

Dynamic External Fixation Using Suzuki Frame for Intra-articular Middle Phalanx Base Fracture with Dorsal Subluxation: A Case Report

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Learning Point of the Article:

Suzuki frame fixation provides a minimally invasive, joint-sparing solution for complex intra-articular phalangeal fractures, enabling early mobilization with satisfactory short- and long-term functional outcomes when combined with structured rehabilitation and standardized evaluation.

Abstract

Introduction: Injuries involving the base of the middle phalanx with intra-articular extension and dorsal subluxation are challenging to manage, particularly when joint congruity and motion preservation are critical. This case report demonstrates the use of the Suzuki frame for dynamic external fixation in such a scenario and discusses broader clinical considerations.

Case Report: A 37-year-old male sustained an intra-articular middle phalanx base fracture with dorsal subluxation of the left index finger during a cricket injury. Examination showed swelling, tenderness, and a flexion deformity. Radiographs confirmed a comminuted volar lip fracture. Under fluoroscopic guidance, a Suzuki frame was applied using three K-wires and rubber band traction. Advanced imaging was not deemed necessary for acute management. Early active motion was initiated post-operatively, followed by a structured hand therapy protocol. At 6 months, radiological union, >90% range of motion, minimal pain, and return to function were achieved.

Conclusion: The Suzuki frame offers a motion-preserving and cost-effective technique for complex phalangeal injuries. Standardized functional outcome measures, complication tracking, and long-term follow-up are essential to support its broader adoption.

Keywords: Suzuki frame, phalanx fracture, dynamic external fixation, dorsal subluxation, hand trauma, functional outcome, rehabilitation protocol.

Introduction

Fractures involving the base of the middle phalanx with proximal interphalangeal (PIP) joint subluxation represent complex intra-articular injuries that, if improperly managed, can lead to stiffness, joint incongruity, and functional impairment. These injuries typically involve the volar lip of the middle phalanx, resulting in dorsal subluxation due to extensor pull and loss of volar buttress [1].

Conventional treatments, including K-wire fixation, volar plate open reduction and internal fixation (ORIF), and static external fixators, are associated with varying degrees of post-operative stiffness and prolonged immobilization [2]. The Suzuki frame, described in 1994, uses dynamic distraction through skeletal fixation to maintain alignment while allowing early joint motion [3]. Although promising, there is a lack of high-quality comparative data against established methods. This report presents a case treated with the Suzuki frame and highlights

Author's Photo Gallery



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Figure 1: Pre-operative X-ray on lateral view showing fracture at the base of the middle phalanx with dorsal subluxation and intra-articular extension.

technical considerations, rehabilitation, and the need for standardized evaluation.

Case Report

A 37-year-old right-handed male presented with pain, swelling, and deformity of the left index finger after a cricket injury.

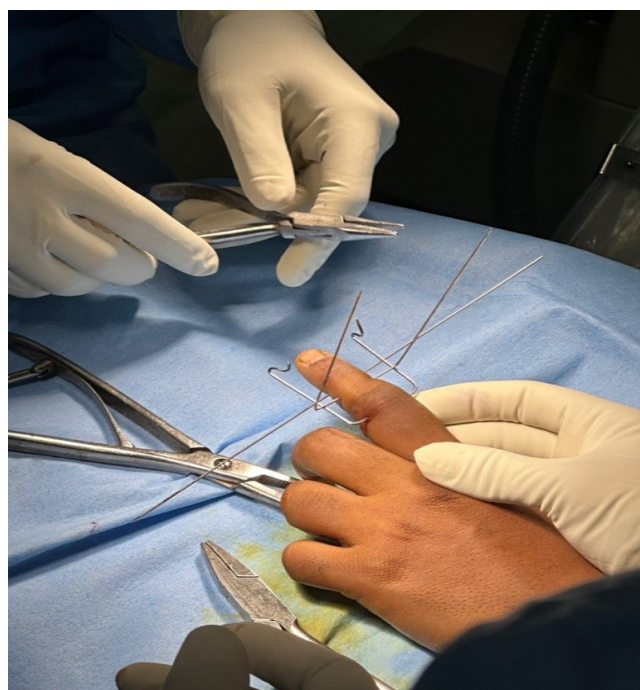


Figure 2: Intra-operative image showing the Suzuki frame construct over the left index finger.

Physical examination showed diffuse swelling, flexion deformity at the PIP joint, and tenderness (Fig. 1). No neurovascular deficits were identified.

Radiographs revealed a comminuted fracture at the base of the middle phalanx with dorsal subluxation. The injury was treated with a Suzuki frame comprising the following:

- 1.2 mm axial traction pin through the proximal phalanx head
- 1 mm hook pin through the distal middle phalanx
- 1.2 mm reduction pin dorsal to the fracture site.

Sterile intravenous tubing was used to provide adjustable dynamic tension. Intraoperative fluoroscopy confirmed alignment. A post-operative structured hand therapy protocol was initiated under physiotherapy guidance, including passive and active range-of-motion exercises starting within the 1st week (Fig. 2-4).

Follow-up at 6 weeks showed radiographic healing and maintained joint congruity (Fig. 5). By 3 months, the patient had regained >90% of active PIP motion. At 6 months, radiographs confirmed complete union. The patient reported minimal pain on the Visual Analog Scale (VAS) (VAS = 1/10), high satisfaction, and resumed work by the 8th week. Functional recovery was assessed using the total active motion score, with near-normal values [4] (Fig. 6-8).

Discussion

The Suzuki frame permits dynamic stabilization with early mobilization, reducing the risk of joint contracture seen in static fixation. By preserving joint motion, it supports cartilage healing and facilitates better long-term outcomes [5].

Compared to ORIF, K-wire fixation, or mini external fixators, it is minimally invasive and requires fewer surgical instruments [6]. Technical considerations, such as accurate pin placement, tension calibration, and consistent follow-up are critical for

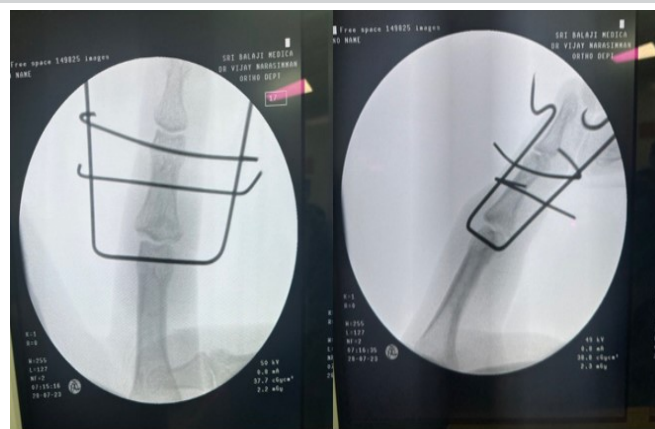


Figure 3: Intra-operative C-arm image of left index finger in anteroposterior and oblique views.



Figure 4: Immediate post-operative clinical image of the left hand with the Suzuki frame in place.



Figure 5: Immediate post-operative X-ray of left hand in Anteroposterior, oblique, and lateral views.

successful outcomes [7]. Rehabilitation plays a pivotal role and must be tailored to ensure joint mobility and prevent stiffness [8].

While the technique has shown success in this case, it should be noted that a single case lacks statistical power. The absence of a control group, limited follow-up, and reliance on radiography without advanced imaging are notable limitations. Potential complications, including pin site infection, extensor tendon irritation, and wire migration, must be anticipated and managed with proper technique and patient education [9]. Comparative cost-analysis data were not collected, although the frame's simplicity suggests resource efficiency. Future investigations

should include validated outcome scores, longer follow-up, and cost-benefit analyses [10].

Conclusion

The Suzuki frame provides a viable option for intra-articular phalanx fractures with dorsal subluxation, combining simplicity, cost-efficiency, and functional preservation. However, larger comparative studies using validated outcome tools and longer follow-up are needed to establish its efficacy over standard techniques.



Figure 6: 6-week post-operative X-ray showing progressing union in anteroposterior and oblique views.



Figure 7: 6-week post-operative clinical image showing good joint alignment and healing.



Figure 8: 3-month post-operative clinical photo following Suzuki frame removal.

Clinical Message

The Suzuki frame enables dynamic and stable fixation for complex finger fractures, ensuring early joint mobilization and good recovery. Successful outcomes depend on meticulous technique, structured rehabilitation, and patient compliance, and should be measured using objective scoring systems.

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

References

- Hastings H 2nd, Carroll C 4th. Treatment of intra-articular fractures of the phalanges. *Hand Clin* 1988;4:537-52.
- Stern PJ, Wieser MJ, Reilly DG. Complications of plate fixation in the hand skeleton. *Clin Orthop Relat Res* 1987;214:59-65.
- Suzuki Y, Matsunaga T, Kamisuru T, et al. Dynamic external finger fixator for fracture dislocations of the proximal interphalangeal joint. *J Hand Surg Am* 1994;19:604-7.
- Freiberg A, Sugi M. Dynamic external fixation for unstable fracture-dislocations of the PIP joint. *J Hand Surg Am* 1996;21:1066-73.
- Stern PJ, Wiesler ER. Complications of fixation of fractures and dislocations in the hand. *Clin Orthop Relat Res* 1987;214:59-67.
- Freiberg A. External fixation for proximal interphalangeal joint injuries. *Hand Clin* 1994;10:187-200.
- Pun WK, Chow SP. Treatment of intra-articular fractures of the phalanges. *J Hand Surg Br* 1986;11:43-7.
- Strauch B, De Moura W. External fixation of proximal interphalangeal joint fracture dislocations. *Hand Clin* 2006;22:389-403.
- Jupiter JB, Belsky MR. Fractures and dislocations of the hand. In: Browner BD, Jupiter JB, Levine AM, Trafton PG, editors. *Skeletal Trauma*. 2nd ed. Philadelphia, PA: WB Saunders; 1998. p. 995-1087.
- Ruland RT, Hogan CJ, Cannon DL, Slade JF. Use of dynamic distraction external fixation for unstable fracture-dislocations of the proximal interphalangeal joint. *J Hand Surg Am* 2008;33:19-25.

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