

# MULTIGEN<sup>+</sup>

THE TOTAL KNEE SYSTEM

CLINICAL CASES



# Foreword

Total Knee Arthroplasty (TKA) is widely performed, and successful clinical outcomes have been achieved for patients with knee joint pathologies which are generally known to cause pain, limitation in ROM and consequently problems in day-to-day activities.

The aim of TKA is primarily to relieve pain, but the post-operative range of movement and patients' satisfaction are the most important outcomes. Although many factors can influence them, one of the most important predictors is the preoperative joint condition, especially in difficult revision clinical cases.

**MULTIGEN<sup>+</sup> Total Knee System** provides surgeons with one complete system for all patient demands and a solution to all clinical cases, moving from primary to revision, fixed to mobile, cementless to cemented, or dealing with complex revisions. The different options can be chosen intra-operatively without changing the surgical technique.

All components are designed to offer high conformity between the articulating surfaces in order to provide excellent function, low wear and long clinical success. Until now more than 30,000 implants have been performed with more than 10 years of follow-up.

Furthermore, the **MULTIGEN<sup>+</sup> Total Knee System** also includes the unique BioloX<sup>®</sup> delta Ceramic Knee, that ensures low wear when combined with EtO sterilized UHMWPE. The ceramic smooth surface and its wettability reduce the wear phenomenon, allowing successful long term outcomes in the young and high-demanding active patients.

Among the most demanding patients are the metal-sensitive ones. Today, hypersensitivity to metals affects between 10 and 15% of the general population and this number is constantly growing. BioloX<sup>®</sup> delta Ceramic Knee is the opportunity for these patients to receive a successful knee replacement.

The following nine interesting clinical cases illustrate the wide range of indications and preoperative situations that can be solved with this versatile system.

# 1 A PROVEN METAL-ALLERGIC PATIENT



PREOPERATIVE

## PREOPERATIVE

74-year-old active lifestyle female (170 cm, 60 kg, 21 BMI) with a severe case of proven allergy to all metal ions showed a varus painful medial osteoarthritis to the right knee not solved with a previous arthroscopy. The patient suffered from severe persistent pain and limited ROM that impaired her daily activities.

## TREATMENT

The only treatment option was a primary TKA with complete metal-free anallergic components. It was performed through medial access under spinal anaesthesia and single shot prophylaxis using a ceramic Biolox® delta femoral component (#3) and a CR all-poly (#3, 10-mm height). Intraoperatively, the stability and ligament balancing were good.

Courtesy of R. Giacomi, MD, M. Manili, MD, P. Colletti, MD, from Ospedale San Carlo di Nancy, Roma (Italy).

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THE TOTAL KNEE SYSTEM

CERAMIC FEMORAL COMPONENT  
+ ALL-POLY TIBIAL PLATE

## POSTOPERATIVE

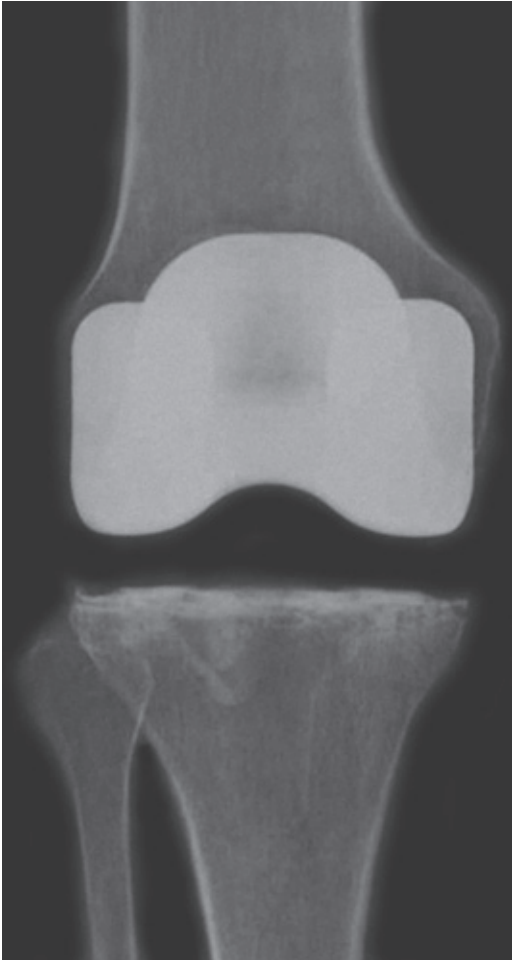
At discharge, x-rays showed an adequate alignment and a congruent implant.

## 3-MONTH FOLLOW-UP

The patient regained good pain relief with only a residual, slight, weight-bearing pain after walking for long distances. ROM was satisfactory with more than 100° flexion and no extension lag. X-rays showed a stable implant without radiolucent lines or signs of loosening.

## 12-MONTH FOLLOW-UP

Clinical outcomes of the 6-month follow-up were confirmed with adequate pain relief and a good functional recovery that allowed the patient to return to her normal daily activities. The initial optimal stability has been consolidated and no signs of radiolucent lines have been observed. No complications occurred. Considering the preoperative condition, the patient is very satisfied with her knee.



3 MONTHS



12 MONTHS

## 2 A NICKEL-SENSITIVE PATIENT



PREOPERATIVE

### PREOPERATIVE

48-year-old female (155 cm, 64 kg, 27 BMI) with an active lifestyle and proven allergy to nickel and chrome had a symptomatic osteoarthritis on the right side (previous osteotomy of tuberositas tibiae) and 2° varus deformity. She suffered from severe pain when walking or at rest, serious limitation of activities and poor ROM.

### TREATMENT

Primary TKA through parapatellar approach (under CSE anaesthesia, single-shot cefuroxime prophylaxis) with implantation of ceramic Biolox® delta femoral component (#2), Ti6Al4V fixed tibial plate (#2) and 10-mm UHMWPE liner. Bone quality was good and no intraoperative complications occurred.

### POSTOPERATIVE

X-rays showed a correct implant alignment and good stability.

### 24-MONTH FOLLOW-UP

X-rays showed implant with good stability and no radiolucent lines both in the femoral and tibial components. The patient had a good functional recovery with flexion up to 120°, no flexion contracture nor extension lag and no residual pain.

Courtesy of W. Mittelmeier, MD, B. Bergschmidt, MD from Orthopädische Klinik und Poliklinik der Universität Rostock (Germany).

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THE TOTAL KNEE SYSTEM

CERAMIC FEMORAL COMPONENT  
+ Ti6Al4V FIXED TIBIAL PLATE



POSTOPERATIVE

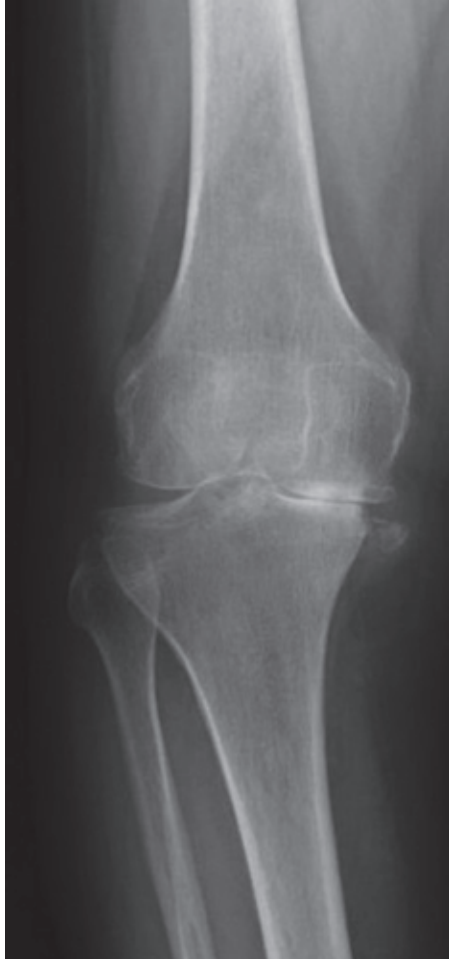


24 MONTHS



24 MONTHS

## 3 A BILATERAL CERAMIC KNEE



RIGHT - PREOPERATIVE

### PREOPERATIVE

59-year-old female, housewife with normal, age-related daily activities (165 cm, 75 kg, 27 BMI), showed severe bilateral primary osteoarthritis. The decision was to operate the more painful, right knee first, even if with a minor deformity ( $8^\circ$ ) in comparison to the left one ( $13^\circ$ ), due to a marked wear of the medial femoral condyle and femuro-tibial subluxation.

### TREATMENT

Both knee joints have been operated on within 1 and a half years (right knee in 3/2007, left knee in 08/2008) with the same median parapatellar approach, under spinal anaesthesia and single-shot prophylaxis (cefazolin-tobramycin). Intraoperatively, it was confirmed a bilateral moderate bone stock quality with the presence of a necrotic part of the left femur condyle, as shown in the preoperative x-rays. A primary cemented TKA was performed bilaterally with a CR ceramic Biolox<sup>®</sup> delta femoral component (# 2) and a fixed Ti6Al4V tibial plate (#size 2). A 10-mm and a 12-mm UHMWPE liner were inserted in the right and left knees, respectively.

### POSTOPERATIVE

The postoperative x-rays showed a bilateral correct alignment of the prosthetic implants with a good restoration of physiological and biomechanical parameters.

### 24-MONTH / 36-MONTH FOLLOW-UP

The right knee implant has 3 year follow-up and the left one has 2 year follow-up. Both knee joints showed very satisfactory clinical outcomes with no pain, very good walking performance and ROM with  $110^\circ$  flexion of the right knee, and  $120^\circ$  flexion of the left knee without any extension lag.

After 3 years, the patient is very satisfied with the possibility of improving her quality of life.

Courtesy of D. Tigani, MD, N. Rani, MD, from Istituti Ortopedici Rizzoli, Bologna (Italy).

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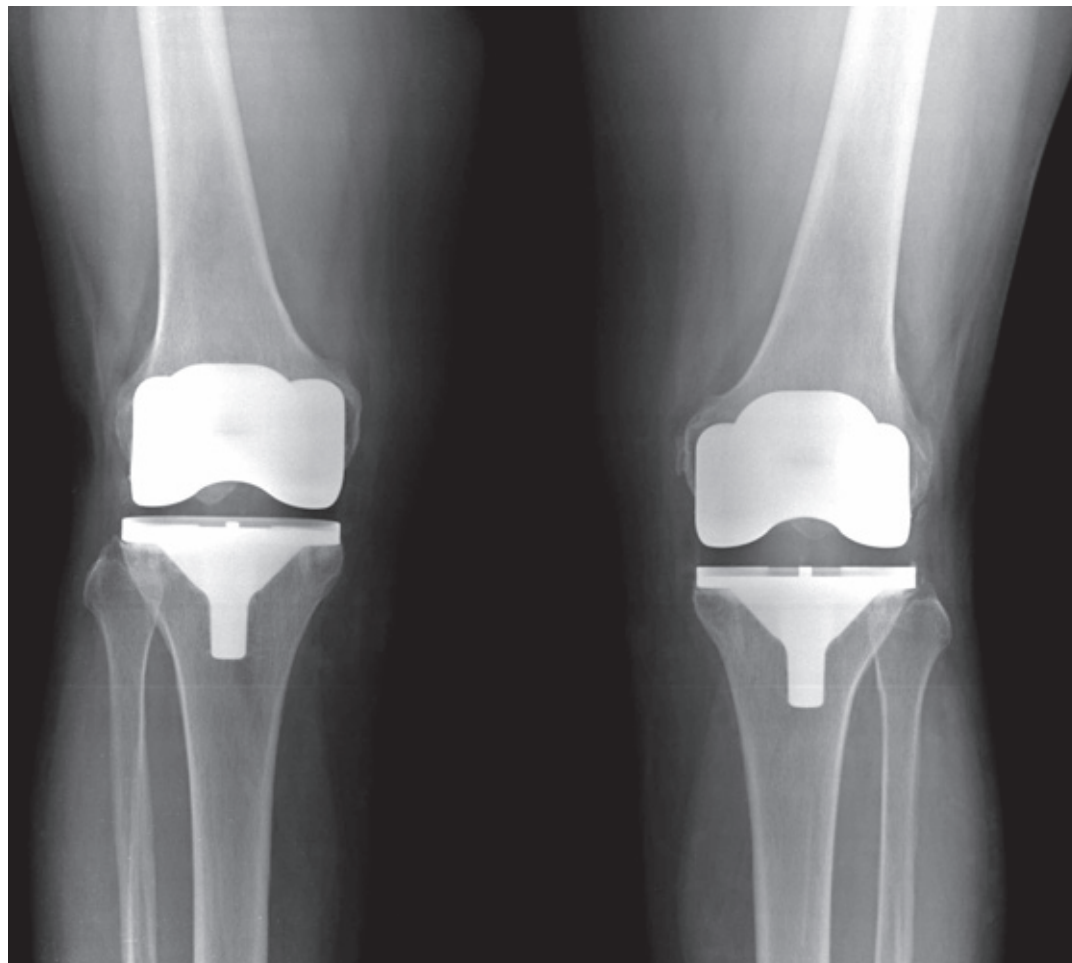
THE TOTAL KNEE SYSTEM

CERAMIC FEMORAL COMPONENT  
+ Ti6Al4V FIXED TIBIAL PLATE



RIGHT - 18 MONTHS

LEFT - PREOPERATIVE



RIGHT - 36 MONTHS

LEFT - 24 MONTHS

## 4 A REVISION OF A CERAMIC MONOCONDYLAR KNEE PROSTHESIS WITH A CERAMIC BIOLOX® DELTA TKA



PREOPERATIVE

### PREOPERATIVE

68-year-old female (160 cm, 58 kg, 23 BMI) with normal age-related activity underwent a ceramic unicompartmental arthroplasty 3 years ago, as a consequence of right medial chondromalacia. 2 years later, the patient suffered from severe persistent pain, reduced ROM and very poor KSS score (functional: 25 points, clinical: 20 points).

The indication for revision surgery was taken because of aseptic loosening of the ceramic monocondylar prosthesis.

### TREATMENT

Revision surgery has been performed through a muscle-sparing subvastus approach to use the previous incision. The failed unicompartmental prosthesis has been replaced with a TKA with a cemented BioloX® delta femoral component (#2), a cemented mobile tibial plate and a 10-mm UHMWPE liner.

Good intraoperative balancing was achieved.

Courtesy of V. Miceli, MD, Presidio Ospedaliero Sant'Antonio Abate, Erice (Italy).

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THE TOTAL KNEE SYSTEM

CERAMIC FEMORAL COMPONENT  
+ MOBILE TIBIAL PLATE



POSTOPERATIVE



24 MONTHS

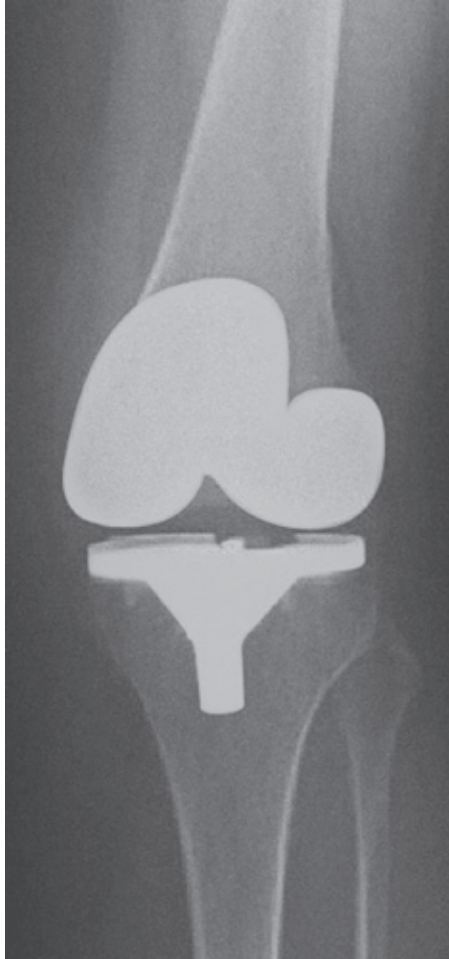
## POSTOPERATIVE

X-rays reported an adequate restoration of biomechanical parameters and a good initial stability.

## 24-MONTH POSTOPERATIVE

The patient showed a very good functional recovery with a significant increase in ROM with 130° flexion and no extension lag, and a very good improvement in the clinical KSS score (functional: 85 points, clinical: 90 points). X-rays confirmed the stability of the implant with no radiolucent lines. The satisfactory outcome obtained with the new implant allowed the patient to return to her normal lifestyle.

## 5 A REVISION OF A METAL TKA WITH A CERAMIC BIOLOX® DELTA TKA DUE TO NICKEL ALLERGY



PREOPERATIVE

### PREOPERATIVE

Under 60-year-old female had severe left knee pain for many years. Under the diagnosis of meniscal lesion with persistent pain and limited ROM, arthroscopy was performed. The intraoperative evaluation revealed grade III and IV lesion that led to decide for a prosthetic replacement.

According to the diagnosis of gonarthrosis, primary TKA was performed with a standard CoCrMo alloy femoral component and a Ti6Al4V alloy tibial component. Optimal implant size and alignment were obtained postoperatively but increasing pain, hyperthermia and consequently joint stiffness occurred after 6 weeks. Under the diagnosis of massive adhesions without any signs of infection, arthroscopic arthrolysis was performed. Allergometry was positive for a type IV hypersensitivity against nickel-II-sulfate and palladium chloride, so revision surgery of the metal implant had been planned.

### TREATMENT

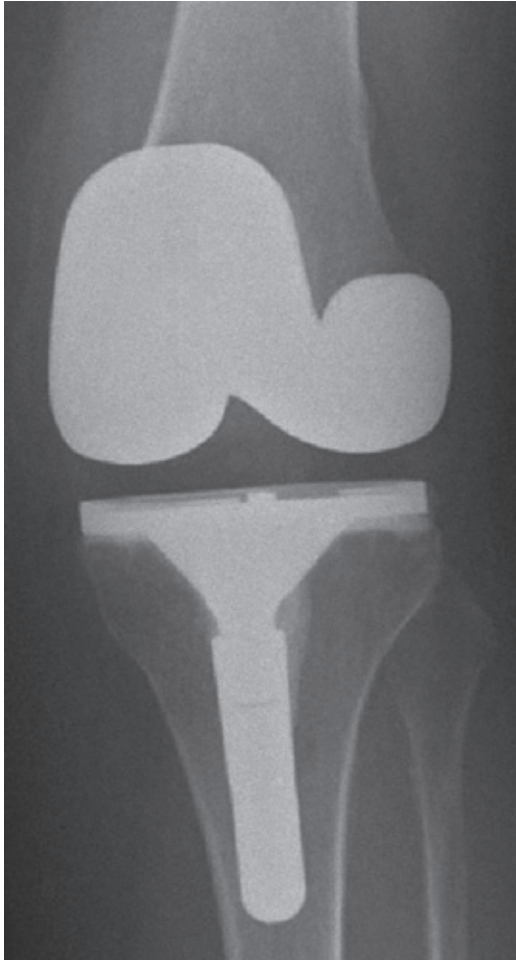
A revision surgery was performed with a cemented ceramic BioloX® delta femoral component and a cemented Ti6Al4V alloy tibial plate through parapatellar approach (under CSE anaesthesia, single-shot cefuroxime prophylaxis).

Courtesy of W. Mittelmeier, MD, B. Bergschmidt, MD from Orthopädische Klinik und Poliklinik der Universität Rostock (Germany).

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THE TOTAL KNEE SYSTEM

CERAMIC FEMORAL COMPONENT  
+ Ti6Al4V FIXED TIBIAL PLATE



12 MONTHS



12 MONTHS

## POSTOPERATIVE

At discharge the patient reported only a slight residual walking pain, a good ROM and no signs of effusion, swelling or joint stiffness. X-rays showed a good implant alignment.

## 12-MONTH POSTOPERATIVE

The patient reported a good functional improvement from the preoperative condition, reaching 90° flexion and no extension lag. No patella stiffness, swelling nor effusion were observed. Radiological evaluation 12 months after revision surgery showed neither radiolucent lines nor signs of loosening.

## 6 A CEMENTLESS POSTERIOR-STABILIZED MOBILE-BEARING TKA



PREOPERATIVE

### PREOPERATIVE

78-year-old retired male (176 cm, 74 kg, 24 BMI), with sedentary daily activities, had an important medial osteoarthritis of the right knee with 6° varus deformity, severe pain and limited ROM with 90° painful flexion. KSS score showed a very poor result with 33 points (clinical) and 35 points (functional). Furthermore, the patient underwent a left TKA in 2007.

### TREATMENT

A primary posterior-stabilized TKA was performed through an antero-medial approach under spinal anaesthesia with the implantation of a cemented PS CoCrMo femoral component (#4) and a cementless CoCrMo mobile tibial plate (#5) with a 12-mm UHMWPE liner. Patella was replaced with a 32-mm/h.8 UHMWPE implant.

Intraoperatively, the bone stock quality was good and an adequate ROM and ligament balancing were obtained.

### POSTOPERATIVE

The immediate postoperative x-rays showed a correct implant alignment. Clinically, a good stability and starting mobility during postoperative physiotherapy were reported.

### 12-MONTH FOLLOW-UP

Postoperatively, the patient showed an excellent recovery of the knee function, already after 3 months. Painless ROM with 110° flexion without extension lag at 3 months increased up to 120° at 12 months. The good clinical result was shown by climbing and descending stairs without pain or signs of instability.

### 24-MONTH FOLLOW-UP

Stable function with a good joint stability and increased forces in extension were achieved. KSS score highlighted a significant improvement to 74 points (functional) and 80 points (clinical).

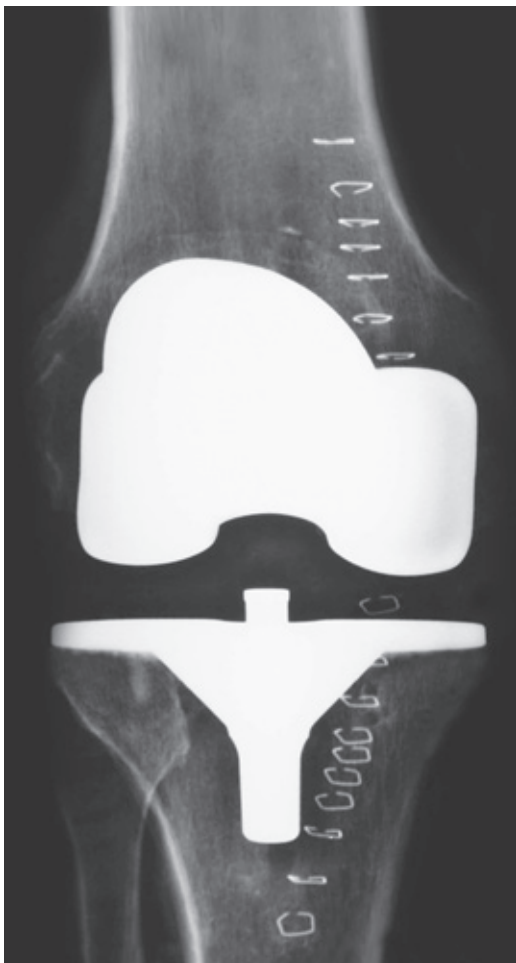
The excellent recovery from the poor preoperative condition, the complete pain relief and a complete integrated implant is the result of the accurate treatment of this patient.

Courtesy of JH Simonnet, MD, Clinique Toutes Aurès Manosque (France).

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THE TOTAL KNEE SYSTEM

PS FEMORAL COMPONENT  
+ MOBILE TIBIAL PLATE



POSTOPERATIVE



12 MONTHS



24 MONTHS

## 7 A CEMENTED POSTERIOR-STABILIZED MOBILE-BEARING TKA



PREOPERATIVE

### PREOPERATIVE

75-year-old sedentary male (160 cm, 65 kg, 25 BMI) had a severe osteoarthritis of left knee with 6° varus. He reported a major reduction of his day-to-day activities due to severe pain and limited ROM with 5° extension lag (initial flexion contracture). The poor preoperative clinical and functional condition was confirmed by poor KSS score (clinical 33 points, functional 40 points). The patient already underwent a TKA on the right side in 2005.

### TREATMENT

Surgery was performed by antero-medial approach in spinal anaesthesia. Intraoperative bone quality was judged as moderate, even with significant bone destruction of the condyles due to the osteoarthritis. Alignment was achieved by implanting a cemented, posterior-stabilized CoCrMo femoral component (#2), a CoCrMo cemented mobile tibial plate (#3) and a 14-mm UHMWPE liner. Patella was replaced with a 32 mm/h.8 UHMWPE one.

Courtesy of JH Simonnet, MD, Clinique Toutes Aurès Manosque (France).

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THE TOTAL KNEE SYSTEM

PS FEMORAL COMPONENT  
+ MOBILE TIBIAL PLATE

## POSTOPERATIVE

At discharge, the implant was radiographically stable with physiological biomechanical parameters.

## 12-MONTH FOLLOW-UP

The patient was very satisfied with his knee, demonstrating a very good clinical and functional result (KSS score: functional 85 points, clinical 100 points). Joint mobility was very good with a 130° flexion without extension lag and pain was completely relieved. Radiologically, the implant was stable without signs of instability.



POSTOPERATIVE



12 MONTHS

## 8 A REVISION OF A MONOCONDYLAR KNEE PROSTHESIS WITH POSTERIOR-STABILIZED FIXED-BEARING TKA



PREOPERATIVE



PREOPERATIVE

### PREOPERATIVE

A 73-year-old female (160 cm, 80 kg, 31 BMI), housewife with sedentary activity of daily living underwent bilateral THA and right side TKA years ago. 13 years ago, the implantation of a medial unicompartmental arthroplasty was performed on the left side. After this time, there was a loosening of the tibial plate with adjacent joint destruction of the lateral and femoro-patellar compartment. The indication for revision surgery was taken because of persistent severe pain, poor score (KSS functional: 17 points, clinical: 20 points) with reduced ROM and joint stability.

### TREATMENT

Revision surgery was performed by an antero-medial approach in spinal anaesthesia. The previous implant was removed and replaced by cemented CoCrMo posterior-stabilized femoral component (#3), Ti6Al4V fixed-bearing tibial plate (#3) with a 12-mm tibial augment and a 60mm tibial stem and 10 mm UHMWPE liner.

### POSTOPERATIVE

There was no complication during the first postoperative time with good recovery of mobility. As normal in such revision cases, slightly moderate functional and clinical score at discharge was mentioned, but with little pain. ROM was satisfactory with 80° flexion. The patient's primary satisfaction was achieved. Even with the reduced bone quality, a stable implantation could have been performed with corrected physiological parameters.

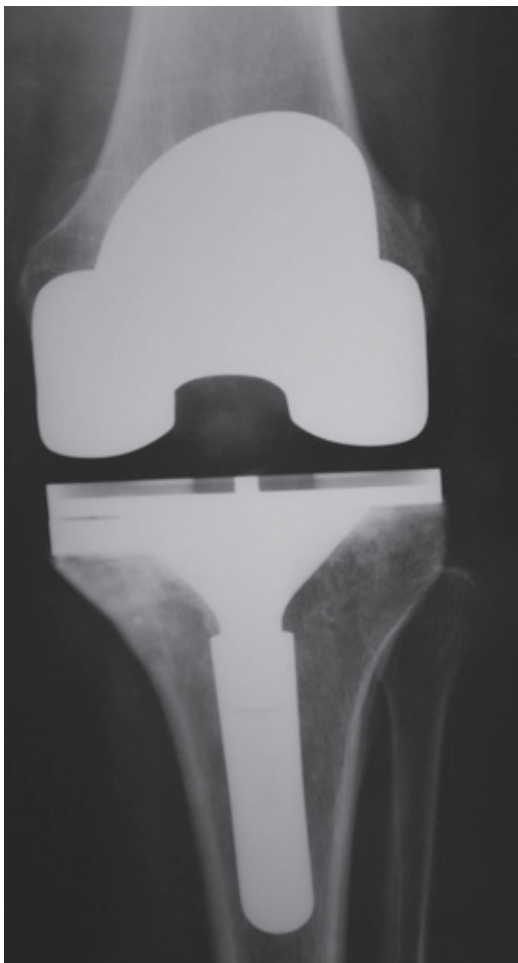
### 12-MONTH FOLLOW-UP

The patient confirmed an increase of clinical and functional result (KSS score: functional 69 points and clinical 70 points). Radiologically, the reconstruction was stable without signs of radiolucent lines. Pain was mild or occasional, especially after prolonged weight-bearing, and some difficulty climbing stairs is described because of limited muscle force, even if the patient assured a daily improvement of his knee function.

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THE TOTAL KNEE SYSTEM

PS FEMORAL COMPONENT  
+ FIXED TIBIAL PLATE



POSTOPERATIVE



POSTOPERATIVE



12 MONTHS

## 9 A REVISION WITH CCK IMPLANT



PREOPERATIVE

### PREOPERATIVE

78-year-old female (165 cm, 60 kg, 22 BMI) with normal daily activity of a retired housewife underwent TKA 10 years ago on the right knee and 8 years ago on the left one. After an initially promising good clinical result, the patient started to complain of increased pain and reduced ROM of the right knee. Climbing stairs and getting up from a deep chair started to be difficult with intolerable pain. Clinical examination confirmed a painful joint, a swollen knee with a palpable synovitis and a constricted patella. X-rays showed a progressive loosening of the tibial and the patellar implant.

### TREATMENT

Revision surgery was performed under general anaesthesia. The failed tibial plate and the patellar component were removed. Femoral implant could be removed without any remaining bone defect. As preoperatively planned, a CCK TKA was implanted with CoCrMo cemented femoral component (#2), a short femoral module with a 18-mm stem and Ti6Al4V cemented fixed tibial plate (#2), with a short tibial module and a 14-mm stem. A 12-mm tibial liner was used.

### POSTOPERATIVE

The postoperative time was marked out by an increase in knee function as well as a constant decrease in pain. X-rays at discharge confirmed an adequate alignment of the new joint.

### 12-MONTH FOLLOW-UP

The patient regained her normal daily activities with a stable and pain-free knee function on the right side. There was a complete absence of the preoperative severe patellar pain, so climbing and descending stairs did not cause problems anymore. 115° knee flexion without extension lag and the perfect alignment confirmed the good result.

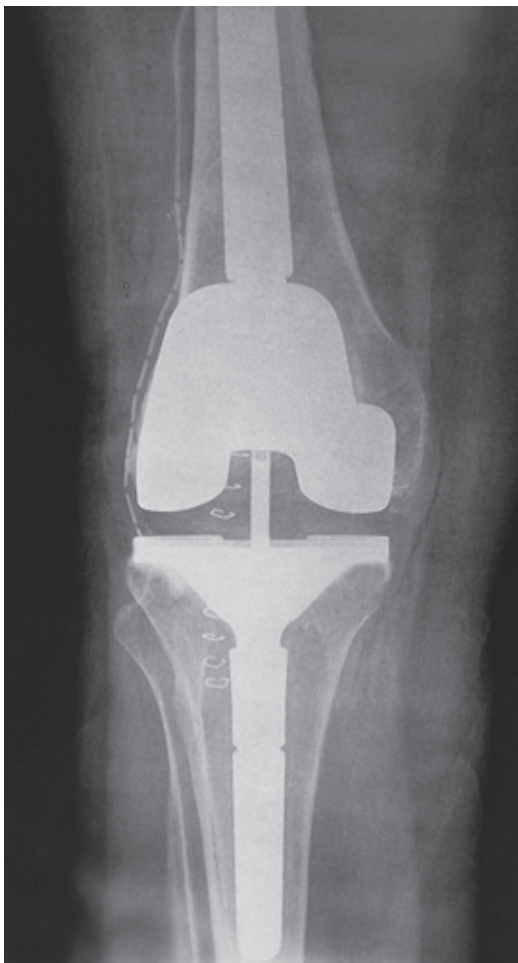
Patient's satisfaction with the performed operation was the most important sign in follow up.

Courtesy of D. Paris, MD, Clinique Charcot, Sainte-Foy-lès Lyon (France).

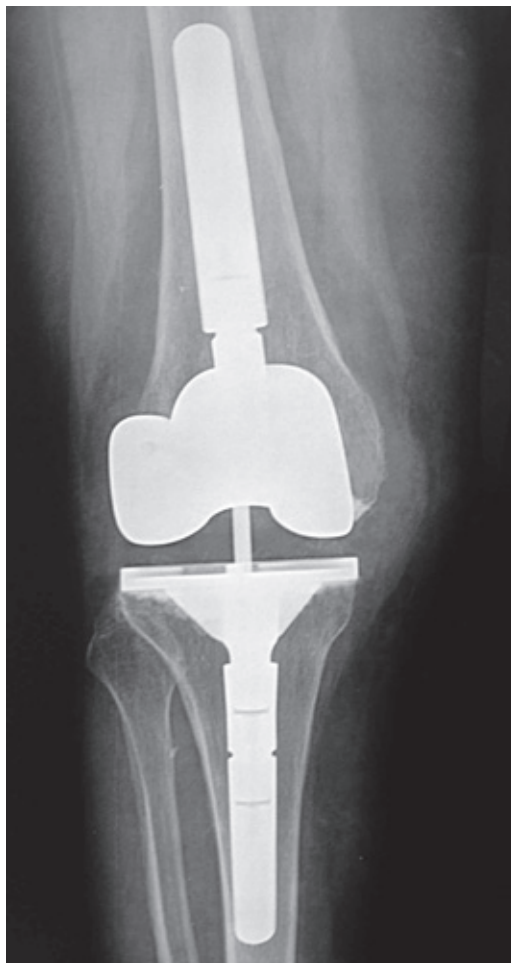
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THE TOTAL KNEE SYSTEM

CCK IMPLANT



POSTOPERATIVE



12 MONTHS



12 MONTHS





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