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Revision of total knee arthroplasty with a hinge-type cemented total prosthesis and augments for the internal tibial plateau was performed following a periprosthetic fracture: Case report

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Introduction

Methodology: In this study, we present a case study of a patient who underwent a total knee replacement (TKA) and subsequently suffered a periprosthetic fracture. The surgical intervention was carried out without using a hemostatic band, and the postoperative treatment excluded the administration of non-steroidal anti-inflammatory drugs (NSAIDs) for the first 7 days. The periprosthetic fracture occurred in the left tibial plateau and was observed in a patient with a cemented knee prosthesis. To address this issue, a revision total knee arthroplasty was performed. During this procedure, the original prosthesis was replaced with a hinge-type prosthesis, and augmentations were added to support the internal tibial plateau.

Results and discussion

The patient in question is a 73-year-old woman from an urban environment who was admitted to the Orthopedics Department 1 of SCJU Bihor with pain in her left knee and relative functional impotence in her left lower limb.

From the anamnesis, we learned that the patient underwent left total knee replacement surgery approximately 2 years ago, performed in another clinic. Initially, the patient felt well postoperatively and resumed her normal physical activity. However, about 1 year after the operation, she went through a difficult time, having experienced the death of two loved ones in a very short interval: her husband and son. These events led to both mental and physical deterioration of the patient's condition. Later, the patient suffered a fall at home from the same level, resulting in a periprosthetic fracture of the internal tibial plateau in her left knee.

The patient refused to be operated on again at the center where she was initially treated and arrived at the Orthopedics 1 ward of SCJU Bihor approximately one year after the fracture. During this interval, the patient mobilized with the help of a walking frame.

On admission, she underwent a clinical examination, radiographs (figure 1), laboratory tests, and an EKG. Treatment with anti-algesics, anticoagulants, antibiotics, and infusion solutions was also instituted.

On clinical examination, the left knee was found to be swollen, with global deformity, varus deviation of the knee axis, and approximately 3 cm of shortening compared to the contralateral lower limb. Additionally, marked instability of the ligaments was observed, and the varus stress test was positive.

Gait examination revealed a difficult gait (video in Figure 1C), with support on the walking frame and a shortening of the loading time on the left lower limb.

After operative planning and adequate preparation of the patient, the surgical intervention called "Revision of total knee arthroplasty with cemented hinge-type total prosthesis and augments for the internal tibial plateau" was performed.

During the surgery, a fracture with infiltration and marked bone destruction was found at the level of the medial tibial plateau (Figure 2A). The prosthetic components were extracted, and nonviable and fibrosed periprosthetic tissues were removed (Figure 2B).

One of the major problems encountered intraoperatively was the presence of remaining cement in the femoral and tibial canal, which was successfully removed with reamers under radiological control (Figure 3).

The rapid immunochromatographic test, with a relative

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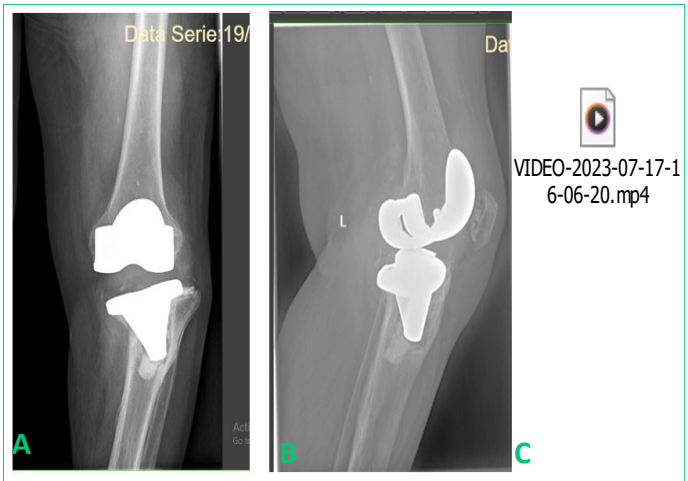

Figure 1: Presentation of lateral (A) and anteroposterior (B) radiographs at the time of admission to our ward, 1 year after trauma, with an attached video (C).

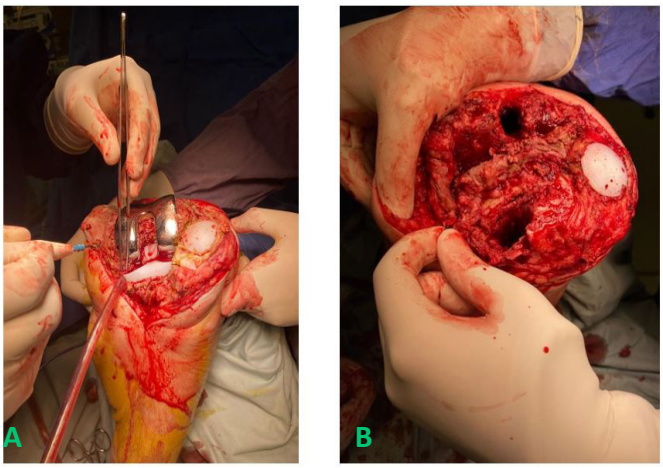

Figure 2: Intraoperative pictures before removal of the prosthetic components (A) and after removal of the prosthesis (B).

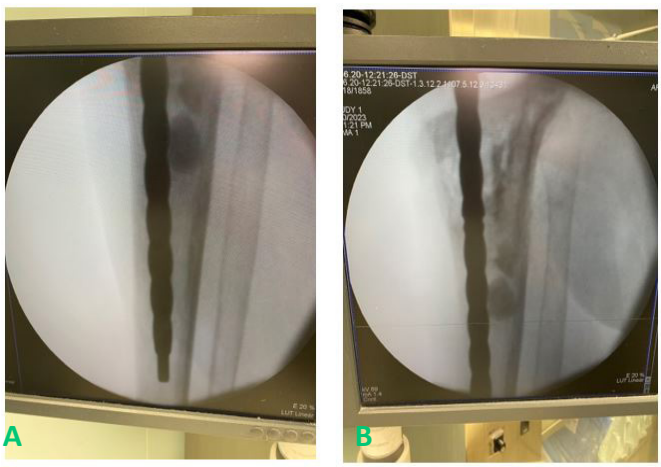

Figure 3: Reaming of the tibial medullary canal under radiological control in the first phase (A) and after successful removal of cement remaining in the femoral canal (B).

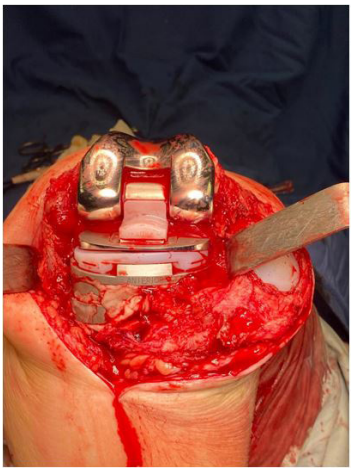

Figure 4: Intraoperative photo after mounting the new prosthesis, before wound closure. The operation was performed without the use of hemostasis tape.

sensitivity of 98% and a relative specificity of 99.6%, was initially negative, then turned positive. A new alternative test method needs to be explored and validated.

Due to the lack of bone substance at the level of the internal tibial plateau, it was necessary to utilize 2 augments to correct the bone defect and restore the normal loading axis of the knee, as depicted in Figure 4.

Paraclinical examination shows the following results: ESR = 15 mm/h, Ac HCV = negative, Uric acid = 7.10 mg/dl, GPT = 15.00 IU/L, Creatinine = 0.89 mg/dL, GGT = 22.00 U/L, Glucose = 103 mg/dL, C-reactive protein = <1 mg/L, urea = 26 mg/dL. ABO/RH group determination = A RH positive, RH/Kell phenotyping = ccEc/Kell negative RH positive, Ag HGs = negative, GOT = 24.0 U/L.

The hematological examination was performed on the day of the intervention and upon discharge of the patient. The results are presented in Table 1.

Other parameters: Fibrinogen = 345 mg/dl, PT = 12.2 sec, INR = 1.08, Prothrombin activity = 87%, APTT (sec) = 29.9 sec, APTT (%) = 0.97%.

Urine examination: Bilirubin = 0 µmol/L, Urobilinogen = normal, Ketones = normal, Glucose = 0 mmol/L, Protein = 0 g/L, Erythrocytes = 0 CELL/uL, pH = 5.0, Nitrites = negative, Leukocytes = 70 CELL/uL, Density = 1.017, Microalbumin = 10 mg/L, Creatinine = 8.8 mmol/L, Calcium = 2.5 mmol/L, Hematocytes = very rare, Leukocytes = very rare, Flat epithelial cells = negative, Hyaline cylinders = negative, Microbial flora = relatively frequent, leukocyte clusters = negative, Calcium oxalate = negative, Uric acid crystals = negative, Other crystals = negative, Yeasts = negative, erythrocyte clusters = negative, Squamous cells = negative, amorphous salts = negative.

Compatibility: Saline compatibility negative autoantibody, Enzymatic = CM ENZ Comp, AGH = CM AGM Comp.

Postoperatively, following skin repair and application of aseptic dressings, the drain tube is removed, physical therapy is initiated, and the established treatment is continued. 24 hours after surgery, the patient mobilizes and has a favorable evolution, which can also be seen from Figure 5, after the postoperative radiological examination. The patient is discharged after 4 days.

Recommendations at discharge: continuation of

Table 1: The hematological examination on the day of the intervention and upon discharge of the patient.

On the day of the intervention	Upon discharge
WBC=9,41 10*3/µL	WBC=9,20 10*3/µL
NEU=4,75 10*3/µL	NEU=6,48 10*3/µL
LYM=3,13 10*3/µL	LYM=1,65 10*3/µL
MONO=0,862 10*3/µL	MONO=0,86 10*3/µL
EOS=0,536 10*3/µL	EOS=0,109 10*3/µL
BASO=0,127 10*3/µL	BASO=0,044 10*3/µL
IG=0,001 10*3/µL	IG=0,056 10*3/µL
RBC=4,06 10*6/µL	RBC=2,73 10*6/µL
HGB=12,3 g/dL	HGB=8,11 g/dL
HCT=36,0%	HCT=23,8 %
MCV=88,8 fL	MCV=87,4 fL
MCH=30,4 pg	MCH=29,8 pg
MCHC=34,2 g/dL	MCHC=34,1 g/dL
RDW=13,9%	RDW=13,8 %
PLT=189 10*3/µL	PLT=149 10*3/µL
MPV=11,3 fL	MPV=11,5 fL

Figure 3: Reaming of the tibial medullary canal under radiological control in the first phase (A) and after successful removal of cement remaining in the femoral canal (B).

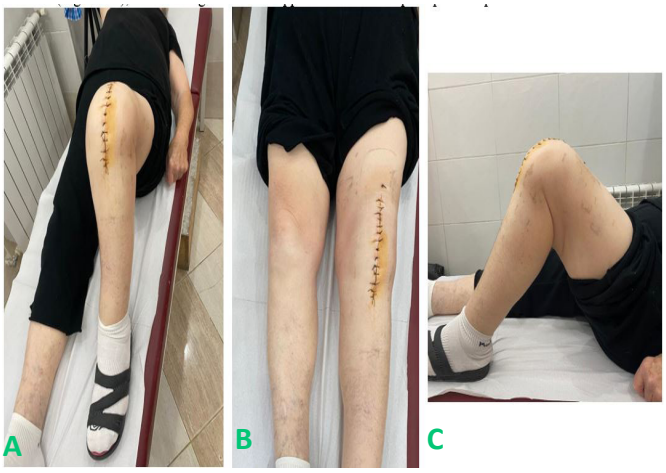

Figure 3: Reaming of the tibial medullary canal under radiological control in the first phase (A) and after successful removal of cement remaining in the femoral canal (B).

anticoagulant treatment (enoxaparin sodium 0.6 ml) for 20 days, alendronic acid with cholecalciferol for 6 months, and administration of aceclofenac 100 mg and omeprazole 20 mg for 10 days, starting 7 days after the postoperative intervention.

14 days after the intervention, the patient returns for a follow-up visit to have the sutures removed. He continues to show favorable progress with a spectacular recovery, achieving 90 degrees of flexion (Figure 6A and 6C), full extension (Figure 6B), and walking with cane support with minimal postoperative pain.

Discussions

The required knee range of motion (ROM) for daily activities has been determined through biomechanical and gait analysis studies. A 2005 study emphasized the importance of range, showing that 67° of flexion is required during the balance phase of walking, 83° for climbing stairs, 100° for descending, 93° for rising from a chair, and between 71° and 117° for grasping an object from the floor [1]. Considering that preoperative flexion is crucial in achieving healthy postoperative flexion [2], in our case study, we encountered limited knee mobility. The inability to maintain adequate knee extension can have a significant negative impact on gait and functional abilities [3]. Flexion contracture causes an increase in energy expenditure and imposes excessive pressure on the quadriceps [4,5]. Post knee joint replacement, intraoperative surgical strategies and intensive rehabilitation methods are utilized to correct the flexion contracture [6,8].

Seyler pointed out that some aggressive postoperative rehabilitation methods may have limitations, and some knee arthroplasty patients may not respond well and continue to experience muscle spasms. In this context, botulinum toxin type A has been used as a temporary neuromuscular transmitter blocker to treat muscle spasms in patients with neurological disorders and as a treatment method for clubfoot [9].

Ceasing non-steroidal anti-inflammatory drugs in the first 7 postoperative days is associated with favoring the healing process [10,11], but other reasons appear in the literature, such as sensitivity to NSAIDs [12,14], or other complications [15,16]. Other studies compared the effect of the combination of Tramadol hydrochloride/acetaminophen with NSAIDs and found that this combination was superior to NSAIDs [17]. In our case, during the first 7 days, the patients received only antialgesic treatment (paracetamol or tramadol, or their combination).

Mizner et al [18] and Yoshida et al [19] suggested that quadriceps femoris strength is one of the strongest predictors of long-term function in patients undergoing total knee replacement (TKA), including stair climbing and chairlift abilities. Similar results were reported by Dennis et al [20], who concluded that patients who underwent TKA and used a tourniquet showed a decrease in quadriceps strength during the first 3 months after surgery. Thus, the use of a tourniquet may adversely affect the early improvement of muscle strength and lower limb function in knee replacement patients.

Surgery with a tourniquet was significantly associated with a higher risk of deep vein thrombosis and infection compared with surgery without a tourniquet. However, no significant association was found between tourniquet surgery and the risk of pulmonary embolism or reoperation compared with non-

tourniquet surgery.

Conclusions

Revision of total knee arthroplasty with a hinge-type cemented total prosthesis and augments for the internal tibial plateau resulted in a favorable evolution of knee osteoarthritis, evidenced by reduced local pain and swelling, 90° flexion, and improved mobility. A spectacular recovery was noted, with the patient achieving 90 degrees of flexion, full extension, and walking with cane support, experiencing minimal post-operative pain.

Data availability: The data presented in this study are available within the article. Other data that support the findings of this study are available upon request from the corresponding authors.

Conflicts of interest: The authors declares that there is no conflict of interest regarding the publication of this paper.

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