Fractures and Dislocations of the Stifle

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The stifle joint of the dog is a complex joint that combines sliding, gliding, and rotation as the joint flexes and extends. The complexity of the motion of the joint is an indication of problems that can occur through injury to this joint. Ligament injuries are common and are discussed in Chapters 69 and 80. Fractures of the knee joint include fractures of the patella, sesamoid bones (Chapter 33), distal femur, and proximal tibia.

AVULSION OF THE LONG DIGITAL EXTENSOR TENDON

The long digital extensor tendon originates on the lateral distal aspect of the femur above the joint surface. Occasionally an animal presents with lameness related to the stifle joint that is a result of the avulsion of the long digital extensor tendon. When this tendon avulses, it usually takes along with it a small piece of bone; hence, on radiographic examination there will be a chip fracture located within the joint. The fracture fragment will usually be in the lateral cranial compartment of the joint and will still be attached to the long digital extensor tendon. This injury is treated by arthrotomy through a lateral parapatellar incision and replacement of the avulsed tendon using a simple mattress suture of wire through the bone (Fig. 30-1). The animal is restricted in exercise and immobilized in a Robert Jones dressing for 2 weeks. Good results are obtained through this procedure, but the condition is rather uncommon. I have seen three cases, all of which responded well to treatment.

FIG. 30-1 (A) Lateral radiograph demonstrates avulsion of the long digital extensor tendon in a Doberman pup. (B) The rapid response following injury is shown in this photograph of the enlarged tendon, which represents one week of injury. The hemostat is under the inflamed tendon. (C) The avulsed bony fragment was reattached using a simple mattress suture of 20-gauge wire.

AVULSION INJURIES OF THE COLLATERAL LIGAMENTS

Occasionally avulsion of a collateral ligament will be seen on either the medial or lateral aspect. If a piece of bone is associated with this avulsion, either lag screw fixation or two Kirschner wires will be adequate to stabilize the fragment. External immobilization will be needed in some instances to maintain integrity of the fixation following injury.(23) Immobilization is usually maintained for 3 to 4 weeks depending on the type of internal fixation used.

FRACTURES THROUGH THE DISTAL END OF THE FEMUR

FIG. 30-2 This single medial condyle fracture of a distal femur in a German shepherd (A) was repaired using small Kirschner wires and a tension band to add stability (B).

Fractures through the distal end of the femur into the joint are common. Often the osteochondral fragments will be situated such that they are absolutely necessary to reconstitute the normal joint surface (Fig. 30-2). Although a lateral or medial approach may be sufficient in most cases, a cranial approach via osteotomy of the tibial crest will give a wide exposure when necessary(5) (Figs. 30-3 and 30-4). Most of these fractures can be handled with multiple small Kirschner wires and some-
times with a tension band wiring technique. If the fractures occur through the joint surface and internal fixation is needed for reduction and stabilization, it is sometimes necessary to insert small Kirschner wires directly through the joint surface and then countersink them below the cartilage to the level of the subchondral bone. The small defects that remain fill with granulation tissue and eventually with fibrocartilage, producing a functional joint (Fig. 30-5).

**FIG. 30-3** This T fracture of the distal femur (A) was approached cranially using an osteotomy of the tibial crest. Pins alone were used to reduce and stabilize the fracture (B,C). A tension band was used to immobilize the tibial crest at the time of closure.

**FIG. 30-4** (A) This extensive fracture of the femur in a dachshund included a T fracture of the distal condyles. The intercondylar notch in this dog was so large that the interfragmentary screws could not be used across the condyles, hence their use from the more proximal fragment. (B) The postoperative view shows the use of the cranial approach via tibial crest osteotomy. Although screws alone are never recommended for fractures of the femoral shaft, the long obliquity of the fracture and the small size of the patient made plate fixation impossible. (C) The two-month follow-up film shows bone healing with minimal callus.

**FIG. 30-5** This comminuted transcondylar fracture (A) was approached laterally (B) and stabilized (C) with Kirschner wires.

**FRACTURES OF THE PROXIMAL TIBIA**

Fractures of the proximal tibia include avulsion fractures of the tibial crest, which are usually treated with tension band wiring techniques (Fig. 30-6). Proximal physeal fractures of the Salter type I and 11, which affect the stifle joint, are common in the proximal tibia. Occasionally comminuted fractures will cross the joint surface and involve the tibial plateau. Avulsion fractures of the cranial cruciate ligament are also seen, with a small piece of bone associated with the distal end of the cruciate. In most dogs this piece cannot be returned to its original place and is removed when the ligament is debrided at the time of surgical repair and stabilization with a cruciate ligament replacement. Most tibial plateau fractures can be handled with either a buttress plate or simple Kirschner wires into the metaphysis to stabilize the fracture (Fig. 30-7). Most fractures of the knee joint seem to occur in the femur, and fractures of the proximal tibia are less common.

**FIG. 30-6** Avulsion of the tibial crest stabilized by a tension band wire.
DISLOCATION OF THE KNEE
Complete dislocation of the knee is uncommon. The usual presentation of such an animal allows for complete cranial and caudal drawer movement, indicating rupture of both cranial and caudal cruciate ligaments as well as at least one collateral ligament, usually the medial collateral ligament, giving complete instability to the stifle joint (Fig. 30-8). Vascular injury can occur, causing rupture or blockage of the popliteal artery. Palpation of pulses distal to the knee, limb temperature, and arteriography all are useful in assessing adequate perfusion. The problem of complete dislocation of the knee is not easily resolved. There are three basic choices of treatment, as described below.

CLOSED TREATMENT
The closed treatment of complete dislocation of the stifle joint can be accomplished using a lateral plaster spica and/or Schroeder-Thomas splint. The stifle joint is positioned as close to normal as possible in slight flexion and is kept immobilized for a period of 4 to 8 weeks. Results are quite variable.

CLOSED REDUCTION AND LIGAMENT RECONSTRUCTION
Most, if not all, dislocations of the stifle joint in the dog can be reduced through closed manipulation. Following this procedure, physical examination and stress radiographs will reveal which ligaments will need open reconstruction. The surgical approach will vary depending on the information learned from the physical exam. On opening the joint the menisci may be seen to be torn or damaged. Removal of the menisci is undertaken only if they are completely mobile. Sometimes the menisci appear to be uninjured. The reconstruction that is necessary to stabilize the joint involves prevention of cranial drawer movement, prevention of medial or lateral instability by associated collateral ligaments and caudal drawer. This can usually be accomplished by reconstruction of one collateral ligament (the other usually is intact) and reconstruction of the cranial cruciate ligament with a fascia strip or other technique. The caudal cruciate is usually untouched and the caudal joint capsule may be reefed or tightened to help stabilize the caudal drawer. Following this procedure external immobilization is used for 3 to 4 weeks. Results of the reconstruction can be quite variable.

INTERNAL FIXATION WITH NO RECONSTRUCTION
In some small animals it is possible to stabilize the knee with internal fixation using a small Steinmann pin to hold the knee in proper position. No other attempt is made to correct the internal derangements of the stifle joint, and external immobilization is used to prevent fracture of the internal fixation device. The pin is introduced through the lateral distal femur just above the lateral trochlear ridge of the femur, passes through the intercondylar joint space, into the joint and through the tibial plateau, and out through the medial portion of the tibia just below the tibial plateau. This is the same procedure that is used when making a tunnel for cruciate repair using the original Paatsama technique for cruciate rupture.(4) In this case, however, the intramedullary pin is left in place for 3 to 4 weeks and then removed; no other treatment is provided. Small animals are more apt to have a good result with this technique than are larger dogs. Although this technique is not documented in the literature, it has been used by various surgeons and has been discussed at meetings on an irregular basis for many years. Following immobilization of the stifle joint with any of these methods, return to functional use may be quite limited. Analgesics and physical therapy may be helpful in some cases. If pain is a persistent problem with or without instability, surgical arthrodesis of the stifle joint may be considered as a method to return the dog to useful function of its limb. Complete dislocation of the stifle joint of the dog and cat remains a difficult problem to treat successfully. The
infrequent nature of the injury does not allow any one person to have a large enough series of cases to make adequate recommendation of treatment modalities. The conflict in the human literature regarding recommendations for treatment of knee joint dislocation is evident, with recommendations of both open and closed techniques.(1,2)

REFERENCES


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