Correction of congenital deformity of hind limbs of cat by femoro-tarsal arthrodesis: a case report

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ABSTRACT: Congenitally deformed tibia-fibulas of both hind limbs were diagnosed in a four-month-old, female, domestic shorthair cat that was unable to bear weight and whose movement was painful on both stifle and hock joints. Bleeding was observed repeatedly from the wound made by deformed tibias at the cranial sides of hock joints where the bones were exposed. Radiography and computed tomography revealed a corn-shaped tibia and bow shaped fibula which extended cranio-distally without formation of the hock joints. Femoro-tarsal arthrodesis was successfully executed on both hind legs after exclusion of the deformed and pliable tibia-fibulas. Follow-up radiography showed that bone fusions had gradually improved and were without complications. Postoperatively, the cat was capable of walking on the corrected hind legs and running on the movement of hip joints. To the authors' knowledge, this is the 1st reported case of femoro-tarsal arthrodesis in a cat. In this case, femoro-tarsal arthrodesis resulted in a satisfactory outcome for congenitally deformed tibia-fibulas in cat.

Keywords: femoro-tarsal arthrodesis; lame; shorthair cat

Arthrodesis (fusion) of a joint is an orthopedic salvage procedure most often performed in the carpus and tarsus (Denny and Butterworth, 2000). The common reasons for arthrodesis in veterinary surgery are hyperextension injuries, luxation, degenerative conditions of the palmar or carpal ligaments, immune-mediated arthritis, non-repairable communicated intra-articular fractures, severe degenerative joint disease, severe soft tissue or bone trauma, refractory infection, radial paralysis and ischiatic nerve injury (Trostel and Radasch, 1998; Harasen, 2002; Kirsch et al., 2005). Plate stabilization of any arthrodesis provides the most substantial and reliable fixation (Harasen, 2002). Different sizes of bone plates are used for arthrodesis in different positions, although the dorsal bone approach is the most commonly used technique in small animals (Guerrero and Montavon, 2005). Cats and dogs are able to walk and engage in non-athletic activity with the loss of tarsal or stifle motion. In the literature, many surgical techniques have been described for surgery to achieve femoral and tarsal arthrodesis separately in cats; however, no instances of femoro-tarsal arthrodesis have been reported. In this case, there was no treatment option other than arthrodesis and the authors chose this femoro-tarsal arthrodesis technique for the correction of the deformity after excluding the pliable, congenitally deformed tibia-fibulas from the affected limbs. This case report should prove instructive for the future treatment of feline patients with this condition.

Case history

A four-month-old female domestic short-hair cat was referred to the veterinary medical center with congenitally deformed tibia-fibula of both hind limbs. Its prior history was unknown as it was an orphan but the deformity of both hind legs was observed. The cat exhibited non-weight bearing lameness in both hind limbs and was in severe pain during palpation of the stifle and hock joints for

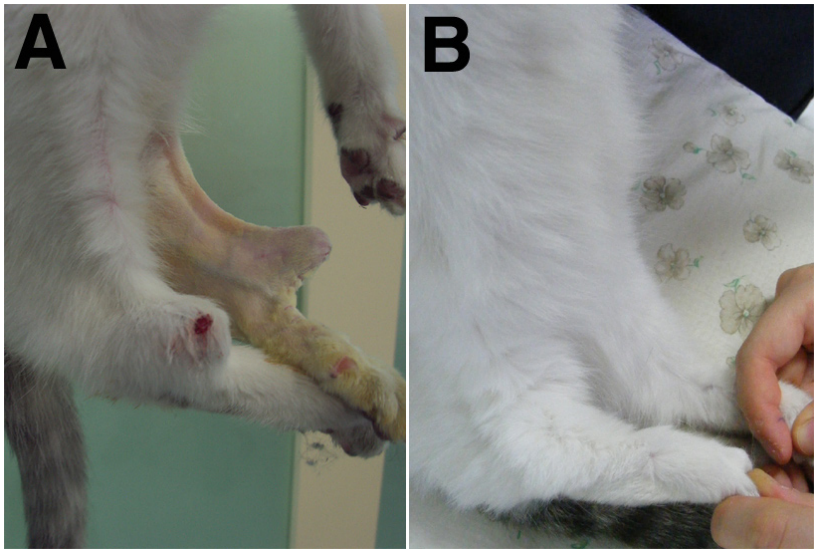

Figure 1. The deformed tibia-fibulas are exposed cranio-distally through the slitting of skin (A); bleeding is not observed postoperatively (B)

physical examination. Its movement was greatly restricted at hock joints where the deformed tibia-fibulas were exposed cranio-distally through the slitting of skin (Figure 1A). The deformed legs were always kept straight and the movement of joints was difficult. Preoperatively, a standard ventro-dorsal radiograph (Figure 2A) and computed tomography (Figure 3) were generated in order to locate the instability and evaluate any other abnormalities in the joints. Both images confirmed the deformity of both the tibia and fibula on the hind legs. The true joints were absent in the deformed stifle and tarsal joints.

The results of laboratory tests were noteworthy only for the high creatine phosphokinase level observed (878 IU/l; reference range, 56 to 529 IU/l). The cat was premedicated with 0.05 mg/kg acepromazine, *s.c.* (Sedaject®, Samwoo Pharmacy, Korea), 0.05 mg/kg atropine sulfate, *s.c.* (Atropine Sulfate Daewon®, Daewon Pharmacy, Korea), 3 mg/kg tramadol hydrochloride, *i.v.* (Tamadol®, Dongkwang Pharmacy, Korea) and 50 mg/kg ampicillin/sulbactam, *i.v.* (Ubacillin®, Whanin Pharmacy, Korea). General anesthesia was induced with 5 mg/kg propofol, *i.v.* (Pofol®, Jeil Pharmacy, Korea), followed by 2–2.5% isoflurane (Aerane®, Ilsung Pharmacy, Korea) in oxygen administered through an endotracheal tube.

Two separate surgeries were performed on this cat. In the first the left hind limb was corrected; in the second four months later, the right was corrected. The skin was incised over the craniolateral aspect of the stifle, extending from the mid-diaphysis of the femur to the middle of the metatarsal bone. The cranial tibial muscle was elevated to expose the proximal tibia. Then the cranial tibial and long digital extensor tendons were retracted and elevated to expose the distal tibia, although

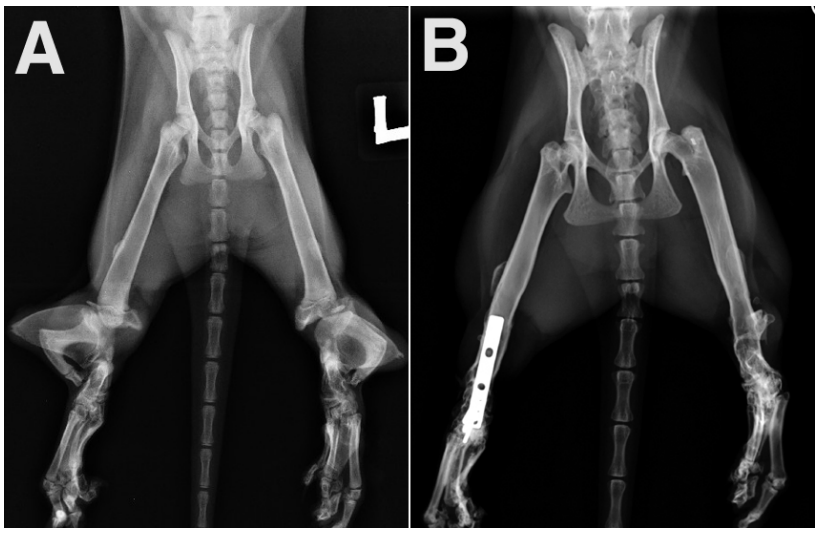

Figure 2. Ventro-dorsal views of radiographs; before (A) and one year after surgery of right hind limb (B). Congenitally deformed bones are excluded and corrected by femoro-tarsal arthrodesis. Left hind limb was corrected first and then right hind limb four months later

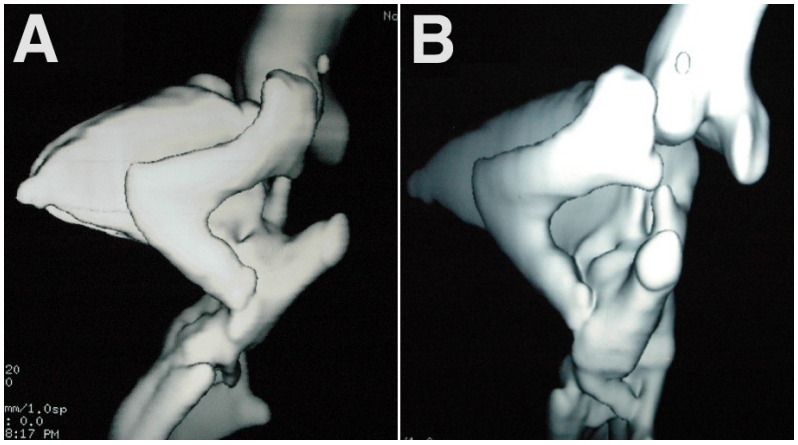

Figure 3. Cranial view (A) and caudal view (B) of 3-dimensional computed tomographies of left hind leg in cat. Notice congenitally deformed stifle and tarsal joints where the true joints are absent

all muscles were short and atrophied in this area. Finally both the tibia and fibula were separated from their joints and excluded from the leg. The articular surfaces of the distal end of femur, and talocrural, intertarsal and tarsometatarsal joint cartilages were removed, using a high-speed burr following the contours of the bone ends to expose the underlying cancellous bone. The surface was rasped and contoured until secure apportion was achieved at an angle of approximately 140°. Subsequently, the bone plate was placed on the cranial surface of the femur and talus. The wound was lavaged with warm saline solution and cancellous bone which had been obtained from the tibia, was placed at the margin of the arthrodesis site. Closure of the subcutaneous tissue and skin were carried out in routine manner. A bivalve plastic cast was fitted for eight weeks until early radiographic evidence of bone bridging was observed. After the operation was completed, the cat was administred 50 mg/kg ampicillin/sulbactam, *i.v.* and 3 mg/kg tramadol hydrochloride, *i.v.* for seven days postoperatively. Radiographs were then repeated on a monthly basis until good radiographic arthrodesis had been achieved. At four months after surgery, the result of the operation was deemed to be satisfactory and the implants were removed. The other deformed hind leg was then corrected using the same approach. The cat had begun to use the affected limbs approximately three to four weeks after the first surgery, the owner noticing a consistent gradual improvement. Radiography performed four and six months after both surgeries revealed a complete union of the arthrodesis site.

The cat walked and ran with slight lameness due to the absence of stifle joints but bleeding and pain were not observed. The owner was completely satisfied with this clinical result. The evaluation at 12 months after surgery (Figure 1B and 2B) indicated that there was no unexpected change in the cat's condition.

DISCUSSION

Congenital defects in cat are less common than in other domestic animals and may be heritable or follow an inheritance pattern, although no individual breed of cat is significantly predisposed to congenital diseases (Hoskins, 1995). A congenital defect of the tibia-fibula is an unusual condition in a cat, although fracture of the tibia has sometimes been reported (Ozsoy, 2004). Occasionally, cat lameness includes fracture and luxation and in some cases is a result of congenital knee cap luxation (Loughin et al., 2006). Congenital and developmental problems of bones are the important causes of osteoarthritis in cat which is characterized by degeneration of the articular cartilage, hypertrophy of the bone at the articular margin and changes in the synovial membranes (Sarah, 2007). This cat had the same degenerative changes in the articular margins of both stifle and hock joints. The tibial bones were deformed and fragile similarly to cartilage. Normally in a simple bone fracture, it is easy to correct the deformity by using different surgical techniques because of the normal size, shape of bone and joints. But in this case the stifle joints were partially defected and the hock joints were not formed congenitally. Therefore, it was impossible to correct this deformity in its normal position and shape. For this reason the authors chose arthrodesis of the femur and tarsal bones with elimination of the deformed tibia and fibula. The lengths of the tibia fibula were very short and the muscles were also abnormal in length and position. The location of the patella was above the normal position of the

stifle joint and the hock joint was not formed. The positions of tibias were just beneath the skin where it pushed cranially and was finally exposed craniodistally without formation of hock joints.

Arthrodesis has been well documented as a treatment option for fractures, irreparable injuries to the articular ligaments, chronic pain and for severe degenerative joint diseases (Moak et al., 2000; Dorea Neto et al., 2007). Instability induces pain due to abnormal movement and the tension placed on the soft tissues and nerves of the joint. Thus, arthrodesis relieves pain by providing a rigid support (Lesser, 2003).

In this case, the authors chose arthrodesis to correct this congenital defect by using bone plates for stabilization, which are the most substantial and reliable in fixation. Arthrodesis of the stifle is not commonly performed except at the end stage of joint disease or instability. Tarsal arthrodesis is suitable for the treatment of severe degenerative joint disease and is a retrieval procedure intended to eliminate pain and preserve some degree of limb usage (Marie-Claude and Noel, 2007). However, reports of femoro-tarsal arthrodesis for cats as well as for other animals are rare in the literature. The arthrodesis was evaluated by radiographs immediately after surgery and on a monthly basis. Bone fusion was observed after one month in this case since the animal was of young age.

Our study is limited by the fact that this was an exceptional case for a cat and therefore there was no scope to compare with others. The results of this study suggest that arthrodesis of the femoro-tarsal joints may be a suitable and satisfactory procedure for the congenitally deformed tibia-fibula in a cat, although more cases are needed to further define complications, more suitable angles, and long term results.

REFERENCES

Denny E.R., Butterworth S.J. (2000): A Guide to Canine and Feline Orthopedic Surgery. 4th ed. Blackwell Science, London. 415–419.

Dorea Neto F.A., Padilha Filho J.G., Santos L.A., Oria A.P., Canola J.C., Stefanes S.A., Regonato E. (2007): The use of hydroxyapatite for arthrodesis in dogs and cats: a clinical study. Arquivo Brasileiro de Medicina Veterinaria e Zootecnia, 59, 932–938.

Guerrero T.G., Montavon P.M. (2005): Medial plating for carpal panarthrodesis. Veterinary Surgery, 34, 153–158.

Harasen G. (2002): Arthrodesis – Part I: The carpus. The Canadian Veterinary Journal, 43, 641–643.

Hoskins J. (1995): Congenital defects of cats. Compendium on Continuing Education for the Practicing Veterinarian, 17, 385–405.

Kirsch J.A., Dejardin L.M., DeCamp C.E., Meyer E.G., Haut R.C. (2005): *In vitro* mechanical evaluation on the use of an intramedullary pin-plate combination for pantarsal arthrodesis in dogs. American Journal of Veterinary Research, 66, 125–131.

Lesser A.S. (2003): Arthrodesis. In: Slatter D. (ed.): Textbook of Small Animal Surgery. 3rd ed. WB Saunders Co., Philadelphia. 2170–2180.

Loughin C.A., Kerwin S.C., Hosgood G., Ringwood P.B., Williams J., Stefanacci J.D., McCathy R.J. (2006): Clinical signs and results of treatment in cats with patellar luxation: 42 cases (1992–2002). Journal of the American Veterinary Medical Association, 228, 1370–1375.

Marie-Claude T., Noel M.M.M. (2007): The use of veterinary cuttable plates for carpal and tarsal arthrodesis in small dogs and cats. The Canadian Veterinary Journal, 48, 165–168.

Moak P.C., Lewis D.D., Roe S.C. (2000): Arthrodesis of the elbow in three cats. Veterinary and Comparative Orthopedics and Traumatology, 13, 149–153.

Ozsoy S. (2004): Fixation of femur, humerus and tibia fractures in cats using intramedullary threaded steinmann pins. Veterinary Record, 155, 152–155.

Sarah C. (2007): Feline arthrodesis. Veterinary Focus, 3, 11–12.

Trostel C.T., Radasch R.M. (1998): Tarsocrural arthrodesis: A clinical report using a circular external fixator. Veterinary and Comparative Orthopaedics and Traumatology, 11, 193–196.

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