

Two-Stage Surgical Management of a Septic Nonunion of The Proximal Phalanx of the Left Third Finger: A Case Report

Youness Mokhchani^{1*}, Bouchaib Chafry², Ahmed Salim Bouabid², Mustapha Boussouga²

¹Department of Orthopedic Surgery and Traumatology, Mohammed VI Military Hospital –Dakhla-Morocco

²Department of Orthopedic Surgery and Traumatology, Mohammed V Military Teaching Hospital –Rabat- Morocco

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*Corresponding author: Youness Mokhchani

Department of Orthopedic Surgery and Traumatology, Mohammed VI Military Hospital –Dakhla-Morocco

Abstract

Case Report

We present the case of a 26-year-old male patient with a septic nonunion of P1 of the left third finger following a neglected open fracture, with a chronic skin opening. Management was carried out in two surgical stages. The first stage consisted of extensive surgical debridement, sequestrectomy, and the placement of an antibiotic-loaded cement spacer in the bone defect. After 6 weeks of targeted antibiotic therapy and confirmation of infection eradication, a second reconstructive stage was performed. This involved a cancellous iliac bone graft to fill the bone defect, stabilized by osteosynthesis with 2 Kirschner wires, and an antegrade dorsal metacarpal flap to cover the skin defect and provide local vascularization. The postoperative course was uneventful, with complete bone and skin healing at 3 months, and satisfactory functional recovery at 6 months of follow-up.

Keywords: septic pseudarthrosis, nonunion, hand surgery, scrap of Foucher, osteoarticular infection.

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INTRODUCTION

Nonunion, defined as the cessation of the bone healing process beyond six to nine months, represents a therapeutic challenge in orthopedic surgery. Its secondary infection, or septic nonunion, is a formidable complication, particularly in the hand where the concentration of anatomical structures (bones, tendons, nerves, vessels) can lead to major functional sequelae. The management of these complex lesions requires a sequential and multidisciplinary surgical strategy, prioritizing first the eradication of the infection, followed by the reconstruction of the bone and soft tissue defect. We report a case of septic nonunion of the proximal phalanx (P1) of the left third finger, successfully treated with a two-stage protocol: infection control followed by

reconstruction with an iliac bone graft and an arterialized flap.

CASE REPORT

Patient: A 26-year-old male, right-handed, with no significant medical history.

The patient presented for consultation for a chronic suppurating wound of the left third finger, present for 4 months, following a neglected blunt trauma. Clinical examination revealed a 4cm dorsal skin opening over P1, with yellowish bone protruding, abnormal mobility at the fracture site, and purulent discharge (Figure1). Pulp sensitivity and distal vascularization were preserved.



Figure 1: clinical aspect of the hand

Standard radiography revealed a discontinuity at P1 with sclerosis of the bone ends and peri-lesional

lysis, confirming the diagnosis of non-union (Figure 2). CT scan was not deemed necessary initially.



Figure 2: X-ray of the left hand

Therapeutic Protocol:

1. First Surgical Stage (Day 0): Infection Management.

- Wide debridement of the fistula and necrotic tissues.
- Exposure of the nonunion site, sequestrectomy, and resection of fibrous tissue and necrotic bone down to viable bleeding bone ("paprika sign").
- Multiple samples sent for bacteriological and pathological examination.
- Pulsed lavage with normal saline.
- Filling of the residual bone defect with a Gentamicin-loaded cement spacer.

- Partial skin closure.
- Immobilization with a forearm-based splint.
- Empiric then targeted intravenous antibiotic therapy for 6 weeks.

2. Second Surgical Stage (Week 7): Reconstruction.

- Removal of the spacer and further debridement.
- Harvest of a 4cm cancellous bone graft from the right anterior iliac crest.
- Filling of the bone defect and osteosynthesis with 2 Kirschner wires (Figure 4).



Figure 4: post-operative x-ray

- Design and elevation of an antegrade dorsal metacarpal flap (Foucher flap) based on the commissural artery, to cover the residual skin defect.
- The flap donor site was primarily sutured (Figure 3).



Figure 3: Clinical appearance of the hand postoperatively showing the flap

Evaluation: Postoperative follow-up included clinical (wound healing, mobility, pain) and radiological (bone union) assessments at 6 weeks, 3 months, and 6 months.



Figure 5: clinical appearance of the hand after healing

RESULTS

The postoperative course for both stages was uneventful, with no infectious or healing complications. At the last follow-up of 6 months, the result was satisfactory:

- Complete bone union of P1 with no signs of nonunion recurrence or lytic lesions. The K-wires were left in place and were removed after 3 months.
- Clinical Findings: Complete skin healing, which was supple and of good quality. Joint mobility was 0-85° for the metacarpophalangeal (MCP) joint and 30-40° for the proximal interphalangeal (PIP) joint (in a functional position); this stiffness is explained by the prolonged immobilization of this joint (Figure 5).

The patient was able to resume his full-time work, with minor adaptations, and was very satisfied with the result.

DISCUSSION

Septic nonunion of the phalanges is a rare but serious entity. Its management is a challenge based on two fundamental principles: the complete eradication of the infection and the creation of a biological and mechanical environment conducive to healing [1]. Our two-stage strategy, although prolonging the total treatment duration, is widely recommended to minimize the risk of failure [2]. The initial stage of debridement and local antibiotic therapy (cement) allows for the transformation of a septic situation into a clean, aseptic one.

Bone reconstruction with an iliac cancellous bone graft remains the gold standard for filling non-

critical size bone defects. The graft's supply of osteogenic and osteoinductive cells is crucial for inducing bone neogenesis [3]. Osteosynthesis with 2 K-wires, although less stable than a mini-plate, can provide rigid primary stability with less bulk, which is essential for the success of the graft in a still fragile environment.

Soft tissue coverage is an often-underestimated pillar of success. A poorly vascularized bone graft bed is doomed to resorption or infection. The dorsal metacarpal flap (Foucher flap) [4] that we used is an axial fasciocutaneous flap, robust and easy to raise. Its proximity to the defect allows for excellent adaptation. Its vascularization, independent of the digital system, allows it to revascularize the injured area, bring growth factors, and improve both bone and skin healing. Other options exist, such as island flaps, but the dorsal metacarpal flap offers a sufficient arc of rotation and acceptable donor site morbidity [5].

The alternative of a single-stage treatment, with en bloc resection and external fixation, exists but is riskier in the context of persistent sepsis. Our sequential approach, although requiring two procedures, offers a high and reproducible success rate [6]. Early and tailored rehabilitation was a key element in regaining satisfactory digital function.

CONCLUSION

This case illustrates the effectiveness of a structured, sequential management approach for a complex digital septic nonunion. The combination of

initial aggressive debridement with the placement of an antibiotic cement spacer, followed by a reconstruction combining an iliac bone graft, stable osteosynthesis, and an arterialized dorsal metacarpal flap, allows for an optimal functional and anatomical outcome. This two-stage strategy, although lengthy, remains the safest way to control the infection and create the biological conditions necessary for bone union and functional recovery

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