

Case Study

Use of the InFrame™ Intramedullary Threaded Micro Nail for an Oblique, Articular Base Fracture with Comminution to the First Proximal Phalanx



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Dr. Niacaris is an orthopedic surgery specialist with over 19 years of experience in the medical field. He has fellowship training from the University of California (San Diego) Medical Center and the Department of Hand Surgery from Medstar Health/Union Hospital. Dr. Niacaris currently practices at Texas Health in Fort Worth and Arlington Texas.

Case Presentation

Patient was a 42-year-old male who suffered a severe blast injury to his left hand, resulting in nearly complete traumatic amputation and avulsion of his thumb. He had multiple open fractures of his hand, including an oblique, articular base fracture with comminution to his thumb proximal phalanx. A minimally invasive approach resulting in stable fixation was desired to preserve soft tissue and allow early range of motion.

Preop Plan

With severe soft tissue compromise, Dr. Niacaris typically addresses proximal phalanx fractures with K-wire fixation to minimize further soft tissue injury. However, he wanted to achieve enough bending and rotational stability for early mobilization given the extent of the injury to the hand. He chose InFrame because the 2.0 mm diameter design allowed him to create a construct that achieved rigid fixation with rotational stability in the narrow intramedullary canal of the proximal phalanx. In combination with the INnate™ intramedullary nails, InFrame expands the Acumed product portfolio to allow comprehensive and stable fixation of the patient's multiple hand fractures. As this trauma case presented in the middle of the night, Dr. Niacaris was confident the Acumed product lines would be readily available as both the INnate nail and InFrame micro nail are sterile-packed and always ready for immediate use without additional on-site processing.

Operative Findings and Approach

Dr. Niacaris initially addressed the patient's vascular and soft tissue injuries. He then used a variety of techniques to address the associated hand fractures, including stable fixation of the comminuted second and third metacarpal fractures with INnate nails. Dr. Niacaris then reduced the comminuted thumb proximal phalanx articular fracture. Once reduction was achieved, Dr. Niacaris inserted the dual diameter guide wire, from the InFrame system, 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. Similar to K-wire fixation, he then placed a second dual diameter guide wire from the proximal ulnar cortex to further stabilize the comminuted proximal articular split. Afterwards, he used the depth gauge to determine the appropriate length of the micro nail needed for the radial to ulnar fixation. The larger diameter of the guide wire was used to push the guide wire distally until the smaller diameter was across the fracture. He then inserted the cannulated InFrame micro nail until bi-cortical purchase was achieved at both the distal and proximal ends. Once he verified the final position of the first implant under fluoroscope, Dr. Niacaris then measured the indwelling guide wire for the second micro nail. Due to the small diameter of the canal, he removed the dual diameter guide wire and placed the narrow portion of the guide wire down the previous path. This created a "Y" configuration with the second, shorter implant that captured the ulnar, articular base fracture fragment at the MCP joint. He then dynamically stressed the construct under fluoroscopy to verify the expected rotational and bending strength of the construct and allow for planned early mobilization. The total surgical time for fixation of the proximal phalanx fracture with InFrame was less than ten minutes.

Preoperative



Postoperative



Follow-up

Immediately following surgery, the patient's digits were allowed to move freely with therapy due to the stability of the InFrame micro nails. At three weeks post-op, Dr. Niacaris was able to remove the thumb distal phalanx K-wire that was preventing early motion of the thumb and begin range of motion of the distal thumb ray due to the stability of the InFrame construct in the proximal phalanx. By five weeks post-op, the patient had gained near full range of motion of his digits and distal thumb. Due to the dexterity that he was able to achieve as a result of his early mobilization, the patient had resumed his work as a city building inspector.

Discussion

The INnate™ and InFrame implants allowed Dr. Niacaris to address this patient's multiple fractures at his initial surgery despite the significant associated soft tissue injury. Using Acumed's minimally invasive surgical approach, INnate and InFrame allowed immediate fracture stabilization. The 2.0 mm diameter design and extended lengths of the InFrame micro nail provide bicortical and threaded fixation, resulting in immediate rotational and bending stability for early range of motion. The unique dual diameter guide wire facilitated the accurate and efficient placement of InFrame by removing the need for reaming and allowing the implant to be inserted over the trailing end of the guide wire with ease. The INnate and InFrame systems simplified a complex case and allowed efficient fixation of this patient's multiple fractures at his index procedure. In addition, these implants are always immediately available for surgery as both the implants and instrument kits are sterile-packed and do not require further processing from the on-site facility. Dr. Niacaris concluded that fractures he would otherwise address with K-wires can be easily and efficiently fixated with InFrame and INnate in a minimally invasive fashion without further disruption of the soft tissue. In addition, the added rotational and bending stability of the InFrame and INnate constructs allow for early range of motion, minimizing postoperative stiffness and the need for prolonged rehabilitation.



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