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Clinical evaluation of tarsocrural luxation with malleolus fracture surgical treatment in dogs: A case series

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Keywords

malleolus fracture, tarsocrural luxation, dog

Abstract

The aim of this study was to evaluate the long-term outcome of treatment using Kirschner wires and tensioning bands for tarsocrural luxation with malleolus fractures resulting from trauma in dogs. Eight dogs with tarsocrural luxation due to malleolus fracture were selected. Following intrathecal anesthesia, the malleolus bone was returned to its normal position using two Kirschner wires and tension bands. Polyester fishing line was used as an artificial band for reconstruction of the ruptured lateral and medial collateral ligaments. These cases were able to walk and run smoothly. Consequently, it can be preferred to the tensioning band with Kirschner wires for malleolus fracture since an artificial band can be created using fishing line to replace the lateral and medial collateral ligament as was observed in our cases.

Abbreviations

PDS: polydioxanone

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Introduction

Ligament ruptures and joint instability are reported as a result of trauma involving damage to the lateral and/or medial collateral ligaments (Schaeffer et al., 1999; Hurter et al., 2003; Ayyappan et al., 2011; Butterworth 2012). Ligament support for the tarsal joint is provided by the lateral and medial collateral ligaments and plantar ligament (Kaya and Yardimci 2006). In addition, fractures in the medial malleolus of the tibia and ruptures of the medial or lateral collateral ligament result in joint instability and disarticulation or luxation. It is not always possible to repair these ligamentous structures in the tibiotarsal joint (Hurter et al., 2003, Kaya and Yardimci 2006).

It has been recommended that prosthetic applications be performed for medial or lateral collateral ligament ruptures in small breed dogs while arthrodesis procedures with dynamic compression plates can be considered for these ruptures in large breed dogs (Taylor and Dee 1993; Piermattei and Flo 1997; Welch 2004; Kaya and Yardimci 2006).

The tarsal joint should be examined for local joint swelling, pain, laxity, limitation of motion and deformity in the case of tarsal dislocation. In tarsal joint dislocations, a successful result can be achieved by repairing the collateral ligament rupture and avulsion fractures when tarsal dislocation is diagnosed early. However, arthrodesis is inevitable in chronic cases. Many different methods have been reported for tarsal joint instability, dislocation or tarsocrural arthrodesis. However, these techniques are limited to treatment without loss of joint function (Kaya and Yardimci 2006; Ayyappan et al., 2011; Butterworth 2012).

The aim of this study was to evaluate the treatment and long-term results of using Kirschner wires and tension bands for tarsocrural luxation with medial malleolus fractures caused by trauma in dogs.

Materials and Methods

This study was conducted on eight dogs with severe lameness brought to surgery clinics of the Faculty of Veterinary Medicine at the Kafkas University in Turkey. In all cases, development of the condition could not be ascertained from the owner. However, it was characterized by a sudden onset of severe lameness. Also, the tarsal joint in each dog was kept upward and swayed. During the clinical examination, severe pain was observed when the joint was manipulated and soft tissue swelling and bruising was evident. Closed reduction could be achieved with manual pressure and traction, but when the hand support was removed, luxation of the tarsocrural joint was seen again. X-rays were taken in the latero-medial and anterio-posterior positions (Figure 1, a-b). In all cases, tarso-crural dislocation due to medial malleolus fracture was clearly seen on the x-ray. Rupture of the lateral and medial collateral ligaments was considered to be the main outcome. Surgery was performed in all cases to repair the malleolus fracture and for reconstruction of the lateral and medial collateral ligament.

Intrathecal anesthesia was performed under aseptic conditions with 20 mg (4 ml) bupivacaine HCl (Marcaine®, 5 mg/ml Astra Zenaca) injected into the lumbosacral space after intravenous administration of 1 mg/kg of xylazine HCl (Rompun ®, Bayer S/A). Before surgery, a 22-G polyurethane catheter was aseptically placed into the ramus dorsalis of the vena saphena and an electrolyte solution (saline 0.9 per cent) was administered intravenously at 10 ml/kg/hour for the duration of intrathecal anesthesia.

Dogs were kept in the lateral position after the tarso-crural joint area was secured using sterile cloths and opened up. Then, the malleolus bone was returned to its normal position using two Kirschner wires and a tension band. An artificial band was created using artificial polyester fishing line due to the difficulty of reconstructing the ruptured lateral and medial collateral ligaments (Figure 2, a-d). The surgical incision was closed routinely. All dogs were kept in bandage for 3 weeks.

After the surgery, routine daily nursing procedures such as postoperative analgesia, antibiotics and dressing were performed on all dogs. Six weeks after surgery, the Kirschner wires and tension band were removed.

All dogs were monitored for 3 years, and follow-up records were kept for long-term results.

Results

Bodyweight and age (mean ± sd) were 38.67 ± 9.52 kg and 2.17 ± 1.17 years, respectively. There were five males and three females in the study group. While intrathecal anesthesia was performed on all dogs in prone position, the rest of the procedure was carried out in lateral recumbency. The duration of surgery (mean ± sd) was 45.00 ± 8.37 minutes.

No information about the history of lameness could be obtained from the owners about any of the dogs, but the onset was severe and sudden in all cases. Also, the hind limb was raised and the tarsal joint was swaying. Tarso-crural dislocation and malleolus fracture was diagnosed with clinical and radiographic examinations (Figure 1, a-b). In the clinical examination, it was determined that luxation could be easily reduced by palpation of the tarso-crural joint, but luxation recurred when joint support was removed.

The approach to the tarsal joint and tibial malleolus was easy to perform and well tolerated by all patients under intrathecal anesthesia. Muscle relaxation was sufficient for surgery in all dogs.

Clinical and radiological findings (Figure 1, a-b) were supported by intraoperative findings because both talocrural dislocation due to medial malleolus fracture and rupture of the medial and lateral collateral ligaments were confirmed during surgery in all dogs.

Tensioning bands with Kirschner wires to the medial malleolus fragment were easily secured (Figure 1, c-d).

Figure 1
Pre- and post-operative x-rays taken in the latero-lateral and anterio-posterior positions; a-b: tarso-crural dislocation, c-d: Tensioning bands with the Kirschner wires to medial malleolus fragment, e-f: The removed Kirschner wires and tension band in postoperative 6th weeks.

Artificial bands were also created using fishing line to replace the lateral and medial collateral ligaments in all of the cases.

At the check-up three weeks later, three dogs did not use their leg and kept it raised until the removal of the tensioning band and the Kirschner wires, and the other five dogs were able to walk smoothly. However, all these three dogs walked normally as soon as the tension band and Kirschner wires were removed (Figure 1, e-f). All of the dogs were walking and running smoothly. There was also nothing abnormal at the postoperative check-ups 3 years later regarding the fishing line used as prosthetic material. In this regard, the study demonstrated that the preferred applications of tensioning bands with Kirschner wires and artificial bands created using fishing line to replace the lateral and medial collateral ligament in our case can be a clinically practical and effective a method.

Discussion

Tibial malleolar fractures can occur either separately or together, and this type of fracture causes instability in the tarso-crural joint. The result is subluxation or dislocation of the tarsocrural joint (Brinker et al., 1997; Piermattei and Flo 1997; Pope 1998; Welch 2004). In the treatment of bone fractures in the tarsal region, there are two important points to consider. The first is permanence and protection of the integrity of the tarsal joint. The second is securing the weight-bearing surface of tibiotarsal joints and tibia in the anatomical position (Brinker et al., 1997; Piermattei and Flo 1997; Pope 1998). Functionally, the tarsal joint allows flexion and extension movements in a plane. The joint has a male and female relationship. The female part consists of the lateral malleolus, the medial malleolus, tibia and distal articular surface while the male part is formed by the trochlea of the tibio-tarsal bone (Piermattei and Flo 1997). Therefore, following treatment, it is important that the components providing joint-to-joint function are returned to their normal anatomical position.

Intraperiosteal and undisplaced fractures of the tibial malleolus are often secured with coaptation splints. However, this treatment is not possible without internal securing when there is displacement. In many cases, the best rigid fixation can be provided by using bone screws. Screws are often used in medium and large breed dogs while Kirschner pins are preferred in small breed dogs and cats (Brinker et al., 1997; Piermattei and Flo 1997; Pope 1998; Kaya and Yardimci 2006). Our cases consisted of young medium-large breed dogs, but it was not possible to use screws due to the small size of the broken malleolus bone. In this study, tensioning bands with Kirschner wires to medial malleolus fragment was performed in every case. When the wires were removed after 6 weeks of treatment, all of the dogs walked comfortably.

Screws and pins are applied by passing through both fragment cortices in the upward direction. Also, the ruptured lateral and medial collateral ligaments can be repaired with suture material using an appropriate material such as monofilament nylon or polydioxanone (PDS) in

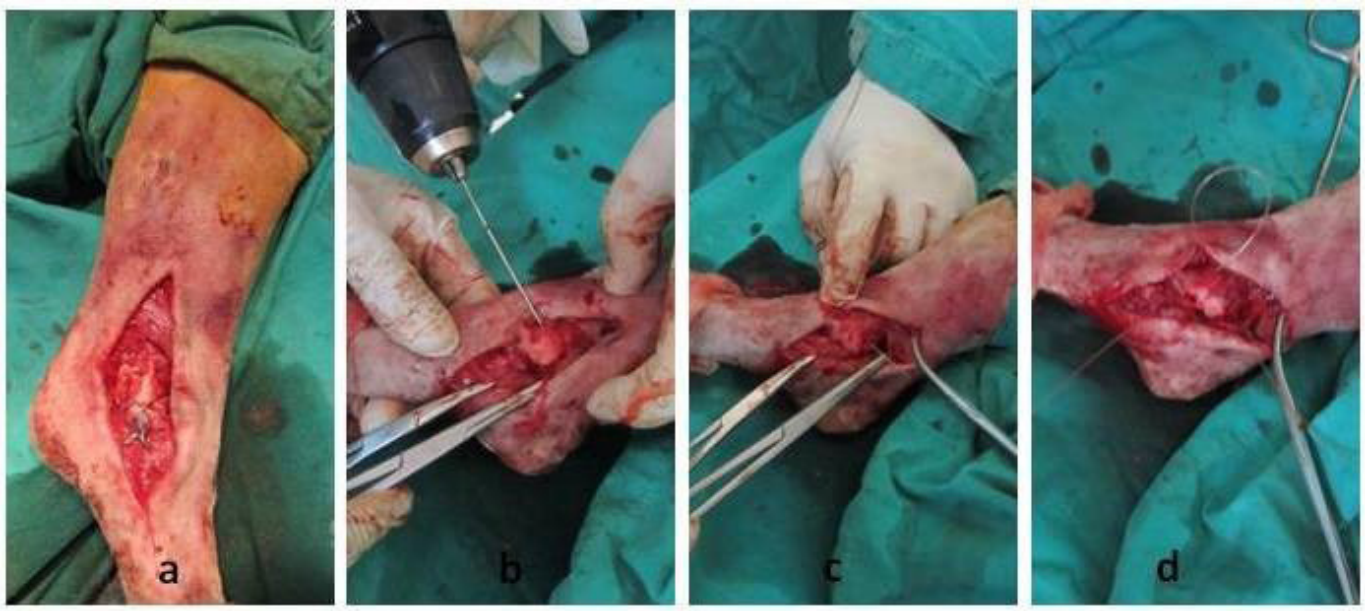

Figure 2
A prosthetic band formed using polyester fishing cutting; a: malleolus bone brought to its normal position using two Kirschner wires and tension band, b-d: prosthetic material for reconstruction of the ruptured lateral and medial collateral ligaments.

place of these ligaments. In such cases, it may be necessary to use prosthetic collateral ligaments of monofilament nylon, braided polyester or wire. Additionally, the hind limb or hock can be kept in a bandage until bone union 4-6 weeks after surgery (Boane and Johnson 1990; Brinker et al., 1997). In our cases, the lateral and collateral ligaments were ruptured and thus prosthetic material was used to repair these ligaments since it could not be repaired with sutures. Also, fishing line was used as a prosthetic material, and there were no abnormalities in the postoperative check-ups for 3 years.

Tarsocrural luxation with malleolus fractures are rarely encountered in dogs, and arthrodesis is commonly recommended for treatment (Kaya and Yardimci 2006; Sheila et al., 2006; Butterworth 2012). To cure this problem, a method has been reported (Aron and Purinton 1985), where a screw is placed in the medial malleolus and then two are placed in the talus, one proximally and one distally, thus allowing placement of a long and a short collateral ligament. This technique is applied to the lateral as a medial application. Also, the hock should be protected with a bandage for 4 to 8 weeks postoperatively. However, in this study, tensioning bands with Kirschner wires to the medial malleolus fragment were used as an artificial band to replace the lateral and medial collateral ligaments. Also, all dogs were kept in a bandage for 3 weeks after surgery and the Kirschner wires and the tension band were removed six weeks after operation.

Tarsocrural luxation cases have the worst prognosis of all hock luxations. Coordinated motion is essential for pain-free use of the hock. Unfortunately, persistent lameness can be caused by periarticular fibrosis and post-traumatic osteoarthritis even when stability has been restored (Kaya and Yardimci 2006). During the postoperative check-ups for our cases, there was no sign or evidence of these complications. Also, clinical results were satisfactory in this study.

Cases with tarsocrural luxation due to malleolus fracture generally have an acute onset and result in severe lameness. Pain is evident on manipulation of the hock and swelling of the soft tissue or in the vicinity of the tarsocrural joint. Tarsal joint instability can be identified during the clinical examination or on the x-rays. However, those cases suffer from severe trauma or accident (Aron and Purinton 1985; Kaya and Yardimci 2006; Butterworth 2012). In this study, the condition could be easily diagnosed based on clinical and radiological findings. These findings also helped to determine the proper treatment.

Consequently, the tensioning band with the Kirschner wires for tarsocrural luxation due to malleolus fracture and fishing line can be used as an artificial band to replace the lateral and medial collateral ligament.

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