

Case Study:

Use of INnate™ Intramedullary Threaded Nail for K-wire
Revision in a Two Metacarpal Gunshot Wound Injury



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Case Presentation

Pre-op



Patient was a 30-year-old right-hand dominant male military police officer who suffered a self-inflicted gunshot wound to his left hand. He was initially treated with incision and drainage (I&D) and closed reduction percutaneous pinning (CRPP). The K-wires were removed as planned at 6 weeks. Range of motion progression was delayed due to pins and then due to persistent radiographic lucency and persistent tenderness on exam. Pending nonunion with a bony defect was diagnosed at 8 weeks and revision surgery planned.

The gunshot wound caused oblique, base fractures with comminution to the 3rd and 4th metacarpals. Revision was required at 10 weeks with iliac crest bone graft augmentation due to the nonunion with bony defect following K-wire fixation. The nonunion with deficit lead to the recommendation of utilizing an intramedullary approach with an implant that provided more rigidity and cortical fixation for stabilization.

Pre-op Plan

K-wires were not considered due to the associated complications and plates and screws were also dismissed because a minimally invasive approach without soft tissue disruption was desired. Dr. Wilson considered headless compression screws but wanted to avoid complications such as shortening caused by compression and implants that were not appropriately sized to fit the narrow isthmus and achieve adequate endosteal purchase at both the distal and proximal ends. He decided to use an intramedullary approach with INnate because of the non-compressive and purpose-built design that maintained anatomic length and achieved canal fill, respectively, providing stable fixation for early range of motion.

Operative Findings and Approach

Dr. Wilson used a percutaneous approach to instrument the metacarpals. An additional open approach was used to bone graft the defects around the percutaneously placed INnate devices. Once reduction was achieved, he made a small stab incision on the dorsal third of each metacarpal

Post-op



head and inserted the provided guidewire across the fracture site under fluoroscope. Dr. Wilson then used the INnate depth gauge to determine that a 4.5mm diameter threaded nail was needed for both metacarpals. He again used the depth gauge to determine that a 55mm and 45mm nail was needed for the 3rd and 4th metacarpal, respectively. Dr. Wilson proceeded to use the cannulated drill to drill over the guidewire and implant the cannulated INnate nail until the trailing end was beneath the articular cartilage, to achieve distal purchase in the subchondral bone. Proximal purchase was achieved at the isthmic level within the IM canal with a metacarpal INnate instrumentation time of 20 minutes. Additional time was needed in this case for bone graft harvest, nonunion takedown, and grafting.

Follow-up

At 2 weeks post-op, a full 12 weeks from injury, the patient was finally allowed immediate active and active assisted range of motion with weight bearing restrictions of five pounds. At 4 weeks post-op, now 4 months from injury, the patient progressed to weight bearing as tolerated with full range of motion. At 6 weeks post-op, radiographic evidence of union and anatomic restoration across all fracture sites were achieved with the patient returning to full duty without any restrictions.

Discussion

Delays to anatomic and functional restoration of the metacarpals would have been avoided if an intramedullary approach with INnate was utilized in conjunction with the Masquelet technique. Unlike K-wires and headless compression screws, INnate was purposefully designed with the metacarpal anatomy in mind. The dual diameter design and robust length offering ensures cortical fixation in the isthmus, proximal and distal cortex, resulting in canal fill and stable fixation. This allows patients to minimize their downtime and return to work or daily activities faster than other implants and surgical approaches.