

Knee arthrodesis as a salvage method for septic TKA failure

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Abstract

Periprosthetic joint infection is the most common reason for a failed TKA, with a septic TKA reported rate of 1 to 4% of primary TKA patients. Septic TKA has a various number of treatment options which include chronic-suppressive antibiotics, irrigation and debridement, single or staged revision arthroplasty. The goal is to eradicate the periprosthetic joint infection and reimplant a sterile and fully functional total knee prosthesis. In case the infection becomes uncontrollable, there is only one option to eradicate the infection: knee arthrodesis or above-knee amputation.

We report the case of a 63-year-old patient who in 2009 underwent TKA, the 1 year follow-up showed periprosthetic infection. At first stage, the prosthetic implants were removed and a solid cement spacer was shaped to occupy the remaining space. In 2011, after achieving complete clinical and biological remission of the infection, the cement spacer was removed and LCCK revision prosthesis was inserted.

In 2013 reinfection occurred leading to removal of the prosthetic implants and reinsertion of an antibiotic impregnated cement spacer.

Since the patient suffered significant bone loss and the local conditions were unfavorable, being prone to infection, there were 2 options to evaluate: knee arthrodesis or above knee amputation. We chose knee arthrodesis using Ilizarov external fixation technique.

Many surgical techniques are available to achieve knee arthrodesis: internal fixation with plates or intramedullary nails and external fixation. The Ilizarov method is a very effective technique that could be taken into consideration when knee arthrodesis is required.

Keywords: Knee arthrodesis; Ilizarov frame salvage method; Septic TKA

Introduction

The number of total knee arthroplasty operations has experienced a tremendous growth in the past years. The number of post operative complications, including infections and implant failures, has an increased growth as well.

Periprosthetic joint infection is the most

common reason for a failed TKA, with a septic TKA reported rate of 1 to 4% of primary TKA patients.

Septic TKA has a various number of treatment options which include chronic-suppressive antibiotics, irrigation and debridement, single or staged revision arthroplasty. The goal is to eradicate the periprosthetic joint infection and reimplant a sterile and fully functional total

knee prosthesis.

In case the infection becomes uncontrollable, there is only one option to eradicate the infection: knee arthrodesis or above-knee amputation.

Knee arthrodesis is a widely performed surgical procedure which has defined indications [21,31,35,42]. It is the best choice for patients with recurring knee infections and extensive bone loss. The goal is to achieve a

better functional outcome compared to an above-knee amputation and gain a pain-free and stable lower limb.

There are many surgical techniques that have been proposed for knee arthrodesis: internal osteosynthesis, intramedullary nailing and external fixation. We present a case study with knee arthrodesis performed in our institution using the Ilizarov method.

Table 1. Indications and contraindications for knee arthrodesis

| Contra-indications | Indications |
|--|---------------------------|
| Contralateral knee amputation | Quadriceps muscle deficit |
| Contralateral knee/ hip arthrodesis | Poor soft tissue coverage |
| Degenerative changes in ipsilateral hip | Extensive bone loss |
| Severe degenerative spine osteoarthritis | Recurring infections |
| Life-threatening infection | Poliomyelitis sequelae |
| | Charcot knee joint |

Methods

We report the case of a 63-year-old patient who was admitted in our clinic in 2009 for bilateral knee arthrosis, pain predominant in the right knee, for which he underwent total right knee arthroplasty. Postoperative evolution was uneventful until the first year follow-up when periprosthetic infection with *Klebsiella Pneumoniae* and multi drug resistant *Staphylococcus Aureus* was detected (fig. 1). At first stage, the prosthetic implants were removed, accurate bone and soft tissue debridement were performed and a solid cement spacer with gentamicin and vancomycin impregnated was shaped to occupy the remaining space (fig. 2).

In 2011, after achieving complete clinical and biological remission of the infection, the cement spacer was removed and LCCK revision prosthesis was inserted (fig. 3).

In 2013 reinfection occurred leading to removal of the prosthetic implants and reinsertion of an antibiotic impregnated cement spacer.

Since the patient suffered significant bone loss and the local conditions were unfavorable, being prone to infection, there were 2 options to evaluate: knee arthrodesis or above knee amputation. We chose knee arthrodesis using Ilizarov external fixation technique (fig. 4).

Results

After surgery, we achieved complete contact between the tibial and femoral surfaces, having a loss of 4 centimeters of the limb length. The operating time was 5 hours, which is a little bit longer as reported by other authors (4.1 according to Conway and colleagues) [8].

Complications that may occur as described in literature: infection at the wire and half-pin insertion sites, loosening of transosseous elements, overload fracture, loss of sensitivity around the knee, soft tissue infection, ankle ankylosis, genu recurvatum. We encountered infection at the wire and half-pin sites which was treated with topic antibiotherapy and dressing change.

Complete bone fusion was gained in 12

months (fig. 5). We removed the frame after plain radiographs showed good contact of the bone surfaces and a clinical stress test showed good mechanical stability. The patient could fully bear weight without crutches or any canes when the frame was removed. The patient was educated to wear a knee brace all the time (day and night), tacking it off only for hygiene.

Follow-up was for 36 months, with stages at 2 and 4 weeks after surgery and after that on a monthly basis; each clinical evaluation included knee radiographs to assess the bone surfaces contact. At the time of the frame removal there was a shortening of the limb of 4 centimeters, which was comparable with the mean shortening reported by other authors (2,5-6,4 cm) [3,5,10,29,31,32].

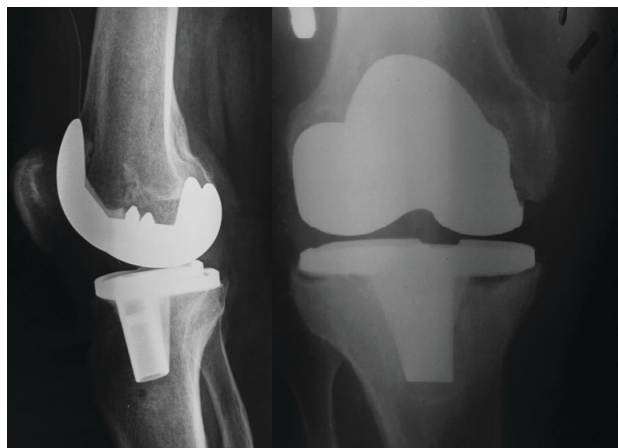


Fig. 1 1 year postop follow-up septic TKA



Fig. 2 Cement spacer – replacement for the septic TKA



Fig. 3 LCCK revision prosthesis

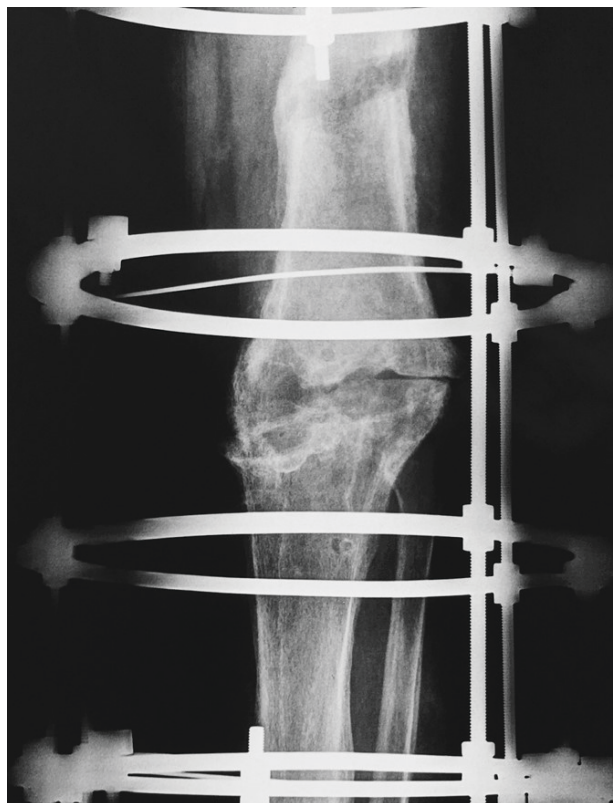


Fig. 4 Postop X-Ray knee arthrodesis using Ilizarov external fixation technique

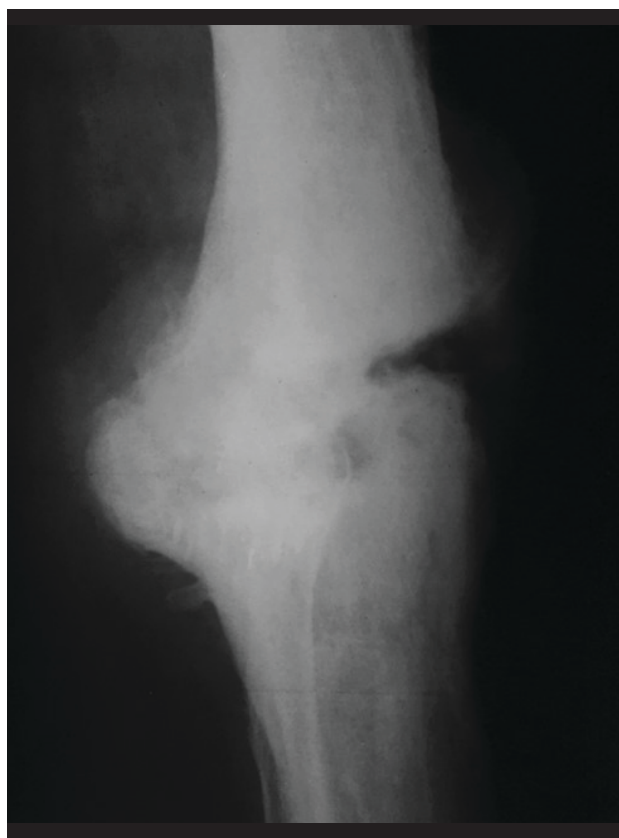


Fig. 5 1 year follow-up after the removal of Ilizarov frame showing complete bone fusion

Discussion

Knee arthrodesis represents a viable treatment option for patients with septic TKA for which other treatment options did not work.

Increased interest in this salvage technique of the affected pelvic limb has generated numerous research studies that ultimately concluded that in order to achieve a good bone fusion, it is necessary to have a very good bone contact between the femur and the tibia [8,19,24,42], a firm fixation [36,42], and a lesser area of bone loss [29,33].

Intramedullary nailing is the best treatment procedure for knee arthrodesis, achieving a consolidation rate of 67-100% [1,2,9,11,12-14,22-25,27,28,30,32,37,41,42]. However, there are limitations in the use of this technique, mainly represented by the existence and persistence of the bone infection. In these cases, the use of the intramedullary nailing is not recommended, as complications such as dissemination or reactivation of the infection may occur [24].

Other complications that may occur in 40-55% cases [25,42,43] are nail migration into the bone canal, distal tibial fractures, pseudarthrosis, vascular-nerve lesions, rotational defects.

In cases of resistant infection, external fixation represents a viable alternative to intramedullary nailing, having a significant contribution to the healing of the infectious outbreak and achieving a consolidation rate of 43-100% [10,18-20,26,29,34,35]. Reported external fixation complications are less important from a biomechanical and clinical point of view, but may be: pin/ wire infections, long-term treatment time, frame maintenance and cosmetic appearance [5-7,16,17,19,36,38-40,42].

Hak and colleagues demonstrated that there were better results when using the multiplanar fixators [20].

Plates are less used, very few cases reported, due to the fact that this treatment

method does not provide compression during weight bearing unfavorable effects on bone consolidation [9,30,41].

Ilizarov circular frame is an important therapeutic option for knee arthrodesis due to the fact that it stimulates bone formation and it improves the bone quality by progressive compression and distraction in the arthrodesis site [29,31]. This device also allows a good alignment of the bone segments through the proper use of the pins. Obtaining bone fusion when using Ilizarov external fixator in patients with bone defects is described by some studies as being between 93-100%, unlike other types of external fixators [10,29,31,42].

The rate of bone fusion may be influenced by both the number of surgical interventions and the type of microorganism involved in TKA infection. Damron and McBeath concluded in their study that patients with mixed infections and those with Gram negative bacteria have a much lower bone fusion rate [9]. In another review study, Hanssen reported an average of 13 surgical interventions before knee arthrodesis has been performed, all these surgical procedures having a negative impact in bone quality [21].

Conclusions

Many surgical techniques are available to achieve knee arthrodesis: internal fixation with plates or intramedullary nails and external fixation. The Ilizarov frame provides a mechanical stimulus for bone formation without the need for bone grafts. The Ilizarov method is a very effective technique that could be taken into consideration when knee arthrodesis is required.

Conflict of Interest statements

Authors state no conflict of interest.

Informed Consent and Human and Animal Rights statements

Informed consent has been obtained from all individuals included in this study.

Authorization for the use of human subjects

Ethical approval: The research related to human use complies with all the relevant national regulations, institutional policies, is in accordance with the tenets of the Helsinki Declaration, and has been approved by the authors' institutional review board or equivalent committee.

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