

MUSCLE INJURIES IN RACING GREYHOUNDS, DIAGNOSIS AND TREATMENT

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MUSCLE INJURIES

Muscle injuries are a frequent problem in athletic dogs. Most of the high performance athletes like racing and coursing dogs are likely to suffer some type of muscle injury during their career.

Typical muscle skeletal injuries, such as contusions, lacerations, strains and complete tears usually occur either during the competition or training sessions. In addition, certain breeds, like Greyhounds, can sustain serious muscle injury with minimal apparent exertion, such as, while being walked on lead or exercising in a small paddock.

There are several predisposing conditions that can influence the frequency and severity of muscle injuries in sporting dogs.

Individual predisposing factors include; age, conformation, previous injuries, temperament, training program and diet. Specifically for racing Greyhounds; track shape, racing surface, care and maintenance of the track, speed and conduct of the hare, number of dogs in the race, race time and length of kenneling are influencing factors for musculoskeletal injury. For other types of working dogs, the nature of the terrain and its conditions are determining conditions. Weather conditions such as relative humidity, temperature and rain fall can also play an important role.

Research by Bloomberg and Dugger on track injuries in racing Greyhounds confirms this data and recognizes that muscle injuries comprise from 3 to 25% of the total injuries. Stretch induced injuries or strains and contusions seem to be prominent in Greyhound Sports Medicine. These injuries can lead to serious pain and disability causing loss of performance and downtime from training.

TYPE OF INJURIES AND INJURY MECHANISM

Muscles injuries can be of a different nature in relationship to the injury mechanism.

Contusions, strains and lacerations are generally considered to be minor injuries while partial and complete ruptures are considered major injuries.

Contusions involve more often the deep portion of the muscle, adjacent to the periosteum. They are traumatic injuries caused by a concussive trauma resulting in local vascular damage with extravasation of blood from the capillary bed or from the main vessels and subsequent hematoma formation. Unless the contusion is massive, treatment is usually unnecessary.

Muscle lacerations are a result of fights or collisions against sharp objects. The treatment, either conservative or surgical, of muscle lacerations depends on the severity of the injury, however in either case the basic principles of treatment of open wounds should be followed.

A basic understanding of how muscles are injured during athletic activity needs to be appreciated to better approach the diagnosis and treatment of strain injuries. Concentric contraction, the most common type of contraction, consists of a shortening of the muscle following the motor unit activation. This is in contrast to eccentric contraction, in which the muscle lengthens during its contraction. There are contractile (active) and passive elements within the muscle that aid in the function and structure of the muscle. The contractile elements are muscle fibers that are activated during contraction. The passive elements of the muscle include the connective tissue within the muscle and are not dependent on contraction of the muscle.

Muscles innately protect themselves and joint structures from injury. It is a combination of these passive and contractile elements which contributes to the muscles ability to absorb energy and this ability is greatly enhanced when the muscle is activated during concentric contraction.

Muscle strains occur when the muscle is elongated passively or when the muscle is activated during stretch by a powerful eccentric contraction. Eccentric contraction of the muscle contributes to injury by generating high muscle forces during lengthening, adding to the forces already produced by the passive, connective tissue element.

Any condition that diminishes the ability of the muscle to contract, diminishes its ability to absorb energy, leaving the muscle more susceptible to injuries.

Strain injuries can vary in severity depending on the amount of muscle fibers involved from a partial to a complete rupture. Although the injury can occur at any location in the muscle, muscle ruptures occur more frequently at the distal musculotendinous junction, leaving a small amount of muscle tissue attached to the tendon. It has also been observed that muscles that cross multiple joints, such as the gastrocnemius or muscles with complex architecture are more susceptible to strain injuries.

MUSCLE INJURIES CLASSIFICATION

For convenience, Hills has classified greyhound muscle injuries into three categories according to severity. Although this classification was originally created for racing dogs it can be applied to any dog.

Stage I: myositis, simple contusion or bruising. This injury is caused usually by direct trauma or overstretching of the muscle. There is minimal muscle fiber disruption and no hematoma formation present.

Clinical signs include: localized pain and inability to resist to firm palpation. Swelling and heat are minimal to absent, there is usually minimal to no loss of function.

Stage II: myositis, minor fiber disruption, tearing of the fascial sheath.

Clinical signs include: marked pain on palpation, localized swelling and slight heat, palpable tear in the fascial sheath. A slight lameness can be present for the first 24-48 hours following the injury.

Stage III: tearing of the muscle sheath, major disruption of the muscle fibers and hematoma formation.

Clinical signs include: obvious pain, palpable disruption of the normal muscle architecture, swelling and heat, variable degrees of lameness.

Sporting dogs are usually very stoic animals and they can often walk without showing any lameness even after a severe muscle injury. If lameness persists longer than 48 hours an additional injury or an injury to other structure should be suspected.

DIAGNOSIS

Clinical history: an accurate clinical history is essential before proceeding with the physical examination. Given the clinical history, it is often possible to identify one or more of the mentioned predisposing factors. It is important to collect data regarding the type of athletic activity, the time of onset of the symptoms, the severity of the injury, and the evolution of the lameness. In patients that are subject to training and competitive activities, the injuries tend to be repetitive (e.g. dogs racing around an oval track, utility dogs or agility dogs) and are often called typical or “professional” injuries.

Videotapes: The careful analysis of the racing behavior in Greyhounds can offer invaluable information regarding the site of a subtle or a chronic injury. The same considerations can be extended to other working breeds.

Physical examination: Most of the muscle injuries in sporting dogs are diagnosed by direct palpation. Some injuries are quite evident especially in short coated breeds due to the obvious swelling or “dropped” appearance of the muscle, e.g., gracilis muscle rupture in sight hounds, or abnormal stance and limb position. Some other muscle injuries are quite difficult to diagnose because of structural complex of the involved muscle or its anatomical location.

Detection of muscle injuries by palpation can be very subjective. A systematic approach is essential, and everyone should develop their own palpation technique and examination pattern. The excellent work produced by Davis provides an invaluable guide to palpation and diagnosis of muscular injuries and is an exceptional reference.

Here are some guidelines to keep in mind when conducting a physical examination of the musculoskeletal system:

- Whenever possible check every individual muscle along its entire length from the origin to the muscle belly and to its insertion. Palpation of the muscle must be performed both in the flexed and stretched positions.
- Always work in a systematic manner comparing one side to the contralateral side looking for asymmetry and different pain responses.
- Palpate gently, looking for minor swelling, edema, loss of anatomical detail and inability to resist palpation. Check for tears in the fascial sheath and splits along the muscle fibers.
- Chronic injuries are characterized by the presence of a distinct fibrous scar that fills a gap between the normal muscle fibers or by a “cording” at the musculotendinous junction.
- Examine the patient while walking at different speeds; sometimes lesions of specific muscles, in their acute stage, can be identified by the typical lameness that they produce. Chronic lesions, with partial loss of function and shortening or lengthening of the musculotendinous unit, may provoke a characteristic “swinging” movement of the limb during the walk, for example contracture of the gracilis muscle. These abnormal limb movements are caused by the inability of the muscle fibers to contract and relax in synchrony with the other normal muscles, by eccentric multifocal contractions or by scar tissue that act as an elastic band.

Ultrasound: While sonographic findings in muscle injuries are well known in human field they have not been studied extensively in small animals. Ultrasonography is an invaluable diagnostic tool as it allows a more precise evaluation of the extension and severity of the muscle damage. The 7.5 Mega Hertz, fluid offset probe is generally considered ideal for muscle and tendon evaluation offering an optimal panoramic view of the muscle together with excellent definition of both the superficial and deep structures.

Magnetic resonance imaging is an extremely useful diagnostic technique. The extreme accuracy of the results make it one of best diagnostic tools, however, obvious economical considerations restrict the use of magnetic resonance imaging to a very few cases.

TREATMENT PRINCIPLES

The first treatment goal is to reduce local bleeding and consequent hematoma formation and to decrease inflammation and the edematous process.

Reducing swelling improves local circulation, decreases pain and enables an early return to function.

Cold:

The application of cold on the acutely injured muscle, reduces bleeding and inflammation by causing vasoconstriction. Cold can be applied in the form of ice packs or chemical refrigerants. Guidelines: ice pack the affected area for 15 to 20 minutes for 2-3 (up to 6 times per day according to the physiotherapists, i.e. as much as possible) times a day for the first 48 hours after the injury.

Avoid excessive cooling and complete wrapping around distal extremities.

Compression bandages:

Whenever allowed by the anatomical conformation of the affected area, a compressive bandage should be applied. Compression bandages restrict movements reducing post-traumatic and postoperative discomfort, and additionally prevent further damage by excess of movement. Local compression reduces fluid accumulation and local swelling making the conservative or the surgical management easier.

Anti-Inflammatory therapy, systemic and topic:

The anti-inflammatory therapy helps decrease myositis and therefore is considered an essential step in the treatment of muscle injuries.

Both steroidal and NSIADs have been used to decrease inflammation and the pain sensation. Based on the results of a recent research work, NSAIDs may be of some benefit for the early treatment of pain control and functional improvement. However the delay in the repair process seen histologically raises concern

regarding the long-term treatment. Whenever using anti-inflammatory medications it is crucial to be cognizant of the potential gastrointestinal, renal and hepatic side effects and to use these medications wisely. In addition, in racing dogs, it is important to be aware of the withholding periods of anti-inflammatory medications according to the racing rules.

Topical anti-inflammatory agents can be used to help stop inflammation and their effect is often enhanced by the massage required to apply them.

Physiotherapy:

Physiotherapy represents an additional therapy in the multimodal treatment of musculoskeletal injuries.

Physiotherapy techniques including Passive range of motion, Massage, Ultrasound, Magnetic field, Trans Cutaneous Electrical Nerve Stimulation (TENS), Laser, Heat therapy, Underwater treadmills, Therapeutic exercise and Faradic Contractors, are currently used. Massage therapy helps to remove edema and reduce adhesion formation. It is necessary to use a good lubricant containing a mild rubifacient to warm up the area. Best results are achieved when treating sub-acute or chronic injuries.

Routine treatment of muscle strain injuries emphasizes the restoration of flexibility and muscle strength. During this period of rehabilitation, graded exercise and stretching play an essential therapeutic rule allowing a faster functional recovery.

TREATMENT FOR SPECIFIC CONDITIONS

Stage I strain injuries are best treated conservatively. Immediate treatment consists of the application of cold packs to the area followed by mild massage and anti-inflammatory drugs for 3 to 5 days.

In addition, 7 to 14 days of “active” rest, physiotherapy and massage, are beneficial and promote early healing and limb function.

Stage II strain injuries can be treated conservatively if the fascial tear is smaller than 1 cm, the same treatment principles as Stage I can be applied.

In the case of greater extensive fascial damage, surgical correction is recommended. The post-op care consists of 3 to 4 weeks of rest and physiotherapy. Controlled exercise should be encouraged after the first 7 days.

Stage III muscle injuries are best treated surgically. Ice packs, systemic anti-inflammatory drugs and compression bandages may be used during the first 48 hours to reduce the inflammation. The golden period for surgical repair is within the first 3 days as additional delay will interfere with the healing process. After 4-5 days the muscle ends tend to retract and the repair is extremely difficult.

The objective of surgical treatment is to: evacuate the hematoma, gently debride the damaged muscle and eliminate the dead space by anatomical realignment of the muscle ends with an end to end anastomosis. To obtain the maximum healing response, the muscle needs a good vascular supply and a substrate of myoblastic cells that can be recruited from the injury site or from a graft of denervated autologous muscle. Deep fascial layers and tendons that pass alongside the muscle may provide solid tissue for suture placement.

The muscle ends may be approximated with large horizontal mattress sutures or near-far-far-near pulley sutures. A combination of the aforementioned suture patterns together with modified Kessler loops may be used to repair ruptures localized at the musculotendinous junction or to reinforce the repair in case of bi- or multipennate muscles.

General suture size and usage recommendations for muscle repair :

Suture size (USP): 0 to 3-0.

Suture material classes: Synthetic absorbable (Polyglactin 910, Polyglycolic acid, Polyglyconate, Polydioxanone) or non-absorbable (Polypropylene, Nylon).

Adduction or abduction of the leg during surgery can be useful to decrease the tension at the repair site.

Post operative care

The return to the function of a repaired muscle is never complete. As described in several experimental studies, the muscle can recover up to 80% of its ability to contract but only the 50% of its original tensile strength. Immobilization is necessary for a minimum of 2 to 3 weeks after repair of a muscle tear to protect the initial repair, promote new collagen formation and sustain the stress of the remobilization.

SELECTED MUSCLE INJURIES

Gracilis Muscle:

Rupture of the Gracilis muscle is one of the most common muscle injuries.

The Gracilis is an adductor of the thigh, an extensor of the hip and probably partially contributes to the extension of the tarsus.

The injury can occur at the muscle origin, mid belly or its tendinous insertion. The rupture can be partial or complete resulting in the typical “dropped” conformational appearance. The injury is usually unilateral with no side predisposition, however, it is not uncommon to have bilateral injuries either concomitantly or staged.

The diagnosis is based on the history, clinical examination and careful palpation as some mid belly partial injuries can be quite subtle to detect.

The owners often report a loss of performance, a mild lameness apparent for 24-48 hours and a typical “throwing out” of the affected leg while ambulating.

With an acute complete rupture of the muscle, a vast hematoma accompanies the dorsal displacement of the insertion or the ventral displacement of the muscle origin.

Immediate surgical repair is the treatment of choice and offers the best prognosis for return to full function.

Proper surgical positioning consists of placement of the dog in lateral recumbence to expose the medial aspect of the affected leg. The contralateral leg can be flexed and secured vertically allowing a perfect approach to the injury site. Muscle debris and the hematoma removal is recommended with meticulous hemostasis and a thorough moistening of the area during surgery. Several near-far-far-near pulley sutures are pre-placed and progressively tightened to achieve the muscle continuity. Slight flexion of the stifle and adduction of the thigh will help to decrease tension at the repair site.

The tendinous portion of the Gracilis muscle is composed of a thick posterior band located caudally that inserts on the proximo-medial aspect of the tibia.

Injuries at this location are best approached by a longitudinal skin incision over the affected site.

Modified Kessler loop sutures can be used in addition to the near-far-far-near suture patterns. Significant flexion of the stifle will be necessary to properly appose the tendon edges. Although difficult to place, a light compressive bandage can be applied postoperatively for two or three days.

Postoperatively, the dog should be confined in a small kennel for 7-10 days. Short walks on the leash will be allowed for elimination.

Early controlled exercise can begin after this period gradually increasing the regimen. Physiotherapy should be encouraged and 8 to 12 weeks should be allowed for return to full activity. Prognosis is ranges from good to excellent when acute injuries are treated with early surgery. Conservative treatment is recommended only for very minor origin and mild belly injures with a recovery time of 6-8 weeks.

Early surgical treatment is recommended whenever possible.

Tensor Fascia Latae (TFL)

Injuries of the Tensor Fascia Latae are very common in racing dogs. Rupture of the tensor Fascia Latae can occur at its distal musculotendinous junction with a complete separation of the muscle belly from the fascia latae. It is not uncommon however to find a distinct longitudinal split along the muscle fibers involving the fascial sheath and the lateral portion of the muscle. During the clinical examination it is possible to appreciate a distinct hematoma with marked pain on palpation; the muscle can present areas of hardening or a marked depression. Extension of the hip is very likely to elicit pain especially if accompanied by a firm palpation. Injuries to this muscle can be easily misdiagnosed resulting in healing by scar tissue formation, loss of function and a high rate of recurrence. Minor injuries can be treated conservatively, with 3-5 weeks of controlled exercise and physiotherapy. Use of 830-nm laser therapy with a power output of 30 mw appears to give encouraging results according to one Author. Early surgical treatment is recommended whenever possible. The TFL is approached by longitudinal skin incision directly over the affected area, the same repair principles as described for the Gracilis M. can be applied. The medial portion of the muscle must be repaired, inadvertent suture of the adjacent muscles can lead to postoperative pain and delayed recovery. Postoperative care is similar to the previously described for the Gracilis M. Rehabilitation period is usually from 4 to 6 weeks.

Triceps Muscle

The Long Head of the Triceps usually tears from its origin along the posterior margin of the Scapula. It is a very classic injury of the front limb of the racing Greyhound that still represents an open controversy regarding the modality of treatment. Some Authors suggest surgical treatment as the best option to achieve a better prognosis; some others propose the conservative treatment as an alternative, describing successful results with a combination of early controlled exercise and physiotherapy. The Author, on the basis of his personal experience, recognizes that a great number of dogs with small injuries return to a successful performance in 3-5 weeks without undergoing surgical treatment. However in case of an acute massive rupture the preference is the primary repair. The same repair principles and postoperative care as already described can be applied. Return to full activity usually in 6-8 weeks.

Other muscles commonly involved

Pectoral Muscles: usually the origins. Trapezius: thoracic portion, Latissimus Dorsi, Rhomboid Thoracicus: insertion. External Abdominal Oblique: origins. Rectus Abdominis: insertion. Longissimus Dorsi. Gluteal Muscles: mid belly. Fore limb: Deltoideus, Biceps Brachii: insertion. Infraspinatus: origin. Hind limb: Pectineus: origin. Sartorius, Biceps Femoris: mid belly. Gastrocnemius: origin of medial and lateral portions, musculotendinous junction. Stage I and II injuries are generally treated conservatively while stage III injuries require immediate surgical treatment.

PREVENTION STRATEGIES

Important factors in preventing muscle strain injuries include warm up and pre-exercise stretching. New data demonstrates the beneficial effects of these factors on the mechanical properties of the muscle due to the stretch reflex mechanism and its viscoelastic properties. Previously strained muscles carry an increased risk

of reinjury. Patients presented with a major muscle strain have often a history of a prior minor injury affecting the same area. Probably some alteration in the mechanical properties of the muscle may precede a major injury. These are important considerations suggesting that an early return to activity and aggressive rehabilitation prior to complete healing may increase the risk of further and more serious injury.

TENDON INJURIES

Tendon injury can occur in a number of ways, strain from overloading, degeneration and disruption.

The majority of tendon injuries in small animals are related to lacerations rather than rupture. A direct trauma may cause a laceration or an avulsion injury. Strain injuries are less common in the canine pet population but are not infrequent in athletic dogs. Strain injury can affect the tendinous unit when the tensile load within the structure exceeds the yield point. A single submaximal load may damage a certain amount of fibers without complete failure of the tendon. However, the loads exerted on the tendons during normal activity are far lower than those required to exceed the elastic range of tendon loading.

Repetitive strain injury may start a degenerative process that lead to inflammation and tendinitis that is generally expressed as lameness. The result of a chronic tendinitis is a progressive weakening of the tendon that can result in a spontaneous disruption.

Because tendons are able to absorb energy more effectively than muscle or bone, an extreme overload rarely result in a midsubstance tendon injury but more like results in an injury to the musculotendinous junction or an injury to the tendon bone junction.

HEALING MECHANISM

Tendons that move in a straight line are surrounded by loose areolar connective tissue called paratenon that is continuous with the epitenon. The paratenon contains a network of blood vessels that, at different points along its length, penetrate the tendon, anastomizing with the longitudinal vessels within the tendon.

Tendons surrounded by a synovial sheath, receive their vascular supply mostly from the periosteal attachment at their insertion, from the musculotendinous junction and in small part from few small bands, located along the synovial sheath that are known as vincula.

Perfusion studies demonstrate consistent areas of hypovascularity in some tendons and suggest that diffusion may play an important role in the nutrition of these tendons.

These areas of hypovascularity are apparently at greater risk of injury.

The healing mechanism of paratenon covered tendons, in presence of a gap is by scar tissue formation as in other tissues.

Initially the gap is filled by the haematoma and fibrin followed by infiltration of inflammatory cells. In within the following week the gap is invaded by undifferentiated fibroblasts and capillary buds that form granulation tissue between the tendon ends. The fibroblasts start producing collagen that organizes initially in fibrils arranged in an irregular pattern. Around the second week the tendon ends are joined by a bridge of fibrous tissue that extends to the surrounding paratenon and epitenon. As the fibroblasts proliferation continue more collagen is produced and the fibrils start to orientate perpendicular to the long axis of the tendon. From the third week the fibroblasts and the collagen fibrils, responding to the stress transmitted along the tendon long axis, start to orientate parallel to it.

The remodeling of the scar tissue continues for several weeks and is associated to increased tendon strength and elastic modulus. Unfortunately the scar tissue do not have the same mechanical properties of the normal tendon and this has an impact on the final outcome in terms of tendon function.

Gliding tendons can heal by two mechanisms. In tendons that are immobilized, particularly in presence of a gap, the healing is by ingrowth of connective tissue from the tendon sheath and scar tissue formation. Healing in this manner result in decrease tendon function due to the adhesions between the tendon and its sheath.

If the tendon is repaired with a perfect end to end apposition and is subjected to controlled passive motion the healing is by an intrinsic response characterized by the migration and proliferation of the tenocytes from the endotenon and epitenon resulting in minimal adhesion and preservation of the gliding ability. This second mechanism of healing is critically important in the repair of lesions to the digital flexor tendons in man. In veterinary surgery the return of sufficient tensile strength may be more important than gliding function.

A practical approach to minimize the formation of tendon adhesions is the use of proper surgical technique, early passive mobilization and proper postoperative care.

PRINCIPLES OF TENDON REPAIR

In general, basic principles of asepsis and atraumatic handling of soft tissues as previously described for muscle injuries, are followed.

The goal of tendon repair is to minimize the formation of adhesions and to restore as much gliding function as possible.

Indications for primary tendon repair are fresh clean tendon wounds. Contaminated or infected wounds or lacerations associated with crushing injuries are best treated by delayed repair.

Skin incision should not be made directly over the tendon but should be parallel to the area to be repaired or should follow a curvilinear pattern over the tendon in order to minimize the risk of adhesions of the skin to the tendon repair.

Maintenance of a perfect hemostasis is essential and can be achieved with the moderate use of electrocautery, by application of gentle pressure with a moistened swab, or where possible, by the application of a tourniquet.

Gentle handling of the soft tissues and of the tendon presuppose the use of adequate surgical instruments. Tendon ends can be grasped with straight needles placed through the tendon, by gloved fingers or by special forceps.

Traumatized tendinous ends should be excised after sutures have been secured.

Various suture patterns have been described for tendon anastomosis.

Locking suture patterns like the Kessler-Mason-Allen (locking loop), modified Kessler and three-loop pulley suture are generally preferred over the traditional horizontal mattress, Bunnell and Bunnell-Mayer patterns.

The Kessler patterns and its many modifications form loops around a small bundle of fascicles achieving an excellent hold of the tendon. The three-loop pulley suture has a greater strength and resistance to gap formation when compared to the locking-loop pattern. This should be expected considering that in the three-loop pulley there are six strands of suture material that cross the repair while in the other there are only two strands.

After placement of the primary load bearing sutures, a fine continuous or interrupted horizontal mattress suture may be placed along the epitendon to increase the strength of the repair and minimize the formation of adhesions.

The choice of the suture material for tendon repair should meet a few basic requirements. It should slide easily through tissue, it should have good knot security and should be nonirritant. Requirement for prolonged retention of strength is necessary due to the slow healing of the tendons.

Monofilament non absorbable sutures are usually the first choice although monofilament absorbable sutures with prolonged retention of strength (eg. polydioxanone or polyglyconate) usually give satisfactory results.

When repairing gliding tendons it is possible to use a soft braided suture, such as polyglycolic acid (Vicryl), in order to minimize the irritation to the surrounding sheath.

The size of the suture is usually determined by the size of the tendinous structure. Large diameter sutures are often used because the tendon is expected to experience significant loads. However a large suture has the tendency to distort the tissue in which it is placed and do not loop or tie appropriately. The best recommendation is to use slightly smaller diameter suture material and place additional strands across the repair in order to achieve extra strength.

Avulsion of tendons from bone requires reattachment. A locking loop or pulley-suture pattern is placed in

the tendon and the suture then threaded through bone tunnels. Because these injuries often take a long time to heal and gain strength, the suture may be subject to wearing and tearing due to the friction against the bone edges. For this reason it is advisable to place additional supporting sutures from the epitenon to the periosteum or surrounding soft tissues. In some cases augmentation of the repair can be achieved using synthetic materials, fascia or tendons.

Post operative support is indicated for up to 6 weeks for larger tendons. The method of support varies according to the specific location of the injury, preference of the surgeon and temperament of the patient.

Bandage support, external fixation and internal fixation have been all successfully used.

The most likely reason for failure of tendon repair is patient overactivity. Because of this, the patient should be strictly confined for at least the first 6 to 8 weeks, after this period controlled limited activity will follow for another 6 weeks.

Physical therapy modalities include application of heat followed by passive range of motion exercises. Water tread mill exercise is an extremely useful modality as it allows early exercise with reduced weight bearing on the repaired tendon.

SELECTED TENDON INJURIES

Injury to the Achilles Mechanism

The Achilles tendon has three distinct components. The primary tendon of the Achilles mechanism is given by the gastrocnemius muscle that inserts on the lateral aspect of the calcaneal tuberosity. The conjoined tendons of the biceps femoris, semitendinosus and gracilis muscles that insert on the medial aspect of the calcaneal tuberosity. The superficial digital flexor tendon that also runs with these tendons but passes over the calcaneus. These tendons may be lacerated by direct trauma or can be affected by varying degrees of strain injury.

Achilles injuries have been classified by Meustege. Type 1 injuries are complete ruptures of the Achilles mechanism and are usually caused by direct trauma. Dogs affected by a Type 1 injury present usually with a typical plantigrade stance.

Type 2 lesions are divided into three subtypes. Type 2a lesions are ruptures affecting the musculotendinous junction. Type 2b lesions are ruptures accompanied by an intact paratenon. Type 2c lesions are avulsions of the insertion of the gastrocnemius tendon with an intact superficial digital flexor tendon. The patient affected by a Type 2c presents a typical plantigrade stance with the digits tightly flexed.

A Type 3 lesion is a tendinopathy affecting the distal part of the gastrocnemius tendon but without functional lengthening of the mechanism.

Ultrasound examination is an excellent diagnostic tool to determine the extent of the injury and the involvement of the different tendon structures.

Type 1, 2a, 2b and 2c are managed by direct repair following the general techniques described earlier in this abstract. Protecting the tendon repair from loading for at least 6 weeks postoperatively is crucial. Limb splintage is usually complicated by pressure sores and requires frequent changes and high patient and owner compliance. For this reason many surgeons prefer to protect the repair with a transarticular external skeletal fixation or with a calcaneo-tibial screw.

Type 3 injuries respond very well to conservative treatment with strict rest or via immobilization of the hock in extension for a short period and usually carry a good prognosis.

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