Patellar tendon reconstruction using an Achilles tendon-bone block allograft for periprosthetic joint infection accompanied by patellar tendon disruption after total knee arthroplasty: a case report

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Background: As a complication of total knee arthroplasty (TKA), patella tendon disruption has been scarcely reported. Moreover, combined periprosthetic joint infection with patellar tendon disruption is even rare. This is a case report on successful treatment of a recurred periprosthetic joint infection accompanying the patellar tendon disruption after revision of TKA.

Case Description: A 63-year-old woman presented with pain and exudate in the right knee. she had a history of two-stage revision TKA at another hospital for periprosthetic joint infection of right knee. With repeated incision and debridement, Achromobacter xylosoxidan was identified in samples collected from deep tissue. Therefore, two-stage revision TKA was performed. Intra-operatively, a complete defect of the patellar tendon was observed. Re-revision TKA was performed as a routine of two-stage revision of TKA for periprosthetic joint infection. Reconstruction of the patellar tendon defect was performed using an Achilles tendon-bone block allograft. Stability of allograft was confirmed at 30 degrees of flexion, and excellent implant placement was confirmed by postoperative radiographs. At the final follow-up 3 years after surgery, evidence of infectious sign was absent, and the range of flexion up to 120 degrees was recovered without extension lag. Normal locomotive gait was restored, and recreational activities previously performed were possible without discomfort.

Conclusions: Proper reconstruction of extensor mechanism was achieved by patellar wrapping technique using an Achilles tendon-bone block allograft.

Keywords: Knee arthroplasty; periprosthetic joint infection; patellar tendon disruption; case report

Submitted Sep 29, 2022. Accepted for publication Feb 19, 2023. Published online Mar 30, 2023.
doi: 10.21037/atm-22-4833
View this article at: https://dx.doi.org/10.21037/atm-22-4833

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Introduction

Total knee arthroplasty (TKA) may result in a variety of complications such as deep vein thrombosis, infection, instability, stiffness, extensor mechanism disruption, dislocation, osteolysis and loosening (1). The extensor mechanism disruption can occur in a variety of locations, including the quadriceps tendon, patella, and patellar tendon (2). Among them, the incidence of patellar tendon disruption after TKA is known to be 0.17% (3). Patellar tendon disruption result in difficulty in active knee extension and thereby severely impairing joint function (2). Several methods have been introduced for treatment of patellar tendon disruption after TKA. Despite variety of procedures, the optimal treatment method has yet not been established. Particularly, in case of concomitant periprosthetic joint infection, proper management is not simple as it includes many considerations, such as recurrent infections and graft failure. We report a case of successful infection control and functional recovery using the patellar wrapping technique with an Achilles tendon-bone block allograft in the case of a patellar tendon disruption owing to repeated periprosthetic joint infection. We present the following article in accordance with the CARE reporting checklist (available at https://atm.amegroups.com/article/view/10.21037/atm-22-4833/rc).

Case presentation

A 63-year-old woman presented with end-staged osteoarthritis of bilateral knees. A bilateral TKA was performed at another hospital. Subsequently, a periprosthetic joint infection was identified in her right knee at 1 year 3 months after index arthroplasty. Thus, two-stage revision TKA was performed. One year after revision surgery, patient complained of pain in the right knee. Exudate from the surgical site was again observed. The patient was in good health and had no family history of the disease. With repeated incision and debridement, surgical site wound kept getting worse and better. *Achromobacter xylosoxidan* was identified in samples collected from deep tissue. Second-generation cephalosporin was prescribed at the time; however, exudation continued. Exudate was found in a very small amount at the distal site of the previous incision (*Figure 1*). On physical examination, 10 degrees of extension lag was identified. The laboratory values were within the normal range: leukocytes, 5,890 (seg 51.5%); C-reactive protein (CRP), 0.8 (0–5) mg/L; erythrocyte sedimentation rate (ESR), 15 (0–20) mm/h; interleukin-6, 4.5 (0.0–7.0) pg/mL; procalcitonin <0.01, (0–0.05) ng/mL. After multidisciplinary consultations with the department of infectious diseases, a two-week break of antibiotics was suggested, and a subsequent re-evaluation was planned. At the revisit after 2 weeks, laboratory values had worsened: leukocyte, 9,050; CRP, 13.7 mg/L; and ESR, 25 mm/h. The patient complained that joint exudate was almost non-existent at rest but increased during activity. Therefore, oral antibiotics were repeated. Despite improvement in blood levels of leukocytes, CRP, and ESR, surgical site infection was not completely controlled with persistent wound drainage. Therefore, two-stage revision TKA was performed under diagnosis of recurrent periprosthetic joint infection. Intraoperatively, a complete defect of the patellar tendon was observed (*Figure 2*). Infectious tissue was meticulously removed and collected for culture examination from various sites. In the frozen biopsy performed in the operating room, >5 neutrophils/high power fields (HPF) were confirmed, and all the previously inserted revision components were removed. Prosthesis with antibiotic-loaded acrylic cement (PROSTALAC) was molded and inserted (*Figure 3*). However, discharge continued at the distal incision site. It was determined that the tissues around the patellar tendon and the tibial attachment of patellar tendon were the source of infection (*Figure 4*). Second-stage re-revision surgery was performed 6 weeks after surgery. After removal of PROSTALAC, on frozen biopsy, <5 and 5 neutrophils/HPF were found in the patella and intramedullary cavity of the tibia, and in the intramedullary cavity of the femur, respectively. Re-revision TKA was performed as a routine of

Highlight box

Key findings

- Proper reconstruction of extensor mechanism was achieved by patellar wrapping technique using an Achilles tendon-bone block allograft in recurrent periprosthetic joint infection accompanying patellar tendon disruption after revision TKAs.

What is known and what is new?

- Bone-patellar tendon-bone grafts, Achilles tendon allografts, and synthetic materials.
- Patellar wrapping technique using an Achilles tendon-bone block allograft.

What is the implication, and what should change now?

- Patellar wrapping technique is one of the techniques to consider in recurrent periprosthetic joint infection accompanying patellar tendon disruption after revision TKAs.

Figure 1 Scanty discharge was observed in a pin-point wound in the distal area of the operative scar during the visit to our hospital.

two-stage revision of TKA for periprosthetic joint infection, and a new Vanguard 360 revision knee system (Zimmer-Biomet, Warsaw, IN, USA) was inserted. Reconstruction of the patellar tendon defect was performed using an Achilles tendon-bone block allograft (*Figures 5*,*6*). The calcaneal bone block of the allograft was cut to fit the size of the tibial tubercle, the attachment part of the patellar tendon, and then reinforced using cortical screw fixation and suture anchor. After that, the proximal part of allograft was divided into two parts, the patella was wrapped with the divided allograft, and the allograft was extended to the quadriceps muscle in 30 degrees' flexion and sutured. Stability of allograft was confirmed at 30 degrees of flexion, and excellent implant placement was confirmed by postoperative radiographs (*Figure 7*).

For 6 weeks post-surgery, an immobilizer was applied to maintain full extension. Touchdown weight-bearing was initiated with isometric quadriceps muscle exercise. Straight leg raise (SLR) exercise was prohibited. Until 3 months after surgery, acceptable flexion range was increased very gradually, and protected weight bearing was taught. The laboratory findings were well controlled: leukocytes, 6,700; CRP, 2.2 mg/L; ESR, 23 mm/h. The joint range of motion was limited to 0–50, which was restored to 90 degrees 2 months thereafter. At the final follow-up 3 years after surgery, evidence of infectious sign was absent, and the range of flexion up to 120 degrees was recovered without extension lag. Normal locomotive gait was restored, and recreational activities previously performed were possible without discomfort (*Figure 8*).

All the procedures performed in this study were conducted in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Declaration of Helsinki (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

Discussion

The extensor mechanism of knee joint consists of the quadriceps muscle, patella, and patellar tendon. These are functionally mandatory structures that should not be damaged during TKA. A rupture of the extensor mechanism can occur in any sites of the quadriceps tendon, patella, and patellar tendon. Among them, patellar tendon disruption is known to be of approximately 0.17% (3). Reconstruction methods for patellar tendon disruption include augmentation using bone-patellar tendon-bone grafts, Achilles tendon allografts, and synthetic materials, such as polypropylene mesh (4).

To our knowledge, occurrence of periprosthetic joint infection together with patellar tendon disruption after TKA is very rare (5). Traditionally, arthrodesis or above knee amputation has been considered; however, the results were not good (5). In this case, two-stage revision TKA with Achilles tendon-bone block allograft was performed without salvage operation such as arthrodesis or above knee amputation. Patellar tendon reinforcement using the Achilles tendon was performed, and the results were successful. With the curettage of the tibial attachment for infection control, extensive tissue damages accompanied. In reconstruction process, the method using the bone tunnel was difficult to perform owing to the state of patellar resurfacing. Therefore, the bone block of the allograft was fixed to the tibial attachment, and the patella was wrapped using the divided tendon portion of the graft, which was extended to the quadriceps muscle at 30 degrees' flexion of knee joint and repaired. Physiologic recovery of the extensor mechanism was obtained. The characteristics of Achilles allograft were appropriate for reconstructing all

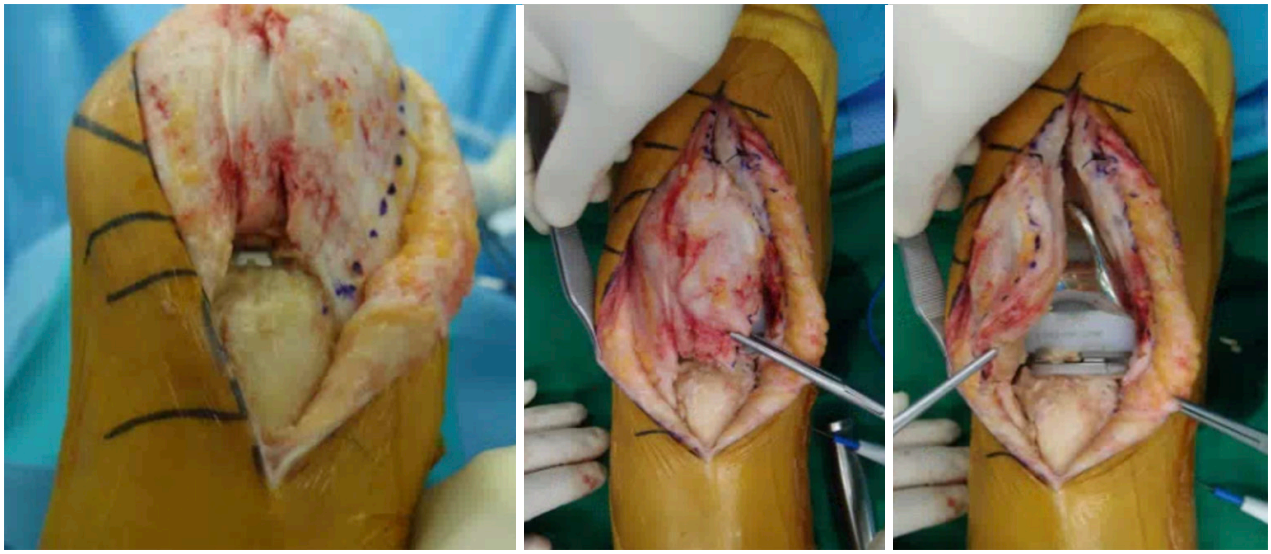

Figure 2 Complete disruption of the patellar tendon was observed after the medial para-patellar approach in the first of the second-stage revision surgery.

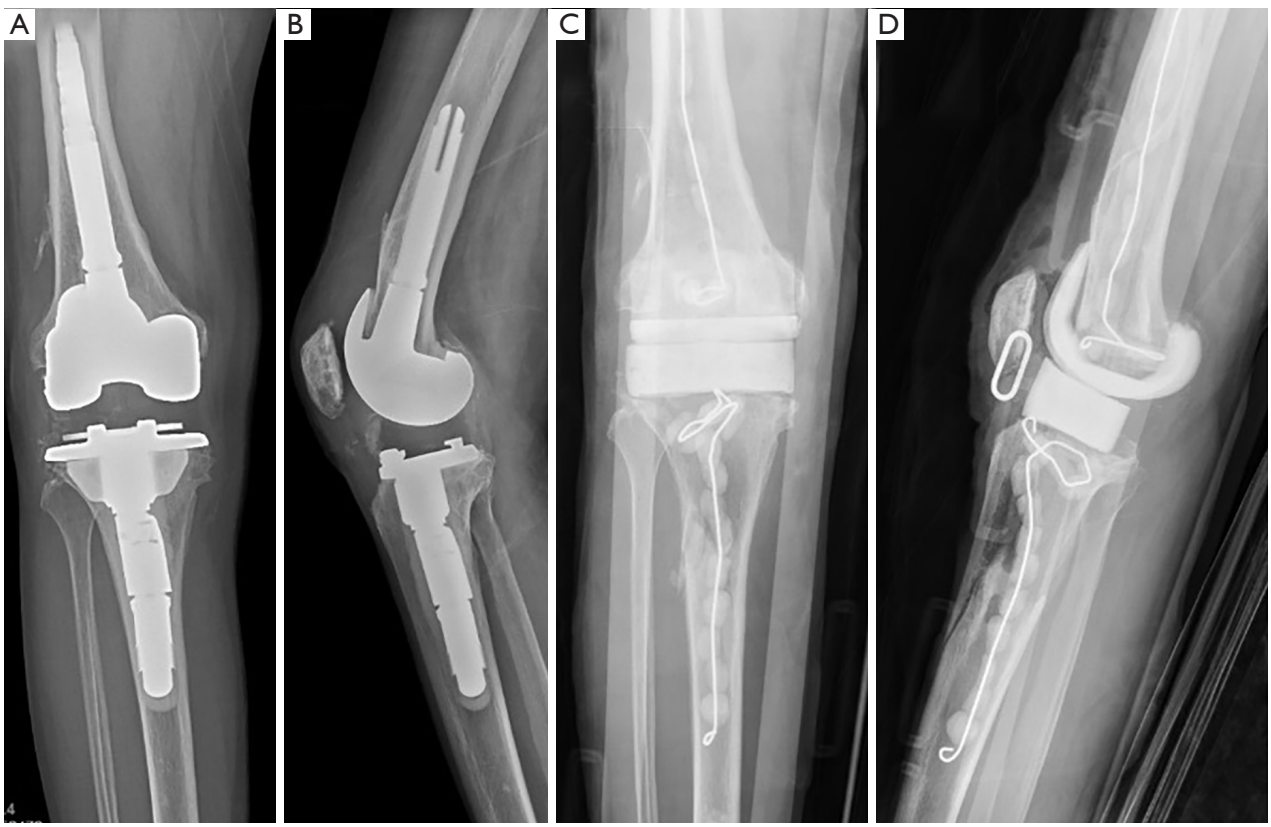

Figure 3 Radiographs before and after the first operation of second-stage revision surgery. (A,B) Preoperative knee radiographs. (C,D) Postoperative knee radiographs.

Figure 4 On postoperative 3 weeks of the first stage operation, the discharge with skin defect continued owing to the damage of the surrounding tissues of the patellar tendon in contact with the tibial bone; subsequently, debridement and sutures were performed.

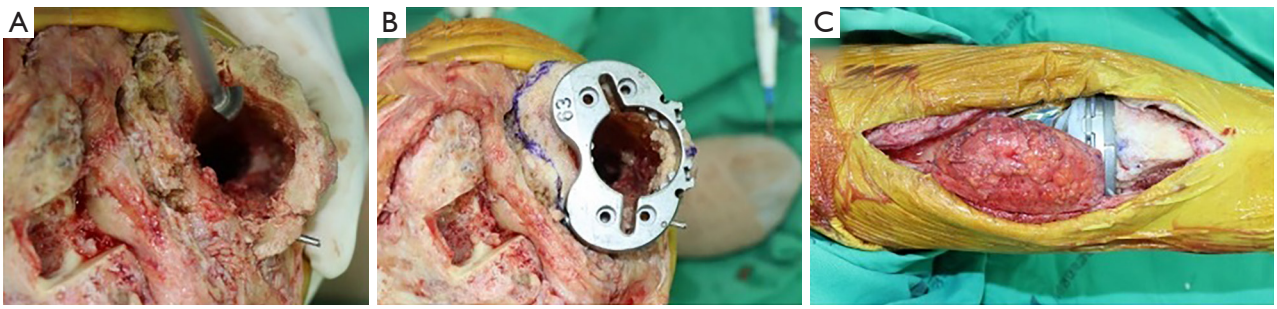

Figure 5 After preparation of the tibia in the second-stage revision surgery, malrotation of the tibia was observed in the previous operation, and the tibial implant was fixed with external rotation.

mandatory structures.

Periprosthetic joint infection is one of very serious complications that can occur after TKA; it is known to occur in 0.9% after primary TKA (6). Management of periprosthetic joint infection consists of repeated debridement and application of antibiotics for eradicating the infection. Later, one-stage revision or two-stage revision TKA may be considered. It is important to accurately evaluate the recurrence of late infection during this process. Excision arthroplasty, arthrodesis, or even amputation may be considered; however, that requires a discreet decision. In revision surgery, there is the possibility of using a long stem, bone loss during implant removal, and the risk of fractures. Achieving both infection control and recovery of mechanical properties in case of complete loss of the patellar tendon owing to repeated infection, is difficult. Moreover, the identified *Achromobacter xylosoxidans* is a genus of non-fermenting Gram-negative bacteria with low virulence and is known to cause infection in immuno-compromised status (7). It is also known that *Achromobacter* spp. is intrinsically resistant to several antibiotics including most cephalosporins (8).

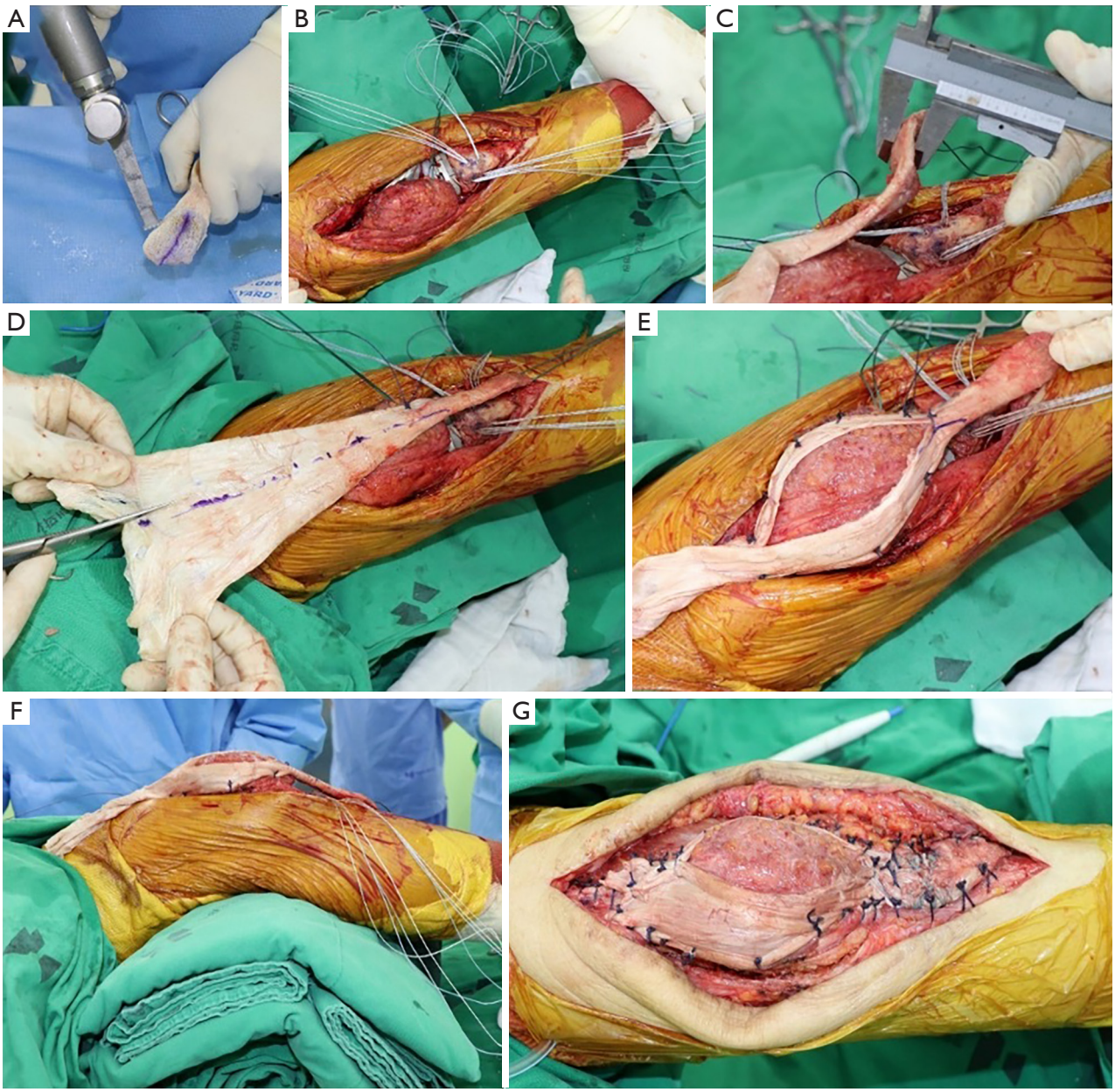

Figure 6 After implant fixation, patellar tendon reconstruction was performed using Achilles tendon with bone block. (A) Cutting fresh-frozen allograft bone. (B) Fixation of the suture-anchor to the tibial attachment of the patella tendon. (C) The tibial metaphysis is prepared with a measurement of approximately 2 cm in length and 1 cm in width and depth to receive the calcaneal bone block of the allograft. (D,E) The Achilles tendon allograft is overturned on the joint capsule and sutured to the underlying extensor mechanism after calcaneal bone block fixed in place with a cortical screw. (F,G) At 30 degrees flexion of knee joint, tighten the suture.

Conclusions

This is a case report on successful treatment of the recurrent periprosthetic joint infection accompanying patellar tendon disruption after revision TKAs. Proper reconstruction of extensor mechanism was achieved by patellar wrapping technique using an Achilles tendon-bone block allograft. It can be considered as a proper reconstruction modality for extensive tissue loss in complicated periprosthetic joint infection cases.

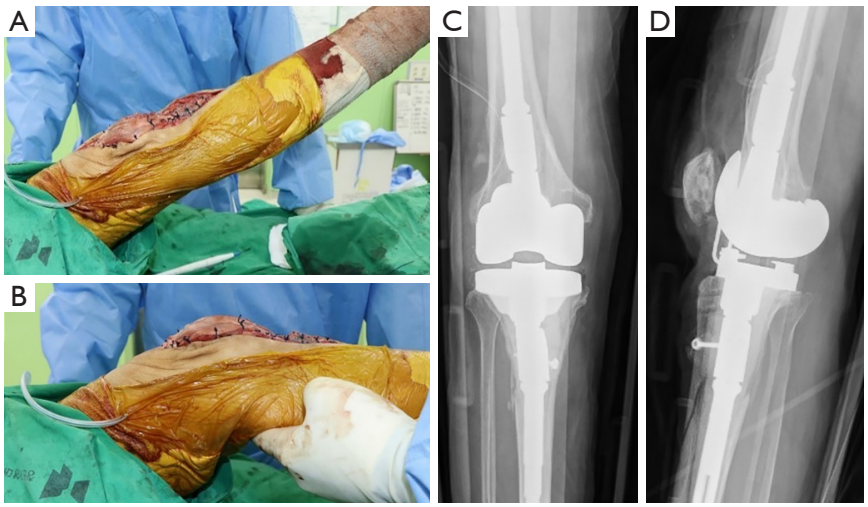

Figure 7 Postoperative range of motion and radiographs. (A,B) Postoperative range of motion (0–30 degrees). (C,D) Postoperative knee radiographs.

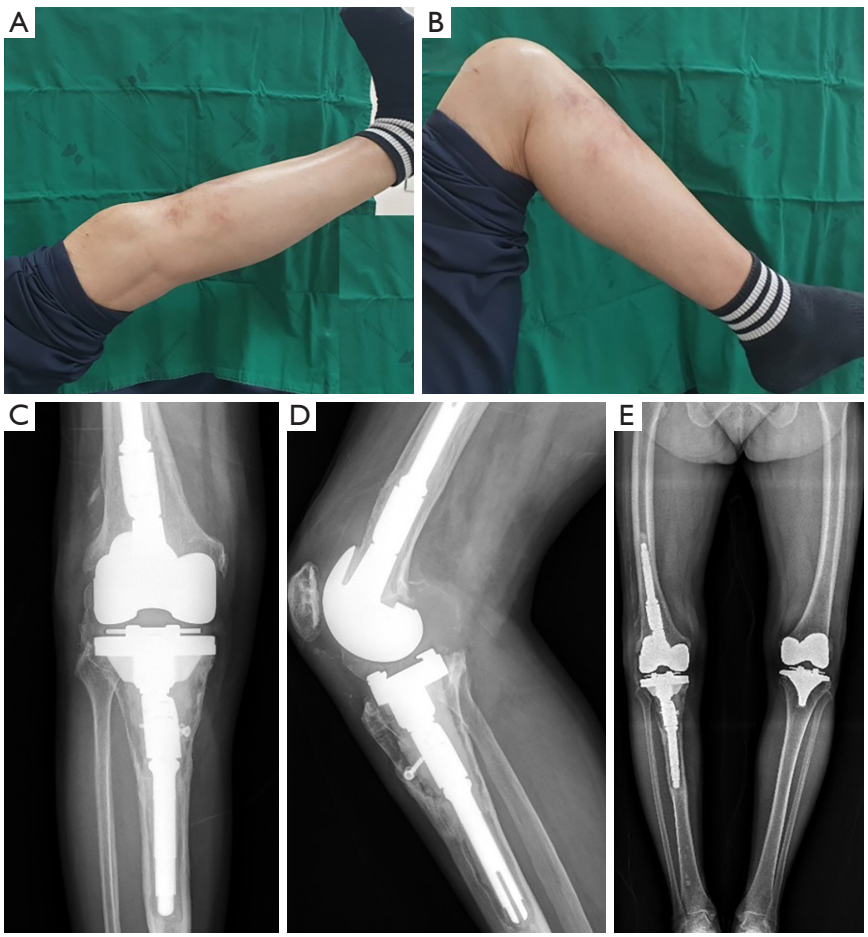

Figure 8 Last follow-up clinical photos, radiographs. (A) At active extension (no extension lag). (B) At active full flexion. (C,D) Knee radiographs. (E) Lower extremity scanogram.

Acknowledgments

Funding: None.

Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at https://atm.amegroups.com/article/view/10.21037/atm-22-4833/rc

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://atm.amegroups.com/article/view/10.21037/atm-22-4833/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work, including ensuring that any questions related to the accuracy or integrity of any part of the work have been appropriately investigated and resolved. All the procedures performed in this study were conducted in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Declaration of Helsinki (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

Cite this article as: Hwang SC, Lee DH, Kang DG. Patellar tendon reconstruction using an Achilles tendon-bone block allograft for periprosthetic joint infection accompanied by patellar tendon disruption after total knee arthroplasty: a case report. Ann Transl Med 2023;11(8):303. doi: 10.21037/atm-22-4833

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