

Intra-articular Fracture at the Base of the Proximal Phalanx in the Index Finger Following a Punching Mechanism in a Patient with an Ipsilateral Ulnar Claw Deformity: A Case Report

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Learning Point of the Article:

Minimally displaced proximal phalanx fractures can be easily missed on imaging and require thorough review based on history, physical exam findings, and awareness of how ulnar claw mechanics can affect the fracture pattern to ensure early intervention to prevent collapse.

Abstract

Introduction: Altercations involving punching forces constitute 18.5% of all hand injuries. Intra-articular proximal phalanx base fractures of the index finger only account for 0.5% of all hand fractures. There is a paucity of ulnar claw deformities discussed in the literature, likely because ulnar neuropathies rarely remain untreated long enough to progress to deformity. We present the first reported case of a chronic ulnar claw deformity leading to an uncommon finger fracture pattern through an altered punching mechanism.

Case Report: A 62-year-old right-hand dominant male who presented to the emergency department for a behavioral health examination was found to have an intra-articular fracture at the base of the proximal phalanx in the left index finger. This occurred secondary to an altered punching mechanism influenced by an existing ulnar claw deformity. Radiographs of the left hand revealed a simple, non-angulated, and minimally displaced oblique fracture at the base of the proximal phalanx. Diffuse edema and ecchymosis of the index finger and gross hypothenar, intrinsic, and adductor pollicis muscle atrophy were observed. A single source of ulnar clawing could not be elicited on the clinical examination alone. Management involving non-operative treatment with buddy-tape and non-weight bearing for 2 weeks was instituted. The patient did not follow-up with orthopedics for repeat evaluation.

Conclusion: This case demonstrates a unique fracture that likely occurred due to altered punching biomechanics from an ulnar claw deformity. The authors recommend that clinicians use their best judgment when comparing clinical findings to seemingly benign imaging studies. Early immobilization is crucial to prevent collapse and surgical intervention of intra-articular phalangeal fractures.

Keywords: Phalangeal fracture, ulnar neuropathy, finger trauma, non-operative.

Introduction

Hand fractures are among the most common fractures to present to the ED [1]. These fractures may result in debilitating traumatic arthritis, deformity, and loss of function [1, 2]. Approximately 18.5% of all hand injuries are due to a punching mechanism. The small finger's ray is the most commonly fractured, accounting for

51% of all hand fractures. One of the least commonly fractured rays belongs to the index finger (10%). Furthermore, it is estimated that fractures to the base of the index finger's proximal phalanx account for only 1.3% of all hand fractures and 4.6% of all index finger fractures. Although rare, intra-articular hand fractures require surgical fixation 42% more often than extra-

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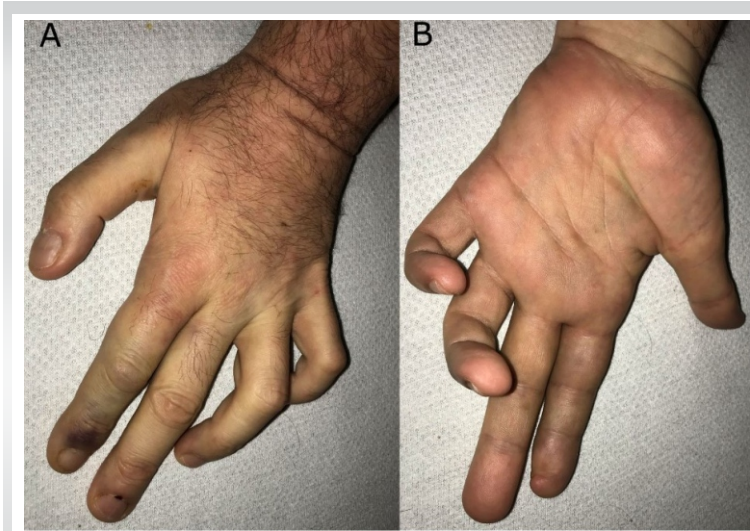


Figure 1: Physical examination findings of the left hand 1 day after hospital admission. (a) Dorsal aspect of the left hand demonstrating clawing of the ring and small fingers. (b) Volar aspect of the left hand. Note muscle wasting on the hypothenar eminence, adductor pollicis, and intrinsic.

articular fractures[2].

Rarely, ulnar neuropathy may lead to an ulnar claw deformity. Ulnar clawing is defined as hyperextension of the ring and small finger metacarpophalangeal joints (MCPJs) with resultant flexion of those fingers' interphalangeal joints (IPJs). Chronic ulnar neuropathy causes clawing due to atrophy of the ulnar two intrinsic muscles, resulting in loss of MCPJ flexion and subsequent long-term volar plate and extensor hood lengthening[3]. Although rare, ulnar clawing can cause functional impairment, including loss of grip and pinch strength as well as finger range of motion[4]. Due to this deformity, altered gripping and subsequent punching biomechanics are likely and may predispose patients to rare hand injuries. In this case report, we present the first patient to be documented with a left-sided ulnar claw deformity and concomitant ipsilateral index finger intra-articular fracture at the base of the proximal phalanx secondary to a punching mechanism.

Case Presentation

A 62-year-old right-hand dominant Caucasian male presented to the emergency department (ED) for a behavioral health examination. His chief complaint was increased depression with suicidal ideation, for which he self-medicated with alcohol abuse. He also reported left index finger pain, edema, and ecchymosis onset 2 days prior, after a physical altercation. At that time, he had punched someone in the head before finger symptom onset. Pertinent medical history reported by the patient included hypothyroidism, bipolar disorder,

degenerative disk disease, cervical arthritis, cervical stenosis diagnosed 30 years prior, and untreated left-sided ulnar neuropathy. He had not been followed by an orthopedic surgeon for his cervical stenosis or ulnar neuropathy. He reported associated left-sided hand deformity, grip and elbow extension weakness, and sensory disturbances. There was no pertinent past surgical history to report. Pertinent social history included substance abuse and one pack per day smoking history of unspecified duration. After the initial presentation in the ED, he was admitted to psychiatry for inpatient care. The orthopedic team was consulted the following day.

A physical examination of the patient's left upper extremity revealed ring and small finger MCPJ hyperextension with proximal IPJ and distal IPJ flexion, consistent with ulnar claw deformity (Fig. 1). Hypothenar, intrinsic, and adductor pollicis atrophy were grossly apparent. The ipsilateral index finger was diffusely edematous with ecchymosis present along the ulnar aspect of the digit from the MCPJ to the distal phalanx. The images in Fig. 1 were

taken 1 day after the initial orthopedic examination (5 days after the primary injury) and demonstrate substantially less edema and ecchymosis than were previously appreciated. A tremor was noted in the patient's bilateral upper extremities, secondary to suspected alcohol withdrawal. A previously healed laceration over the ulnar aspect of the index finger's distal phalanx was noted. When questioned about the laceration, the patient mentioned that it was due to a table saw injury many years prior. No acute laceration, erythema, or other signs of impending skin breakdown were present about the hand. Sensation to light touch was altered over the patient's small finger, ulnar aspect of the ring finger, and along the anteroulnar aspect of the forearm, but otherwise intact in the C5–C7 dermatomal distributions. Wrist tenodesis was intact for all digits. The patient was able to actively extend his small and ring finger IPJs with some effort, but the deformity returned with relaxation. Left-sided finger adduction strength was rated 1/5 and elbow extension 4/5. No motor deficits were noted in the right upper extremity. The left index finger's range of motion was limited by pain, but he was able to flex and extend the MCPJ, PIPJ, and DIPJ. The patient's index finger was not noted to be malrotated when examined in as much flexion as possible. Left anterior interosseous and posterior interosseous nerves were intact. Tinel's test was positive over the left cubital tunnel with reproduction of pain and paresthesias into the ulnar aspect of the forearm, hand, small finger, and ring finger. Spurling and reverse spurling tests were positive with the generation of neck pain and paresthesias that radiated into the left posterior arm. The ankle clonus test was negative. Bilateral radial pulses were 2+ with brisk capillary

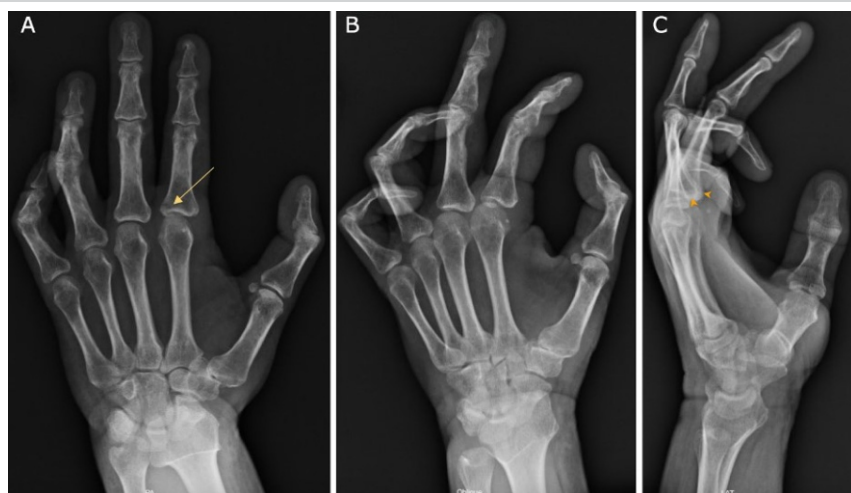


Figure 2: X-rays of the left hand obtained 1 day after hospital admission. (a) Posteroanterior X-ray of the left hand demonstrating an intra-articular, non-displaced fracture on the index finger at the base of the proximal phalanx (arrow). Previously healed distal radius fracture is also present. (b) Oblique x-ray of the left hand. Note the fracture line cannot be visualized on this view. (c) Lateral x-ray of the left hand. Note the fracture line is barely visible on this view (arrowheads).

refill.

Before orthopedic consultation, the patient was sent for plain radiography of the left hand (Fig. 2); three views (posteroanterior, lateral, and oblique) were obtained and initially read as negative for acute fracture by the in-house radiologist. Based on physical examination findings, suspicion of occult fracture was still high. After close inspection of the patient's imaging by the orthopedic team, a minimally displaced (approximately 1 mm) oblique fracture of the base of the index finger's proximal phalanx was identified. The fracture extended into the MCPJ and was not comminuted, nor was the digit shortened or malrotated. A healed previous distal radius fracture was also present. Based on the radiographic and physical examination findings, it was decided to treat the fracture non-operatively. The patient's index finger was buddy-taped to his long finger for additional fracture support. The patient was instructed to leave the tape in place for 2 weeks, remain non-weight bearing, and follow-up with the orthopedic clinic after this period for repeat hand X-rays. Despite instruction, the patient was seen weight-bearing light objects, such as a cup full of water and a book, throughout his inpatient stay. He also was seen not wearing his buddy tape after the first few days of treatment. Edema, ecchymosis, and pain mostly resolved during his 2-week inpatient psychiatric care. The patient failed to follow-up with orthopedics as an outpatient. The patient was contacted through phone and reported, against physician advice, he did not follow-up due to resolution of his pain.

Discussion

Intra-articular proximal phalanx fractures of the index finger are rare following a punching mechanism (approximately 0.5% of all hand fractures)[2]. The authors of this report theorize that this patient's unlikely injury was secondary to altered gripping and punching biomechanics associated with this patient's ulnar claw deformity. On reviewing the literature using the PubMed/Medline database, the authors conclude that this is the first case report of its kind to document this fracture pattern associated with a chronic ulnar claw deformity.

Due to the rare nature of this injury, it is easy to radiologically misdiagnose a minimally displaced phalangeal fracture, as demonstrated in this case. Unlike the radiographic lines of the hip, there are no universally accepted radiologic lines that exist for the phalanges.

However, Chan and Hughes described an ABC systematic approach for reading finger X-rays in the emergency setting[5]. Thus, in scenarios where clinical suspicion is high, it is worth carefully tracing the cortical outline of each phalanx on more than one view to evaluate for fracture. Future studies should evaluate means of consistent phalangeal fracture identification, such as developing a systematic approach to reading hand X-rays with a focus on the digits or identifying common radiographic lines to evaluate. Accordingly, patients with gross hand deformities or neuropathies warrant thorough physical examinations to screen for occult injury. Although not obtained in this case, if intra-articular phalangeal fractures are suspected, dedicated finger films are indicated[6].

Because the patient's past medical records were not available, the source of this patient's ulnar neuropathy was unclear. Multiple studies have indicated that ulnar neuropathy arising at the elbow is correlated with male sex, advanced age, obesity, smoking status, holding a tool in a single position, repetitive tasks, flexed sleeping posture, and pre-existing cervicobrachialgia[7, 8, 9, 10]. Many of these risk factors were present in this patient. Little information is available on the etiology and epidemiology of ulnar neuropathy originating strictly from cervicobrachial pathology. Given the patient's history and physical examination findings, the authors suspect the patient's ulnar neuropathy may have had both a cervicobrachial and cubital tunnel component. Further, diagnostic workup may include left upper extremity EMG and cervical spine magnetic resonance imaging.

Conclusions

The authors recommend that clinicians use their best judgment when comparing clinical findings to seemingly benign imaging studies. Neuropathies and gross deformities likely alter hand biomechanics and may predispose patients to atypical injury patterns.

Clinical Message

This case highlights multiple important clinical factors. First, this fracture was initially missed by the radiologist. It is important to carefully evaluate each radiograph, particularly when the history and physical examination have significant findings. This case also demonstrates a unique fracture that can occur in someone with altered punching biomechanics due to an ulnar claw. Early immobilization and weight-bearing restrictions are crucial to prevent collapse and surgical intervention. Furthermore, there is debate and minimal literature on discussing how to treat minimally displaced, intra-articular proximal phalanx fractures. This case illustrates that it can be treated with non-operative management based on stable fracture characteristics.

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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