

Resection arthroplasty after total knee arthroplasty septic failure: case report and literature review

Abstract

Knee arthrodesis, above the knee amputation and resection arthroplasty is salvage procedures for patients with refractory infection after Total Knee Arthroplasty (TKA). The aim of this study was to review the literature of patients submitted to knee resection arthroplasty after septic failure of a TKA. This literature review identified three case series with more than two years of follow-up. After the resection arthroplasty, in a global analysis of the three studies, the rate of infection control reached 96% and with 56% of patients showing satisfaction. However, only 14% of them were able to walk without assistance.

Keywords: total knee arthroplasty, infection, resection, arthroplasty, surgery, staphylococcus, antibiotic therapy, painful ankylosis

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Abbreviations: PJI, periprosthetic joint infection; TKA, the total knee arthroplasty; MRSA, methicillin-resistant Staphylococcus aureus; CJI, continuous joint irrigation

Introduction

The periprosthetic joint infection (PJI) after the total knee arthroplasty (TKA) is the main cause of early failure of the procedure, compromising the outcome after surgery.¹ The rate of infection after TKA is described in approximately 1%, overage 0.5 and 3%.¹⁻³ The two-stage exchange arthroplasty with implant removal, placement of an antibiotic spacer and subsequent reimplantation after control the infectious process is considered the golden standard in the literature with successful rate of 90% to control the infection after TKA.¹ However, the reinfection rate may reach 24% methicillin-resistant Staphylococcus aureus (MRSA) infection.⁴ A twofold increase in the risk of failure after revision knee arthroplasty has been reported with the presence of MRSA.⁵ Culture-negative in patients with PJI increase the risk of treatment failure over fourfold in the first two years [6]. Suppressive antibiotic therapy is described as another treatment option after infected TKA for patients not eligible for the TKA revision procedure or who do not have bone stock for an arthrodesis procedure. In order to make this indication possible, prosthetic implants must be fixed and the pathogen responsible for the infectious process must be low virulence and sensitive to systemic antibiotic therapy.¹ In cases in which the infectious process endangers the patient's life or cases of failure in limb salvage procedures, amputation above the knee should be considered.⁷ However, the limitation to adaption a limb prosthesis is described and the functional status after the procedure is poor. [8].

Resection arthroplasty was described by Girdlestone in 1926 for the treatment of painful ankylosis of the hip joint.⁹ Patients undergoing the procedure had bacterial infection or secondary arthritis due to bone tuberculosis. Girdlestone's surgery is currently indicated as a salvage procedure in cases of impossibility of prosthetic replacement of the coxofemoral joint due to massive bone loss or cases of recurrent joint infection after total hip arthroplasty.¹⁰⁻¹² Knee resection arthroplasty is not frequently performed by the orthopedic surgeon due to unpredictable functional outcomes.¹³⁻¹⁵ The resection arthroplasty should be considered in cases of massive bone loss after TKA, patients with few possibilities to bone fusion after a knee arthrodesis or

recurrent infection not eligible for suppressive antibiotic therapy.^{8,10,17} The objective of the present study is to perform a systematic review of the literature on the procedure of knee joint resection arthroplasty as a treatment option for patients with infection after primary TKA or revision TKA and describe a successful resection arthroplasty.

Material and methods

The selection of articles was carried out by two independent researchers. Articles in the English take out were selected from the following databases: PubMed, SciELO, and Cochrane. Key words used were total knee arthroplasty, infection and resection. Included articles had at least two years of follow-up of resection knee arthroplasty after septic failure of a TKA. Case reports or case series with less than two years of follow-up were excluded. Also excluded articles where the underlying disease was related to the presence of a bone tumor around the knee joint. Articles in which resection arthroplasty had been performed as a prior procedure to prosthetic reimplantation in cases of a two-stage revision were excluded. An article was excluded because the author performed a resection arthroplasty only on the patella articular surface. Two other articles were excluded because they described the results of resection arthroplasty only of the patellar component due to aseptic failure after TKA. After evaluation of the inclusion and exclusion criteria three articles were discussed.

Results

Three studies with Level III evidence were included after applying exclusion criteria. The authors sought to evaluate the final follow-up rate of control the infectious process, the persistence of pain symptoms, the percentage of satisfaction, the range of motion (ROM) and articular stability of the limb in the coronal plane (varus and valgus) (Table 1). Functional results and patient satisfaction are described in Table 2. All the authors performed the immobilization of the limb in lower limb splint and stimulate joint mobility after healing of the surgical wound. After the end of the postoperative immobilization period the patients were stimulated to ambulate with the aid of external orthopedic orthosis and crutches. In one study the transfer of a local pediculate muscular flap was performed to cover the bone surfaces after the resection arthroplasty. In the study of Mine et al.⁵ patients developed hyperextension of the knee joint between

5° and 20° (average 17°). Among the fifteen patients evaluated by Lettin et al.¹⁵ patients had joint hyperextension between 10° and 25° (average 15°) at final follow up. Falahee et al.¹⁴ had 3 patients with 10° hyperextension.

Table 1 Clinical results. ROM (range of motion), follow up, ** (overage), NI (Not informed)*

Authors	F-up* (years)*	Age (years)*	Residual pain	Infection control	Articular stability (varus/valgus)	ROM (flexion)	Limb length reduction(cm)
Falahee et al. ¹⁴	5	62	53.8% soft 15.0% moderate	92%	3°	36°	NI**
Lettin et al. ¹³	4.2	70	33.3% soft 20.00% moderate	100%	16°	52°	4.6
Mine et al. ³⁰	2.2	71	33.3 % moderate	100%	13°	67°	5.2

Table 2 Functional results and satisfaction rate at final follow up. NI (Not Informed)* (average)

Authors	Postoperative immobilization time (months)*	Walk without orthosis suport	Walk with orthesis suport	Wheelchair	Satisfied patients
Falahee et al. ¹⁴	5	19.20%	73.10%	7.60%	53.80%
Lettin et al. ¹³	5.5	6.60%	93.30%	0.00%	60.00%
Mine et al. ³⁰	NI	0	44.40%	55.50%	44.50%

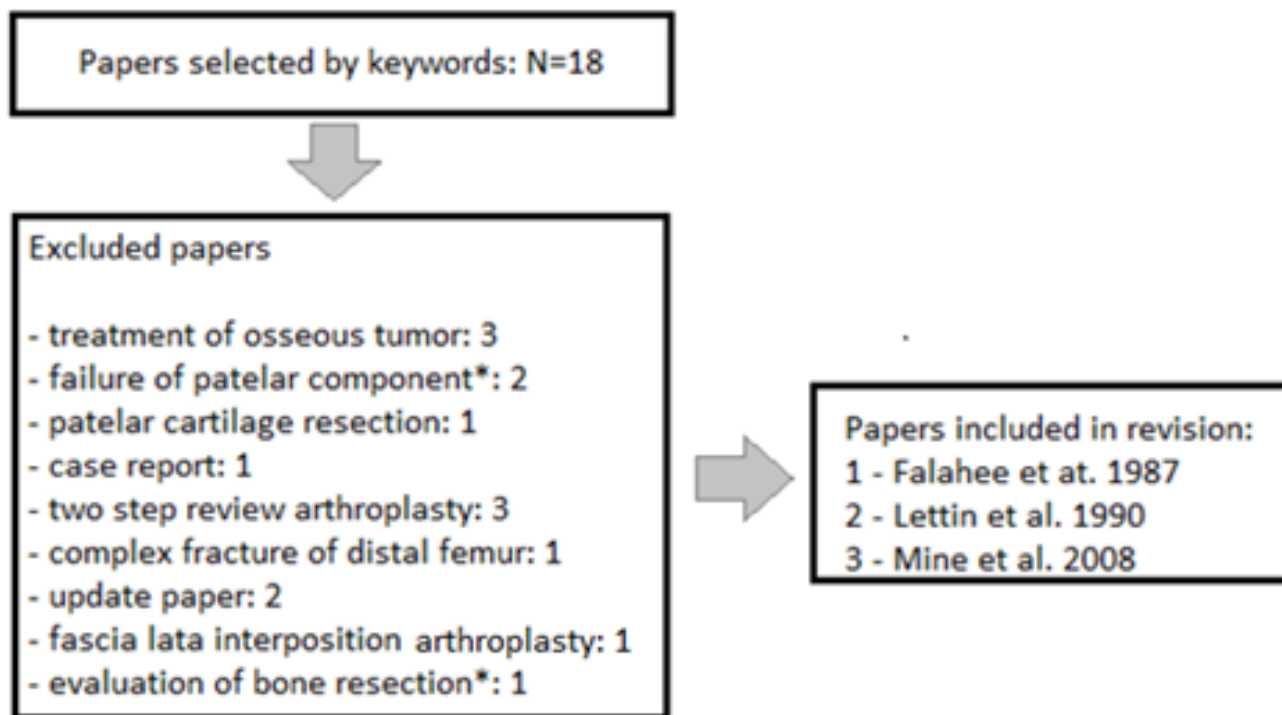


Figure 1 Selected articles after applying inclusion criteria to exclusion from the systematic review process. *TKA (total knee arthroplasty).

Case report

A woman with 78 years old woman who was submitted to a primary. The patient had systemic arterial hypertension and was in use of anticoagulant (aspirin 100mg/day) before the surgery. In 2013 she had an instable periprosthetic fracture after fall. The fracture was

fixed with a less invasive plate system. After that she evaluated with septic failure of the prothesis and lose the femoral component. In this moment all components were remove and the tissue culture of bone tissue was not informed in the medical documents. The patient evaluated with uncontrol infection and after union of femoral fracture the plate need to be removed. In this time, because the bone lost and

the challenge to control the infection the senior surgeon decided to perform resection arthroplasty to a salvage limb procedure. The other fact that influence this approach was the intact lateral and medial knee

collateral ligament. Six months later the patient had a stable joint in coronal plane, movement in the limb and the infection was control (Figure 2 A,B). The final radiologic result is show in Figure 2C.



Figure 2 Joint function and mobility (A and B). Lateral x-ray image of the resection arthroplasty (C). Personal files.

Discussion

Treatment of infection after TKA remains a challenge to the orthopedic surgeon. In patients with refractory periprosthetic infection it is necessary remove the implants in order to control the infectious process. In these other cases a salvage procedure as an arthrodesis, above the knee amputation or a resection arthroplasty should be considered.^{1,2,7} During a retrospective evaluation of 35 patients who underwent knee amputation due to septic failure of TKA followed up for 6 years, 43% died. At the end of the follow-up, 40% of the patients were able to walk with prosthesis, but only 22.8% were able to walk outside home the home.²⁵ Mozella et al.²⁶ retrospectively evaluated 2,409 patients undergoing TKA at a tertiary referral center. The authors identified a prevalence of 0.41% of above the knee amputations due to TKA complications, with 81% of case related to refractory joint infection to other treatment methods. After the average follow-up of 6.7 years, 56% of these patients were not able to walk with prosthesis, from being restricted to a wheelchair.²⁶ Sierra et al.²⁶ evaluated 18,443 patients submitted to TKA, of these 0.14% (19 patients) were submitted to above the knee amputation after refractory infection in the joint. At final follow-up, 14 of these became wheelchair users. The author found the functional outcome unsatisfactory in patients submitted to knee amputation in cases of recurrent infection after TKA and emphasizes that both physician and patient should be aware of the possible unsatisfactory result.⁸

Infection after TKA is currently the main indication for arthrodesis at the knee joint.^{7,17,18} Other Other indications are: irreversible damage to the extensor mechanism, massive bone loss, persistent infection after two-stage revision arthroplasty and loss of soft tissues that compromise the cutaneous tissue of the joint.¹⁹ Bone fusion after knee arthrodesis in the context of an infected TKA may range from 50 to 100% of cases.²⁰ Current research describes an increase in the rate of consolidation –88% to 100%, with the use of intramedullary nailing.^{21–24} In patients where bone fusion is not achieved resection arthroplasty or above the knee amputation become the options for the control of the infectious process and pain. take out all this session.

Son et al.²⁷ evaluated the factors associated with mortality after knee amputation for treatment of septic failure of TKA in 1,864 patients over 65 years of age. The authors concluded that the procedure

represents an isolated risk factor for mortality in this population and that preservation of the limb should be attempted even in cases of recurrent infection in the joint.²⁷ Amputation procedure procedure has little acceptance in our society, and resection arthroplasty is a therapeutic option capable of preserving the limb and controlling the infectious joint process.

Resection arthroplasty with interposition of the fascia lata at the knee joint has been described in the literature. Koga et al. evaluated 25 patients with a limitation of the knee knee ROM due due to ankylosis or joint contracture for a period of 22 years. The authors judged as unsatisfactory the patients with less than a 45 ° 45 of flexion in the knee joint. Only one patient evolved with significant joint instability and 10 developed 10 developed moderate pain moderate pain related to the performance of work activities.²⁸

The procedure of knee resection arthroplasty allows the maintenance of joint mobility facilitating daily activities, does not require additional surgical procedures and control the infectious process by not retaining any metallic implants in the joint. Residual articular instability represents the primary complication related to the procedure.⁷ Lettin et al.⁵ evaluated fifteen patients submitted to resection arthroplasty after the use of constrained prostheses in the knee. They were maintained on continuous irrigation with antibiotic solution for four or five days. According to the results presented the dissatisfied patients at the at the final follow-up were those who remained with articular pain complaints. Even in patients in which the joint remained unstable (a case with hyperextension >30°), control of pain symptoms led to patient satisfaction at at the final follow up follow-up. According to the authors, skeletal traction in the distal tibia has led to a decrease in pain complaints in the immediate postoperative period. The use of continuous joint irrigation (CJI) for the treatment of infection after TKA is described in the literature. The retrospective evaluation of 18 patients followed up for a mean period of 6.1 years submitted to CJI therapy with antibiotic solution after revision of an infected TKA reported a success rate of 94.4% at final evaluation.²⁹ However, this method is not routinely used in joint replacement centers.

Mine et al. in their series of case, evaluated nine patients submitted to resection arthroplasty after septic failure of TKA. Differing from the

other methods, the authors performed interposition of a vascularized muscular flap between the femoral and tibial bone surfaces. The authors postulate that the vascularized flap enhances antibiotic concentration to the resection focus promoting control of the local infectious process. According to the results reported, control of the infectious process had been achieved in 100% of cases after an average 14.6 months (range 5 to 35 months).³⁰ Falahee et al.¹⁴ described the results of the largest case series in the literature (n=26) of patients submitted to knee resection arthroplasty after septic failure of TKA. The authors used a temporary fixation at the focus of resection with Steinmann pins in the first five cases, but they judged this method to be unnecessary in the other patients. The functional outcome at final follow-up was not related to the presence of inflammatory disease in other joints and concluded that patients with greater functional disability before TKA were the most satisfied after the resection procedure.¹⁴

Both studies described in the literature have not been performed with comparative groups, just as the preoperative functional evaluation scores have not been cited limiting interpretation of the results. Both authors have used distinct surgical techniques as well as rehabilitation methodology and antibiotic therapy making it difficult to standardize an ideal method for the management of those patients eligible for a knee resection arthroplasty after an infected TKA. This literature systematic review identified only three studies with level III evidence evaluating the results of the resection arthroplasty after TKA infection. The described results identify the end goal after the procedure: joint stability, pain relief and control of the infectious process. The treatment of recurrent infection after TKA remains controversial in the literature, with a tendency towards joint fusion (arthrodesis), letting knee resection arthroplasty as an option after a failed arthrodesis. The ambulatory capability can be achieved with the aid of external bracing and crutches in patients submitted to resection arthroplasty. Knee resection arthroplasty should be considered as a limb salvage procedure, with the physician and patient being aware of the possibility of unpredictable results regarding joint stability and function, given the outcomes reported in this study.

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None.

Conflicts of interest

Author declares there is no conflict of interest.

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