LAMENESS IN BOVINE

BOVINE LAMENESS

Lameness:

Is defined as an alteration in the animal's normal stance and/or mode of progression caused by pain or neural or mechanical dysfunction.

INCIDENCE

- 95% of lame cattle are dairy breeds
- 80% of cases involve the digits
- 80% of digital lameness is located in the hind limbs
- 50% of digital lameness involves the horny tissue and 50% the skin, mostly digital dermatitis
- 70% of the horny lesions involve the outer claw

Essential equipment for investigation of bovine lameness problems

- facilities for good restraint and ready elevation of hind- or forelimbs
- good lighting, hosepipe, water, bucket, brush, and ropes
- left- and right-handed hoof knives
- double action hoof cutters
- hoof rasp
- hoof testers
- straight grooved probe
- grinder for large-scale (i.e. herd) trimming with electrical cut-out in case of short-circuiting


ELECTRIC
HOOF KNIFE

Economic Importance

Only infertility and mastitis cause greater economic losses than lameness in most intensive dairy units in the UK, western Europe and North America. In developing countries infectious diseases and malnutrition are of more economic importance. Losses result from lameness include :

- **Reduced milk yield**
- **Weight loss**
- **Infertility(attributable), prolonged calving interval**
- **Veterinary expenses, drugs**
- **Additional stockman's time**

Lameness Scoring (LS)

Many numerical scales (e.g. 0–3, 1–6, 1–10) have been devised by and utilized in recording the severity of lameness in an individual cow. The simplest appears adequate, viz.

0 = not lame

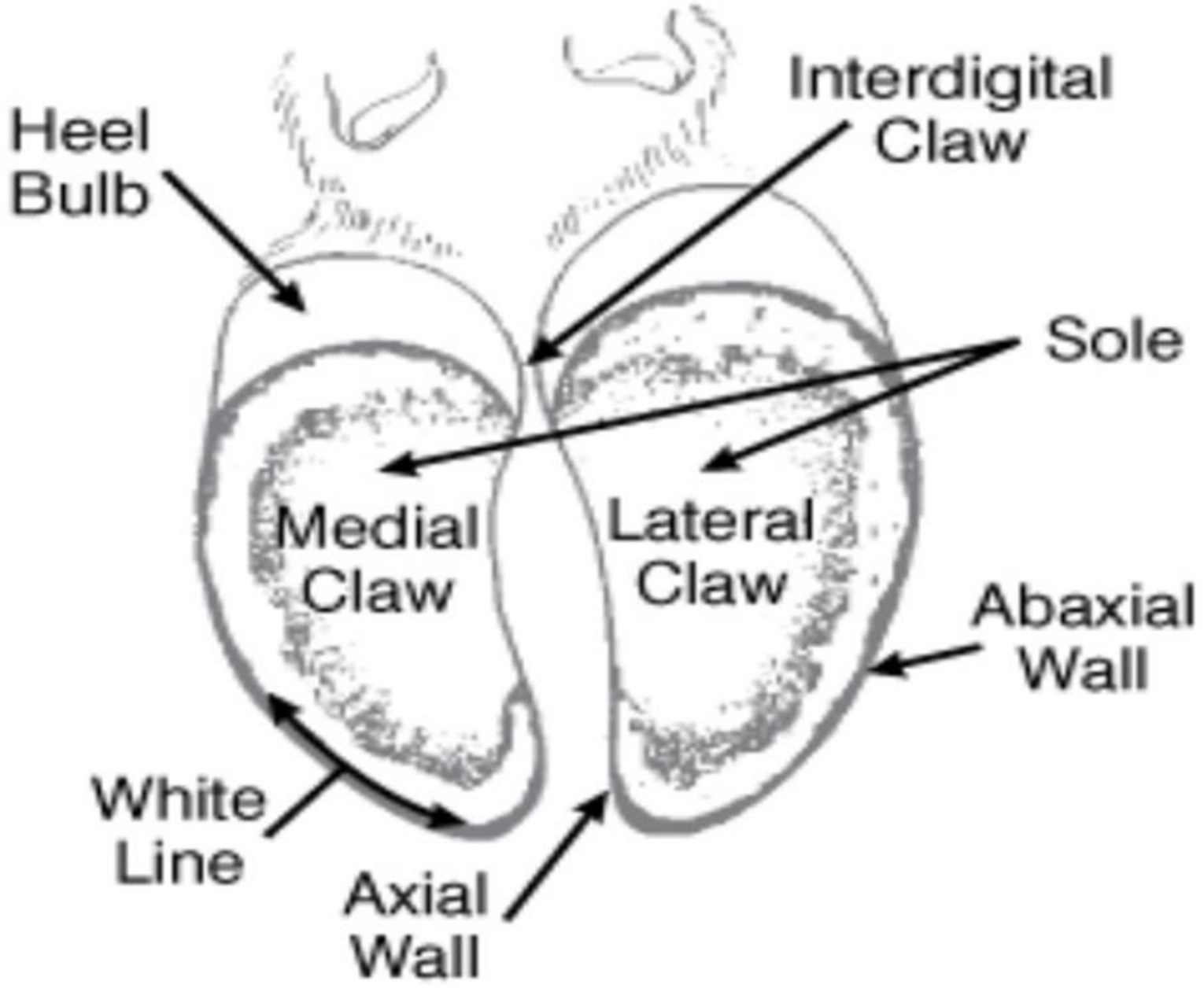
1 = slightly lame

2 = moderately lame

3 = severely lame

Important Conditions Of The Bovine Digit

1. Digital dermatitis
2. Sole ulceration
3. White line separation and abscessation
4. Interdigital necrobacillosis
5. Heel erosion
6. Interdigital dermatitis
7. Laminitis/sole haemorrhage
8. Interdigital hyperplasia
9. Punctured sole
10. Toe ulcer


Heel
Bulb
Interdigital
Claw
Sole
Medial
Claw
Lateral
Claw
Abaxial
Wall
White
Line
Axial
Wall

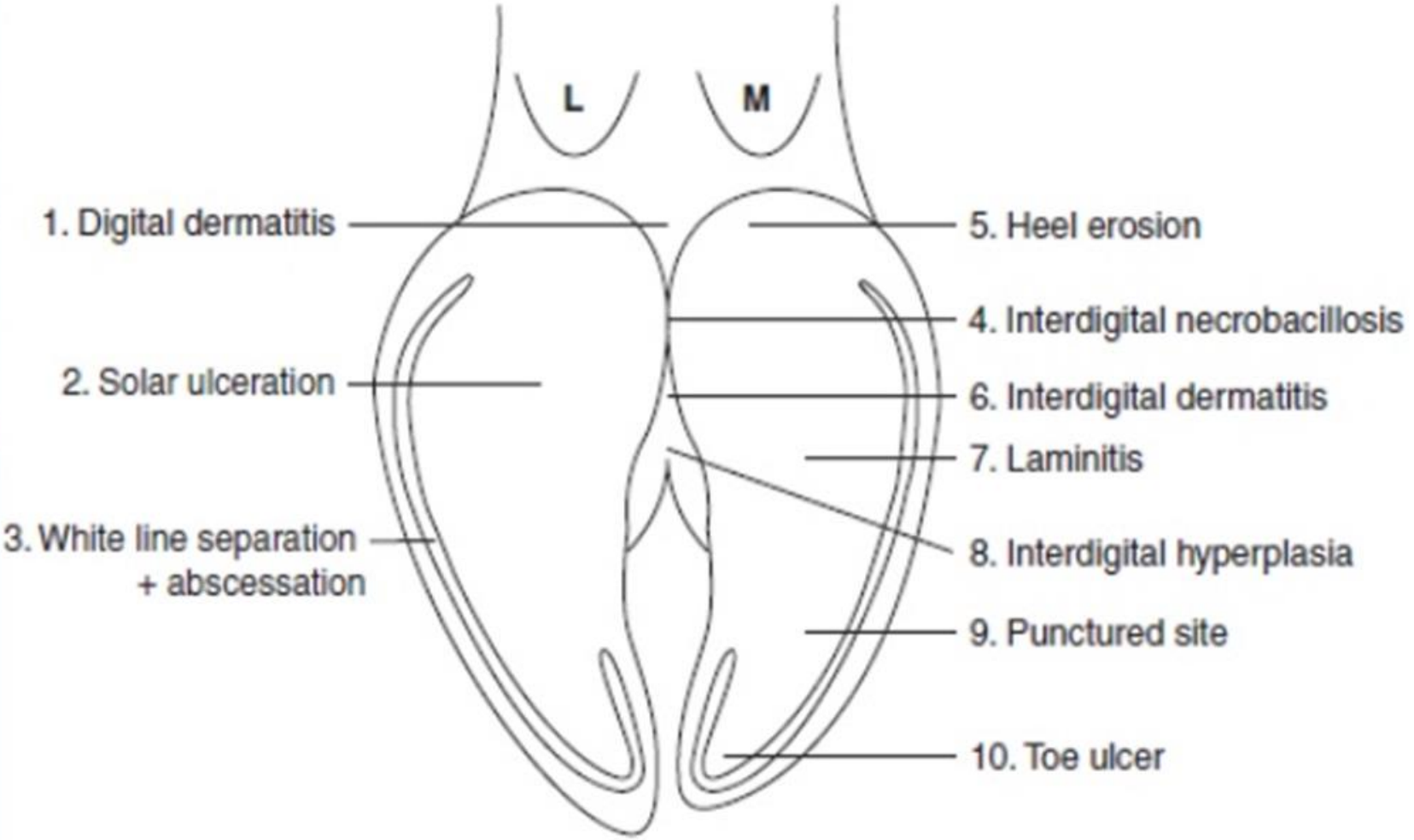
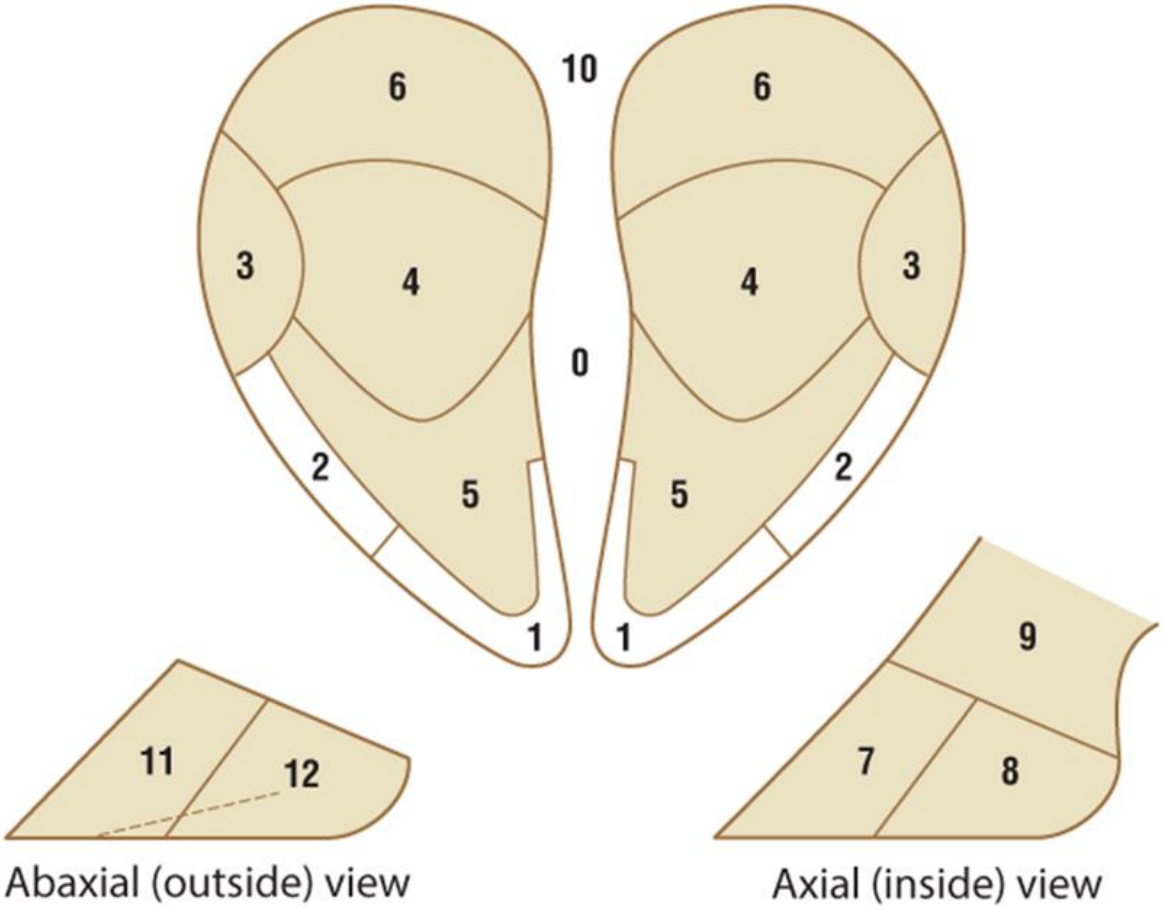


Figure 7.2 Important conditions of the bovine digit.
1. digital dermatitis; 2. sole ulceration; 3. white line separation and abscessation; 4. interdigital necrobacillosis; 5. heel erosion; 6. interdigital dermatitis; 7. laminitis/sole haemorrhage; 8. interdigital hyperplasia; 9. punctured sole; 10. toe ulcer.

Claw Zones

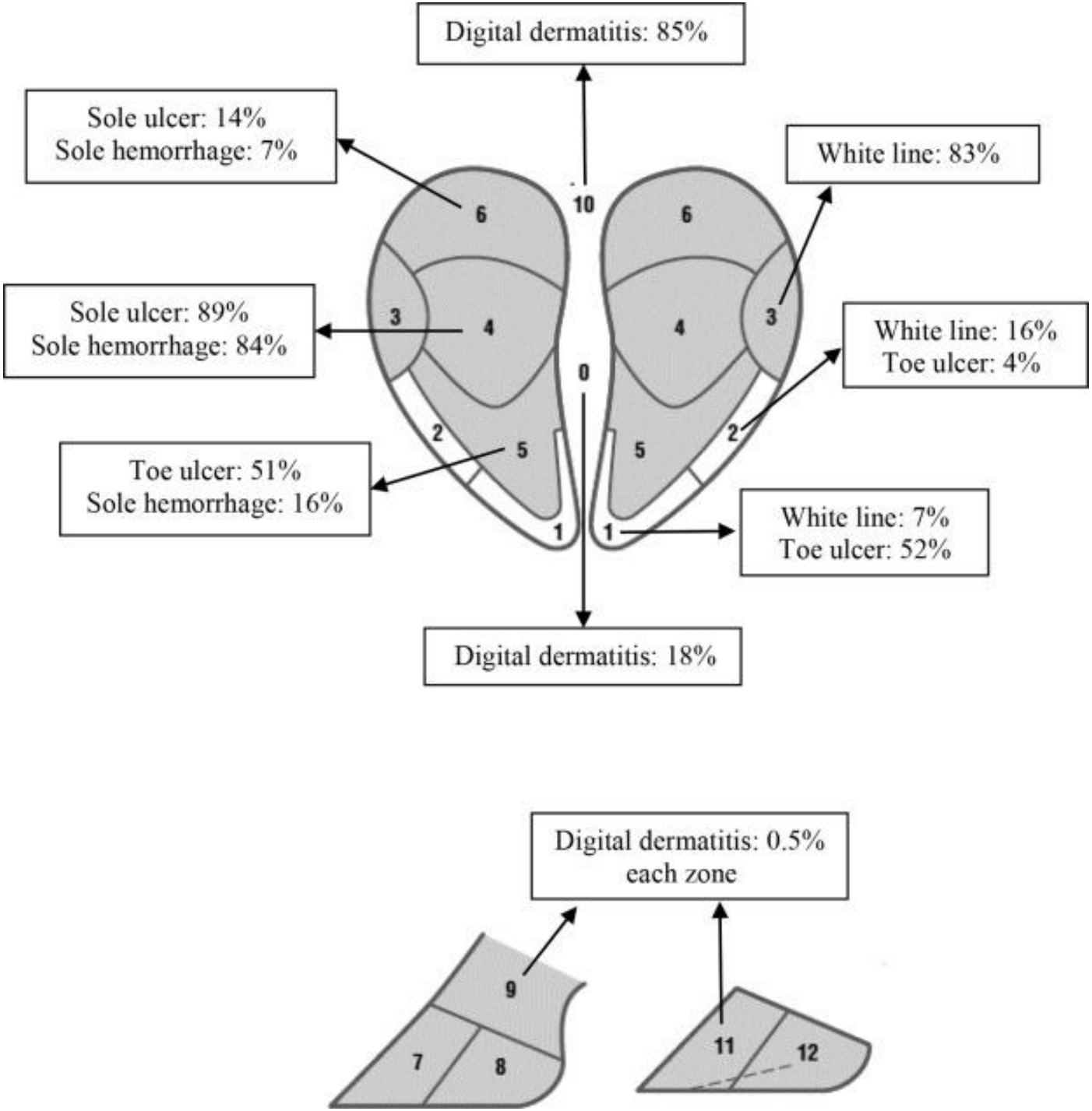


1. White Zone At Toe; 2. Abaxial White Zone; 3. Axial Groove Zone;; 4. Junction Of Sole And Bulb (Heel); 5. Apex Of Sole 6. Bulb (Heel).

DIGITAL DERMATITIS (MORTELLARO)

Definition:

Circumscribed superficial ulceration of skin bordering coronary margin at heels, occasionally more dorsally. Can develop into mass of verrucose fronds. Widespread in many dairy farms in word where incidence can reach 100% and prevalence 20%. Often the major lameness problem.


Digital dermatitis: 85%
Sole ulcer: 14%
Sole hemorrhage: 7%
White line: 83%
Sole ulcer: 89%
Sole hemorrhage: 84%
White line: 16%
Toe ulcer: 4%
Toe ulcer: 51%
Sole hemorrhage: 16%
White line: 7%
Toe ulcer: 52%
Digital dermatitis: 18%
Digital dermatitis: 0.5%
each zone
10
6
6
3
4
4
3
0
2
5
5
2
1
1
9
7
8
11
12

Signs

- **Predisposition is not known, but disease affects adult cattle causing variable and often severe lameness (LS 1–3)**
- **White epithelial border and signs of surrounding chronic dermatitis**
- **Caudally in skin adjacent to heel horn, also occasionally anterior interdigital space, coronary band or in granulation tissue on sole**
- **Apparently contagious, mostly introduced into 'clean' farm by bought-in heifers which may not themselves show clinical lesions**
- **Role of skin microtrauma as permitting entry of organisms is speculative.**

TREATMENT

- **Treat all but most severe lesions in milking parlour**
- **Cleanse with water spray, wait one minute, and apply topical aerosol antibiotic, e.g. Oxytetracycline, daily for three days**
- **Drugs have included Oxytetracycline, Lincomycin, Erythromycin And Lincomycin/Spectinomycin, And Tylosin**
- **Severe proliferating masses (‘hairy warts’) should be resected through epidermis (not subcutis) under local anaesthesia.**

Differential diagnosis:

1. possibly interdigital dermatitis
2. heel horn erosion
3. plantar eczema

Digital Dermatitis

Solear (Solar) Ulceration

Synonyms: pododermatitis circumscripta, sole ulcer, Rusterholz ulcer.

Definition: limited reaction of the pododerm (deep sensitive tissues) often characterized by an erosive defect typically at the sole-heel junction of the lateral hind claw.

Incidence: high (up to 40% of digital lameness cases) and widespread in dairy breeds, from calved heifers to mature cows in good body condition.

Aetiology: excessive weight-bearing by lateral claw following horn overgrowth. Associated almost invariably with abnormal claw (poor trimming), and frequently with laminitis. Primary and secondary causes are difficult to distinguish.

Predisposition: inherited factors such as stance, which may also be acquired, and deviations from normal hoof shape (e.g. severe overgrowth), loose housing with small (narrow, short) cubicles, giving tendency for cows to stand with hind feet in passageway, overgrown digits, acidotic rations.

SIGNS

- **Moderate degree of lameness (LS 1) typically up to three months postpartum, masking the frequently bilateral nature of the lesions**
- **Severe lameness (LS 2–3) when granulation tissue protrudes and in presence of deeper purulent infection (osteomyelitis, septic arthritis)**
- **Under-run heel horn exposes sensitive laminae**
- **Contralateral claw: check for similar changes!**
- **At typical site granulation tissue may protrude through undermined horn**
- **Under-running commonly extends cranially and peripherally to abaxial white line**

Differential diagnosis

1. Solear abscessation due to foreign body penetration
2. Aseptic pododermatitis (solear haemorrhage) elsewhere in weight-bearing surface
3. Simple heel erosion
4. Subacute laminitis

TREATMENT

- Trim all feet initially or at end
- Remove under-run horn, trim horn of wall and heel so that weight-bearing by affected claw is minimal
- Possibly apply block (hoof resin) to sound claw which should be minimally trimmed, if weight-bearing cannot otherwise be reduced
- Remove protruding granulation tissue, leaving healthy pododerm and apply tetracycline spray, and bandage (waterproof) for five days
- Alternatively, put on sulphadimidine powder, bandage, and spray oxytetracycline over bandage to prevent wicking by mud into bandage
- Broad spectrum antibiotics in septic cases
- Confine to box and straw bedding for five days

White Line Separation And Abscessation

Synonym: white line disease.

Definition: abaxial, or less commonly axial, wall separation from laminae at sole-wall area extending proximally, with cavity impacted with mud, faeces; or with development of abscess cavity at deepest part (abscessation).

Incidence: high and in some areas is major cause of digital lameness.

Predisposition and pathogenesis:

- abnormal horn production resulting from laminitic insult (coriosis)
- insufficient hoof trimming
- related to peripartum events some months previously

SIGNS

- **Moderate lameness (LS 1–2)**
- **White line wider than usual, and in early stages has series of pinpoint dark marks, later obvious foreign material impacted in white line**
- **Separation evident on paring, no pain**
- **Cases of white line abscessation are lame and have pain localised to wall**
- **Internal wall abscess, without obvious track distally, also very sensitive to pincers pressure**
- **Advanced cases have supracoronary septic sinus discharge**

Differential diagnosis: solear foreign body, laminitis, small coronary sandcrack.

TREATMENT

- Routine trimming of all digits
- Pare off wall over impacted and septic area to achieve drainage and prevent further impaction
- Also remove all under-run sole (some cases have a large ‘false sole’)
- Apply local antiseptic dressing (e.G. Oxytetracycline spray) and firm dressing
- Pare horn to normal shape of claw
- Consider block on ipsilateral claw
- In septic cases give broad spectrum antibiotics for three days

Radical surgery, possibly amputation, is required in involvement of coronary tissues and distal interphalangeal joint

Interdigital Necrobacillosis

Synonyms: Phlegmona Interdigitalis, 'Foul-in-the-foot', 'Clit Ill', 'Foot Rot', Interdigital Pododermatitis.

Definition: Acute Inflammation Of Subcutaneous Tissues Of Interdigital Space And Adjacent Coronary Band, Spreading To Dermis And Epidermis.

Differential Diagnosis: Interdigital Foreign Body, Acute Laminitis, Solear Penetration By Foreign Body, Severe Interdigital Dermatitis, Interdigital Changes From BVD/MD, FMD, Distal Interphalangeal Septic Arthritis, Distal Phalangeal Fracture

Signs

- Mild to severe lameness (LS 1–3) of sudden onset, all ages
- Interdigital swelling, later involving coronet and pastern
- Toes spread apart due to interdigital swelling, initially with unbroken skin for first 24 hours of lameness
- Sometimes more proximal spread, and a secondary interdigital necrosis very common
- Little pus but characteristic foul smell and pain with split in interdigital skin

Treatment

- Ceftiofur, ampicillin, oxytetracycline, penicillin, sulphonamides (Trimethoprim-sulpha) systemically
- Clean affected necrotic area with disinfectant and apply a topical oxytetracycline or copper sulphate, or BIPP paste (bismuth subnitrate, iodoform and petrolatum)
- Do not bandage, but put on to dry floor or straw bedding, preferably isolated to avoid spread of infection
- Daily cleansing with disinfectant if feasible
- ‘Superfoul’: early cases respond well to 6 g oxytetracycline, more advanced cases to tylosin, careful local debridement under analgesia and local antibiotic dressing. Isolation is important.

Heel Erosion

Synonym: Erosio ungulae. slurry heel

Definition: Irregular loss of bulbar horn in form of multiple blackish pit or pock-like depressions or later deeper oblique grooves, usually affecting hind digits more severely than fore.

Incidence: widespread in winter-housed cattle from yearlings to adults, usually disappears at grass.

Predisposition: wet environment, long-term exposure to slurry, possible sequel to interdigital dermatitis, unrelated to parturition.

Signs : Slight or no lameness (LS 0–1) except in deep chronic cleft formation, which may damage corium, cause mild lameness, and lead to under-run heel.

Aetiology: Chronic irritation, bacterial infection, interdigital dermatitis.

Differential diagnosis: Interdigital dermatitis.

Treatment

- **single case:** Pare away diseased and under-run horn, spray topical oxytetracycline gentian violet aerosol on to any exposed corium and transfer to dry floor
- **multiple cases:** Foot paring, footbaths (formalin) at twice weekly intervals
- **if feasible:** Transfer to dry environment
- **if not feasible:** Put lime into cubicles to disinfect and dry out heel horn

Interdigital Dermatitis

Synonyms: *dermatitis interdigitalis*.

Definition: inflammation of interdigital skin without extension to deeper tissues, and variable associated disturbance of horn growth.

Incidence and predisposition: widespread in certain moist housing systems and wet climates, in all age groups.

Signs:

- mild inflammatory lesions of interdigital skin causing little or no lameness (LS 0–1)
- bulb horn clefts can lead to contusion of corium and sometimes eventually to solear ulceration. Lameness may be severe and chronic in such cases.

Differential diagnosis:

- Interdigital Necrobacillosis
- Heel Erosion
- Digital Dermatitis

Treatment

- pare off any diseased horn
- single severe case: interdigital spray with oxytetracycline or copper sulphate
- multiple cases: formalin or copper sulphate footbath
- regular foot paring
- put into dry housing and dry grazing
- consider formalin footbath for herd control

Laminitis/sole haemorrhage

Synonym: *Pododermatitis aseptica diffusa*, coriosis, 'founder'.

Definition: diffuse acute, subacute, subclinical or chronic inflammation of pododerm, usually in several digits. Chronic cases without acute stage (subclinical) are often seen.

Incidence: sporadic acute cases, widespread subacute, subclinical and chronic cases commonly in dairy units, high incidence in recently calved heifers and younger cows around parturition. Acute form occasionally presents as outbreak in barley beef units. Common in beef feedlots.

Predisposition

- **Inherited factors (proven in jersey)**
- **Parturition**
- **Feeding stress (ruminal lactic acidosis, subacute ruminal acidosis or SARA) from change of dry cow concentrate diet to high production rations, with potentially dangerous reduction of roughage intake**
- **Exacerbation by trauma (overburdening), as in excessive standing due to reluctance to use cubicles (inexperience, bullying by herdmates)**

SIGNS

- **Acute stage:** painful hot digit, digital arterial pulsation, general depression, severe lameness, abnormal stance, possibly recumbent (LS 2–3)
- **Subacute:** less painful but persistent stiffness, stilted gait, solear and white line haemorrhages (LS 1)
- **Chronic:** stiff gait or not lame (LS 0–1), ‘slipper foot’ malformation with horizontal lines on wall, concave dorsal wall, widened white line and evidence of old solear and white line haemorrhages.

Differential diagnosis

- **Bruised Sole,**
- **White Line Disease,**
- **Punctured Sole,**
- **Solear Ulceration**
- **All Of Which May Be Present**

Treatment

Acute stage:

- Give systemic nsaids (meloxicam) corticosteroids (only if non-pregnant) and diuretics
- **Ensure exercise (to improve local circulation and further reduce developing oedema), preferably by turning on to soft ground, e.G. Field**
- **Remove any precipitating dietary causes**
- **Feed no concentrates until acute phase is over**
- **In recumbent case consider digital nerve block to get heifer or cow to stand, then forced exercise**

Subacute stage: as in acute case

Chronic case: hoof trimming

Interdigital hyperplasia

Synonyms: *hyperplasia interdigitalis*, corn, interdigital granuloma, interdigital vegetative dermatitis, fibroma, 'wart'.

Definition: proliferative reaction of interdigital skin and/or subcutaneous tissues to form a firm mass.

Incidence: usually sporadic, common in certain beef breeds (e.g. Hereford) and in bulls. Occasionally follows severe interdigital disease in dairy cows, then is unilateral. May start in yearling bulls, but most clinical cases (with lameness) are in adults of four to six years.

Predisposition: inherited in some breeds (e.g. Hereford, Holstein Friesian). Severe interdigital dermatitis or sole ulcer often precedes involvement of single limb. Frequently associated with poor conformation e.g. splayed toes with wide interdigital space.

Differential diagnosis: interdigital foreign body, interdigital necrobacillosis, digital dermatitis.

Treatment

- none if small and asymptomatic
- local caustic (e.g. silver nitrate, copper sulphate) if small and causing lameness
- most clinical cases require resection by knife surgery electrocautery or cryosurgery: ideally in Wopa crush under IVRA (intravenous regional analgesia), bandage (e.g. Vetrap®) after applying sulphadimidine powder. Remove bandage after one week.

Punctured sole

Synonym: ***pododermatitis septica (traumatica)*****, septic (traumatic) pododermatitis.**

Definition: diffuse or localised septic inflammation of solear corium, causing moderate to severe lameness if purulent (SL 2-3).

Incidence: sporadic.

Predisposition: thin solear horn from preceding laminitis (coriosis) excessive abrasion from rough concrete, rough tracks, any tendency to hustle herd along inside passageways or outside tracks. Corium (pododerm) has no fatty tissue in toe area, making entry of infection into distal phalanx easier.

Signs

- sudden onset of lameness (LS 2), usually in hindlimb, with solear penetration
- site often near toe or adjacent to white line
- defect in horn extends to solear pododerm, with variable under-running and pus production (black colour)
- localised pain

Differential diagnosis

- subacute laminitis,
- solear ulceration,
- toe ulcer
- interdigital necrobacillosis.

Treatment

- Primarily surgical: identify and remove FB; drain after exposure of under-run horn
- Local astringent dressing
- Curette distal phalanx if involved
- Possibly elevate sole by block on other digit
- Single injection of long-acting oxytetracycline if soft tissue (corium) is severely damaged
- Tetanus prophylaxis indicated in known tetanus environment

Digital Amputation

Indications:

In descending order of frequency are:

- **Septic arthritis of distal interphalangeal joint**
- **Septic tenosynovitis of deep flexor**
- **Osteomyelitis of distal sesamoid**
- **Osteomyelitis of distal phalanx**
- **Severe digital trauma, e.g. Exungulation, loss of much coronary band**
- **Sepsis of coronary band and supracoronary soft tissues.**

Frequently several of the above indications are present.

Advantages

- **Immediate removal of potentially lethal material (reducing risk of pyaemic spread)**
- **Relief of pain**
- **Relatively rapid return to thriftiness and production with improved condition and milk yield**
- **Simple surgical technique compared with alternatives**

Disadvantages

- Potential failure if case selection is poor and infection is present above amputation site
- Persisting poor gait in some heavy cows and bulls due to altered stance and strain on remaining digit, especially in difficult terrain
- Lowered market value
- Few cows with amputated digits are retained for more than eighteen months

SITES FOR DIGITAL AMPUTATION

1. Amputation with oblique cut in distal third of proximal phalanx (open or skin flap technique both possible);
2. Exarticulation through proximal interphalangeal joint;
3. Exarticulation through distal interphalangeal joint.

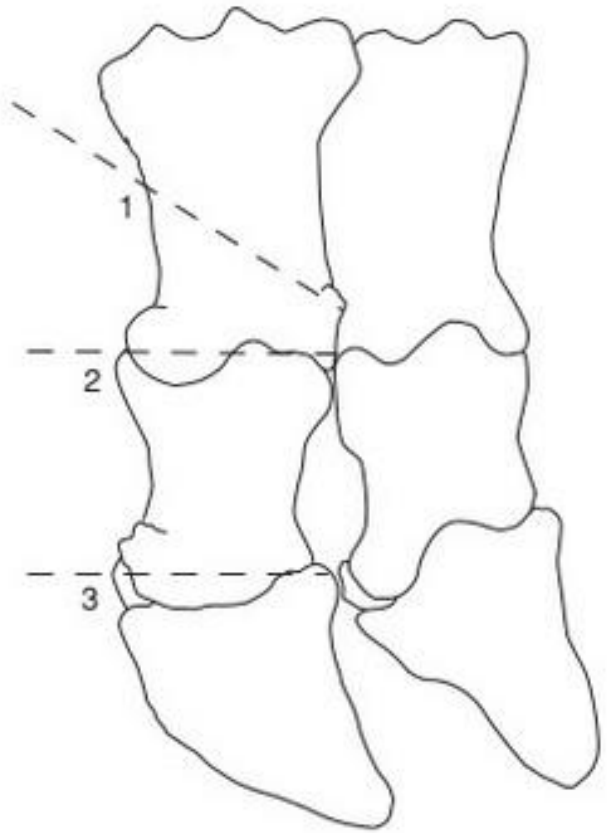
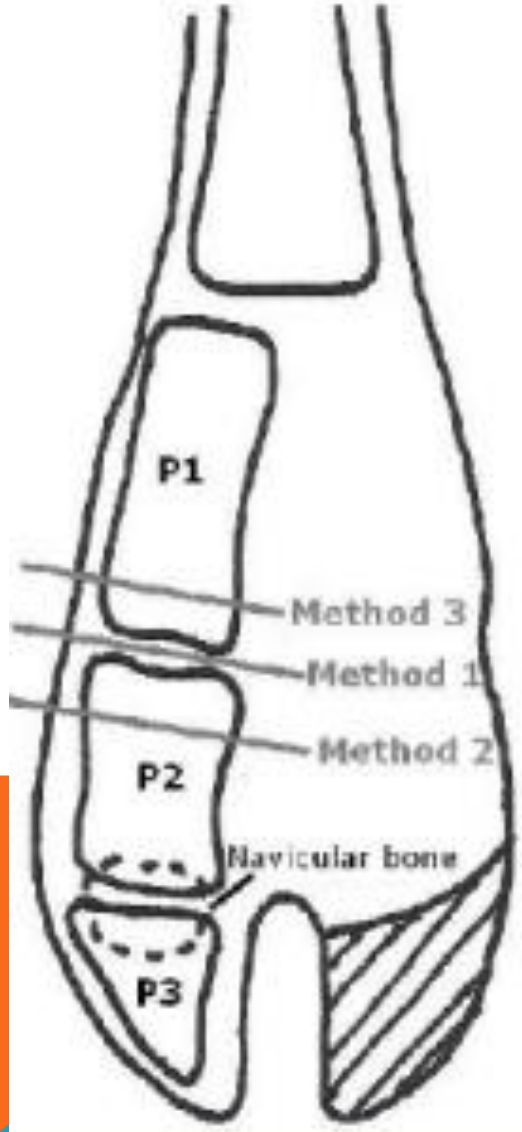
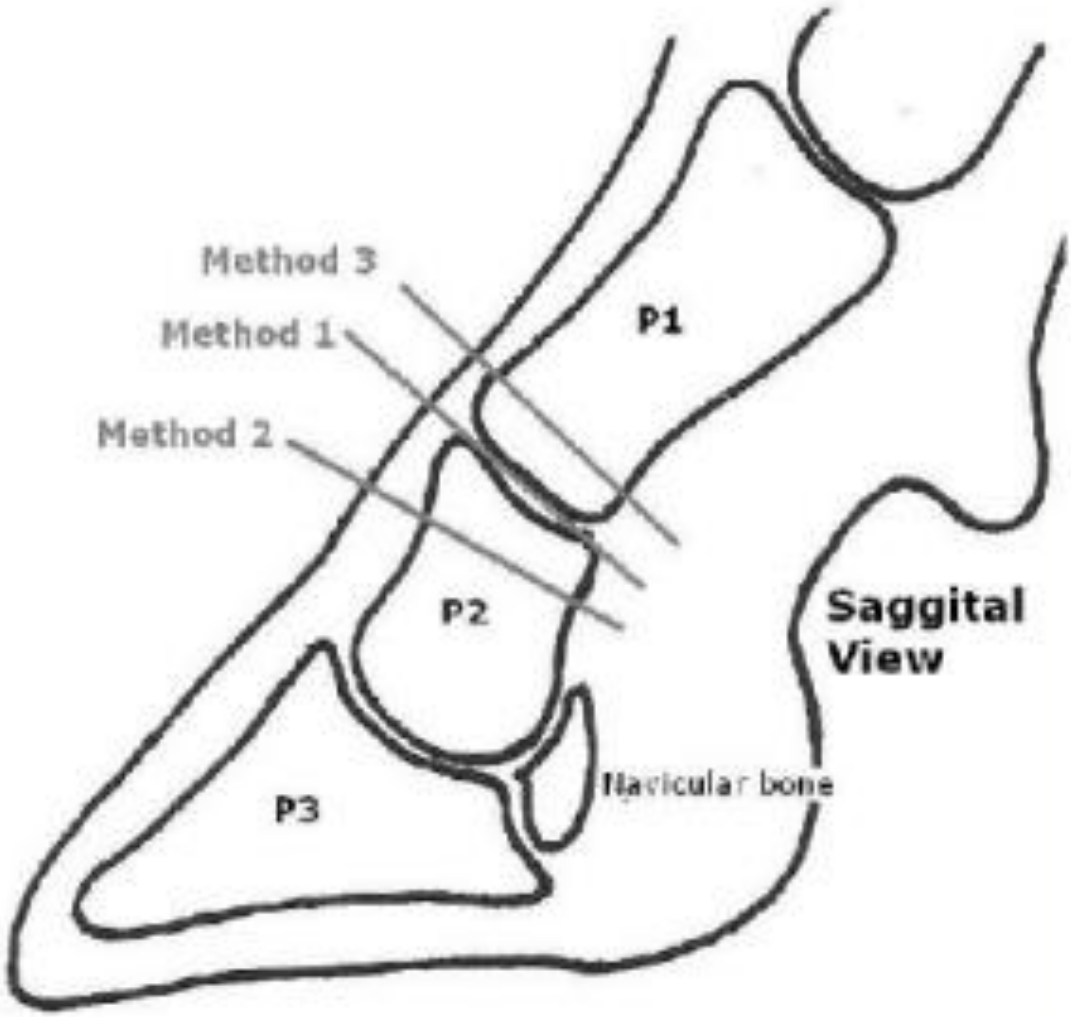


Figure 7.7 Sites for digital amputation or disarticulation.
1. amputation with oblique cut in distal third of proximal phalanx (open or skin flap technique both possible); 2. exarticulation through proximal interphalangeal joint; 3. exarticulation through distal interphalangeal joint.

Method 1: Disarticulation of the distal interphalangeal (DIP) joint
Method 2: Amputation through proximal Phalanx 2 (P2)
Method 3: Amputation through distal Phalanx 1 (P1)

Figure 1: Amputation Sites





Technique

- **Intravenous regional analgesia (IVRA) which is preferred method, or ring block above fetlock**
- **Examine digits to check that infection has not reached level of fetlock joint, and that sepsis is confined to distal part of proximal phalanx and more distal structures**
- **Clip hair from level of fetlock distally to coronet over affected side and over median line, i.e. Interdigital space**
- **Remove caked faeces, use stiff brush, run bandage through interdigital space, and give surgical scrub to area**

ANESTHESIA OF THE FOOT

Anesthesia of the foot may be required for debridement of severe foot abscesses, corn removal, digit amputation, or laceration repair. Anesthesia can be accomplished by performing a ring block of the limb above the surgical site; however, this provides only minimal anesthesia and is often incomplete in its distribution. For interdigital surgery, such as corn removal, adequate anesthesia can be provided by injecting 5 to 10 mL of 2% lidocaine deeply (5 cm) approximately 2 to 3cm proximal to the interdigital space.

The Bier block (intravenous regional anesthesia that produces effective regional limb anesthesia) requires placing a tourniquet and injecting lidocaine into the distal limb veins. Regional anesthesia is produced for as long as the tourniquet is in place. The tourniquet is placed in the mid metacarpus or metatarsus for foot surgery, and up to 30 mL of 2% lidocaine is injected into one of the following: dorsal metacarpal (metatarsal) vein, palmar (plantar) digital vein, dorsal digital vein, or lateral saphenous vein with a 20- or 22-gauge butterfly catheter The particular vein that is used is immaterial as long as it is easily accessed.

Advantages:

of intravenous regional anesthesia include

1. complete anesthesia of the foot,
2. reduced bleeding,
3. one injection , a smaller amount of lidocaine required
4. and rapid onset of anesthesia.

Disadvantages:

1. the need for knowledge of vessel anatomy in the foot,
2. and failure of the nerve block despite accurate penetration of the vessel.
3. The tourniquet should be released slowly to prevent signs of lidocaine toxicity from rapid release of the lidocaine into the systemic circulation. A tourniquet can be safely left in place for up to 90 minutes without loosening.

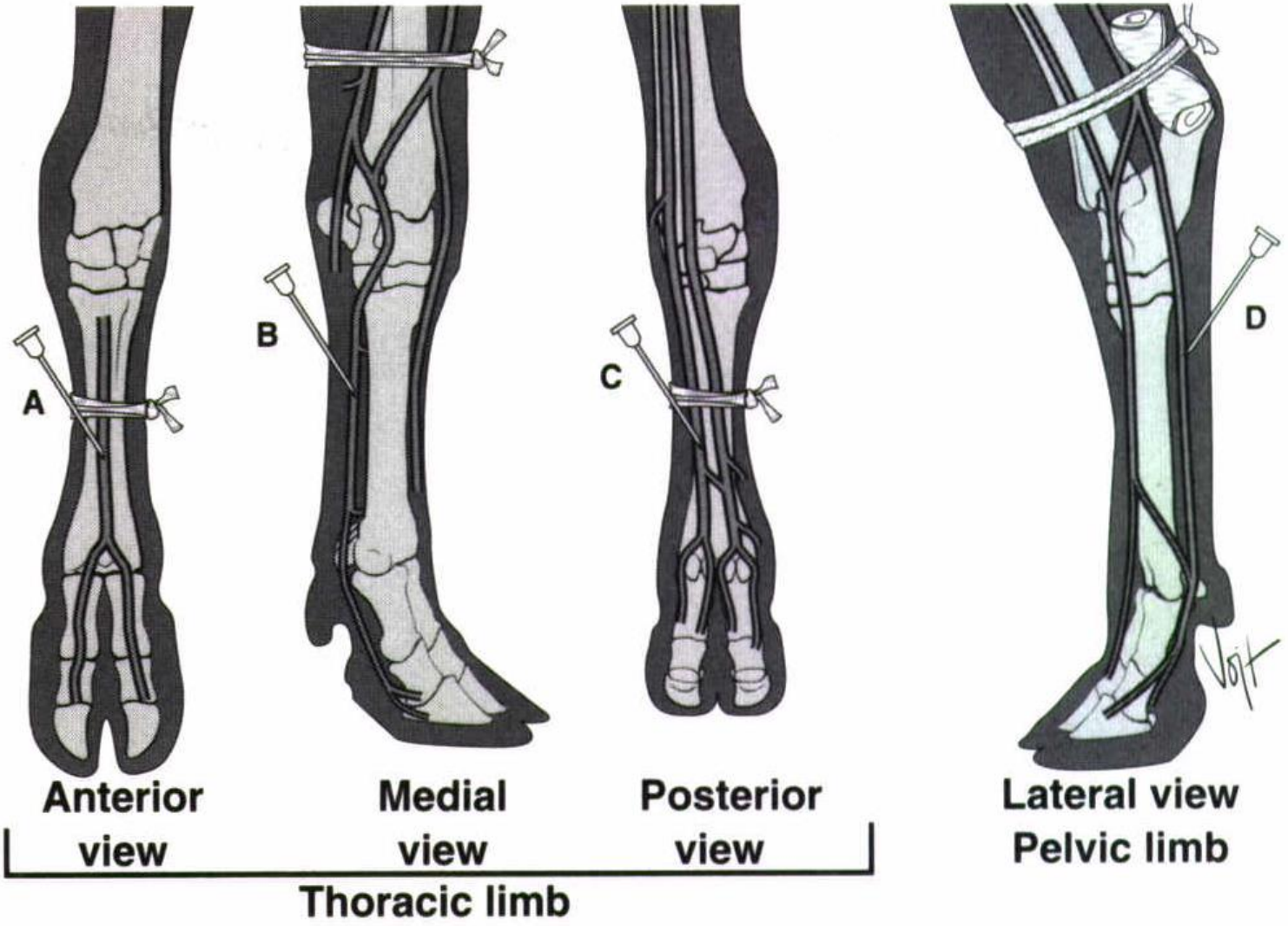


Figure 6-6 Intravenous regional anesthesia of the distal limb in the bovine. The suggested sites are only for reference; any visible or palpable vessel may be used.

Method of amputation obliquely through distal third of proximal phalanx without preservation of skin flap, is preferred method:

- **Apply tourniquet above fetlock or hock, if not already in position for IVRA**
- **Incise interdigital space close to affected digit along whole length, continuing proximally 3 cm dorsally, and 2.5 cm at plantar aspect**
- **Insert embryotomy (obstetrical) wire into incision and adjust to a level 1–2 cm above axial aspect of proximal interphalangeal joint**
- **With assistant firmly holding digit down towards ground, saw rapidly at an oblique angle so that cut emerges 2–3 cm above abaxial joint level, continuing through skin**
- **Trim off protruding interdigital fat pad**
- **Twist off any major vessels e.g. Dorsal digital artery lying axially**

- Examine cut surface meticulously for signs of s.c. Abscessation and necrosis, peritendinous infection and septic tenosynovitis
- Massage distally along deep flexor tendon sheath to check synovia
- Purulent synovia should be irrigated out of tendon sheath (male dog catheter, 50 ml syringe and saline), and reconsider need for resection of part of deep flexor tendon
- Dress wound with oxytetracycline or sulphadimidine powder (not essential), apply gauze swab or paraffin-impregnated tulle, and hold in place by pressure bandage and possibly protect by waterproof covering (e.g. Duct tape)
- In bandaging avoid pressure necrosis around accessory digits
- Remove tourniquet
- Inject single prophylactic dose of ceftiofur or long-acting oxytetracycline and, in known risk areas, tetanus antitoxin

Aftercare

- **Change dressing after two days, when cut surface should be cleaned and checked for residual infection**
- **Foul odour suspicious**
- **Apply new dressing for six days**
- **Surface may then safely be left exposed for granulation and epithelialization**
- **Rinse wound with water once daily until healing well**

Animal should be kept in dry surroundings, either housed (preferably) or outdoors on dry level ground, during the three week recovery period.