

Metacarpal Joint Arthroplasty in the Acute Setting: A Case Report

Amel Gorani^{1,2}, Aleid C J Ruijs²

Learning Point of the Article:

In case of traumatic articular destruction of the second MCP joint, replacing the lost articulation with a prosthesis could be a valid option.

Abstract

Introduction: Traumatic bone loss at the metacarpal phalangeal joint level can be a challenging clinical situation. Not many cases have been described in the literature for this specific articulation.

Case Report: Our patient presented with a work-related accident of his hand with loss of the metacarpophalangeal joint of the index finger. After temporary external fixation and wound closure, a prosthetic joint arthroplasty was chosen to allow a reconstruction of his lost joint.

Conclusion: After traumatic articular bone destruction in the hand, there are several possibilities to reflect on. Taking into consideration the patient's characteristics and the degree of bone loss, implanting a prosthesis can be a safe option with acceptable results.

Keywords: Metacarpophalangeal joint, bone loss, prosthesis, MCPJ arthroplasty.

Introduction

Metacarpophalangeal (MCP) joint arthroplasty is a promising and successful technique described for the treatment of post-traumatic metacarpophalangeal joint (MCPJ) arthritis and rheumatoid arthritis. However, this technique could also be considered a valuable treatment option in the setting of acute MCPJ trauma with bone loss. Therefore, we would like to present a case report which reinforces this hypothesis.

Case Report

A 37-year-old male, worker in a production factory of billiard balls, presented a large dorsal-radial wound over the second MCPJ of the left hand. His skin was severely crushed, after a work-related trauma by a grindstone machine while the MCPJs

were flexed. On admission, the X-ray showed bone loss at the dorsal part of P1 and the metacarpal head of the index finger (Fig. 1). There were also important lesions of the second and third extensor digitorum tendons as well as the extensor indicis tendon. There was no soft-tissue loss, and the neurovascular bundles of the index finger were intact. The first stage of treatment consisted of wound debridement and saline irrigation, suture of the extensor tendons of the index and the middle finger, and stabilization by a temporary external fixator to preserve the length and alignment (Fig. 2). Two weeks later, we performed a second look to clean the wound and verified the integrity of collateral ligaments of the MCPJ. The favorable evolution of the wound allowed us to remove the external fixator and the patient started an active rehabilitation protocol with a physiotherapist.

After the initial debridement and stabilization of this injury, we

Access this article online

Website:
www.jocr.co.in

DOI:
<https://doi.org/10.13107/jocr.2023.v13.i11.4040>

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Dr. Amel Gorani



Dr. Aleid C J Ruijs

¹Department of Orthopaedic Surgery, Cliniques Universitaires Saint-LUC, Avenue Hippocrate, 1200 Brussels, Belgium,
²Department of Orthopaedic Surgery, Centre Hospitalier de Wallonie Picarde, 7500 Tournai, Belgium.

Address of Correspondence:

Dr. Aleid C J Ruijs,
Department of Orthopaedic Surgery, Centre Hospitalier de Wallonie Picarde, Avenue Delmée 9, 7500 Tournai, Belgium.
E-mail: aleidruijs@hotmail.co

Submitted: 17/08/2023; Review: 20/09/2023; Accepted: October 2023; Published: November 2023

DOI: <https://doi.org/10.13107/jocr.2023.v13.i11.4040>

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Figure 1: Initial X-rays (anteroposterior, lateral, and oblique views) showing a bone loss at the dorsal part of P1 with involvement of the metacarpal head of the index finger.

discussed the best therapeutic option for this patient. A decision was made to reconstruct the joint with a MCP prosthesis (TMPR™, MatOrtho Limited, Leatherhead, United Kingdom) using a dorsal approach (Fig. 3). This operation was performed 38 days following the initial trauma (5 weeks).

The patient returned to his job within 6 months following the procedure with the same manual work on the same machine, suitable for his abilities. At this time of follow-up, he was experiencing little pain with a slight lack of grip. Despite loss of finger length, the extension was complete and the flexion of the MCPJ was 15°.

The last follow-up was at 3 years postoperatively (Fig. 4) and the patient described occasional pain rated 4/10 on the Visual Analog Scale (EVA), and 5/10 during heavy activities. The QuickDASH score was 29 (40.91%), and the Patient-Rated Wrist Evaluation Score was 56/150. He scored 90% on the SF-36 physical functioning. X-rays validate the satisfactory stability and position of the implant.

Discussion

Traumatic bone loss at the MCP joint is a serious injury, leading in general to a loss of function. Multiple strategies and salvage procedures can be explored to achieve, in acute or delayed settings of trauma, the best functional outcome for the patient with minimal sequels. In most cases, the initial treatment is emergency stabilization by wires or a temporary external fixator. Pomares et al. [1] described an atypical case of a patient treated, in the first step of a two-stage protocol, by an articular

spacer designed for MCP comminuted joint fractures, with the fragmentation of the 2nd metacarpal head, before considering a reconstruction of the MCPJ. For our patient, this short-term solution was limited by the large bone loss at the dorsal part of the first phalanx and proved to be difficult to get joint congruency. Regarding the other treatment options sustaining the early mobilization of the injured MCPJ, we find in the literature non-prosthetic arthroplasties such as soft-tissue interposition, especially the use of the volar plate described by Tupper [2], or costal cartilage grafting presented by Zappaterra et al. [3]. These interventions were not suggested in the emergency.

The implant arthroplasty, popularized by Swanson's silicone implants, was used as a well-founded technique in the reconstruction of post-traumatic arthritis and rheumatoid arthritis of MCP and PIP joints, to such an extent that these successful implants were used in primary intention with or without bone grafting in complex traumatic joint fractures with bone defect [4, 5, 6]. After long-term assessment, the literature raised concerns about the high risk of implant fractures, late failure, delayed infections, lack of stability, and loss of strength, leading to loss of function. These complications might be similar to new surface replacement arthroplasties developed recently. However, in the last decade, a few scientific articles have been published with poor follow-up concerning the treatment by MCPJ prosthetic arthroplasty in the acute setting of trauma.

Pomares and Jager [7] described their experience in the management of MCPJ destruction with emergency silicone

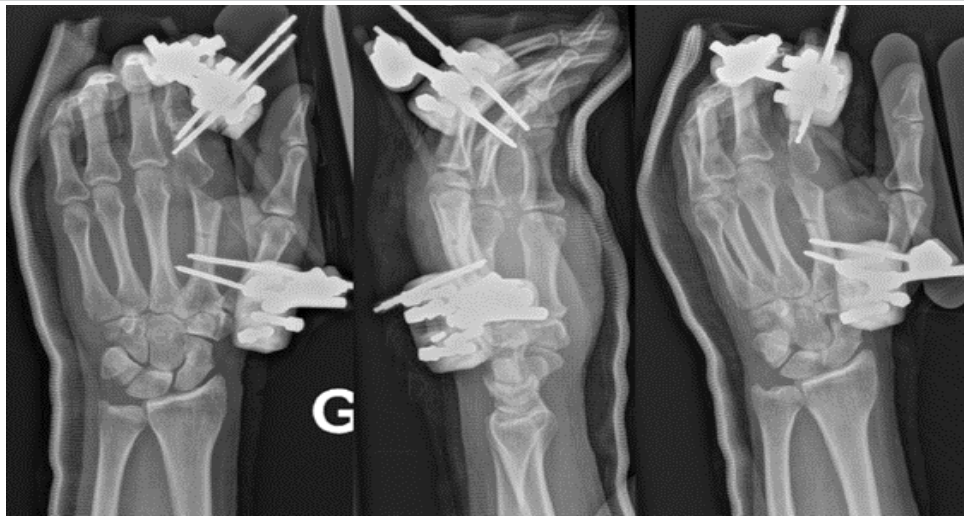


Figure 2: Post-operative X-ray images after surgical stabilization by temporary external fixator.

implant arthroplasty in association with grafting of the metacarpal bone in a patient victim of trauma by a circular saw. Results in ROM 8 months after surgery showed 50° of passive and active MCPJ flexion and complete extension. Houdek et al. [8] reported the outcome of 10 pyrocarbon MCPJ implants (6 hemiarthroplasties, 4 total joint replacements) performed within 24 h in seven patients for open MCPJ injuries resulting in soft tissue and bone defects. The mean total arc of motion for MCP was 56° (30°–70°). No authors listed mentioned instability after treatment.

The idea of maintaining a rapid mobilization and preserving a good range of motion using implants for MCPJs in single-stage reconstruction seems to be an alternative treatment option,

recommended in open trauma wounds with minimal contamination [8]. The other advantages of prosthetic joint replacement are avoiding fusion and authorizing further reconstructions or revisions in the situation of failure.

MCPJ arthrodesis stands for another treatment option in conditions of non-salvageable reconstruction joint or associated tissues. Many techniques have been described. This procedure is generally indicated in higher demand and young patients with MCPJ instability. The goal is to

provide a stable and painless union. However, joint arthrodesis results in loss of joint motion, limitation, and impairment of hand function, possible non-union with bone shortening, and hardware failure.

In the treatment of severely traumatized joints, we can also retain an essential practice with vascular autogenous joint transfer, especially the use of the second toe. Dautel [9] recommends this MCPJ reconstruction in children and young adults with dominant finger joints and high functional demands, aiming to restore ROM and growing capacities for long-running outcomes. Their performance in 11 cases of MCPJ destruction after trauma showed a mean amplitude of 60° of



Figure 3: Post-operative X-ray images after reconstruction of the joint with MCP prosthesis.

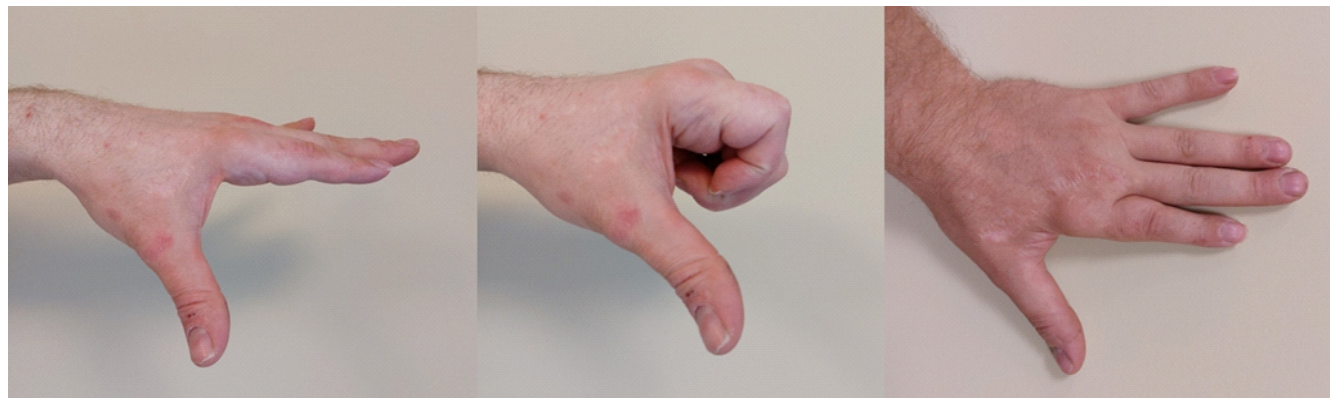


Figure 4: Clinical photos at 3 years of follow-up. Index in extension, flexion, and dorsal view.

active ROM (35° – 80°) at 50 months of mean follow-up, slightly inferior or similar to the results pulled off by implant arthroplasty in terms of final ROM. Taking this into consideration, this surgical solution remains suitable in cases when fusion and arthroplasty are contraindicated. Our patient refused this intervention.

Large defects around MCPJ involving bone, tendons, and soft tissues, after tumor resection or trauma, can also be managed by osteoarticular allograft replacement, which is still a current alternative to prosthetic implantation. The benefit of this technique is restoring at the same time digital length, bone stock, tendon, and soft-tissue integrity. Compared to autogenous joint transfer, banked allograft joints present the advantage of the absence of donor site defect with the corresponding arc of flexion in terms of ROM [10]. In case of complications resulting from this highly demanding surgical technique and possible infection, leading to failed treatment, amputation, or arthrodesis could become a salvageable treatment option [11].

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

Conclusion

Although amputation seems to be an extreme measure, this solution should be conceived and performed if the injuries occur in the proximal segment of the digit, when there is a combined sensory deficit, and when endless attempts are done to restore normal anatomy but do not meet the expected function. This operation is generally carried out as a secondary procedure, before warning the patient about the development of dysesthesia, impairment, or loss of hand force.

Clinical Message

Our satisfactory results show that in patients presenting MCPJ trauma with bone loss, prosthetic arthroplasty should be considered in the acute setting among many alternative strategies and salvage procedures to preserve painless immediate mobilization and provide the best functional outcome.

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Conflict of Interest: Nil

Source of Support: Nil

Consent: The authors confirm that informed consent was obtained from the patient for publication of this case report

How to Cite this Article

Gorani A, Ruijs ACJ. Metacarpal Joint Arthroplasty in the Acute Setting: A Case Report. *Journal of Orthopaedic Case Reports* 2023 November;13(11): 147-151.