

Case Report

Knee arthrodesis with ring fixator for lower limb salvage after necrotizing fasciitis involving extensor apparatus

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ABSTRACT

Necrotizing fasciitis (NF) is a rare but severe infection with high morbidity and mortality, requiring urgent and aggressive intervention. This case describes a 64-year-old male who presented with septic arthritis of the knee complicated by NF and Streptococcal toxic shock syndrome. Despite early surgical debridement and empiric antibiotic therapy, the infection progressed, resulting in extensive necrosis of the knee extensor apparatus and exposure of the knee joint. Knee arthrodesis with a circular external fixator was performed, allowing for joint stabilization, soft tissue closure with skin grafts, and comprehensive functional rehabilitation. Six months post-discharge, the patient achieved pain-free, independent ambulation, avoiding amputation. This case underscores the feasibility of knee arthrodesis with a circular external fixator as a viable option for limb salvage in severe NF cases.

Keywords: Necrotizing fasciitis, Knee, Arthrodesis, Ring fixator

INTRODUCTION

Necrotizing fasciitis (NF) is a rare but severe and life-threatening infection characterised by fast destruction of the fascia and subcutaneous tissues. Despite its low incidence, ranging from 0.4 to 1 per 100,000 individuals worldwide, NF has a high mortality rate, reported among 24 to 80% in the literature.^{1,3}

The aggressive nature of NF often requires urgent surgical intervention, including extensive debridement or even limb amputation, to control the infection and prevent systemic complications such as septic shock or multi-organ failure.^{4,5}

Involvement of the lower limb is particularly challenging, as it can lead to extensive tissue destruction, functional deficits, and potential disability. This study describes a case in which progression of the infection resulted in extensive necrosis of the knee extensor apparatus and knee arthrodesis with ring fixator was a good solution for limb salvage.

CASE REPORT

A 64-year-old male presented to the emergency department with two days of right knee pain, fever (39°C) and inability to weight bearing. He had a significant joint effusion, lower limb oedema and heat. Blood tests revealed a CRP of 41g/dl without leukocytosis. An arthrocentesis was performed, and it confirmed a knee septic arthritis with 75 000 WBC count on the synovial fluid.

The patient was promptly brought to the operating room for joint drainage and irrigation. During the procedure, haemorrhagic blisters were observed forming on the patient's right leg due to worsening limb edema. Fasciotomies were performed and samples from knee fluid and leg soft tissue were sent to microbiologic and pathological anatomy analysis. Empiric antibiotic treatment with clindamycin, piperacillin-tazobactam and vancomycin was started. In the following day the patient was admitted in intensive care with progression to multi-organ dysfunction due to *Streptococcal* toxic shock syndrome and *Streptococcus Pyogenes* was isolated in all

the collected knee synovial fluid samples. The antibiotic treatment was adjusted to penicillin and clindamycin.

During the next few days, several surgical soft tissue debridements were performed on the right thigh, knee and leg (Figure 1 A and B). The knee joint became exposed due to necrosis of the extensor apparatus and its subsequent excision. After surgical removal of all necrotic tissue and medical stabilisation of the patient, a large soft tissue defect in the right lower limb remained, associated with a non-functional extensor apparatus and progressive knee joint exposure over several days (Figure 1 C). The next surgical steps were planned between orthopaedics, plastics surgeons and physiatrists based on the lack of soft tissue coverage and extensor apparatus nonfunction in a

patient with preserved hip and ankle mobility. The knee arthrodesis was performed with a circular external fixator which allowed the apposition of distal thigh and proximal leg soft tissue (Figure 1 D). Subsequently, split-thickness skin grafts were performed for final coverage. The fixator's stability was essential for soft tissue healing. The patient started physical rehabilitation with hip and ankle motion and ambulation with total weight-bear using crutches.

At four months postoperatively the knee fusion was confirmed and the external fixator was removed (Figure 6). Six months after initial hospital discharge, the patient was painless, walking without external support and he was independent in daily activities.



Figure 1: (A) Skin necrosis after fasciotomies; (B) progression of the extensor apparatus necrosis after skin and fascia debridement; (C) femoral exposure after extensor apparatus debridement; (D) knee arthrodesis with a circular external fixator allowing apposition of soft tissue.



Figure 2: (A and B) Knee fusion on x-ray four months postoperatively, AP view and lateral view; (C and D) patient post-treatment appearance after removal of the external fixator, front view and back view.

DISCUSSION

NF is a devastating soft tissue infection with significant morbidity and mortality. This case underscores the critical importance of prompt surgical and medical intervention in the management of NF involving the knee, particularly when compounded by *Streptococcal* toxic shock syndrome.

The progression of infection in this patient, despite timely intervention, resulted in extensive necrosis of the knee extensor apparatus and exposure of the joint. In such scenarios, amputation may be considered, as noted in previous literature.^{4,5} However, the limb-salvaging strategy employed here demonstrates that alternatives such as knee fusion with a circular external fixator can be effective. This approach provided joint stabilisation, allowed soft tissue closure, and facilitated skin grafting, as described in similar reconstructive challenges by Matsumine et al.⁵

The decision-making process in this case highlights the value of a multidisciplinary approach. This collaboration ensured a comprehensive plan that balanced infection control, structural integrity and functional rehabilitation.

While limb salvage in NF often presents a significant clinical challenge, this case aligns with the findings of Magala et al who emphasise that aggressive surgical debridement combined with appropriate antibiotic therapy can yield favourable outcomes.³ Furthermore, Lahham et al underline the importance of tailoring management to the functional and anatomical deficits caused by NF, which was clearly demonstrated in this case.⁶

CONCLUSION

This case illustrates that knee arthrodesis with a circular external fixator is feasible and can be an effective limb-salvaging procedure for NF involving the knee extensor apparatus. Despite the extensive tissue loss and functional deficits, early and aggressive surgical intervention, combined with a multidisciplinary approach and comprehensive rehabilitation, enabled the patient to regain pain-free mobility and independence. This case supports

previous studies' findings, emphasising the importance of timely, collaborative, and innovative management strategies for severe NF. Further research is warranted to optimise treatment protocols and improve long-term outcomes in such complex cases.

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