

## Case Study:

# Use of the INnate™ Intramedullary (IM) Threaded Nail and InFrame™ IM Threaded Micro Nail for Multiple Comminuted Fractures of the Metacarpals and Phalanges

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## Case Presentation

The patient was a 30-year-old male who sustained a crush injury to his hand from a trailer. He presented to clinic with midshaft, oblique fractures with comminution to his third and fourth metacarpals and a comminuted fracture of his second metacarpal head. This complex fracture case also included midshaft to base, oblique fractures with comminution to his third and fourth proximal phalanges. As a manual laborer, the patient wanted a minimally invasive approach that achieved stable fixation for early range of motion (ROM) so that he could return to work quickly.

## Preop Plan

To address the metacarpal fractures, Dr. Sisco-Wise initially considered plates and screws due to their benefit of rigid fixation but wanted to avoid any complications such as tendon adhesions or potential soft tissue damage from open reduction internal fixation (ORIF) surgery. In addition, the patient had a large degloving injury, so soft tissue coverage was a concern. For the proximal phalanx fractures, she considered K-wire fixation, but due to rotational instability, she did not want to immobilize the patient for four weeks. Since the patient needed to return to work and daily activities quickly, Dr. Sisco-Wise chose IM fixation with the INnate IM Threaded Nail for the metacarpal fractures because the implants were long enough in length and wide enough in diameter to fill the canal.

This provided the necessary stable fixation that would restore alignment and length of the metacarpals. To treat the proximal phalanx fractures, she also decided to proceed with IM fixation using the InFrame IM Threaded Micro Nail because its 2.0 mm diameter design enabled her to use more than one implant to create fracture-specific constructs to achieve rigid fixation with rotational stability. Additionally, the unique dual diameter guidewire of the InFrame system facilitated the accurate and efficient placement of the fully threaded micro nail by eliminating the need for reaming and allowing the implant to be inserted over the trailing end of the guidewire with ease.

## Operative Findings and Approach

Dr. Sisco-Wise first performed longitudinal traction to restore alignment. After she reduced the fracture on the second metacarpal, she made a 2 mm incision on the dorsal third of the metacarpal head and inserted the provided guidewire across the fracture site under fluoroscopy. Dr. Sisco-Wise next measured with the INnate depth gauge to determine that a 4.5 mm x 55 mm implant was needed. She then used the cannulated reamer to drill over the guidewire and inserted the fully threaded INnate nail until the trailing end was beneath the articular surface. Distal purchase was achieved in the subchondral bone while proximal purchase was achieved at the isthmus and in the subchondral bone of the proximal end of the metacarpal. She repeated these steps for the third and fourth metacarpals but used a 3.6 mm diameter nail for the anatomically narrower fourth metacarpal. When the metacarpal fractures were stabilized, Dr. Sisco-Wise proceeded to address the phalangeal fractures.

## Preoperative



## Postoperative



Starting with the third proximal phalanx fracture, once anatomic reduction was achieved, Dr. Sisco-Wise inserted the dual diameter guidewire across the fracture site from the radial proximal cortex to the ulnar distal cortex under fluoroscopy to stabilize the fracture and accurately align the desired final implant position. Next, she used the InFrame depth gauge to determine that a 30 mm implant was needed. The larger diameter end of the guidewire was pushed distally until the smaller diameter end of the guidewire crossed the fracture site. She then inserted the cannulated InFrame micro nail until bicortical purchase was achieved at both the distal and proximal ends of the phalanx. Once she verified the final position of the first implant under fluoroscopy, Dr. Sisco-Wise used the same methodology to place a 22 mm micro nail in a different plane from the first implant, creating a “Y” construct based on the fracture pattern. She repeated these steps for the fourth proximal phalanx but used 26 mm and 14 mm implants instead. The total surgery time to provide fracture fixation for the entire hand was approximately one hour.



## Follow-up

At the two-week follow-up, the patient experienced no pain and could perform early active ROM but was advised to not lift any heavy objects as a precaution. Four weeks postoperatively, the patient was healing so well that Dr. Sisco-Wise cleared him to return to work and daily activities without any restrictions.

## Discussion

By using a minimally invasive, percutaneous approach for the entire hand, Dr. Sisco-Wise was able to avoid complications such as stiffness that typically accompany plate and screw fixation and infections often experienced with K-wire fixation. With INnate, Dr. Sisco-Wise achieved three points of fixation and IM canal fill of the metacarpal due to the implant's innovative dual diameter design, resulting in rigid fixation and early ROM. Similarly, the 2.0 mm diameter design of InFrame allowed more than one implant to fit the narrow IM canal of the proximal phalanx, while its extensive length offering enabled fracture-specific constructs customized to the patient's anatomy. Equally as important to Dr. Sisco-Wise was the unique delivery mechanism of InFrame because it eliminated the need for a dedicated reamer, which simplified the precise placement of the micro nails and reduced operating room time. The rigid fixation and early mobilization achieved by both the INnate and InFrame systems ultimately allowed her patient to minimize downtime and return to work and daily activities faster than other implants and surgical approaches.





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