Meniscal Injury - Examination and Treatment

Cranial cruciate ligament (CrCL) disease is a common condition in small animal practice. Many clinics offer surgical solutions to their clients ranging from extra-capsular ligament prosthesis through to the myriad of osteotomy techniques, each with the goal of improving stifle stability during weight bearing.

The recognised spectrum of cruciate disease is the early development of degenerative CrCL ligament change with a 'competent' or stable ligament, through to an incompetent ligament with palpable instability and ultimately complete ligament failure. As ligament stability is lost, the risk of meniscal injury increases. Whilst there are two menisci, the medial meniscus is less mobile (owing to a different arrangement of attachment points) than the lateral meniscus and explains the much higher incidence of damage to the medial meniscus.

Irrespective of the surgical technique employed, an essential part of treatment involves accurate evaluation and management of intra-articular pathology, particularly that within the menisci. Meniscal pathology is recognised as a source of morbidity, pain, worsening osteoarthritis and can further reduce femorotibial joint stability.

Options for evaluating intra-articular structures include open arthrotomy, arthroscopy, ultrasound and magnetic resonance imaging. Whilst arthroscopy is considered the gold standard, it is highly dependent on operator ability and is out of reach of most general practices due to the investment in equipment necessary.

But wait, do I really need to evaluate the joint if there isn't a meniscal click?

It is important to assume a meniscal injury is present in all cruciate ruptures where instability is present until proven otherwise on joint exploration. Meniscal injury has been shown to be present in dogs with cruciate instability in 30-60% of cases.

Meniscal click has been shown to have a 38% sensitivity and 95% specificity for meniscal pathology (Gleason)[1]. This highlights the inaccuracy of relying on meniscal click as an indication for meniscal pathology given the high rate of false negatives. All cruciate incompetent or unstable joints should be explored for the purpose of evaluating for meniscal or other pathology that may be a source of ongoing lameness.

Stifle joint exploration - step by step

1. Positioning and draping

Dorsal recumbency with a hanging limb preparation. The limb should be prepared in a way that allows 4-quarter draping around the mid-thigh and to the level of the tarsus. An impervious layer is applied to the foot wrap followed by sterile co-plus. An optional iodine impregnated impervious layer can be applied for additional sterility. The limb should be positioned in a way that allows manipulation of the tibia in all directions, including flexion and extension. By having the stifle 'free-floating' and not laying down on a table facilitates inspection of both the medial and lateral compartments of the joint.

Left to right: *Positioning and draping*

2. Equipment

Essential equipment includes:

- Self retaining stifle distractors
- Gelpi or 2nd pair of stifle distractors
- Meniscal probe
- Meniscal hook knife
- No. 11 blade or beaver blade
- Suction
- Good focal lighting

3. Surgical approach

There are 3 arthrotomy approaches that can be used to evaluate the stifle. A complete lateral parapatellar, complete medial parapatellar, and a mini-medial. The benefits of a medial approach is that it gives direct access to the medial meniscus which is the point of focus during cruciate disease management and is positioned at the level of soft tissue dissection for osteotomy techniques. The authors strongly encourage use of the mini-medial arthrotomy for evaluation of meniscal disease in the dog when an osteotomy technique is being employed. It provides all necessary exposure of the medial meniscus and reduces surgical time and morbidity compared to a complete arthrotomy.

4. Mini-medial arthrotomy

a. The incision runs 4-5mm medial to the palpable patella tendon to provide non-tendinous fascia for closure. It should begin immediately distal to the palpable distal patella pole and terminate immediately proximal to the tibia.

b. The incision is extended into the subcutaneous tissue, again remaining medial to the patella tendon. Gelpi's are inserted at this stage to provide tissue distraction prior to joint entry.

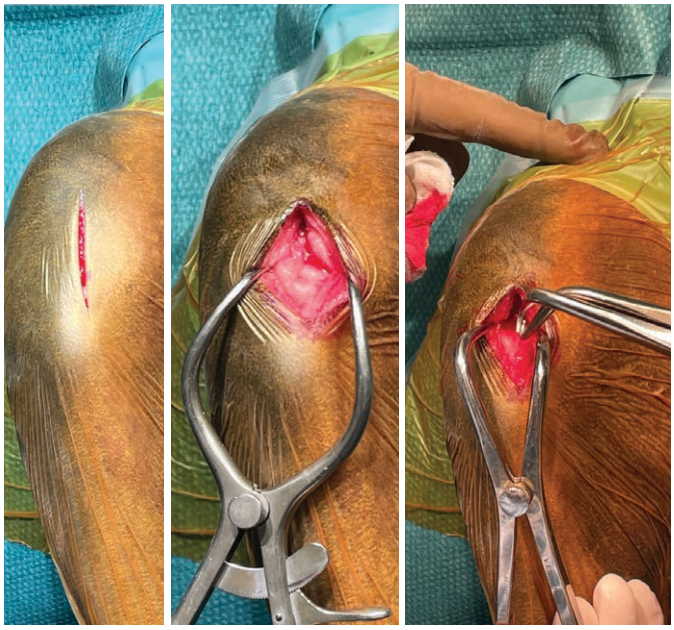
c. The joint is entered with a stab incision using a no 15 scalpel blade or electrosurgery at the proximal extent of the incision to avoid confusion with the presence of the infra patella fat pad. Joint entry is typically evident by a release of joint fluid at this stage. Gelpis can be re-positioned at this point within the joint capsule to facilitate insertion of stifle distractors.

d. With the gelpi's running perpendicular to the incision line, stifle distractors are inserted in their closed position with the tips perpendicular to the patella tendon. The proximal distractor is positioned to anchor in the dorsal arch of the intercondylar fossa. The distal tip is positioned to insert immediately caudal to the intermeniscal ligament which is immediately caudal to the fat pad on the tibia. The cranial cruciate ligament inserts immediately distal to the inter meniscal ligament.

In cases of partial cruciate rupture where the ligament is intact, the distal tip of the stifle distractor can be positioned to "slide" distally along the cranial cruciate ligament which will position the distractor tip in the correct position immediately caudal to the intermeniscal ligament.

Sometimes on application of tension to the distractors they become loose. This is usually because the distal tip is not inserted caudal to the intermeniscal ligament but rather is inserted into the fat pad. If the distal tip is inserted in the correct position caudal to the inter meniscal ligament it will not become loose and strong distraction can be applied to the distractors without damaging the intermensical ligament.

The other cause of loss of tension of the stifle distractor is when there is considerable osteophyte presence that has remodelled the proximal edge of the intercondylar fossa causing slipping of the proximal tip. If this occurs insert the proximal tip slightly deeper into the fossa. The goal should always be maximum possible application of tension to the stifle distractors to maximise the viewing window.



Left to right: *Incisions a, b & c, d*

5. Improving access to the medial compartment of the joint

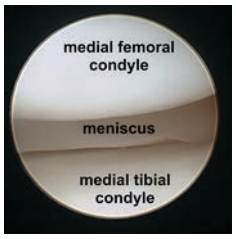
Tip 1

With the aid of an assistant, use the distractors to induce a varus or valgus force whilst holding the distractors to create improved distraction of the medial or lateral joint compartment. This can be accomplished by either 'pulling' or 'pushing' on the stifle distractor. Alternatively the hock can be pushed medially or laterally to accomplished a similar effect.

Tip 2

With the aid of an assistant, the hock can be gently but progressively forced into extension to create a lever arm against the stifle distractors and open the caudal aspect of the joint.

6. Meniscal inspection

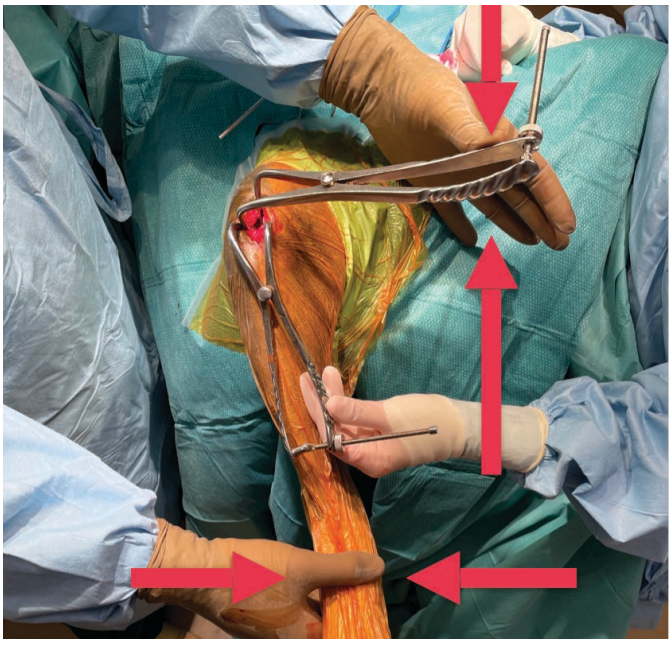


Visual inspection alone is inferior to use of a probe for the accurate detection of meniscal pathology regardless of surgical approach (Pozzi)[2]. Menisci should be inspected systematically, with particular focus at the caudal horn of the medial meniscus where most meniscal pathology occurs.

Normal menisci have a smooth, white, glossy appearance. They are widest on their abaxial ("outside) edge. The axial ("inside") edge is much thinner and has a well defined 'oyster-flounce' or wavy edge. An abnormal appearance raises suspicion for meniscal injury.

Probing of the medial meniscus should begin at the caudal meniscotibial ligament and move medially along the caudal horn. The probe is inserted flat to the tibial surface, between the meniscus and tibia and advanced caudally until the tip of the probe touches the caudal capsular attachment at which point it will not advance further. The probe is then rotated 90 degrees so the tip points proximally and gentle firm traction is applied to the meniscus pulling in the direction of the surgeon. A normal medial meniscus is firmly attached to the caudal joint capsule and will not luxate into the cranial joint compartment when tension is applied to the probe.

Assuming the caudal horn of the medial meniscus is stable, the probe is then withdrawn and replaced on the dorsal surface of the caudal horn of the medial meniscus with the probe tip horizontal. The tip is then gently rotated 90 degrees to point ventrally towards the meniscal surface and the tip is slid down the meniscal face from caudal (abaxial) to cranial (axial). In a normal meniscus the probe tip will slide smoothly over the intact dorsal surface of the meniscus. If a bucket handle tear is present the probe tip will drop into the circumferential defect and the "bucket handle" can then be displaced cranially.



Above: *Improving access to the joint*

It is important to recognise that the medial and lateral menisci are very different with different attachment points. The lateral meniscus is larger and more mobile than the medial meniscus. Clinically significant lateral meniscal injuries are rare. A clear knowledge of the anatomic differences between the lateral and medial menisci is essential before even considering surgical treatment of supposed lateral meniscal injuries.

7. Meniscal injury treatment

Surgery is the treatment of choice for meniscal injury. Conservative treatment is not recommended due to the avascular nature of the majority of the meniscus and consequent lack of healing. Only the peripheral 10%-15% of the meniscus has a significant blood supply. The remainder of the meniscus receives nutrition from the synovial fluid. Dogs with untreated meniscal injuries remain with significant lameness.

There are three common types of meniscal injury:

- bucket handle tears
- peripheral capsular detachment
- radial tears.

All occur predominantly only in the caudal 1/3 of the medial meniscus between the medial collateral ligament and the caudal meniscotibial ligament. Once cruciate disease has progressed to the point where the cranial cruciate ligament is functionally incompetent and stifle joint instability is present, the resulting cranial tibial thrust creates relative shear subluxation between the femoral condyles and the tibial condyles / plateau. The firm attachment of the medial meniscus to the medial tibial condyle results in the medial femoral condyle repeatedly subluxating over the caudal horn of the medial meniscus. The shear force eventually can tear the caudal capsular attachment to the entire caudal horn or can create circumferential tears (bucket handle tears) of the caudal horn.

The goal of treating a torn meniscus is to remove all of the torn piece but only the torn piece. Any stable intact meniscus should not be removed. Partial meniscectomy (removal of only the damaged part of the meniscus) is strongly preferable to total meniscectomy.

Axial partial meniscectomy is the removal of the "bucket handle" part of a bucket handle tear. This leaves the periphery of the meniscus intact and, unless the bucket handle is very large, preserves some of the load bearing and stabilisation capacity of the meniscus.

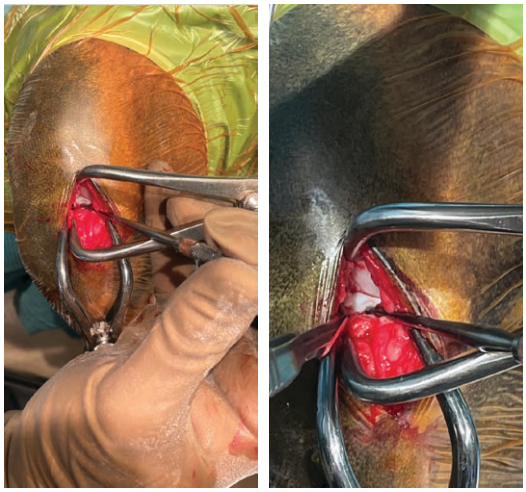
Caudal pole hemimeniscectomy is the removal of the entire caudal pole of a detached medial meniscus. While this is necessary in cases where the entire caudal horn is detached it inactivates the shock absorbing capacity of the meniscus and increases the severity of subsequent osteoarthritis similar to total meniscectomy.

Tips on managing meniscal bucket handle tears

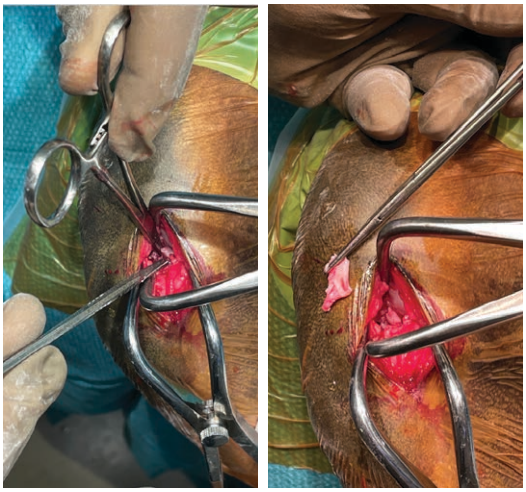
a. A probe is used to identify the tear within the meniscus at the caudal axial (inner) edge and pulled towards the surgeon.

b. A no 11 blade or other fine meniscal cutter is used to cut the lateral edge (usually in or adjacent to the caudal meniscotibial ligament) of the torn part of the medial meniscus using the probe as a 'cutting board' to protect local structures. By applying tension to the damaged piece of meniscus with a probe or fine mosquito haemostat or meniscal forcep means that less force is needed to cut the meniscus. Less force means more accuracy and less chance of causing iatrogenic damage to the articular surface of the tibia or femur.

c. Once the meniscus is completely separated at its lateral edge, the probe becomes 'free'.



Left to right: *Steps a, b & c*



Left to right: *Steps d, e & f*

d. A fine haemostat or meniscal forcep is applied to the cut edge to apply tension to the damaged piece of mensicus. This "unmasks" the medial extent of the bucket handle tear. It is usually immediately caudal to the level of the medial collateral ligament as the ligament attachment reinforces the meniscus and prevents the bucket handle tear progressing cranial to that point.

e. The damaged bucket handle piece of the meniscus is tractioned towards the surgeon and the no 11 blade is again used to cut the remaining medial edge, being careful to avoid cartilage injury.

f. The meniscus is removed. The joint is lavage and suctioned. Probing is repeated to check for multiple meniscal injuries that were initially undetected.

8. Closure

Arthrotomy closure is completed in 3 layers. The joint capsule/peri-patella fascia are often indistinguishable from each other and closed simultaneously. The subcutaneous and skin layers are closed finally.

What about meniscal release?

Meniscal release refers to deliberate transection of the caudal body or menisco-tibial ligament of a healthy meniscus. Meniscal release results in permanent and accelerated cartilage wear within the medial compartment of the tibial condyle as well as altered femoro-tibial mechanics.Instead of selecting a technique to reduce late meniscal injuries by permanently disabling the important role of the medial meniscus, surgeons should select a technique that affords stifle stability and has a low incidence of meniscal injury after surgery. The optimal treatment of meniscal injury should alleviate pain while preserving meniscal function. If this principle is applied to clinical decision-making regarding an intact meniscus, meniscal release should not be performed because of its impact on meniscal function and consequently joint function.

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