BILATERAL TOTAL KNEE ARTHROPLASTY FOR COMPLEX METAL INCOMPATIBILITY

Introduction

Excessive immune response of the body to metal implants is associated with persistent discomfort symptoms and reduced mobility. Patients with a diagnosed environmental or drug allergy, including metal hypersensitivity, have significantly poorer functional outcomes and more pain after treatment with a conventional metal implant than patients without allergies and metal hypersensitivity.[1]

Medical history

A 62-year-old female patient presented on September 23rd, 2021 to my orthopaedic consultation with chronic pain in her right knee. In the clinical examination, the soft tissue mantle was completely free of irritation. However, there was pressure pain at the medial joint space, with a slightly varus leg axis. In comparison with the opposite side, the drawer test revealed that the tibia could be clearly displaced ventrally („anterior drawer phenomenon"). The Lachman test was positive as well as the collateral ligaments were clinically firm. Peripheral blood flow, motor function and sensitivity were normal. Radiologic examination was performed to confirm the diagnosis (Fig. 1). Medial gonarthrosis with insufficiency of the anterior cruciate ligament was found. The joint space was still well preserved laterally and retropatellarly. The magnetic resonance imaging (MRI) scan of the right knee joint showed medially accentuated grade 4 osteoarthritis of the knee, grade 2 to 3 chondropathy in the lateral and retropatellar region and a clear insufficiency of the anterior cruciate ligament.

In addition, the patient had a documented complex metal intolerance. The clincial decision was made to use the BPK-S Integration Ceramic primary knee system (PETER BREHM GmbH, Fig. 2) in order to avoid metal-related peri-implant reactions. The clinically proven metal-free knee system consists of biologically inactive (inert) all-ceramic material, which is characterised by high immunological compatibility.

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Fig. 1 Preoperative imaging on the right, (a) MRI image

Treatment

On March 14th, 2022, the all-ceramic BPK-S Integration Ceramic knee system (femur and tibia size 5, insert 7 mm, PETER BREHM GmbH) was implanted in accordance with the preoperative planning. The surgical procedure was without complications and the intraoperative radiological control confirmed the correct implant position (Fig. 3). The postoperative course was unremarkable, the wound was non-irritating and the control of the peripheral blood flow, motor function and sensitivity revealed no abnormalities. Weight-bearing mobilisation of the right knee was carried out using crutches under physiotherapeutic guidance. Mobility was trained daily. The clinical follow-up examination revealed an extension/flexion of 0-0-90°. Postoperative radiological examinations documented the correct positioning of the metal-free BPK-S Integration Ceramic knee system (Fig. 4).

After successful rehabilitation, the patient presented at our clinic again. She complained of pain on exertion and movement in the left knee joint, which significantly reduced her quality of life. The clinical examination revealed a slight intra-articular effusion and diffuse pressure pain in the medio-lateral region. The range of motion was 0-0-110° in extension/flexion. Ligament tracking was stable. Radiological and MRI diagnostics of the left knee joint revealed pangonarthrosis in all joint segments, a complex lesion of the medial and lateral meniscus and grade 3 to 4 cartilage damage in the femorotibial, medial and lateral regions (Figs. 5, 6). Due to the constellation of findings, the left knee joint was also treated with the metal-free BPK-S Integration Ceramic knee system (femur and tibia size 5, insert 7 mm, PETER BREHM GmbH) on June 5th, 2024. The surgical procedure and further course were without any complications. The intraoperative radiological control (Fig. 7) and postoperative imaging (Fig. 8) confirmed the correct implant position. Postoperative mobilisation was performed on forearm crutches with accompanying physiotherapeutic guidance. The patient was discharged to rehabilitation on the 6th postoperative day.

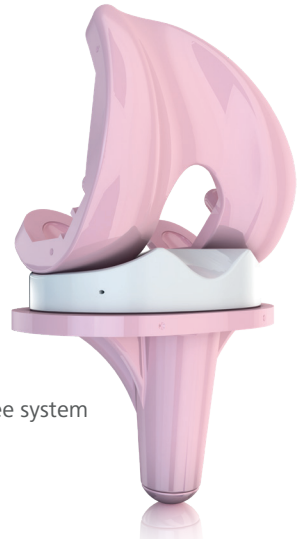

Fig. 2 Metal-free primary knee system BPK-S Integration Ceramic

Fig. 1 Preoperative radiograph on the right, (b) a.p. projection

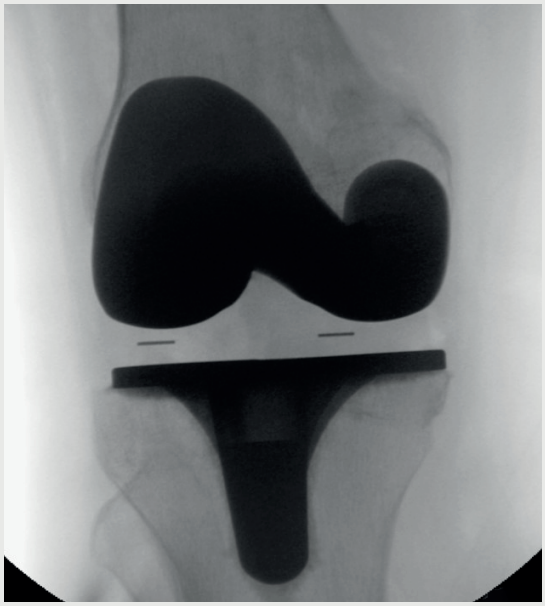

Fig. 3 Intraoperative radiological image on the right in frontal view, control of the correct implant position

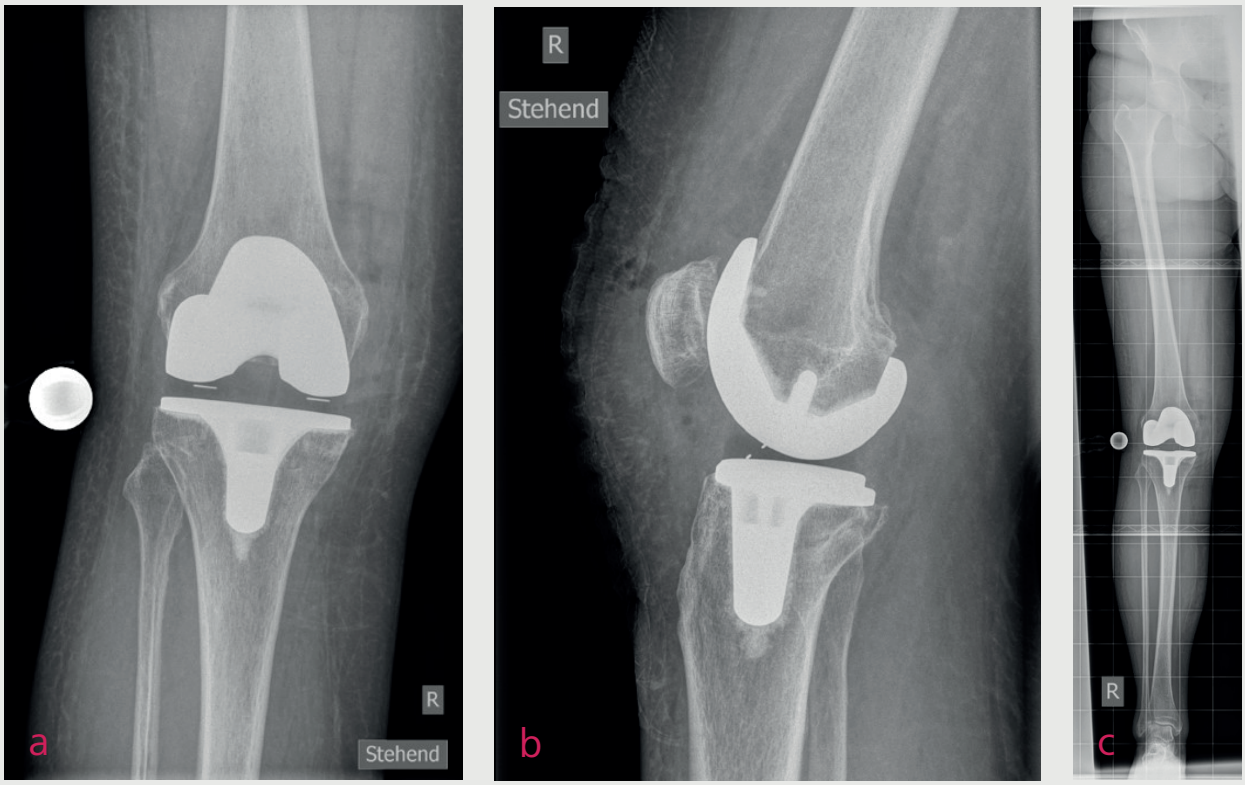

Fig. 4 Postoperative radiographs on the right (a) in a.p. projection, (b) in m.l. projection and (c) whole-leg radiograph in a.p. projection, control of the knee axis and implant position

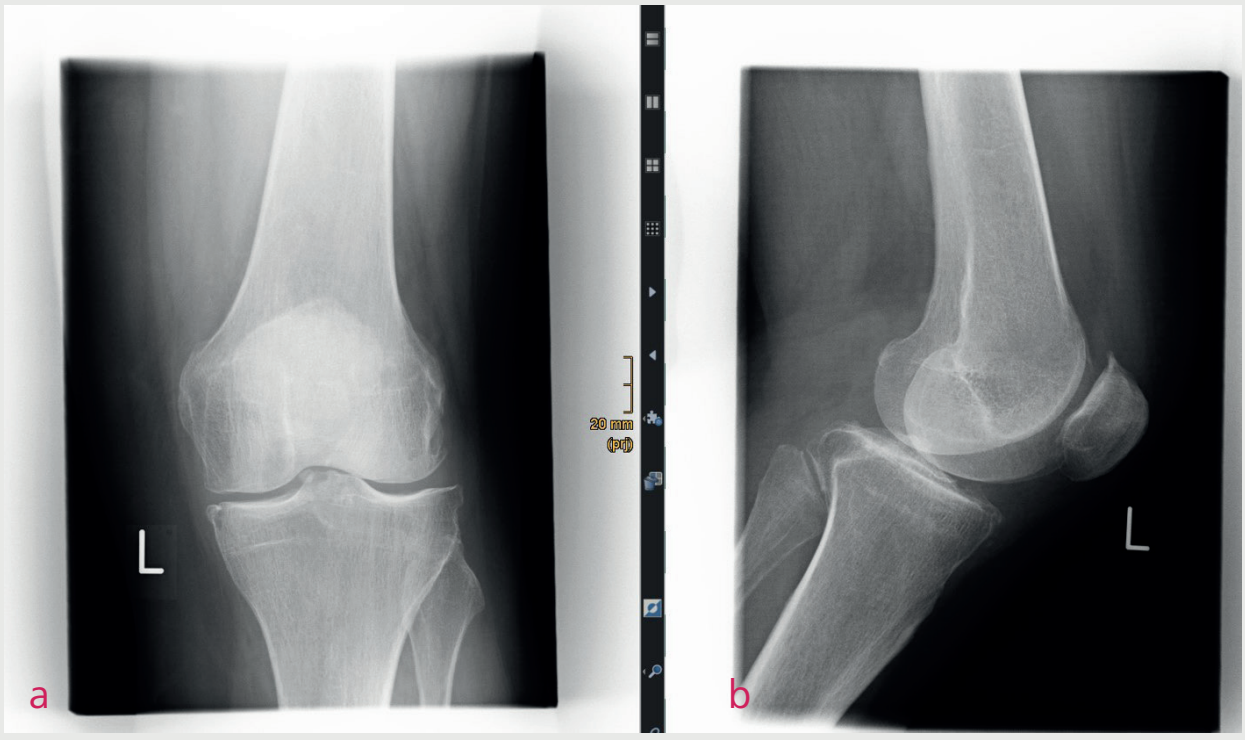

Fig. 5 Preoperative imaging on the left, a.p. projection (a) and (b) m.l. projection

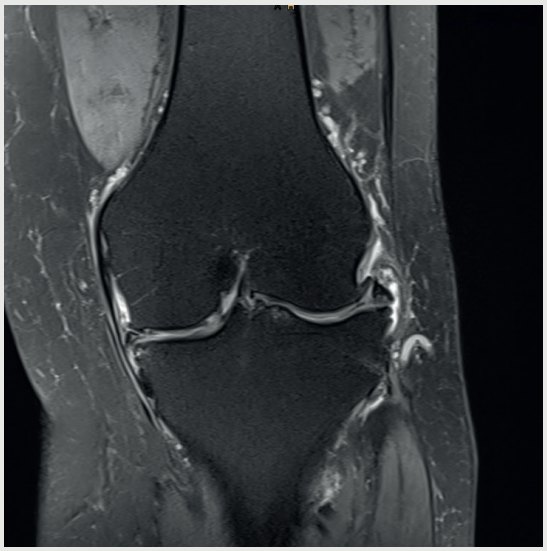

Fig. 6 Preoperative MRI imaging left

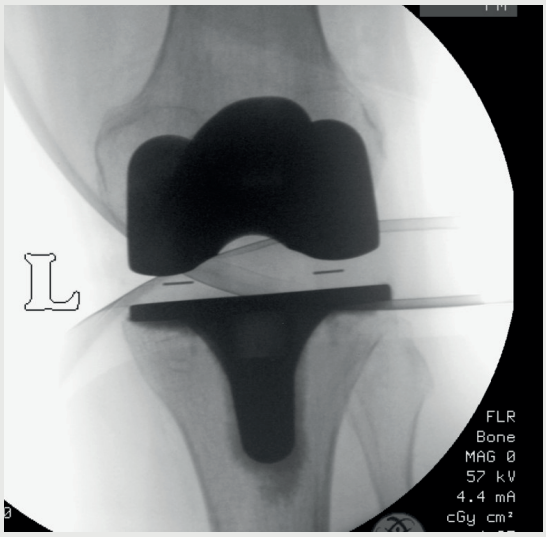

Fig. 7 Intraoperative radiological control image in frontal view, control of the correct implant position

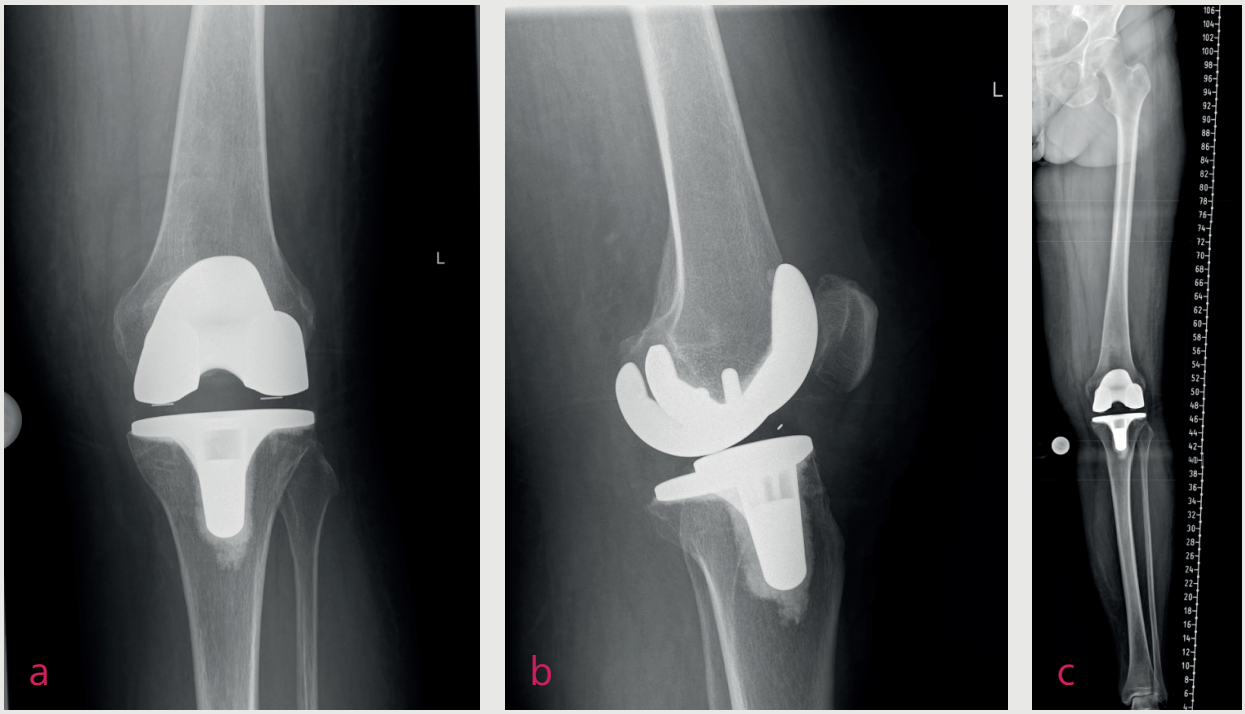

Fig. 8 Postoperative radiological control on the left (a) in a.p. projection, (b) in m.l. projection and (c) whole-leg radiograph in a.p. projection, control of the knee axis and implant position

Result

The clinical-radiological follow-up examinations showed correct positioning of the total knee arthroplasty implants without signs of loosening or implant-related complications. The bilateral knee replacement with the all-ceramic BPK-S Integration Ceramic knee system proved to be a successful, reliable treatment and led to a good functional result. The patient is very satisfied with the treatment result.

References

[1] Soler F, Murcia A, Benlloch M, Mariscal G. The impact of allergies on patient-reported outcomes after total hip and knee arthroplasty: a systematic review and meta-analysis. Arch Orthop Trauma Surg. 2024 Jul 15. doi: 10.1007/s00402-024-05433-z.

Image sources

Fig. 1 and 3 to 8 Elisabeth-Krankenhaus Thuine
Fig. 2 PETER BREHM GmbH