

## Correction of the Proximal Intertarsal Instability in a Dog

Yunsoo Jung<sup>†</sup>, Ho-hyun Lee<sup>†</sup>, Sungho Yun and Young-sam Kwon<sup>1</sup>

*Department of Veterinary Surgery, College of Veterinary Medicine, Kyungpook National University, Daegu 41566, Korea*

Received: April 01, 2019 / Accepted June 03, 2019)

**Abstract :** A 22-month-old female mongrel dog weighing 4.8 kg was referred with chief complaint of bite wounds and lameness. The patient showed non-weight bearing lameness on left hindlimb and lateral instability of intertarsal joint. On radiograph, proximal intertarsal luxation between calcaneus and fourth tarsal bone was diagnosed. To imitate the long collateral and calcaneoquartal ligament, bone tunnels were drilled in the distal calcaneus and proximal fifth metatarsal bone. The figure-eight suture was placed with 0.5 mm cerclage wire through the predrilled holes. At 2 weeks after surgery, the lameness of hindlimb was still present. However, the patient had weight bearing lameness for 4 weeks after operation and was able to walk and run without lameness at 5 weeks after surgery. This case report explains the successful correction of intertarsal luxation with a single figure of eight wire suture in case of luxation to the intertarsal joint.

**Key words :** proximal intertarsal instability, collateral ligament, calcaneoquartal ligament, cerclage wire, dog.

### Introduction

Ligament injury of the tarsal joint could result from damage within or surrounding the tarsocrural, proximal intertarsal, distal intertarsal, or tarsometatarsal joints (9) and commonly be caused by severe trauma such as car accident. Most damages are open abrasions with loss of soft tissue, bone or both. The ligaments around these joints include crural extensor retinaculum, lateral collateral ligament, medial collateral ligament, tarsal extensor retinaculum, calcaneoquartal ligament, long plantar ligament, calcaneocentral ligament, plantar centrodistal ligament, sustentaculum tali (6). Most intertarsal injuries have been considered as the result of disruption of related ligaments between tarsal bones. Proximal intertarsal subluxation, proximal intertarsal luxation, and tarsometatarsal luxation are most common (9). Proximal intertarsal subluxation with plantar instability occurs when severe dorsal flexion causes the disruption of the plantar ligament complex of calcaneus and fourth tarsal bone. The affected animals often have non-weight bearing lameness with pain and swelling in the involved area. Also, the patient may have abnormal foot deviation or rotation. Radiographic examination can be useful for complete evaluation of intertarsal luxation and subluxation. Standard craniocaudal and mediolateral radiograph of tarsus with stress should be included. If instability is doubtful but not confirmed, craniocaudal and varus-valgus stress views are useful.

Medical management is not effective with these ligament damages. Surgical correction should be accomplished for complete recovery of the functional joint integrity. Treatment for proximal intertarsal subluxation includes partial tarsal arthro-

desis or selective fusion of the joint surfaces between the calcaneus and fourth tarsal bone (9) because primary repair of small ligaments is often not possible. Arthrodesis can be performed with various ways, including transfixation pin and tension band wire or a single compression screw plus or minus a tension band wire or a laterally placed bone plate (6). If there is a severe lateral instability, a lateral tension band wire can be performed. The most important key points for competent result are removal of the calcaneoquartal joint cartilage and correct implants placement.

To our knowledge, there is no case report using a single figure of eight wire suture method for intertarsal luxation with lateral instability in dogs. The purpose of this report is to describe the single lateral figure of eight wire suture placement between calcaneus and fifth metatarsal bone and how it works.

### Case

A 22-month-old female Mongrel dog weighing 4.8 kg was referred with chief complaint of bite wounds and lameness to the Veterinary Medical Teaching Hospital of Kyungpook National University. The patient's left hindlimb was bitten by another dog during a walk. The patient was diagnosed as ligament injuries and treated with anti-inflammatory drugs from local animal hospital for a few days. But the owner felt that there was no improvement.

On physical examination, the patient had several bite wounds around the left hip and the hindpaws, and showed non-weight bearing lameness on left hindlimb. Also, it revealed that intertarsal joint had lateral instability with abnormal varus. She showed severe pain and mild swelling was palpated on left hindlimb. Radiographic examination showed left calcaneus displacement and bony reaction between calcaneus and fourth tarsal bone. On stress radiograph, proximal intertarsal

<sup>†</sup>Drs. Jung and Lee contributed equally to this work

<sup>1</sup>Corresponding author.

E-mail : [kwon@knu.ac.kr](mailto:kwon@knu.ac.kr)

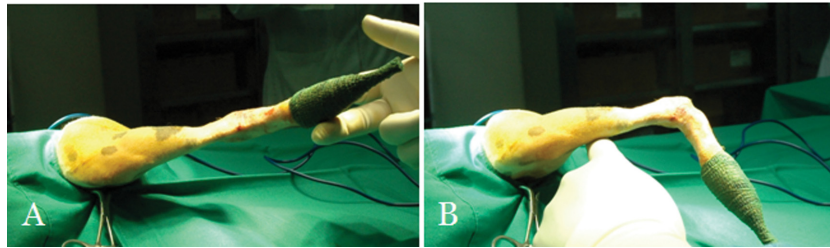


**Fig 1.** Preoperative radiographs showing proximal intertarsal subluxation. Left intertarsal joint radiograph (A). Stressed left intertarsal joint radiograph (B).

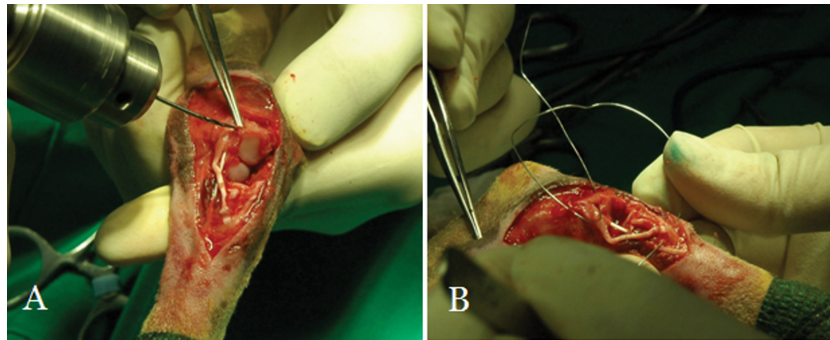
subluxation was found (Fig 1). There were no other possible causes of lameness such as patellar luxation or avascular

necrosis of femoral head etc.

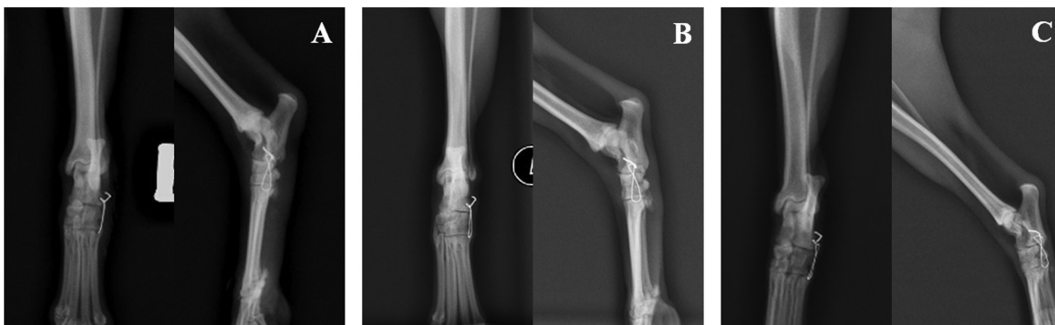
Bite wounds were cleaned with sterile saline, debrided and sutured. The patient was administered intravenously with cefazolin (22 mg/kg) and tramadol (4 mg/kg). The patient was on right lateral recumbency and prepared aseptically from the hip joint to the paws (Fig 2). Lateral incision beginning from the distal end of fibula to proximal end of fifth metatarsal bone along tarsometatarsal joint line was performed. Incisions of subcutaneous tissue and deep fascia were made along the same line. Calcaneoquartal joint capsule rupture, calcaneoquartal and long lateral collateral ligaments damages were found (Fig 3A). Articular surface was aligned correctly. Joint capsule was sutured with absorbable material. To imitate the long collateral and calcaneoquartal ligament, bone tunnels were drilled in the distal calcaneus and proximal fourth metatarsal bone (Fig 3A). The figure-eight suture was placed with 0.5 mm cerclage wire through the predrilled holes in the calcaneus and fifth metatarsal bone (Fig 3B). The suture was tightened with wire twister and the suture end was



**Fig 2.** Preoperative left intertarsal joint subluxation with lateral instability. Digital Support below intertarsal joint (A) and over the joint (B).



**Fig 3.** Ruptured left intertarsal joint capsule and damaged long part of lateral collateral ligament and calcaneoquartal ligament. Pinning (A) and cerclage wiring (B) between left calcaneus and left 5<sup>th</sup> metatarsal bone.



**Fig 4.** Postoperative radiographs with the figure of eight suture using cerclage wire on day 1 (A), 8 months later (B), and 3.5 years later (C).

hidden by bending it over in the direction of the twist. Deep fascia, subcutaneous tissue and skin were closed routinely. The intertarsal joint was bandaged with modified Robert-Jones method and applied with Thomas-Schroeder splint for 4 weeks. Also, the patient was treated with carprofen (2.2 mg/kg) and cephalexin (22 mg/kg).

Regular checkups and left hindlimb radiographs were performed right after operation and at 2, 3 and 5 weeks post-operatively. At 2 weeks after surgery, the lameness of hindlimb was still present. However, the patient had weight bearing lameness and range of motion of affected tarsal joint was recovered for 4 weeks after operation and was able to walk and run without lameness at 5 weeks after surgery. The volume of hindlimb muscle was slightly reduced for 4 weeks after surgery and then became normal since bandage was removed. During follow up period about 3.5 years, there were no complications such as bony reaction and articular degeneration (Fig 4).

## Discussion

There are several ways to perform arthrodesis in proximal intertarsal luxation with lateral instability (5,6). First, transfixation pin and tension band wire method makes a pilot hole on the joint surface of the calcaneus to ensure implants on their central placement. Second, a single lag screw placed through the calcaneus and into the fourth tarsal bone method is simple and effective in all breeds (6). Third, laterally placed bone plate method apply a compression bone plate from the lateral surface of the calcaneus to fifth metatarsal bone through fourth tarsal bone (9). These methods include removal of related articular cartilages and complete fixation bridging the bones. However, in the case, only single figure of eight wire suture technique was used. At first, we considered applying a routine partial tarsal arthrodesis using transfixation pin and tension band wire. Because complexity of ligaments primary repair was difficult, it had been known conservative management is ineffective (2). But there were just two bite wounds on the lateral surface of calcaneonavicular joint only. After observing the surgical site, we concluded intertarsal joint capsule are ruptured laterally and caudally, and the long part of lateral collateral ligament and calcaneonavicular ligament are damaged. Moreover, after capsulorrhaphy was performed and a single figure of eight wire suture was placed laterally, there was no more abnormal varus at the hock joint and excessive dorsal or plantar instability.

Complications of partial tarsal arthrodesis include infection, implant loosening, implant breakage, on-going discomfort, cast-associated soft tissue injuries and plantar necrosis (1,4). Difficulty in skin closure and increased tension with lateral bone plate method were mentioned previously. Also, pin and tension band wire method showed slow healing and persistent lameness compared to lag screw method (4). Ongoing discomfort associated with implants is evident with the

tension band wire and with the screws bridging multiple metatarsal bones for implant removal (7,11). Existing partial arthrodesis methods also had previously discussed disadvantages, thus we devised a modified method using a single figure of eight wire suture. Therefore, we estimated this subluxation only needed minimal manipulation, not partial arthrodesis.

As a view of postoperative management, previous studies recommended eight weeks immobilization period of external coaptation after arthrodesis (8,10). However, it is uncertain how effective external coaptation are, and some research reported more than twice the incidence of post-surgical complication in cases external coaptation was used (3). Furthermore, some authors recommended external support should be kept to the minimal to reduce associated soft tissue damages (3). According to this, the patient was managed with modified Robert - Jones bandage and Thomas - Schroeder splint only for 4 weeks. The patient walked and run without lameness 5 weeks after operation. This case report explains the successful correction of intertarsal luxation with a single lateral figure of eight wire suture in case of minimal damage to the intertarsal joint.

## References

1. Allen MJ, Dyce J, Houlton JEF. Calcaneonavicular arthrodesis in the dog. *J Small Anim Pract* 1993; 34: 205-210.
2. Arwedsson G. Arthrodesis in traumatic plantar subluxation of the metatarsal bones of the dog. *J Am Vet Med Assoc* 1954; 124: 21-24.
3. Barnes DC, Knudsen CS, Gosling M, McKee M, Whitelock RG, Arthurs GI, Ness MG, Radke H, Langley-Hobbs SJ. Complications of lateral plate fixation compared with tension band wiring and pin or lag screw fixation for calcaneonavicular arthrodesis. *Vet Comp Orthop Traumatol* 2013; 26: 445-452.
4. Campbell JR, Bennett D, Lee R. Intertarsal and tarsometatarsal subluxation in the dog. *J Small Anim Pract* 1976; 17: 427-442.
5. Hudson CC, Pozzi A. Minimally invasive repair of central tarsal bone luxation in a dog. *Vet Comp Orthop Traumatol*. 2012; 25: 79-82.
6. Carmichael S, Marshall W. Tarsus and metatarsus. In: *Veterinary Surgery: Small Animal*, 1st ed. Missouri: Elsevier Saunders. 2012: 1193-1209.
7. Dyce J, Whitelock RG, Robinson KV, Forsythe F, Houlton JEF. Arthrodesis of the tarsometatarsal joint using a laterally applied plate in 10 dogs. *J Small Anim Pract* 1998; 39: 19-22.
8. Harasen G. Arthrodesis - Part II: The tarsus. *Can Vet J* 2002; 43: 806-808.
9. Schulz K. Diseases of the joints. In: *Small animal surgery*, 4th ed. Missouri: Mosby Elsevier. 2013: 1364-1371.
10. Theoret MC, Moens NMM. The use of veterinary cuttable plates for carpal and tarsal arthrodesis in small dogs and cats. *Can Vet J* 2007; 48: 165-168.
11. Wilke VL, Robinson TM, Dueland RT. Intertarsal and tarsometatarsal arthrodesis using a plantar approach: a carpal arthrodesis plate or dynamic compression plates: four arthrodeses in three dogs. *Vet Comp Orthop Traumatol* 2000; 13: 28-33.