*Case Report*

# Stifle joint reconstruction technique using fascia lata in a cat with cranial cruciate ligament rupture

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***Abstract***

A two-year-old spayed female mongrel cat presenting with right hind limb lameness with intermittent weight bearing while walking was taken to the veterinary medicine teaching hospital of National Chung Hsing University. Both drawer test and tibial compression test were positive, stifle radiography showed synovial fluid had become more radiopaque. The tentative diagnosis for the cat was rupture of the right cranial cruciate ligament (CrCL), medical management using corticosteroids was prescribed with anticoagulants and surgical treatment recommended. Intracapsular reconstruction was performed and the postoperative recovery of this cat presented normal physical status with improved right hind limb weight-bearing activity. This report presents the first use of fascia lata in intracapsular reconstruction surgery to simulate the original ligament in normal stifle.

**Keywords:** cat, cranial cruciate ligament, fascia lata, reconstruction, rupture

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## Introduction

Cranial cruciate ligament (CrCL) rupture is one of the most common orthopedic conditions affecting the stifle joint in dogs but less in cats (McLaughlin 2002). In cats, rupture of the CrCL may be caused by traumatic events including vehicular trauma, a fall from height, an altercation with another animal (McLaughlin 2002) or intercondylar notch width as well as tibial plateau angle (TPA) (Kyllar and Čížek 2018). Meanwhile, in cats, CrCL might be associated with the low differentiation of fibrocartilage due to lower body weight compared to dogs (Wessely *et al*. 2017). Surgeries commonly performed in treating CrCL rupture are divided into osteotomy (Nanda and Hans 2019) and extra- and intra-capsular stabilization (Arthurs and Langley-Hobbs 2007). The goal of osteotomy is to re-establish a new geometry on stifle which will neutralize cranial tibial thrust, while extra- and intra-capsular reconstruction technique aims to stabilize the stifle by putting an artificial implant fixing femur and tibia osseous. Both intracapsular and extracapsular fixation have been used in cats with CrCL (Umphlet RC 1993). All of the surgical techniques have their disadvantages such as medial patellar luxation (Flesher *et al*., 2019), degenerative joint disease (Hurley *et al*., 2007), foreign body-associated infection (Stine et al. 2018) and higher techniques being required (Mariano *et al*., 2016). In humans, ligaments from the patient itself have been used (Samuelsen *et al*., 2017) but information concerning autologous ligaments used in dogs is still rare. Thus, this report presents the surgical protocol of cranial cruciate ligament rupture reconstruction using fascia lata and the outcome of 22 months post-surgery using fascia lata in a cat. It may used be as a surgical protocol for clinician to treat CrCL rupture in cats.

## Case description

A two-year-old, 4.45 kg, spayed female mongrel cat was presented with right hind limb lameness of unknown cause. Both a cranial drawer test and tibial compression test were positive on orthopedic examination and positive cranial drawer and tibial compression tests results diagnosed cranial cruciate ligament rupture. Normal results of a complete blood count and serum biochemistry were detected. Prednisolone (1 mg/kg, once daily, orally, Donison®, China chemical & pharmaceutical Co., LTD., Taiwan, R.O.C.), Metoclopramide (0.1 mg/kg, once daily, orally Pulin®, Yung shin pharm. Ind. Co., LTD., Taiwan, R.O.C.) as well as Clopidogrel (18.75 mg/cat, once daily, orally Plavix®, Sanofi Co. LTD., France) were prescribed for one week and surgical treatment recommended. Radiography was performed on both of the stifles; the caudal to cranial view and medial to lateral view revealed more radiopaque synovial fluid and recommended for and a slight cranial displacement of the tibia (Fig. 1) where the image produced no specific finding in the osseous and soft tissue.

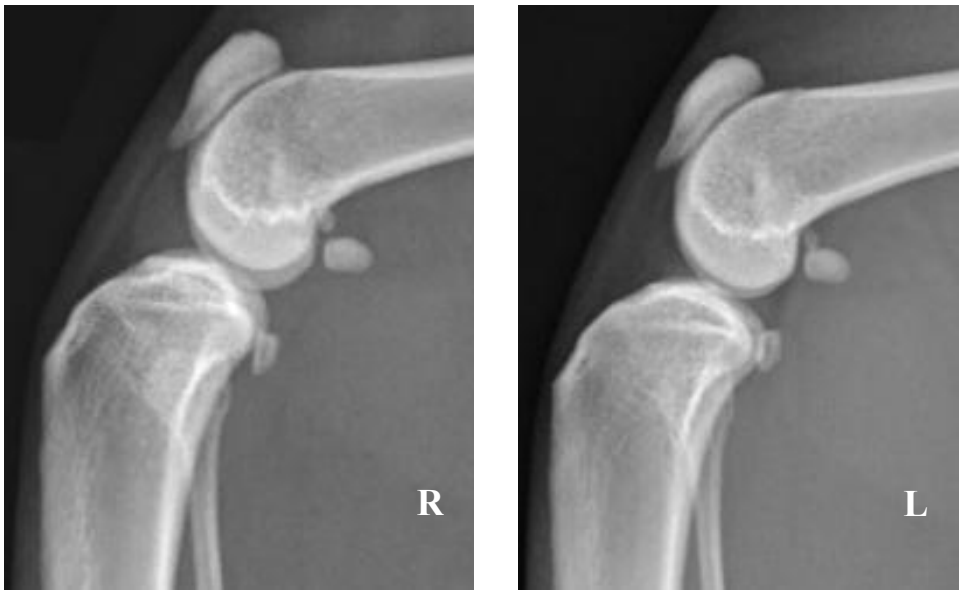


**Figure 1** Medial lateral view of tibia showed increased opacity and volume of the right joint capsule. The distance between these two sesamoid bones had become further, indicating tibia slightly cranial translated. The left stifle showed no significant abnormality.

## Treatment and discussion

Intraoperative knee joint observation revealed rupture CrCL (Fig. 2A). Intracapsular stabilization of the right stifle joint by fascia lata reconstruction was performed. A 0.5 cm wide and 5 cm length of fascia lata was stripped off (Fig. 2B) and was fully hand chucked to make a 0.3 cm diameter horizontal tunnel of tibial tuberosity and another tunnel from the femoral lateral condyle to the internal capsule (Fig. 2C). The fascia lata was led by a suturing a knot on its end with 3-0 violet monofil (MonoSorb ®Vömel, D-61476 Kronberg Germany), guiding it to pass through the perforations made previously, from lateral to medial tibial tuberosity and the internal capsule to lateral condyle (Fig. 2D). The end of the strip was sutured with biceps femoris and the fascial lata surrounded by 3-0 violet monofil. Before suturing, extend the hindlimb was

extended to make sure the fascia lata was tight. The joint capsule was closed by 3-0 violet monofil in a simple interrupted suture. The fascia lata and subcutaneous tissue were sutured by 3-0 violet monofil in a simple interrupted pattern and then the skin was closed by 3-0 Nylon in a simple interrupted suture.

This cat presented normal physical status with improved right hind limb weight-bearing activity during postoperative recovery. The skin sutures were removed on the 14th day post-operation hospital visit when the patient could put weight on the affected limb. The patient returned to normal walking gait during clinic examination 2 months post-operation and at follow up 22 months post-operation, the patient showed normal weight bearing gait and good spirits; stifle radiography showed no sign of degenerative joint disease and the cat tolerated the current medication well without any complications (Fig. 3).

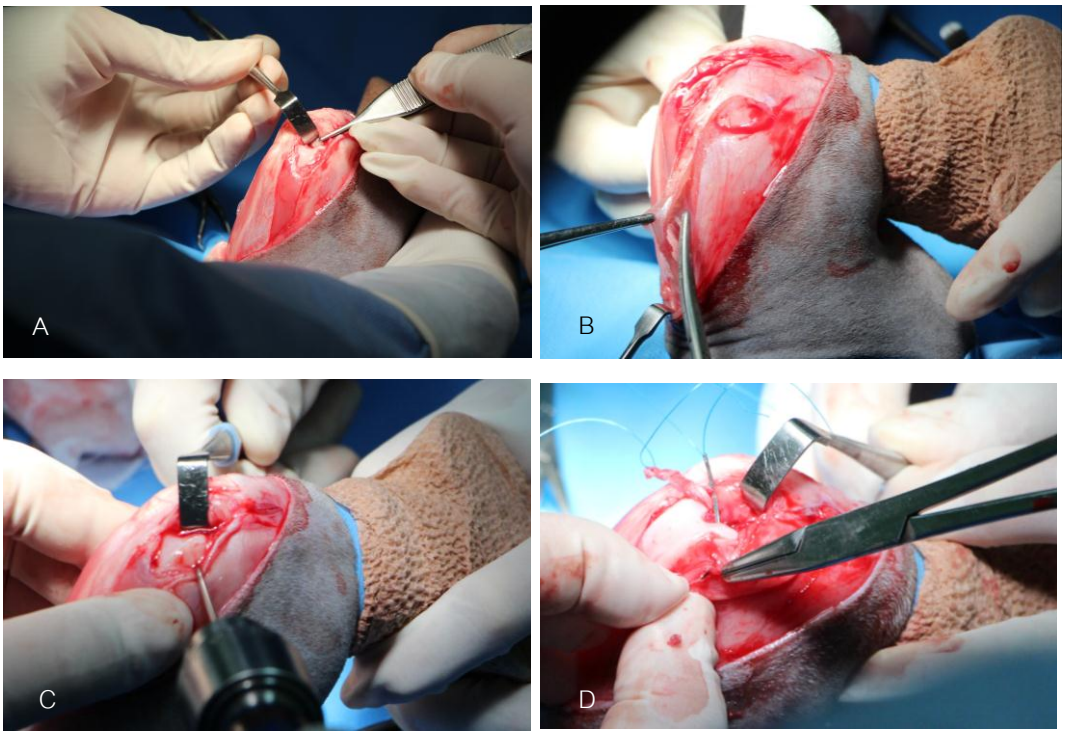


**Figure 2** The stifle joint incised to expose the internal capsule and remove remaining ruptured cranial cruciate ligament (A). A fascia lata which was fully dissected it to proximal tibial attachment site was stripped off (B). A Steinmann pin with Jacob hand chuck used to make a horizontal tunnel on tibial tuberosity and another tunnel from femoral lateral condyle to internal capsule (C). The end of the fascia strip sutured with biceps femoris and the fascial late surrounded by 3-0 violet monofil and the joint capsule, subcutaneous tissue and skin sequentially sutured (D).


**Figure 3** The image at 22 months post-operation in this cat. The stifle joint surface remains smooth without any sign of degenerative joint disease.

Three of the most commonly used surgical techniques to treat CrCL rupture are extracapsular stabilization, intra-articular reconstruction and osteotomy (Arthurs and Langley-Hobbs 2007). Tibial plateau leveling osteotomy (TPLO) has been the most commonly used surgical technique recently since the

functional recovery in the intermediate postoperative time period has been superior to the others and it supports a normal return to clinical function (Bergh *et al.,* 2017). Intra-articular reconstruction consists of passing autogenous/allograft through the joint, imitating the original CrCL alignment (Samuelsen *et al.,* 2017). The autologous graft is taken from a piece of hamstring or patellar ligament to reconstruct by simulating the original CrCL which has no blood supplement (Samuelsen *et al.,* 2017). However, intra-articular reconstruction surgery is relatively rare, due to elastic fatigue or inflammation reaction that are frequently observed in long term follow up. Currently TightRope® achieves the best balance of long-term safety to efficacy in intra-articular reconstruction (Christopher *et al.,* 2013), however, TightRope® consists of synthetic ligament-like biomaterial which may provoke the receiver's immune response, potentially risking rupture and/or looseness (Christopher *et al.,* 2013).

In this case of a young and low body weight cat presenting an intermittent non-weight bearing lameness in the right hindlimb, intra-articular reconstruction using fascia lata surgical plan was done. It was modified by an "over-the-top technique" (Arnoczky SP 1979) using fascia lata rather than the patellar tendon and going through bone tunnels on tibial tuberosity and lateral condyle, which have a similar alignment of the CrCL and simulate its biomechanical function. Since the fascia lata strip with one end attached to the origin without being cut off provides blood supply with the same concept of a skin flap, its autograft characteristic may decrease the occurrence of inflammation. Fascia lata is the fascial sheath surrounding the thigh muscles which is uniformly distributed and has been well-documented as a graft material in people. (Indorewala S 2002), a retrospective study, recorded the patient's motor function after anterior cruciate ligament reconstruction surgery using the fascia lata, showing that the quadriceps to hamstring ratio is close to physiological standards (Haillotte *et al.,* 2017). Veterinary studies on fascia lata have been reported to have been used in perineal hernias and urethral defects (Bongartz *et al.,* 2005). In vitro evaluation of allogeneic canine fascia lata has shown it allowed attachment and proliferation of fibroblasts throughout layers of the graft and revealed its biocompatibility was clinically well tolerated in the receiver (El-Taliawi et al. 2020). Likewise, mechanical properties reveal that fascia lata is a biomechanically suitable soft tissue replacement material that accommodates a significantly higher load and energy to yield (Arnold *et al.,* 2009).

In conclusion, at the two years post-operation follow up clinic, the cat presented with a normal walking gait and had a normal daily life. In this surgical protocol we selected a strip of fascia lata to simulate original CrCL and reconstruct the normal geometry of stifle joint. The strip was still alive because of vasculature which was different TightRope® and might not induce immune response or inflammation. Actually, no signs concerning DJD were noted by radiographic observation. Thus, this surgical protocol may provide a method for clinicians in small animal practice.

## *References*


Arnoczky SP 1979. The over-the-top procedure : A technique for anterior cruciate. Ligament substitution in the dog. J Am Anim Hosp Assoc. 15:283-290.

Arnold GA, Mathews KG, Roe S, Mente P, Seaboch T 2009.Biomechanical. Comparison of Four Soft Tissue Replacement Materials: An In Vitro Evaluation of Single and Multilaminate Porcine Small Intestinal Submucosa, Canine Fascia Lata, and Polypropylene Mesh. Vet Surg. 38:834-844.

Arthurs GI and Langley-Hobbs SJ 2007. Patellar luxation as a complication of. Surgical intervention for the management of cranial cruciate ligament rupture in dogs. A retrospective study of 32 cases. Vet Comp Orthop Traumatol. 20:204-210.

Bergh MS, Sullivan C, Ferrell CL, Troy J, Budsberg SC 2014. Systematic review. Of Surgical Treatments for Cranial Cruciate Ligament Disease in Dogs. J Am Anim Hosp Assoc. 50:315-321.

Bongartz A, Carofiglio F, Balligand M, Heimann M, Hamaide A 2005. Use of. Autogenous Fascia Lata Graft for Perineal Herniorrhaphy in Dogs. Vet Surg. 34:405-413.

Christopher SA, Beetem J ,Cook JL 2013. Comparison of Long-Term Outcomes. Associated With Three Surgical Techniques for Treatment of Cranial Cruciate Ligament Disease in Dogs. Vet Surg. 42:329-334.

El-Taliawi OG, Taguchi T, Dong F, Battig J, Griffon DJ 2020. Biocompatibility. Of allogenic canine fascia lata: In vitro evaluation and small case series. *Vet Surg* 49:310-320.

Flesher K, Beale BS, Hudson CC 2019. Technique and Outcome of a Modified. Tibial Plateau Levelling Osteotomy for Treatment of Concurrent Medial Patellar Luxation and Cranial Cruciate Ligament Rupture in 76 Stifles. Vet Comp Orthop Traumatol. 32:26-32.

Haillotte G, Hardy A, Granger B, Noailles T, Khiami F 2017. Early strength. Recovery after anterior cruciate ligament reconstruction using the fascia lata. Orthop Traumatol Surg Res. 103:1021-1025.

Hurley CR, Hammer DL, Shott S 2007. Progression of radiographic evidence of. Osteoarthritis following tibial plateau leveling osteotomy in dogs with cranial cruciate ligament rupture: 295 cases (2001-2005). J Am Vet Med Assoc. 230:1674-1679.

Indorewala S 2002. Dimensional Stability of the Free Fascia Grafts: An Animal. Experiment. Laryngoscope. 112:727-730.

Kyllar M and Čížek P 2018. Cranial cruciate ligament structure in relation to the tibial plateau slope and intercondylar notch width in dogs. J Vet Sci.19:699-707.

McLaughlin RM 2002. Surgical diseases of the feline stifle joint. Vet Clin Small Anim . 32: 963–939.

Mariano AD, Kowaleski MP, Boudrieau RJ 2016. Novel TPLO Alignment Jig/Saw. Guide Reproduces Freehand and Ideal Osteotomy Positions. PloS One.11:e0161110.

Nanda A and Hans EC 2019. Tibial Plateau Leveling Osteotomy for Cranial Cruciate. Ligament Rupture

in Canines: Patient Selection and Reported Outcomes. Vet Med (Auckl). 10:249-255.

Samuelsen BT, Webster KE, Johnson NR, Hewett TE, Krych AJ 2017. Hamstring. Autograft versus Patellar Tendon Autograft for ACL Reconstruction: Is There a Difference in Graft Failure Rate? A Meta-analysis of 47,613 Patients. Clin Orthop Relat Res. 475:2459-2468.

Stine SL, Odum SM, Mertens WD 2018. Protocol changes to reduce implant-associated infection rate after tibial plateau leveling osteotomy: 703 dogs, 811 TPLO (2006-2014). Vet Surg. 47:481-489.

Umphlet RC 1993. Feline stifle disease. Vet Clin North Am Small Anim Pract. 23:897.

Wessely M, Reese S, Schnabl-Feichter EJ 2017. Aetiology and pathogenesis. Of cranial cruciate ligament rupture in cats by histological examination. Feline Med Surg. 19:631-637.