VETERINARY PROFESSIONAL DEVELOPMENT SERIES

DISORDERS OF THE TARSUS IN THE DOG II

L. C. VAUGHAN

Department of Surgery & Obstetrics, Royal Veterinary College, Hawkshead Lane, North Mymms, nr Hatfield, Herts AL9 7TA

EPHYSEAL INJURIES

Separation of the distal tibial epiphysis

In puppies, prior to growth plate closure, this epiphysis is vulnerable to displacement as a result of direct trauma. Although the separation is usually along the growth plate (Type 1, Salter & Harris, 1963), a fragment of the metaphysis sometimes remains attached to the epiphysis (Type 2). Fracture of the distal third of the fibula may accompany the injury and allows quite considerable displacement of the distal components (Fig. 1). At times the lateral malleolus remains intact and this helps minimize the degree of displacement.

Fig. 1. Separation of the distal tibial epiphysis (Type 1) and fracture of the fibula in a 6-month-old Labrador.

The main clinical signs are pain, swelling, and a variable degree of distraction at the level of the hock joint. Radiography is essential for a proper assessment of the damage.
Reduction of the separation should be undertaken promptly under general anaesthesia and is usually reasonably simple to achieve. If the reduced elements appear stable to manual testing, it may well suffice to apply a rigid cast from the proximal tibia to the foot, with the hock in slight flexion. Union is usually rapid in such cases and the cast may be replaced with a supporting dressing after four weeks. If, on the other hand, the reduction is unstable, some surgical fixation is required or else the repair will be vulnerable to stress. A variety of techniques are available. Rush pins may be introduced from the medial and lateral aspects of the epiphysis; K-wires may be inserted in cruciate fashion especially in miniature breeds. If the fibula is intact, it may be used to splint the tibia by driving a screw horizontally through the fibula and into the tibia above the level of the growth plate. Intramedullary pins are not particularly helpful: if taken along the tibia from its proximal end, the tip of the pin will have little hold in the epiphysis, and the method of driving a pin right through the articulation which has been described, leaves a legacy of joint stiffness even if it is removed after three weeks.

Most of these surgical repairs are best supported in a rigid cast.

**Separation of the distal fibular epiphysis**

This is seldom encountered alone without damage to the adjacent tibial plate. It causes joint instability and local signs of pain and swelling. Stabilization may be adequate in a cast or else a K-wire may be inserted along the epiphysis and up into the shaft of the fibula.

**Avulsion of the epiphysis of the fibular tarsal bone**

This has already been referred to under calcaneal (Achilles) tendon injuries.

**Premature closure of the distal tibial growth plate**

This is an uncommon site for premature growth plate closure but the Shetland Sheepdog and Rough Collie appear prone and one or both hind legs may be affected. Lateral angulation of the tarsus and metatarsus from the level of the hock (tarsal valgus) usually arises insidiously, the degree of deviation depending on the age at which the plate defect arose and on the severity of the damage. The condition may also follow epiphyseal separation of the distal tibial or fibular plates, usually noticeable 3-4 weeks after this injury occurred. Since this plate contributes 50% of tibial growth, the potential for a major distortion and for tibial shortening is considerable.

The valgus defect or tibial bowing are readily recognizable but lameness is slight unless the defect is severe. The status of the growth plate must be assessed radio-graphically (Figs. 2, 3, 4), and in unilateral cases comparison with the normal leg—regarding not only its appearance but also the length of the tibia/fibula—is helpful to the prognosis.

Slight valgus defects seldom warrant attention but a major deviation demands surgery. In puppies, while the growth plate is still active, stapling the medial side of the distal tibial plate provides a simple way of straightening the limb. After 6 months of age insufficient growth remains which makes stapling ineffective, and the same applies should the plate be substantially disturbed at any time in puppyhood. Osteotomy may be undertaken in these cases, the site depending on the level at which the angulation has arisen. Not uncommonly a wedge osteotomy has to be performed close to the tarsus and this may cause difficulty over the rigidity of the ultimate repair because the use of a plate
may not be feasible and K-wires in cruciate form are needed. Rigid support for four weeks is indicated for operations close to the hock in which the repair is considered relatively fragile.

**Fig. 2 left.** Right tarsus of a 9-month-old Shetland Sheepdog; tarsal valgus (arrow) due to differential growth plate closure.

**Fig. 3 centre.** Same case as in Fig. 2, after correction of valgus defect by stapling the distal tibial growth plate.

**Fig. 4 right.** Gross defect of the distal tibial growth plate (arrow) in the left hind leg of a 5-month-old Labrador (opposite leg for comparison).

**DISLOCATIONS**

A variety of dislocations and subluxations affect the tarsus and careful examination, manipulation and radiography are required to determine whether the problem involves the tibio-tarsal, intertarsal or tarso-metatarsal joints, and also to help establish what closed or open reduction technique is appropriate to treat a given case.

**Tibio-tarsal joint**

Complete dislocation of this joint is often associated with fracture of one or both malleoli, and collateral ligament damage is inevitable. Lameness is sudden in onset, and local evidence of pain, swelling, capsule distension and distortion makes the diagnosis straightforward. Radiography is essential for a full assessment of the bone damage and treatment is often based on the findings. In the absence of fractures, the dislocation may be reduced under general anaesthesia and the joint then tested for stability. If the joint is relatively stable, support in a cast for four weeks may well prove effective and this method may be particularly advisable for miniature breeds. However, should the joint be readily redislocated manually, there is little alternative but to explore the ligament on the ruptured side of the joint with a view to it being sutured or replaced with a carbon fibre, polyester or steel wire implant. A rigid support is essential postoperatively.
If a malleolus is fractured, it has to be repaired with a K-wire or tension band wire, in order effectively to stabilize the joint.

On occasions a subluxation arises which is spontaneously reduced and this may not be recognized unless the joint is tested manually and radiographs taken with the joint appropriately stressed. When proven, the ligament should be repaired or replaced.

**Plantar proximal intertarsal subluxation** (fibular tarsal subluxation)

This is the commonest tarsal injury in dogs and is caused by rupture of the plantar ligament between the fibular tarsal and the fourth tarsal bone. Shetland Sheepdogs and Collie-type breeds are especially prone, and the prevalence is greatest in middle-aged and overweight animals. Such a tarsal injury may arise insidiously or follow a bout of vigorous activity. It is usually unilateral but the second leg may become affected some months later—possibly because of the extra stress it has borne during this time. When both legs are affected the dog is severely incapacitated.

The dysfunction produced is severe—the leg being carried in some or adopting a plantigrade posture in others. The characteristic clinical feature is forward tilting of the fibular tarsal bone, and manual movement of the latter temporarily back into its correct alignment. Swelling and discomfort are not marked. A lateral radiograph is most instructive, diagnostically, confirming the forward tilt of the calcaneum. In addition, sometimes fragments are avulsed from the base of the fibular tarsal bone or new bone develops at this site (Figs. 5, 6, 7).

![Fig. 5 left. Plantar proximal intertarsal subluxation (arrowhead) in a 5-year-old Shetland Sheepdog.](image1)

![Fig. 6 centre. Plantar proximal intertarsal subluxation in a 9-year-old Shetland Sheepdog.](image2)

![Fig. 7 right. Same case as in Fig. 6, after tension band wiring.](image3)

Conservative therapy is seldom successful, and although supporting the hock in extension in a cast will make the dog more comfortable, the fibrous tissue repair that ensues is not strong enough to support weight and soon breaks down when the cast is removed.
The treatment of choice is prompt arthrodesis of the affected joint. Through a posterolateral approach the appropriate intertarsal articular surfaces are debrided with a curette. In chronic cases a wedge of fibrous tissue has to be cut from the joint before the hock can be straightened.

A number of techniques are available to fix the bones rigidly in correct alignment while fusion proceeds. The most secure method for the medium sized and large breeds is the application of a 2·7 mm or 3·5 mm ASIF plate to the lateral aspect of the calcaneus and the base of the fourth and fifth metatarsal bones. One or more screws may also be inserted at mid-tarsus, depending on the size of the hock. The plate must be bent to accommodate it to the shape of the hock and this process can be aided by levelling small protuberances with a chisel.

For Shetland Sheepdogs a good alternative is to use a tension band wire, having first placed one or two K-wires longitudinally along the calcaneus and into the fourth tarsal bone. Another possibility is to insert a lag screw from the tuber calcis down into the metatarsus.

Wound closure requires careful attention because the skin over the hock is tight and it can be difficult to cover a plate with enough tissue to avoid dehiscence. Preferably, a continuous suture of polyglycolic acid (00 or 0 size) is placed in deep fascia and this is covered by a subcuticular suture. Skin sutures are also used and the leg is supported in a Robert Jones bandage.

In bilateral cases the second leg may be repaired after 4–6 weeks so long as the first has made good progress.

**Intertarsal and tarso-metatarsal subluxations**

Rupture of tarsal ligaments produces instability at differing levels of the hock. Generally, they result from severe wrenching of the limb, either in car accidents or by the

---

**Fig. 8 left.** Distal intertarsal dislocation (arrowhead) in a 3-year-old Mongrel.

**Fig. 9 centre.** Intertarsal dislocation (arrow) in a 5-year-old Crossbred.

**Fig. 10 right.** Tarso-metatarsal subluxation with dorso-medial instability (arrow), in a 7-year-old Crossbred.
leg being caught when jumping at speed. Some such injuries arise spontaneously: not uncommonly in old and overweight animals. Marked lameness, local pain and swelling, and the manual demonstration of instability in the latero-medial or dorso-plantar planes are their main diagnostic features. Radiographs taken with the joint appropriately stressed help to define the site of the subluxation (Figs. 8, 9, 10).

A variety of means of correcting these conditions has been described by Brinker, Piermattei & Flo (1983) but the basic purpose of the different techniques is to achieve fusion of the joint in question. To this end the joint is debrided, and plates, K-wires, compression screws, figure-of-eight wire taken around two screw heads, and tension band wiring are used to secure the bones together depending on the site and on the size of the dog. External support in a light cast is advisable for four weeks.

DEVELOPMENT ERRORS

Congenital tarsal defects are rarely encountered, but newborn puppies with detectable deformities would, most likely, not be reared. Anomalies involving the number of bones in the distal row of the tarsus or affecting the shape of some bones, have been identified. Such cases are usually presented with a mild lameness or the owner has noticed that the hock is abnormal in size or shape. As a rule no therapy is called for.

It is essential to recognize that in some individuals of breeds—such as the Pyrenean Mountain Dog, Rottweiler, and St Bernard—the shape of the medial aspect of the central tarsal bone is markedly different from that of other dogs, there usually being an extra buttress or a curving promontory of bone outside the medial line of the tarsus (Figs. 11 & 12). In the Pyrenean it is often associated with the presence of a well developed first digit, some in the form of the so-called ‘Double dewclaw’. These anatomical vestiges are mostly bilateral and are not clinically significant.

SHEARING INJURY

An injury similar to that affecting the carpus occurs when the leg is dragged along the road by a motor car. The medial or lateral aspects may be abraded and the extent of the damage varies. Skin laceration is often extensive and some may be lost, but ligaments or even parts of the bones also may be sheared away by the friction, and the joints thus exposed (Fig. 13). In some cases there may be no alternative to amputation, which should be done at mid-thigh level. For those in which preservation of the leg is attempted, thorough debridement and wound lavage to remove devitalized tissue and debris are essential. Unstable joints have to be realigned, preferably using implants such as Kirschner wires to minimize the size of the foreign material introduced, and a well-padded splint applied. Antibiotic cover, local and parenteral, is essential. Healing is often surprisingly good and secondary skin repair may be undertaken once healthy granulation tissue has established and the absence of infection is ensured. Future function of the joint depends on the extent of the original injury, there may be merely a loss of hock joint movement which does not greatly influence weight bearing, or a gross deformity causing permanent lameness.
Fig. 11 left. Tarsus of a 5-year-old Border Collie with anatomical vestiges on the medial aspect (arrow).

Fig. 12 centre. Tarsus of a 7-month-old Pyrenean Mountain Dog with anatomical vestiges medially, and a 'double dewclaw' (arrowheads).

Fig. 13 right. Shearing injury to the right tarsus of a 5-year-old German Shepherd Dog. Considerable destruction of the bones on the lateral surface (arrows) of the tarsus.

Fig. 14 left. A 10½-year-old Springer Spaniel, with a highly malignant fibrosarcoma (arrowheads) affecting the fibular tarsal bone.

Fig. 15 right. An 18-month-old German Shepherd Dog, with a calcinosus circumspecta lesion (arrowhead) postero-lateral to the tarsus.
NEOPLASIA

Synovial sarcomas have been encountered in the tarsus and their clinical features, radiological and histopathological identification, and possibilities regarding treatment are similar to those found in the carpus (Vaughan, 1985).

Although rare, osteosarcomas and fibrosarcomas sometimes arise in the fibular tarsal bone (Fig. 14). Additionally, the distal tibia is a recognized site for osteosarcoma development—especially in large breeds of dog. All these neoplasia present with signs of swelling and pain, localization to the hock, are not difficult to identify radiographically, and carry a grave prognosis.

The tarsus is also not an uncommon site for the development of calcinosis circumscripta, especially in young adults of the German Shepherd Dog breed. They occur as firm, painless enlargements which do not, as a rule, affect leg function. Sometimes the lesion becomes abraded and a chalky fluid leaks from the surface. Their characteristic clinical and radiological features enable them to be distinguished from bone neoplasms (Fig. 15). Although benign, surgical removal is advisable at this site before they enlarge or become abraded.

ACKNOWLEDGEMENTS

The author is indebted to Miss C. France for radiographic assistance, to Mr D. Gunn for the illustrations, and to Miss R. Harrison for typing the manuscript.

REFERENCES

