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Case Report

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Treatment with custom partial condyle prosthesis of a comminuted femoral condyle fracture in a dog: a case report

Kemal ALTUNATMAZ[1,*], Ebru ERAVCI YALIN[1], Büşra İNAL GÜNAY[1], Defne Joan ŞADALAK MCKINSTRY[2], Zeynep Tol SEVİM[1]

[1]Department of Surgery, Faculty of Veterinary Medicine, İstanbul University-Cerrahpaşa, Avcılar, İstanbul, Turkey

[2]32 Sion Hill, Bath, United Kingdom

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Abstract: The patient in this case report was a male Golden Retriever dog, approximately 5 years of age, found in woodlands and presenting with an inability to use the right hindlimb. In craniocaudal and mediolateral radiographs taken of the patient, presence of an old comminuted fracture caused by a firearm injury was observed in the right femoral condyle. A custom-made trochlear groove of suitable dimensions for the patient was produced. The patient tip-toed on postoperative day 1 and was seen to be mostly weight-bearing by day 7. The lameness was determined to have lessened to a great extent after 1 month and at the end of 6 months it had completely disappeared. In control radiographs taken 1 year later, no osteoarthritis findings were observed in the knee joint.

Key words: Femoral condyle, comminuted fracture, partial knee prosthesis, dog

1. Introduction

Chronic instability in the knee joint and tissue damage occurring on the femoropatellar joint surface are among the important causes of hindlimb lameness (1,2). Knee joint problems in dogs are more commonly caused by cartilage erosions and osteoarthritis due to patellar luxation (1–3). These problems are treated using either medical or surgical methods (1,4,5). In cases of cartilage tissue loss or comminuted condyle fracture, treatment options include joint arthrodesis, total knee prosthesis, or leg amputation (1,4,6–8). The purpose of this case report is to present the successful treatment of a comminuted femoral condyle fracture in a dog, using for the first time a custom partial condyle prosthesis.

2. Case history

The patient in this case report was a male Golden Retriever dog, approximately 5 years of age, found in woodlands and presenting with an inability to use the right hindlimb. Clinical examination revealed excessive swelling and crepitation in the knee joint.

Preoperative goniometric measurements of the right stifle joint were 45° in flexion and 70° in extension, while the left stifle joint was 45° in flexion and 165° in extension.

It was observed that the patient was unable to use the right leg or suspended it. Distinct atrophy was present in the quadriceps and other muscles. In the examination of the knee joint, the drawer test and cranial-tibial thrust test were negative. In craniocaudal and mediolateral radiographs taken of the patient, the presence of an old comminuted fracture caused by a firearm injury was observed in the right femoral condyle (Figure 1). Bullet pieces had also caused damage in the joint capsule and its surroundings. No abnormal findings were seen in the blood tests.

Preoperative planning was carried out based on radiographic images and a decision of trochlear groove reconstruction was made. Two custom-made trochlear grooves (stainless steel, 316 L) of suitable dimensions for the patient were produced (Figure 2). Following premedication of the patient with IV xylazine (Rompun, Bayer, Turkey), induction was done with ketamine HCl (Alfamine 10%, Ege-Vet, Turkey) and, after endotracheal intubation, general anesthesia was continued with isoflurane (Forane Likid, Abbvie, Turkey). Prior to surgery, the patient was given IV antibiotics (ceftriaxone sodium [Novocef, Zentiva İlaç, Turkey], 22 mg/kg). For analgesia during surgery, IV alfentanil hydrochloride (Rapifen, Jansen-Cilag, Belgium) was administered at a dose of 10 µg/kg via IV infusion. The surgical site was covered with sterile drapes. The site was approached via a parapatellar incision. Sterile gauze was sutured to the incision line to

* Correspondence: altunatmaz@hotmail.com

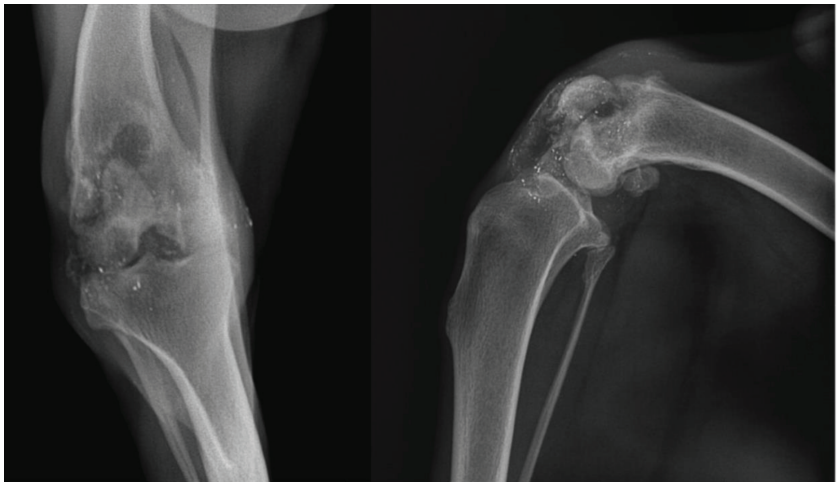

Figure 1. Presence of an old comminuted fracture: (A) craniocaudal and (B) mediolateral preoperative radiography of the right knee.

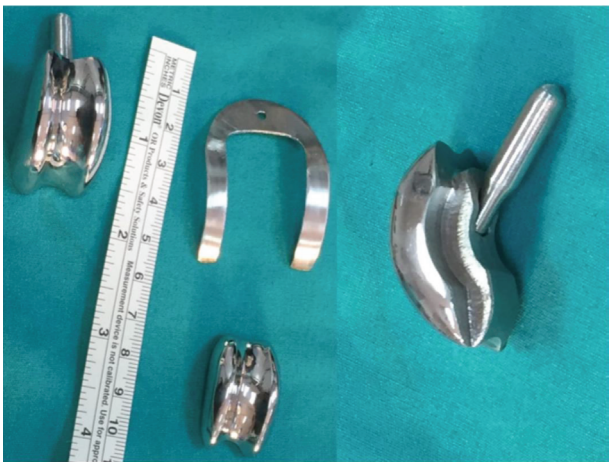

Figure 2. Custom-made trochlear groove and tester.

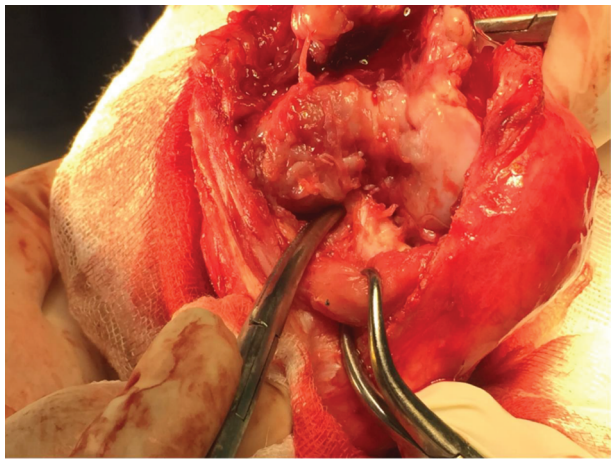

Figure 3. Broken down bone tissue and shrapnel pieces on the femoral condyle.

minimize the risk of infection. Extensive fibrous adhesions were observed in the subcutaneous tissue. The area with inflammation was dissected using electrocautery and the joint was exposed. It was seen that the trochlear groove had been destroyed; however, the tendon of the extensor digitorum longus muscle, its collateral ligaments, and the cranial and caudal cruciate ligaments had remained intact (Figure 3). After removal of the fibrous adhesions in the region, in order to establish the prosthesis, broken down bone tissue and shrapnel pieces on the femoral condyle were removed and the area was prepared for the prosthesis with the use of a saw and an osteotome (Figure 4). The medullary canal was opened with a 6-mm drill and the cavity into which the femoral stem would be placed was established. Once the bleeding had ceased, the medullary canal and cavity was filled with polymethylmethacrylate (PMMA) cement prepared by adding 0.5 g of ceftriaxone sodium (Novocef, Zentiva İlaç, Turkey) and the prosthesis was put in place (Figure 5). The cement overflow was cleaned and time was allowed for adhesion of the prosthesis. Once the cement had solidified, the conformity between the prosthesis and the bone was assessed. For the purpose of denervation, the area around the patella was cauterized using electrocautery (Figure 6). This was aimed at avoiding possible postoperative pain. The capsule and lateral femoropatellar ligament were sutured with polydioxanone (PDO, Katsan, Turkey), subcutaneous tissues with polyglactin 910 (Vicryl, Ethicon, USA), and the skin with polypropylene suture material (Medilen, Medeks, Turkey). Postoperative radiographs were taken (Figure 7). For 5 days in the postoperative period, tolfenamic acid (Tolfine,

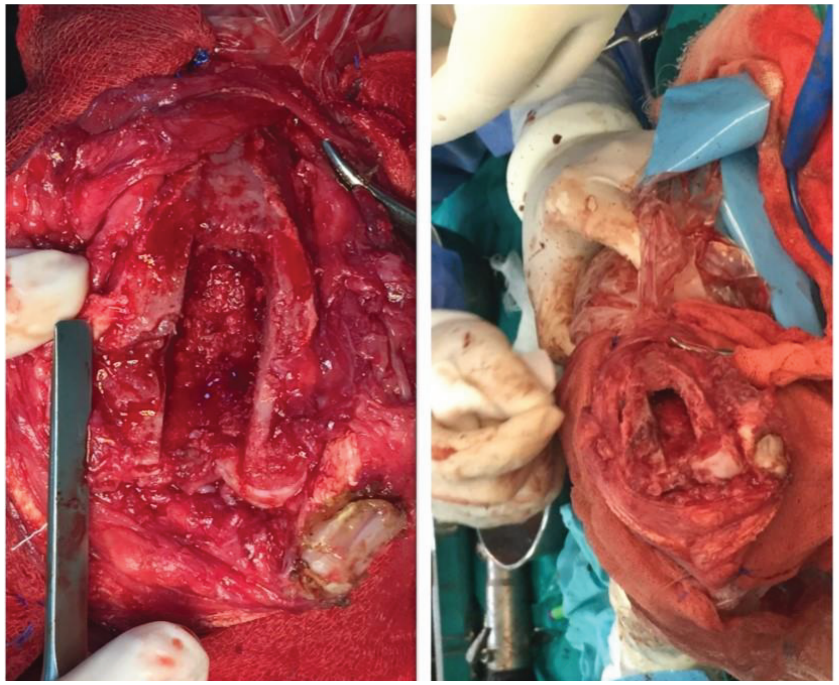

Figure 4. View of joint after clearing the fibrous adhesions and broken down bone tissue and shrapnel pieces from the femoral condyle and preparation of the area for the prosthesis.

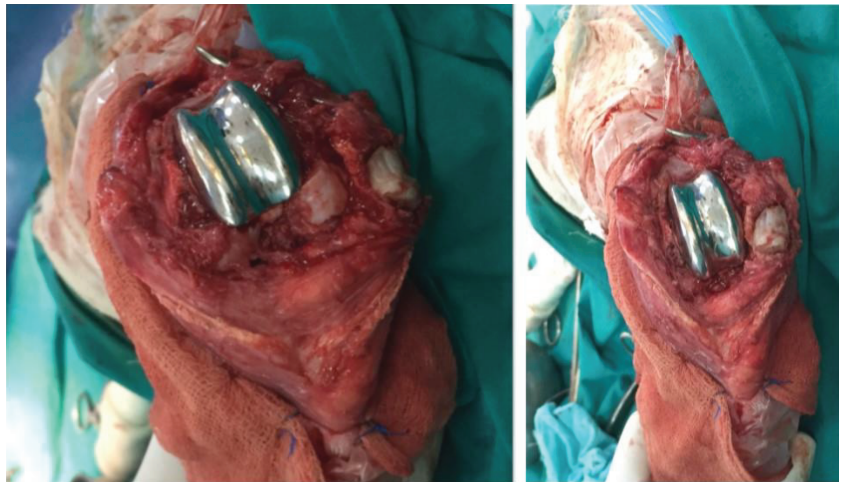

Figure 5. Views after the prosthesis was put in place.

Vetaquinol, Poland) was administered at a daily dose of 4 mg/kg SC for pain relief and ceftriaxone sodium (Novocef, Zentiva İlaç, Turkey) was administered for 10 days at a daily dose of 22 mg/kg.

The aim of the physiotherapy and rehabilitation protocol was to control the pain, swelling, and edema and improve the stifle range of motion (ROM) to achieve early toe touching and weight bearing after the surgery. Exercise restriction was required with slow controlled leash walking only for 5 min 2 times a day, and 5–8 repetitions of passive range of motion (PROM) to the stifle joint and gentle massage (effleurage) sessions were recommended within the first 48 to 72 h of surgical fixation. Postoperatively by 72 h to 4 weeks slow controlled leash walking for 10 min and 10 repetitions of PROM to the stifle, hip, and tarsal joints twice a day with balancing-weight shifting exercises twice a day were recommended. The patient's right rear limb was in toe-touching position 1 week after the surgery.

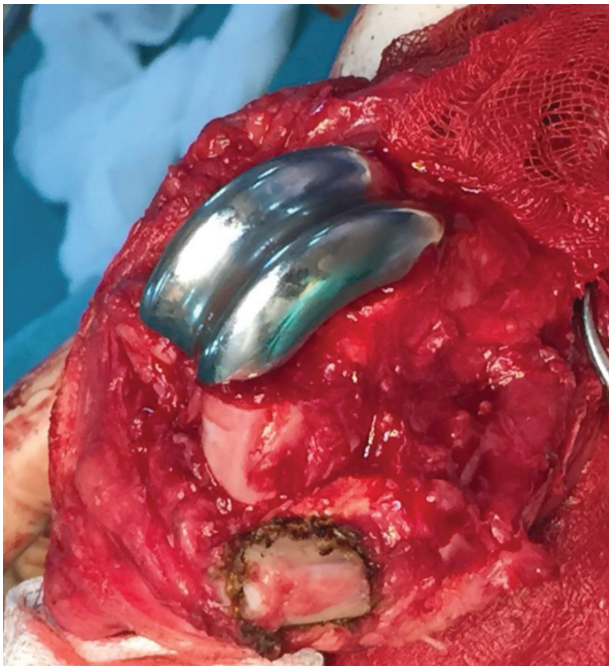

Figure 6. View of the cauterization area around the patella using electrocautery.

According to clinical assessment, 1 month after the surgery there was significant improvement in function (Figure 8). Postoperatively on the 30th day goniometric measurements of the right stifle joint were 45° in flexion and 135° in extension, while the left stifle joint was 45° in flexion and 165° in extension. Between 4 to 6 weeks slow controlled leash walking for 20 min and 15 repetitions of PROM to the stifle, hip, and tarsal joints twice a day with balancing-weight shifting exercises twice a day were recommended. After the 6th week, goniometric measurements of the right stifle joint were 45° in flexion and 155° in extension, while the left stifle joint was 45° in flexion and 165° in extension. The lameness was determined to have lessened to a great extent after 1 month and at the end of 6 months it had completely disappeared. In control radiographs taken 1 year later, no osteoarthritis findings were observed in the knee joint (Figure 9).

3. Results and discussion

In cases of severe osteoarthritis, total knee replacement is used in human medicine with satisfactory results (9,10). Partial arthroplasty has many advantages, especially in younger patients who have failed to respond to more conservative surgery, since limited bone resection is undertaken. Liska et al. (5) reported the treatment of a comminuted condyle fracture with total knee prosthesis. In this case of trochlear groove destruction due to a firearm injury, treatment with custom femoropatellar arthroplasty was successful. The fact that this patient returned to complete function 6 months later was related to the total conformity between the ROM in the knee joint and the prosthesis. In the authors' opinion, the denervation produced by cauterization of the tissues surrounding the patella played a role in relieving the pain and enabling the patient to use the leg from postoperative day 1. Patellar groove reconstruction has been reported for patellar groove erosion or severe osteoarthritis of the joint (11,12). The majority of bone defects in knee arthroplasty

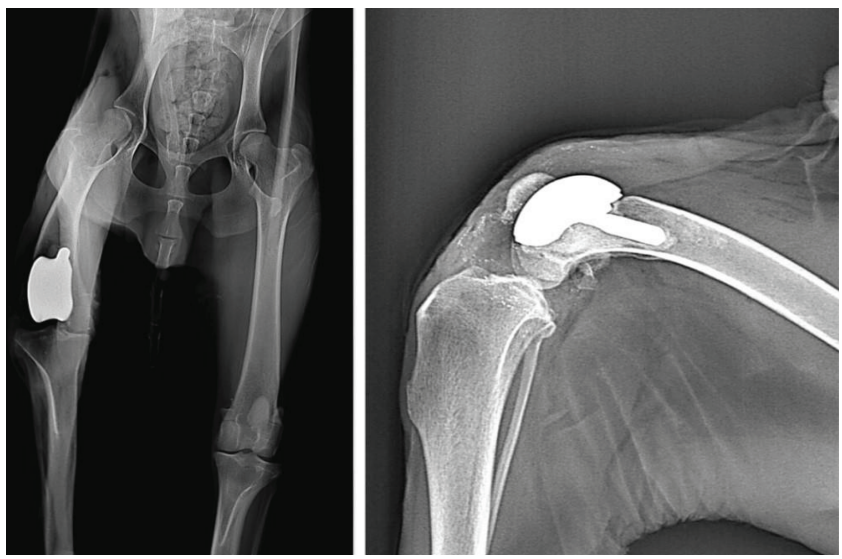

Figure 7. View of craniocaudal and mediolateral via immediate postoperative radiographs.

Figure 8. View of dog 1 month after surgery.

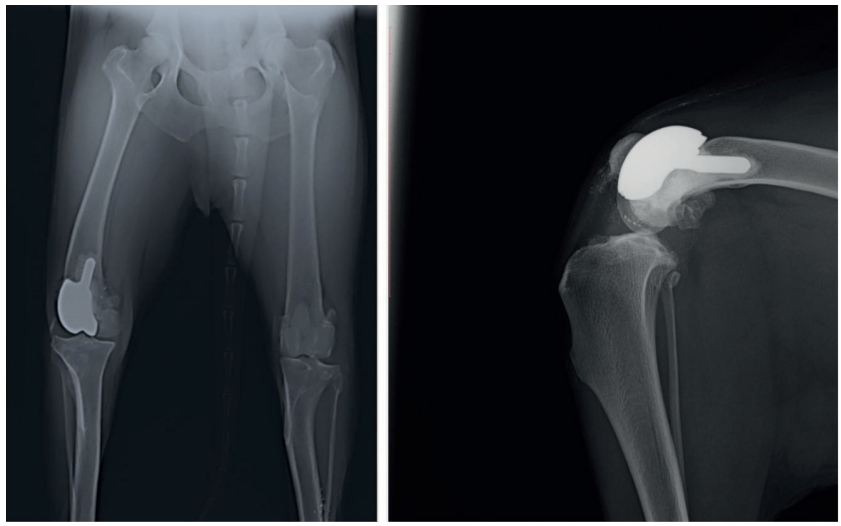

Figure 9. Craniocaudal and mediolateral control radiographs of the right knee taken 1 year later; no osteoarthritis findings were observed in the knee joint.

can be treated with the metal prosthetic augments available in modern knee arthroplasty systems (13). In cases with severe bone loss, an implant specific for the patient should be designed or an autograft should be used.

In conclusion, in problems involving only the patellar groove and not the entire joint, a partial condyle prosthesis may be used for the same purpose and as an alternative to a total knee prosthesis.

Acknowledgments

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