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Case report

Acute Anterior Dislocation in a Total Knee Arthroplasty Patient With a History of Sarcoma Resection

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ABSTRACT

Dislocation after total knee arthroplasty (TKA) is a rare complication, and few cases of anterior dislocation have been reported. Furthermore, there are no reports of early postoperative dislocation. A 72-year-old woman who had previously undergone resection of the posterior thigh muscle group for liposarcoma of the thigh underwent TKA for knee osteoarthritis. However, anterior dislocation was observed at 1 week postoperatively. We considered that the cause of the early anterior dislocation was previous resection of the posterior soft tissues of the knee joint. This case is a rare report of early anterior postoperative dislocation after TKA.

Introduction

Dislocation after total knee arthroplasty (TKA) is a rare complication [1,2]. Generally, the reported risk factors for anterior dislocation include trauma, polyethylene wear, extensor mechanism dysfunction, tibial component malalignment, extension-flexion gap mismatch, and suboptimal soft-tissue balance [3-13]. Furthermore, dislocation after TKA may cause vascular and nerve injuries, such as popliteal artery and peroneal nerve impairment. Because of neurovascular complications, early recognition and proper treatment are required [3,8-10,13,14]. The present report describes a patient who had undergone resection of the posterior thigh muscle group for a femoral liposarcoma several years earlier. We performed TKA as usual for knee osteoarthritis, but early anterior dislocation occurred. Posterior knee muscle groups such as the biceps femoris and hamstrings control the anterior instability of the knee joint [15-17]. Therefore, we considered that the cause of the anterior dislocation was previous resection of the posterior femoral muscle group. There have been no other reports of resection of the posterior thigh muscle group causing anterior dislocation of TKA. We changed the patient's treatment to a constrained implant in the revision surgery, and good results were obtained after the reoperation. Patients with posterior thigh muscle group resection, as in the present case, may develop anterior dislocation after conventional TKA. Therefore, we should consider the use of a constrained implant.

Case history

The patient was a 72-year-old woman who had been diagnosed with knee osteoarthritis 9 years earlier, and she visited our hospital because of disease progression. She had a medical history of extensive tumor resection for liposarcoma of the thigh 31 years earlier at another hospital. Part of the biceps femoris, semitendinosus, semimembranosus, adductor, and gastrocnemius muscles had been resected. In addition, the patient had undergone approximately 10 rounds of radiation therapy to shrink the sarcoma before femoral liposarcoma resection. Upon presentation to our hospital, she was walking with a single cane. Physical findings showed tenderness on the medial and lateral sides of the knee joint; no swelling or feeling of heat was observed, and the knee range of motion (ROM) was 15°—90°. The quadriceps muscle strength was grade 4 on manual muscle testing. The anterior drawer test was positive, the posterior drawer test was positive, and instability was observed in the varus and valgus stress tests. Surgical wounds from the tumor resection from the distal posterior thigh to the proximal posterior lower leg were observed (Fig. 1). The wound had healed well, but a scar remained.

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X-ray examination showed disappearance of the joint space, osteophyte hyperplasia, a bony defect in the proximomedial tibia, and severe knee osteoarthritis (Fig. 2). The oblique joint line angle in the valgus and varus stress radiograph was 5° and 7°, respectively. Varus and valgus stress radiographs showed instability of the knee joint. Radiographic lower limb alignment showed a femorotibial angle of 204° and a mechanical axis of −73% (Fig. 3).

The Knee Injury and Osteoarthritis Outcome Score breakdown was as follows: total, 44 points; symptoms, 39%; pain, 47%; function/daily living, 63%; sport/recreation, 10%; and quality of life, 0%. The Knee Society Score was 42/100, and the Function Score (Knee Society Score) was 55/100.

We performed TKA (Persona, CPS; Zimmer Biomet, Warsaw, IN) with the medial parapatellar approach and with the measured resection technique. The patient had severe osteoarthritis of the knee; therefore, we prepared a constrained implant as a backup. No medial-lateral instability of the knee joint was observed during the operation. In addition, we used CPS-type implants because we confirmed that there was no anterior instability at 0° and 90° of knee joint flexion. Postoperative radiographs showed no abnormalities (Fig. 4). The patient began ROM training the day after surgery, with no weight-bearing for 1 week after surgery. One week after surgery, the patient developed discomfort in the knee joint during ROM training, and radiographs showed anterior dislocation of the tibia (Fig. 5). No pain and no neurovascular symptoms in the lower leg were observed. Computed tomography showed anterior tibial dislocation, as with radiographs. The rotational femoral component angle (RFA) was 2.7°, the rotational tibial component angle (RTA) was 2.4°, and the implant placement was normal (Fig. 6). Magnetic resonance imaging showed continuity of the patellar tendon and maintenance of the knee extensor mechanism (Fig. 7).

On the same day that anterior dislocation was observed, we manually reduced the knee joint. The dislocation was reduced by a posterior translocation force applied to the proximal tibia in approximately 10° of flexion. No neurovascular symptoms in the lower leg were observed after reduction. However, the day after reduction, radiographs showed redislocation. No neurovascular symptoms in the lower leg were observed after redislocation. We determined that conservative treatment such as long leg casting would not be successful, and 7 days later, we performed TKA revision (NexGen, RHK; Zimmer Biomet, Warsaw, IN). Intraoperative findings showed that the tibia was dislocated and that reduction was possible in a slight flexion position. There was no instability at 90° of flexion, and the tibia was dislocated when the tibia was pulled anteriorly with the knee in approximately 10° of flexion. There was no loosening of the implant. The surgery was performed with the medial parapatellar approach, and we changed the femoral and tibial implants to stemmed implants and hinge-type inserts. The revision surgery restored knee joint stability. Because of the two major surgeries in a short period of time, the knee was immobilized in the extended position for 1 week to allow the knee to rest. The patient was allowed to begin ROM training at 2 weeks and full-weight-bearing exercise at 4 weeks postoperatively.

One year after the operation, radiographs showed no redislocation and no implant loosening. Radiographic lower limb alignment showed a femorotibial angle of 170° and a mechanical axis of 60% (Fig. 8). There was no pain in the knee joint, and the ROM was 0°−90°. The Knee Injury and Osteoarthritis Outcome Score breakdown was as follows: total, 71 points; symptoms, 93%; pain, 97%; function/daily living, 75%; sport/recreation, 5%; and quality of life, 37.5%. The Knee Society Score was 93/100, and the Function Score (Knee Society Score) was 70/100.

Figure 1. Surgical wounds from the tumor resection extending from the distal posterior thigh to the proximal posterior lower leg.

Discussion

2Dislocation after TKA is a rare complication, and few cases have been reported. In 1979, Insall et al. [18] reported posterior subluxation of the tibia in 4 of 220 patients with condylar replacements. Since then, several cases of posterior dislocation have been reported, but very few reports of anterior dislocation have been published. Generally, the reported risk factors for anterior dislocation are ligament injury due to trauma, polyethylene wear, extensor mechanism dysfunction, tibial component malalignment, extension-flexion gap mismatch, suboptimal soft-tissue balance, and muscle atrophy [3-13]. Lee et al. [5] reported a case of anterior tibial dislocation caused by soft-tissue imbalance secondary to quadriceps atrophy. Furthermore, the authors stated that because of the small number of cases, it was unclear whether there was an association with posterior stabilized or cruciate-retaining prostheses. Our case was an anterior dislocation that happened early postoperatively. No reports to date have described anterior dislocation in the early postoperative period. There was no problem with the extension-flexion gap at the time of the first operation, and radiographs showed no problems with the tibial slope or the implant placement position. We did not check for anterior instability of the knee in mid-flexion during the initial surgery. However, Hino et al. [19] reported on the stability of the knee joint in the flexed position after posterior-stabilized-type TKA. The authors reported that stability of the knee at 0° of extension correlated with stability at 0°−20° of flexion, and stability at 90° of flexion correlated with 20°−80° of flexion. The authors also reported the importance of confirming stability at 90° of flexion to achieve stability in the mid-flexion position. In this case, we confirmed stability at 0° and 90°. There was slight laxity on the lateral side compared with the medial side, but we allowed for this and used the CPS type of implant.

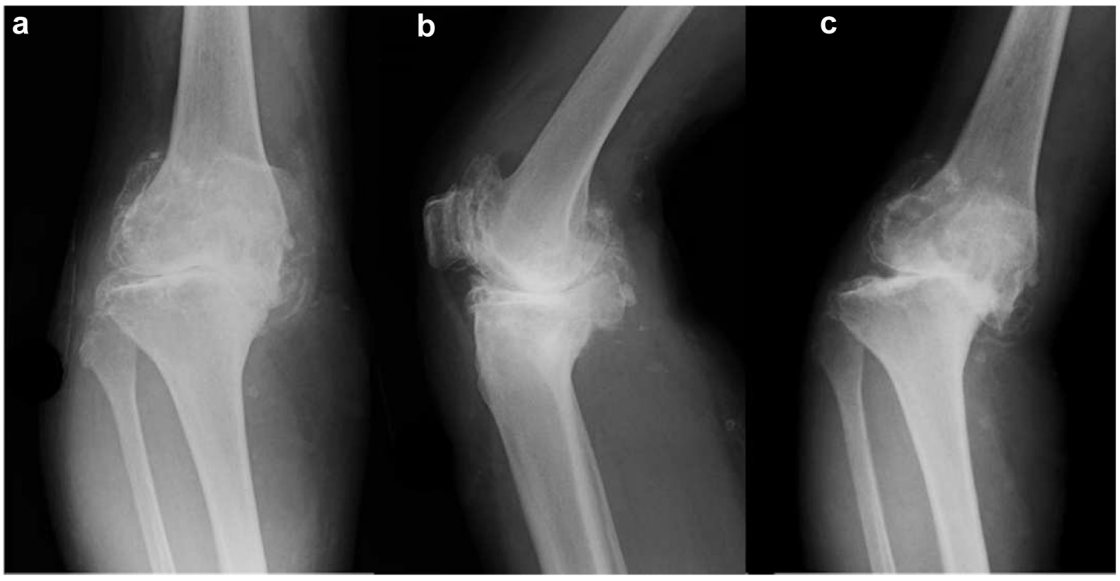

Figure 2. Preoperative radiograph. (a) Anteroposterior view. (b) Lateral view. (c) Rosenberg view.

Mizu-uchi et al. [20] reported the evaluation of postoperative alignment after TKA. The authors defined the following: The RFA was the angle between the surgical epicondylar axis and the posterior condylar line, and the RTA was the angle between a line connecting the center of the tibial component and the medial third of the tibial tubercle and a line perpendicular to the posterior condylar line of the tibial component. The ideal angles for both the RFA and RTA were defined as within 3°. The CT findings in our case showed that the RFA was 2.7° and that the RTA was 2.4°; therefore, there was no problem with the implant placement position. Magnetic resonance imaging showed continuity of the patellar tendon, and there was no problem with the knee extensors. In addition, no damage to the polyethylene insert was found during the reoperation. Therefore, we considered that the cause of the dislocation in our case was that the stabilizers at the knee mid-flexion range had been resected (biceps femoris, semitendinosus muscle, semimembranosus muscle, adductor muscle, and gastrocnemius muscle) during the previous thigh surgery for liposarcoma. Toor et al. [15] reported the importance of the hamstrings in maintaining the dynamic stability of the knee joint. The authors reported that knees with excised semitendinosus and gracilis muscles had more anterior instability than normal knees in the flexed position. Zhao et al. [16] also mentioned knee anxiety in patients who had their biceps femoris resected because of proximal fibular tumors and those who had their biceps femoris reconstructed. In addition, Draganich et al. [17] reported instability of the knee joint in a patient who underwent resection of the proximal

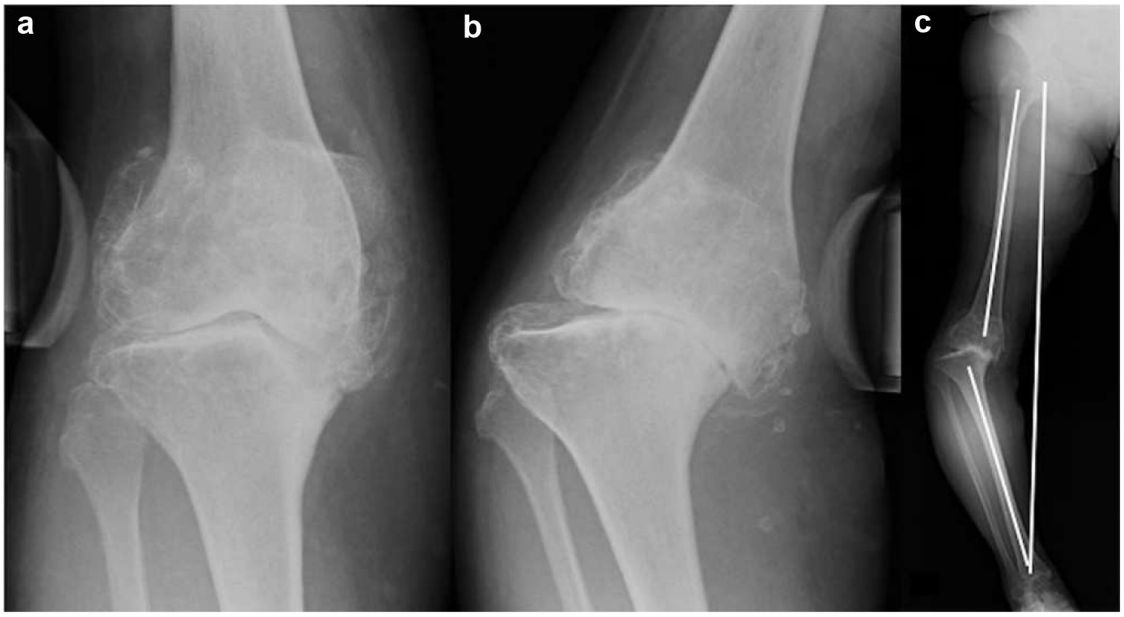

Figure 3. Preoperative radiograph. (a) Valgus stress view. (b) Varus stress view. (c) Radiographic whole lower limb alignment. The femorotibial angle is 204°, and the mechanical axis is −73%. The mechanical axis represents the point at which the Mikulicz line (the line connecting the center of the femoral head to the center of the talus) passes from the most medial side of the tibial plateau.

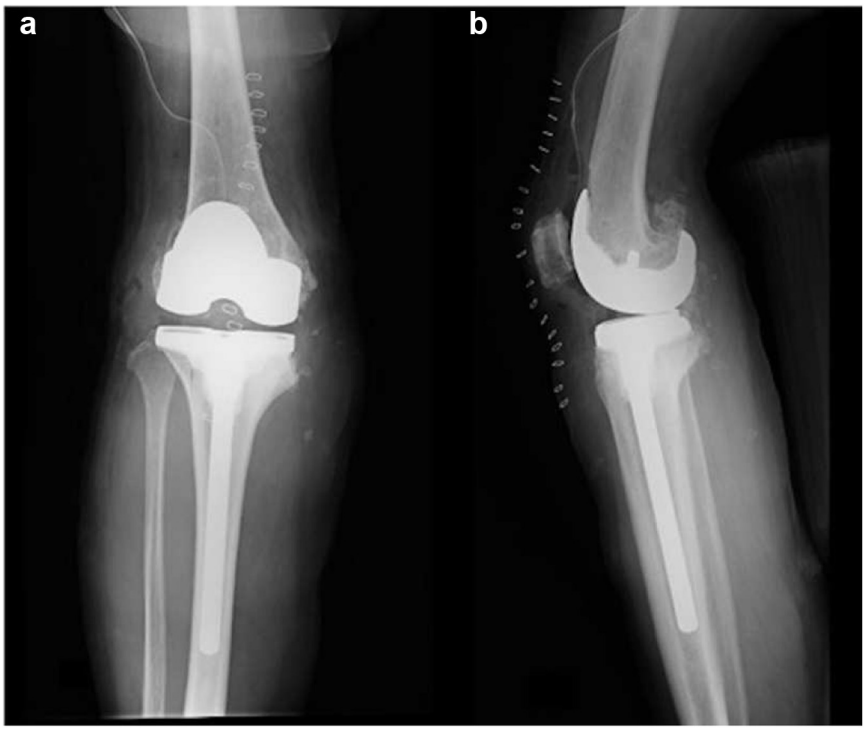

Figure 4. Postoperative radiograph. (a) Anteroposterior view. (b) Lateral view.

fibula, including the biceps femoris, for a proximal fibula tumor. The biceps femoris was repaired, but the patient had apparent anterior instability at 20° and 90° of knee flexion compared with healthy subjects. The authors stated that the hamstrings and biceps femoris are important for the stability of the knee joint in mid-flexion. In our case, we considered that the cause of anterior dislocation was the increased anterior instability of the knee joint secondary to the resection of muscles at the posterior knee joint, including the hamstrings and biceps femoris. In a case such as this, in which the knee flexor muscle group has been resected, the CPS type of implant cannot be used; we should have used the hinge-type constrained implant in the initial surgery.

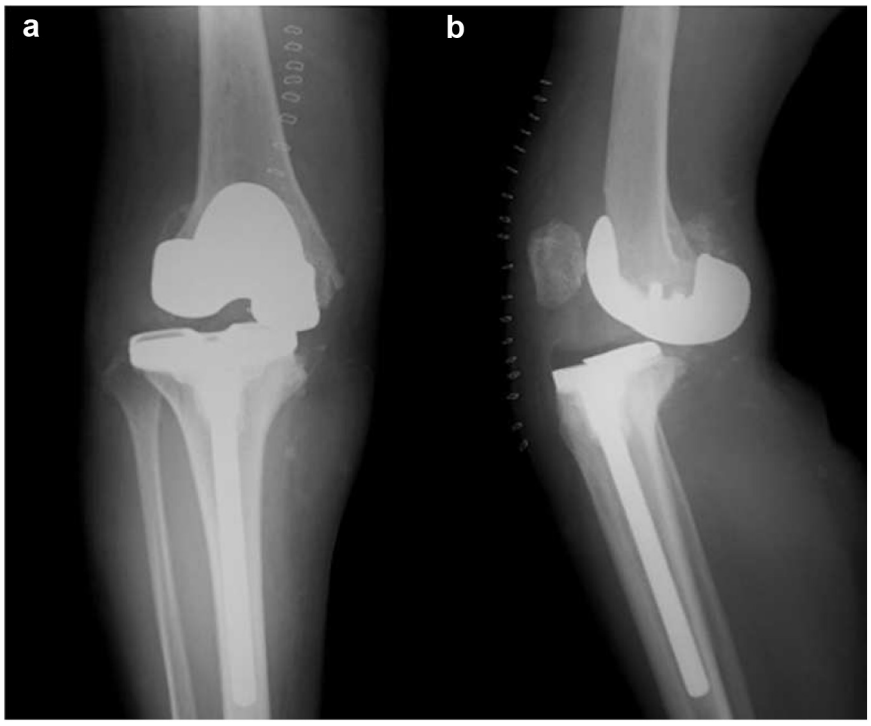

Figure 5. Radiographs 1 week after the operation. (a) Anteroposterior view. (b) Lateral view. Anterior dislocation is seen.

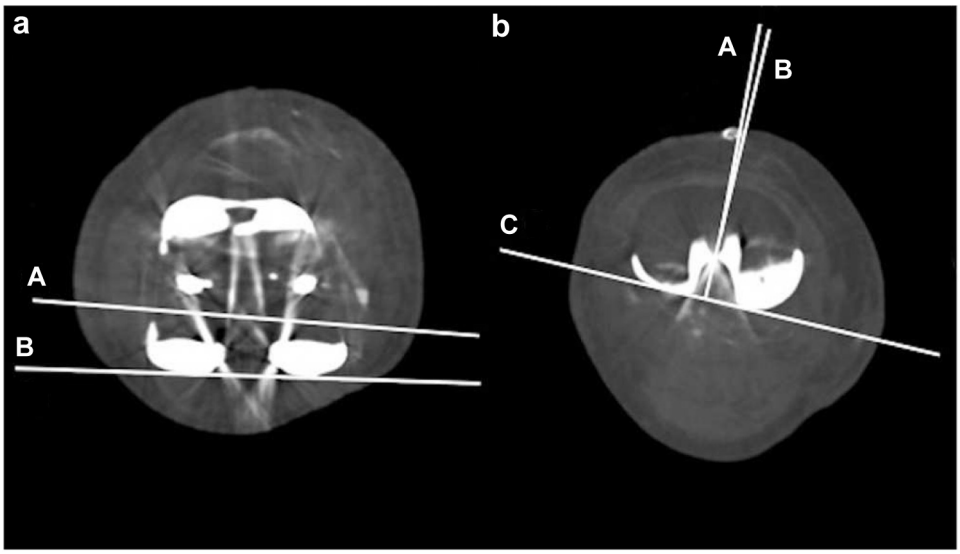

Figure 6. Computed tomography on the day of dislocation. (a) Axial view of the femoral component. A, Surgical epicondylar axis. B, Posterior condylar line. The rotational femoral component angle is the angle between A and B, which is 2.7° in this patient. (b) Axial view of the tibial component. A, A line connecting the center of the tibial component and the medial third of the tibial tubercle. B, A line perpendicular to the posterior condylar line of the tibial component. C, Posterior condylar line. The rotational tibial component angle is the angle between A and B, which is 2.4° in this patient.

A high incidence of related neurovascular complications can be observed in cases of anterior dislocation after TKA [6,7]. For this reason, the recommended treatments are immediate extension fixation after reduction and assessment of neurovascular injury [4,13]. If vascular damage is suspected, imaging evaluation such as angiography is required, and in cases of unsuccessful closed reduction, open reduction is required. Villanueva et al. [8] reported a case of anterior dislocation with palsy due to occlusion of the peroneal nerve and injury to the genicular artery. The causes of dislocation were considered to be misalignment of the tibial component, excessive internal rotation and varus of the tibial component, and extension-flexion gap mismatch. Pao and Jiang [3] reported a case of traumatic anterior dislocation resulting in popliteal artery injury requiring vascular repair and eventual above-knee amputation. Aderinto et al. [9] also reported anterior dislocation, with popliteal artery injury requiring vascular repair; the cause of the dislocation was severe obesity.

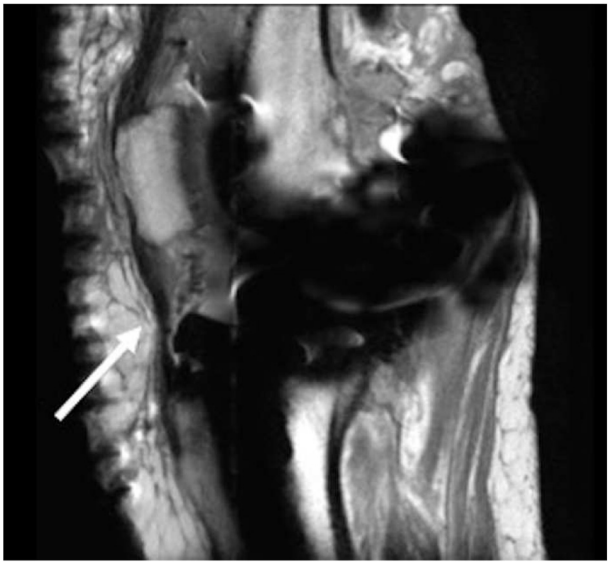

Figure 7. Magnetic resonance imaging at the time of dislocation. The white arrow shows continuity of the patellar tendon.

In our case, there were no neurovascular symptoms after reduction. We attempted conservative treatment with extension-positioned casting, but this treatment was unsuccessful. During the reoperation, we changed to stemmed implants and hinged components. In our case, the main cause of the anterior dislocation was instability in mid-flexion secondary to resection of the posterior femoral muscle group. When the knee flexor muscles such as the hamstrings, semimembranosus muscle, sartorius muscle, gracilis muscle, popliteus muscle, and gastrocnemius muscle are not functioning because of tumor resection, as in our case, there is a possibility of anterior dislocation in mid-flexion. It is difficult to predict anterior dislocation in advance, and using constrained implants should be considered when such cases are diagnosed.

Summary

Anterior dislocation after TKA is a rare complication. Early reduction and assessment of complications of neurovascular injury are necessary. Knee flexor dysfunction can cause anterior dislocation. Therefore, when dysfunction of the knee flexor muscles is present, such as that caused by large resection of the posterior thigh musculature, we should consider using higher level constrained-type implants.

Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

For full disclosure statements refer to https://doi.org/10.1016/j.artd.2021.11.015.

Informed patient consent

The authors confirm that written informed consent has been obtained from the involved patient or if appropriate from the parent, guardian, power of attorney of the involved patient, and they have given approval for this information to be published in this case report.

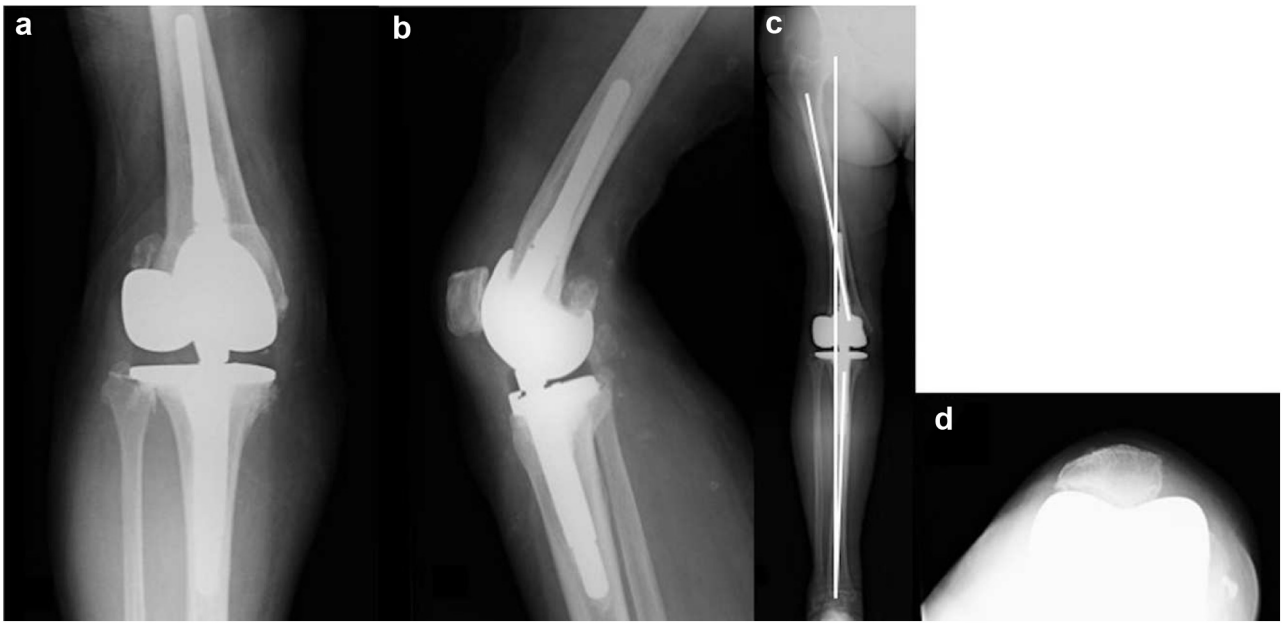

Figure 8. Radiograph 1 year after the operation. (a) Anteroposterior view. (b) Lateral view. (c) Radiographic whole lower limb alignment. The femorotibial angle is 170°, and the mechanical axis is 60%. (d) Merchant view.

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