

### Introduction

Phalangeal fractures are the most common hand fractures in pediatric populations, but some fracture patterns are less common than others.<sup>1</sup> Seymour fractures are uncommon phalangeal injuries in the pediatric population and are frequently undertreated, resulting in a high rate of complications.

Moreover, Seymour fractures are often misdiagnosed in the acute timeline and require prompt recognition and appropriate treatment to prevent complications such as infection and growth disturbances. Rask et al. found that patients who underwent delayed evaluation (>24 hours after injury) had a 90.9% infection rate compared to a 9.5% infection rate in those who received appropriate, timely treatment.<sup>2</sup>

In this single-center retrospective chart review, we explore the causes of and trends associated with Seymour fractures to evaluate the factors that influence patient outcomes and complication rates.



Figure 1: Lateral X-Ray of Seymour Fracture on 4<sup>th</sup> Finger

### Methods

A retrospective chart review was conducted of all patients under 18 years of age treated for a distal phalangeal fracture at a Level 1 pediatric trauma center between 1/1/2015 and 12/12/2023. Five reviewers independently assessed X-ray images of all patients diagnosed with phalangeal fractures during this timeframe to identify Seymour fractures.

Key variables included demographic information, duration of follow-up, and injury characteristics. The primary outcomes included treatment methods, risk factors, and incidence of complications such as soft tissue infection, mobility impairment, and osteomyelitis. Data was analyzed to identify potential relationships between the primary outcomes and fracture characteristics.

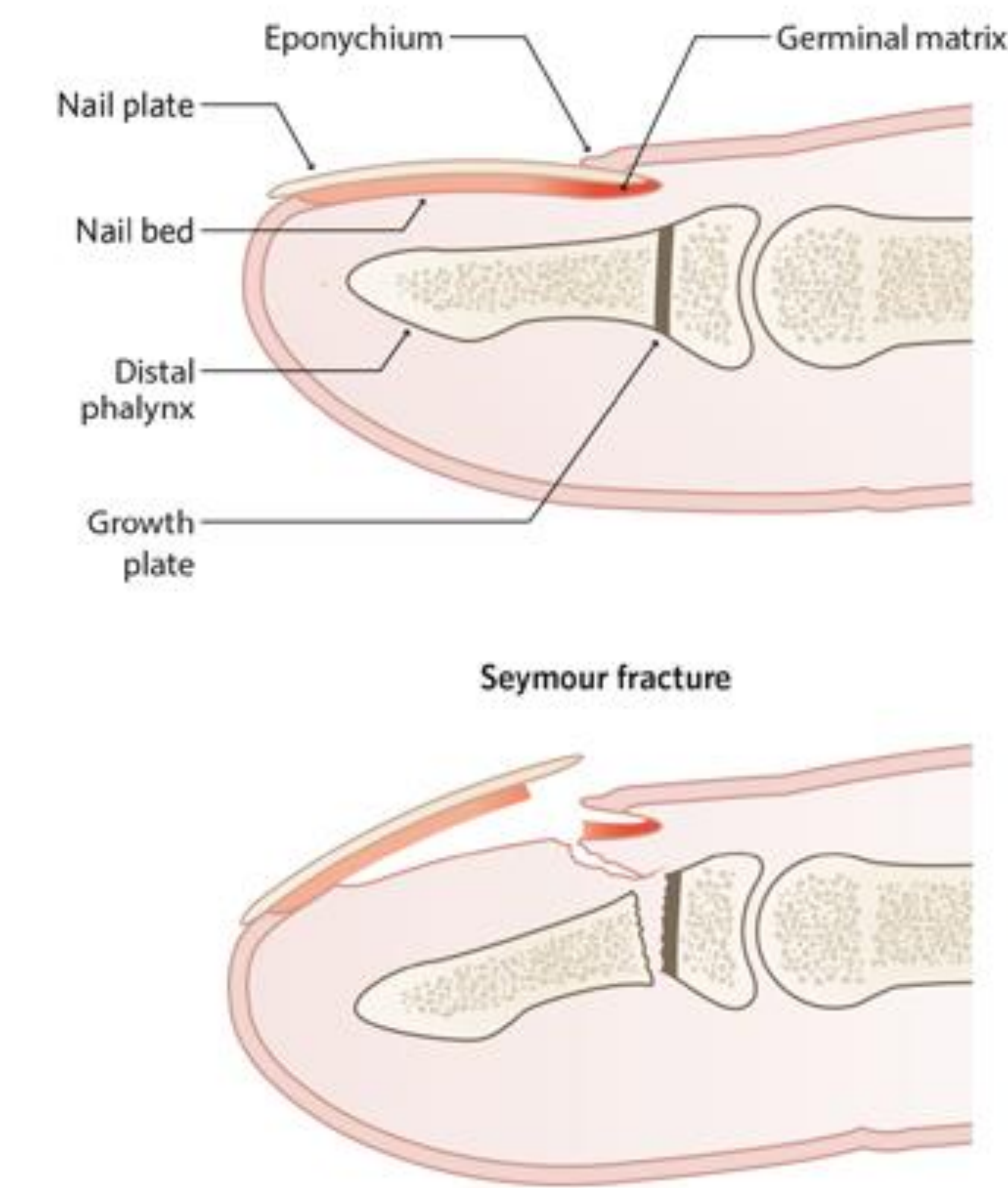


Figure 2: Anatomical illustration of a normal distal phalanx (top) and a Seymour fracture (bottom), a juxta-epiphyseal injury commonly seen in children. This fracture involves the distal physis with associated nail bed injury and is often considered an open fracture.<sup>3</sup>

### Results

Of the 846 charts reviewed, 22 subjects had confirmed Seymour fractures. Patients had a mean age of 9.8 years and 68.2% were male. Fractures were most frequently caused by crush injuries (68.2%) followed by hyperflexion (18.2%) and falls (9.2%). The right hand (59.1%) was affected more often than the left (40.9%). The ring finger accounted for the greatest proportion of injuries (40.9%), followed by the small finger (27.3%), index finger (18.2%), and middle finger (18.2%).

Demographics & Fracture Characteristics		% of total (n=22)
Gender	Males (15)	68.2%
	Females (7)	31.8%
Average age	9.8 years (range: 4-14)	-
Digit involved	Index finger (4)	18.2%
	Middle finger (4)	18.2%
	Ring finger (9)	40.9%
	Little finger (6)	27.3%
Laterality	Right (13)	59.1%
	Left (9)	40.9%
Fracture mechanism	Crush (14)	68.2%
	Hyperflexion (5)	18.2%
	Fall (3)	9.2%

- Table 1: Demographics and fracture characteristics of subjects with a Seymour fracture
- Four subjects (18.2%) suffered complications including subperiosteal abscess (1), soft tissue infection (1), nail deformity (3), deformity (1), and mobility impairment (1).
  - Subjects who experienced complications had more severe fractures in terms of angulation (38.5 degrees) than those who did not (34.1 degrees). Two-sample t-test showed no significant effect for fracture angulation ( $t(18) = -1.4909$ ,  $p = 0.1533$ ) despite those with complications displaying a higher average dorsal angulation.
  - Of the 15 subjects who underwent surgical intervention, the 12 who did not sustain complications waited an average of 3.13 days between the time of presentation to surgery, while the 3 who suffered complications waited an average of 5.05 days. Length of time to surgery and post-op complications were weakly correlated, though the relationship was not statistically significant ( $r(13) = 0.25$ ,  $p > 0.377$ ).



Figure 3: Post-op X-ray s/p open reduction and percutaneous K-wire fixation

### Conclusions

The data collected thus far suggests possible associations between fracture severity and a greater delay in treatment with complications in patients with Seymour fractures. However, the lack of statistical significance in our results ( $p > 0.05$ ), attributed to the small sample size, highlights the need for further investigation to draw more definitive conclusions.

### References

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2. Rask DMG, Wingfield J, Elrick B, et al. Seymour Fractures: A Retrospective Review of Infection Rates, Treatment and Timing of Antibiotic Administration. Pediatr Emerg Care. 2021;37(12):e1299-e1302. doi:10.1097/PEC.0000000000002009
3. 1. The Royal Children’s hospital melbourne. The Royal Children’s Hospital Melbourne. December 2020. Accessed February 28, 2025. [https://www.rch.org.au/clinicalguide/guideline\\_index/fractures/Phalangeal\\_Finger\\_Fractures/](https://www.rch.org.au/clinicalguide/guideline_index/fractures/Phalangeal_Finger_Fractures/).