the joint (28). Disadvantage are the lack of postoperative drainage and risk of damaging the distal sesamoid bone. When the osteolytic area is small, it can be curetted and packed with cancellous bone to promote healing (10).

Resection of the apex of the distal phalanx

After an injury to the tip of the claw where there is no subcutis protecting the bone, an infection can spread very rapidly into the distal phalanx (7). The infected area of the phalanx is approached from the sole for resection (17). Osteolytic bone is subsequently drilled out, parallel to the dorsal wall of the claw, until only healthy bone is visible. Eight weeks after operation, the defect is nearly covered with new horn. Alternatively the tip of the distal phalanx can be removed with a wire saw (22). If more than one third of the pedal bone is infected the marrow cavity of the pedal bone is likely to be involved, and digit amputation should be performed.

Resection of the superficial and deep digital flexor tendon within the common digital sheath.

The digital flexor tendons may require resection if they are infected during the course of a tendosynovitis (16). Furthermore, the pouches of the tendon sheath often harbour pockets of fibrin and purulent debris, which can only be completely removed after resection of the tendons.

Surgery begins with an incision of the skin, five centimeters proximal to the dewclaw, in a vertical direction. Close around the dewclaw, it then curves axially so as not to damage the blood vessels and nerves lying in the abaxial region. After careful preparation of the subcutis, the dewclaw can be folded to the abaxial side, allowing a straight incision through the underlying fascia, the annular ligament and the tendon sheath. Then the tendons are subsequently removed.

Resection of the proximal interphalangeal joint or the fetlock joint

The proximal interphalangeal joint can become infected as a result of injury, spread from a local infection or hematogenous spread. If the primary cause is a interdigital phlegmon, other synovial structures are often affected (12). The affected joint is drilled out using either a dorsal approach (25), or combined with a second opening on the axial side (4). If a resection is not economically feasible, or not possible from a medical point of view, a digit amputation is the only viable alternative.

Resection of the fetlock joint is necessary if radiographic changes are found in subchondral bone. Since the lateral and medial compartments communicate, it follows that they are

simultaneously infected (6, 15). The joint is opened dorsally, by semicircular incision at the level of the articular surface of the proximal phalanx, extending around to the collateral ligaments (8, 15, 23, 24). To gain access to the palmar/plantar joint cavities, the joint is flexed enough to pass the collateral ligaments axially, or separate incisions are made in the palmar/plantar pouches. In advanced cases, as much of the articular cartilage as possible is removed.

Resection of infected epiphyseal plates of the phalanges or the metacarpal/metatarsal bones

Often the epiphyseal plates of the metacarpus/metatarsus, and rarely of the phalanges, can become infected by hematogenous spread. Surgical excision involves curettage of the affected physis, and in advanced cases it may even necessitate the drilling out of the entire epiphyseal plate (2). After surgery, a walking cast has to be applied to stabilize the limb.

Fractures and luxations

Fractures of the proximal phalanx or the metacarpal/metatarsal condyles may be amenable to repair by internal fixation. Also, subluxation or luxation of the digits can be reduced and a torn ligament replaced with a synthetic prosthesis (21).

Digit amputation

When amputating a digit, a 'high' amputation at the level of the proximal phalanx is preferred (18). Our patients were operated using the method described by Pfeiffer, whereby skin flaps are created which are then sutured together over the remaining tissue (20). The distal end of the proximal phalanx can be removed either with a wire saw, or with an amputation saw. The surgical preparation is done under visual control. If no abscess is present in the coronary area and no contamination has occurred during the procedure, the wound can be closed with single interrupted sutures. Otherwise, the wound is only partially sutured and a tampon is placed in the wound cavity. Another 'high' amputation procedure is the exarticulation at the level of the proximal interphalangeal joint. The second phalanx can be removed from a distal approach, carried out after a skin incision along the coronary band, or by circular skin incision at the level of the proximal interphalangeal joint. The medial phalanx can also be drilled out from a distal approach with a large Forstner-drill (1).

Résumé (Chirurgie du pied chez le bovin)

Les maladies des onglons sont les causes principales de boiteries chez le bovin. Trois pourcent de ces maladies sont dues à des infections profondes du pied, causées par une blessure ou un ulcère de sole. En règle générale, ces cas compliqués ne peuvent être traités que chirurgicalement. Les techniques fréquemment utilisées seront brièvement évoquées dans le texte. Il est important de faire la distinction entre les opérations nécessitant l'amputation et celles où l'on doit conserver l'onglon (résection). La résection sera réservée aux articulations et aux os constituant les articulations interphalangiennes du pied. Ce traitement est techniquement plus difficile et le risque de complications plus élevé comparé à l'amputation. Par contre, il permet une vie productive plus longue et une démarche plus normale (14). En comparaison, l'amputation a l'avantage d'éliminer complètement et rapidement l'infection.

References

1. Clemente C. Operationen an der Klaue des Rindes. *Tierärztl Prax* 1979; 7: 153-206.
2. De Kesel A, Verschooten F, De Moor A, Steenhaut M, Wouters L. Bacterial osteitis-osteomyelitis of the growth plates in cattle. *Vlaams Diergeneeskd Tijdschr* 1982; 51(5): 397-422.
3. Desrochers A, Anderson DE, St-Jean G. Surgical treatment of lameness. *Vet Clin North Am Food Anim Pract* 2001; 17(1): 143-158.
4. Desrochers A, St-Jean G. Surgical management of digit disorders in cattle. *Veterinary Clinics of North America, Food Animal Practice* 1996; 12(1): 277-298.
5. Dirksen G. Krankheiten der Bewegungsorgane. In: Dirksen G, Gründer H-D, Stöber M, eds. *Innere Medizin und Chirurgie des Rindes*. 4 ed. Berlin: Parey 2002; 753-1029.
6. Fessler L. Erkrankungen des Bewegungsapparates. In: Hofmann W, ed. *Rinderkrankheiten*. Stuttgart: Ulmer 1992; 284-320.
7. Fritsch R. Therapie von Klauenkrankheiten beim Rind. In: Knezevic P, ed. *Int Tagung Orthopädie bei Huf- und Klautentieren*. Hannover: Schaper 1985; 105-113.
8. Geishauer T. Eitrige Fesselgelenkentzündung beim Rind - Behandlung durch Gelenkresektion. *Tierärztl Prax* 1997; 25: 123-129.
9. Greenough PR, Ferguson JG. Alternatives to amputation. *Vet Clin North Am: Food Anim Pract* 1985; 1(1): 195-203.
10. Kasari TR, Taylor TS, Baird AN, Morris EL. Use of autogenous cancellous bone graft for treatment of osteolytic defects in the phalanges of three cattle. *JAVMA* 1992; 201(7): 1053-1057.
11. Kersjes AW, Németh F, Rutgers L, eds. *Atlas der Großtierchirurgie*. Stuttgart: Fischer 1986.
12. Kofler J. Die septische Arthritis des Kron gelenkes beim Rind - Klinische, röntgenologische sowie sonographische Befunde und Behandlung. *Berl Münch Tierärztl Wschr* 1995; 108(8): 281-289.
13. Köstlin R, Nuss K. Behandlung der eitrigen Klauengelenkentzündung beim Rind durch Gelenkresektion - Ergebnisse. *Tierärztl Prax* 1989; 16: 123-131.
14. Nuss K. Results of treatment of septic arthritis of the distal interphalangeal joint in cattle by joint resection. *Revue de Medecine Veterinaire* 1989; 140: 8-9.
15. Nuss K. Stadienorientierte Sequenztherapie der septischen Monarthritis beim Rind. *Habilitationsschrift*. München: Ludwig-Maximilians-Universität 2000.
16. Nuss K, Hänichen T. Fibrinös-eitrige Tendinitis der Beugesehnen bei der infizierten Tendovaginitis der Fesselbeugesehnscheide beim Rind. *Tierärztl Prax* 1995; 23: 565-569.
17. Nuss K, Kostlin RG, Bohmer H, Weaver M. [The significance of unguis-coriitis septica (traumatica) at the toe of the bovine claw]. *Tierärztl Prax* 1990; 18(6): 567-575.
18. Osman M. A study of sequelae of amputation of the digit using three operative techniques. *Vet Rec* 1970; 87: 610-615.
19. Petzoldt F-J. Zur Klauenbeinfraktur beim Rind. *Behandlung und Ergebnis in den Jahren 1970-1984*. Inaugural-Dissertation. München: Ludwig-Maximilians-Universität 1985.
20. Pfeiffer W. *Operationskurs für Tierärzte und Studierende*. 5 ed. Berlin: Schoetz 1912.

21. Rothlisberger J, Schawalder P, Kircher P, Steiner A. Collateral ligament prosthesis for the repair of subluxation of the metatarsophalangeal joint in a jersey cow. *Vet Rec* 2000; 146(22): 640-643.
22. Tischbirek D, Müller K, Roming L. Die Klauenspitzenresektion beim Rind - ein die Zehe erhaltendes Operationsverfahren. In: 15th World Congress on Diseases of Cattle 1988; Palma de Mallorca, Spain; 1573-1574.
23. Van Huffel X. Surgical treatment of joint and tendon disease in calves and cattle. *Cattle Pract* 1996; 4(2): 187-192.
24. Verschooten F, De Moor A, Steenhaut M, Desmet P, Wouters L, De Ley G. Surgical and conservative treatment of infectious arthritis in cattle. *J Am Vet Med Assoc* 1974; 165(3): 271-275.
25. Waksman I. Drilling through septic arthritis under field conditions. In: Bargai U, Efron Y, Meir E, eds. 9th Int Symp Disord Ruminant Digit and International Conference on Lameness in Cattle 1996; Jerusalem, Israel; 53.
26. Warnick LD, Janssen D, Guard CL, Grohn YT. The effect of lameness on milk production in dairy cows. *J Dairy Sci* 2001; 84(9): 1988-1997.
27. Westhues M, Breuer D. Klauengelenksresektion und Sehnenresektion beim Klauengeschwür des Rindes. *Nordisk Veterinaermedicin* 1964; Suppl. I: 335-343.
28. Zulauf M, Jordan P, Steiner A. Fenestration of the abaxial hoof wall and implantation of gentamicin-impregnated collagen sponges for the treatment of septic arthritis of the distal interphalangeal joint in cattle. *Vet Rec* 2001; 149(17): 516-518.