

Chronic Osteomyelitis of the Thumb Treated with Surgical Debridement, Antibiotic Cement Beads, and K-Wire Stabilization: A Case Report

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Learning Point of the Article:

Chronic osteomyelitis of the thumb can cause severe structural destruction and profound functional impairment, and its management requires both eradication of infection and preservation of skeletal stability. Surgical debridement with appropriate tissue sampling for microbiological and histopathological evaluation, combined with local antibiotic delivery and K-wire stabilization, can provide an effective limb-preserving strategy.

Abstract

Introduction: Chronic osteomyelitis of the thumb is an uncommon but potentially disabling condition that can result in persistent pain, swelling, restricted motion, bone destruction, and functional impairment. Successful treatment generally requires adequate removal of infected and necrotic tissue, microbiological and histopathological assessment, and appropriate stabilization when structural integrity is compromised.

Case Report: An 18-year-old male presented with a 2–3-month history of pain and swelling of the right thumb, associated with severe swelling, loss of thumb movement, and discharge for approximately 2 weeks. Pre-operative clinical photographs demonstrated marked swelling and a localized lesion over the thumb. Radiographic evaluation demonstrated destructive changes involving the thumb with associated soft-tissue swelling. The patient underwent surgical debridement of infected and necrotic soft tissue and bone, excisional biopsy, microbiological investigation, local antibiotic cement bead placement, and K-wire stabilization. Postoperatively, the thumb was immobilized in a slab, with planned K-wire removal after 4–6 weeks and physiotherapy after 2 months. Histopathological examination demonstrated caseating granulomatous inflammation with epithelioid cells and Langhans-type giant cells. Although Ziehl–Neelsen staining was negative, tissue GeneXpert detected *Mycobacterium tuberculosis* at a very low level with no rifampicin resistance. Routine bacterial culture additionally demonstrated scanty methicillin-resistant coagulase-negative *Staphylococcus*.

Conclusion: This case demonstrates the importance of aggressive surgical management in chronic thumb osteomyelitis. Thorough debridement of infected and necrotic tissue, combined with local antibiotic delivery and stabilization of the affected bone, represents an important limb-preserving treatment strategy.

Keywords: Chronic osteomyelitis, thumb, debridement, antibiotic cement beads, K-wire fixation, hand infection.

Introduction

Osteomyelitis of the hand can lead to substantial morbidity because infection involving the small bones of the digit can rapidly compromise bone integrity and hand function. Chronic

infection is particularly challenging because necrotic bone and surrounding infected soft tissue may serve as a persistent focus of infection [1].

The treatment of chronic osteomyelitis requires elimination of

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Figure 1: Pre-operative clinical presentation. Pre-operative clinical photographs demonstrating marked swelling and localized cutaneous involvement of the right thumb in an 18-year-old male with chronic osteomyelitis.

the infectious focus while preserving as much viable tissue and function as possible [2]. Surgical debridement is therefore a fundamental component of management. In selected cases, local antibiotic delivery using antibiotic-loaded cement can provide high local antimicrobial concentrations, while temporary stabilization may be required when infection and debridement compromise skeletal stability [3].

We present an 18-year-old male with chronic osteomyelitis of the right thumb who underwent surgical debridement, excisional biopsy, culture and sensitivity testing, antibiotic cement bead placement, and K-wire stabilization.

Case Report

An 18-year-old male presented with complaints involving the right thumb for approximately 2–3 months. His primary symptoms were pain and swelling of the right thumb. The swelling was described as severe, and active thumb movement was absent. The patient reported a history of visiting Goa approximately 2 months before presentation, following which he developed sudden swelling of the thumb. He subsequently developed discharge from the affected thumb, which had been present for approximately 2 weeks at the time of presentation.

Clinical examination

On clinical examination, the patient had severe swelling of the right thumb with an open wound and black discoloration of the overlying skin. (Fig. 1) The thumb interphalangeal and metacarpophalangeal joint ranges of motion were absent [4]. Grip strength was <5 kg, and pinch grip was absent. The pre-operative Disabilities of the Arm, Shoulder, and Hand (DASH) score was 75, with a Work Module score of 87.5, indicating severe

upper-limb functional disability [5].

Given the prolonged history, severe local inflammatory changes, loss of movement, and discharge, chronic osteomyelitis of the right thumb was suspected.

Imaging

Pre-operative radiographs of the right hand demonstrated destructive and erosive changes involving the proximal phalanx of the thumb, with associated osseous irregularity and surrounding soft-tissue swelling (Fig. 2). These findings, together with the clinical presentation of an open wound, severe swelling, skin discoloration, and

absent thumb motion, were consistent with the clinical diagnosis of chronic osteomyelitis. Based on the clinical and radiological findings, a diagnosis of right thumb osteomyelitis was made, and surgical debridement with K-wire fixation was planned.

Surgical management

The patient underwent operative treatment under regional anesthesia. The right hand and thumb were prepared and draped in a sterile fashion. A pneumatic tourniquet was applied. An incision was made over the affected region, and dissection was carried through the skin and subcutaneous tissue.

Intraoperative photographs demonstrated extensive abnormal tissue involving the thumb (Fig. 3). Infected and necrotic soft tissue and bone were identified. Thorough surgical



Figure 2: Pre-operative radiographic assessment of the right thumb. Anteroposterior and oblique radiographic views demonstrating destructive and erosive changes involving the proximal phalanx of the right thumb with associated osseous irregularity and surrounding soft-tissue swelling.



Figure 3: Intraoperative findings. Intraoperative findings demonstrating infected and necrotic tissue and bone involving the right thumb during surgical exploration and debridement.

debridement was performed with removal of unhealthy soft tissue and necrotic bone.

Excisional biopsy specimens from the infected bone and soft tissue were sent for histopathological examination and culture and sensitivity testing.

The wound was thoroughly irrigated. Antibiotic cement beads were placed locally, followed by K-wire fixation to stabilize the affected thumb. The K-wire position was checked intraoperatively, after which the wound was closed, and a sterile dressing and thumb slab were applied. (Fig. 4).

Post-operative radiographs demonstrated the K-wire traversing the affected thumb and maintaining stabilization of the involved phalanx (Fig. 5).

Post-operative management

The patient received post-operative antibiotics, analgesics, and proton-pump inhibitor therapy and was discharged following routine post-operative care. The planned post-operative protocol included regular dressing changes, suture removal after 2 weeks, K-wire removal after 4–6 weeks, thumb slab immobilization for 4–6 weeks, and physiotherapy after approximately 2 months.



Figure 4: Surgical reconstruction. Immediate post-operative image demonstrating K-wire stabilization of the affected thumb following debridement and local antibiotic cement bead placement.

Microbiological investigations

Intraoperative tissue samples were obtained during debridement and sent for microbiological analysis.

Gram staining demonstrated numerous pus cells without identifiable organisms, while KOH preparation did not demonstrate fungal elements. Ziehl–Neelsen staining and AFB immunofluorescence were negative.



Figure 5: Post-operative radiographs. Post-operative radiographs demonstrating K-wire stabilization of the affected thumb with maintained alignment following surgical debridement.

Despite the negative AFB staining, tissue-based GeneXpert MTB/RIF testing [6] detected *Mycobacterium tuberculosis* at a very low level [7], with no rifampicin resistance detected.

Routine bacterial culture demonstrated scanty growth of methicillin-resistant coagulase-negative *Staphylococcus* [8,9].

Histopathological examination

Excisional biopsy specimens obtained from the infected bone and soft tissue demonstrated fibroconnective and granulation tissue containing multiple small to confluent granulomas composed predominantly of epithelioid cells, Langhans-type and foreign-body giant cells, and lymphocytes. Areas of caseous necrosis were also identified.

Ziehl–Neelsen staining was negative for acid–fast bacilli. However, the histopathological appearance was considered suggestive of mycobacterial infection, and correlation with molecular testing was recommended.

The subsequent positive tissue GeneXpert result supported the diagnosis of chronic osteomyelitis of the thumb.

Discussion

Chronic osteomyelitis of the thumb presents a particular therapeutic challenge because infection may involve both soft tissue and bone while simultaneously compromising thumb mobility and overall hand function. In the present case, the patient had a prolonged history of pain and severe swelling associated with absent thumb movement and persistent discharge, ultimately resulting in a diagnosis of chronic osteomyelitis.

The pre-operative photographs demonstrate the substantial local inflammatory changes and swelling associated with the infection. Radiographs demonstrated destructive changes involving the thumb, supporting the clinical diagnosis of osteomyelitis.

The central principle in the surgical management of chronic osteomyelitis is adequate removal of infected and devitalized tissue. In this patient, intraoperative exploration demonstrated both infected soft tissue and necrotic bone, necessitating thorough debridement. Excision of visibly unhealthy tissue was combined with collection of specimens for histopathological

examination and microbiological culture. This approach allows the diagnosis to be confirmed and provides information that can guide antimicrobial therapy.

An additional feature of the treatment was the use of local antibiotic cement beads. Local antibiotic delivery can be particularly useful in chronic osteomyelitis because it allows antimicrobial agents to be delivered directly to the infected region while minimizing dependence on systemic delivery alone [10]. In the present case, cement beads were placed after surgical debridement as part of the local infection-control strategy.

The use of temporary K-wire stabilization was another important component of the reconstruction. Chronic infection and removal of necrotic bone can compromise the mechanical stability of a digit. Stabilization helps maintain the structural alignment of the thumb during the healing period and allows the soft tissues and bone to recover following debridement. In this case, K-wire fixation was performed after debridement and the position was confirmed intraoperatively.

The patient's post-operative protocol was designed to balance infection control, skeletal stabilization, and subsequent functional rehabilitation. The thumb was immobilized in a slab for 4–6 weeks, with planned K-wire removal during the same period and physiotherapy planned after 2 months.

Conclusion

Chronic osteomyelitis of the thumb can result in substantial structural and functional impairment. In this case, aggressive surgical debridement with removal of necrotic bone and infected soft tissue was combined with tissue sampling, local antibiotic cement bead placement, and K-wire stabilization. This multimodal approach aimed to eradicate the infectious focus while maintaining thumb stability and preserving the potential for subsequent functional recovery.

Clinical Message

Chronic osteomyelitis of the thumb requires early recognition and definitive surgical management. Removal of infected and necrotic tissue, combined with microbiological assessment, local antibiotic delivery, and appropriate skeletal stabilization can provide an effective limb-preserving strategy while creating a foundation for subsequent functional rehabilitation.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None



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