

Foot and Ankle Technique Guide
Proximal Inter-Phalangeal (PIP) Fusion



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HAT-TRICK[◇] Lesser Toe Repair System

Surgical Technique

Smith & Nephew does not provide medical advice and recommends that surgeons exercise their own professional judgment when determining a patient's course of treatment. This guide is presented for educational purposes only.

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Indications for Use

The Smith & Nephew HAT-TRICK PIP Fusion Implant Pack is indicated for the fixation of osteotomies and reconstruction of the lesser toes following correction procedures for hammer toe, claw toe, and mallet toe.

Contraindications

- Known hypersensitivity to the implant material. Where material sensitivity is suspected, appropriate tests should be performed and sensitivity ruled out prior to implantation.
- Surgical procedures other than those listed in the Indications for Use section.
- Pathological conditions of bone, such as cystic changes or severe osteopenia or osteoporosis, which would compromise secure implant fixation.
- Psychologically compromised patient.
- Physical conditions which would eliminate, or tend to eliminate, adequate construct support or impair healing, i.e., limitation of blood supply, infection, etc.
- Growing patients with open epiphyses.

Introduction

This technique provides a complete description of proximal inter-phalangeal (PIP) fusion using the Smith & Nephew HAT-TRICK[®] PIP Fusion System. The system consists of single use disposable implant packs containing fusion implants of various sizes, and a sterilization tray with reusable instruments.

This system may be used in conjunction with the complete HAT-TRICK Lesser Toe Repair System, which also includes the HAT-TRICK MTP Joint Repair System (Bilateral and Unilateral) and the HAT-TRICK Metatarsal Osteotomy Guide.

Standard K-wire treatment is associated with a number of complications, including swelling and pain, pin-tract infection, delayed union, delayed healing of the arthrodesis site due to lack of compression, motion and rotational concerns, and pain upon removal.¹

Benefits of the HAT-TRICK PIP Fusion System include:

- **PEEK construction:** The implant is made of PEEK (polyetheretherketone), which requires no special handling, including refrigeration or heating.
- **Radiolucent:** The implant is radiolucent for easy viewing on an X-ray
- **Controlled compression:** Surgeon can dial in the required compression.
- **Easy removal:** Allows straightforward removal of the implant with a 0.5mm bone resection (no window required).



0°



10°

Information regarding the instruments used in this procedure can be found in the “Ordering information” section at the end of this document.

Position the patient

1. Place the patient in the supine position with the foot at the end of the bed.
2. Apply a thigh tourniquet.

Proximal Inter-Phalangeal (PIP) Fusion Technique

Prior to performing this technique, consult the Instructions for Use documentation provided with the devices – including indications, contraindications, warnings, cautions, and instructions.

Exposure and joint preparation

1. Make an approximately 3cm longitudinal dorsal incision centered over the PIP joint (Figure 1).



Figure 1: Incision

2. Transect the extensor hood transversely to expose the dorsal aspect of the PIP joint.
3. Sharply transect the collateral ligaments of the proximal phalanx and the middle phalanx (Figure 2) and distract the joint.

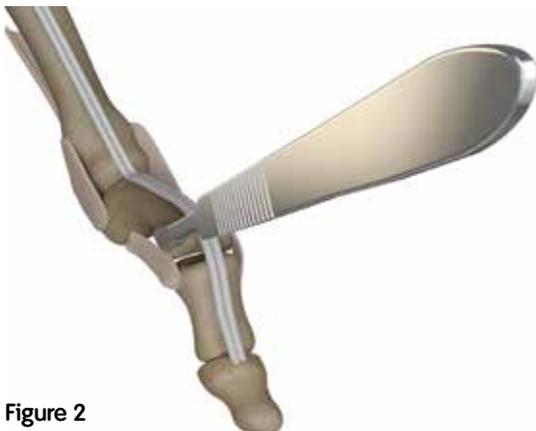


Figure 2

Prepare the pilot holes at the insertion sites

1. Use a microsagittal saw to resect the distal condyles of the proximal phalanx perpendicular to the shaft.

Note: The proximal phalanx implant is available in two angles, 0° and 10°. If the desired position of the toe is in slight flexion and the 10° implant is used, angle the cut 10 degrees in the plantar direction. Ensure that the proximal phalanx is tapped along its central axis. How much bone is removed depends upon the degree of the contracture as well as the length relationship to the neighboring toes (Figure 3).



Figure 3

2. To prepare the middle phalanx, perform a minimal resection. Preserve as much subchondral bone as possible in order to optimize implant purchase in the bone.

Note: The saw cuts to the proximal and middle phalanges must be parallel to ensure good bony apposition (Figure 4).



Figure 4

Drill the pilot holes

1. Use a 1.6mm Drill Tip Wire (REF 71101502) to drill a pilot hole along the central axis of the middle phalanx (Figure 5). Drill to a sufficient depth to accommodate the length of the implant.



Figure 5

2. Drill a pilot hole along the central axis of the proximal phalanx using a 1.6mm drill tip wire.

Note: Drill beyond the isthmus of the proximal phalanx (Figure 6).



Figure 6

Tap the middle phalanx

1. Assemble the HAT-TRICK® Modular Handle and HAT-TRICK PIP 4.0mm Middle Phalanx Tap (REF 72204362).

Note: For larger-boned patients, a 5mm middle phalanx implant (REF 72204594) and tap (REF 72204598) are available.

Note: In cases where the middle phalanx is too small for the 4.0mm tap, the proximal implant can be used as a one-piece implant. To prepare the site for a one-piece implant, pre-drill the middle phalanx with the 2.3 mm drill (REF 72204599) until the top of the laser mark band on the drill is flush with the bone. Then proceed to the “Tap the proximal phalanx implant” step on page 8.

2. Tap the middle phalanx until the top of the laser mark on the tap is flush with the bone (Figures 7 and 8).



Figure 7: Tap the middle phalanx



Figure 8: Tap until the laser mark is no longer visible

3. Record the largest tap size used.

Tap the proximal phalanx

1. Assemble the HAT-TRICK® Modular Handle (REF 72204337) and the HAT-TRICK 2.7mm Proximal Phalanx Tap (REF 72204358).
2. Tap the proximal phalanx until the top of the laser mark band on the tap is flush with the cut surface of the bone, so that the black line is no longer visible (Figures 9 and 10).



Figure 9: Tap the proximal phalanx

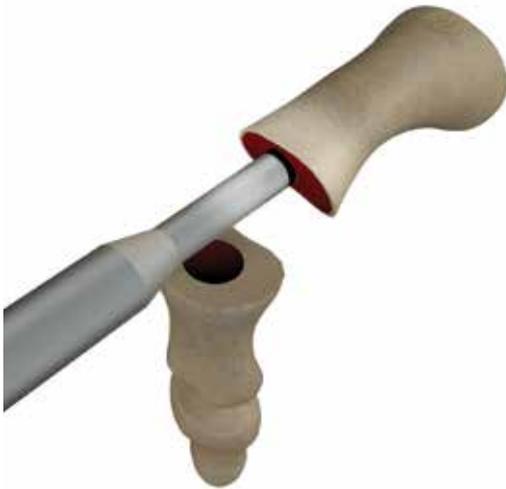


Figure 10: Tap until the laser mark is no longer visible

3. Continue to tap with progressively larger size taps (3.2mm, REF 72204359; 3.7mm, REF 72204360; and 4.2mm REF 72204361) until the resistance from the cortical bone on the isthmus of the proximal phalanx is detected.

Note: Be careful not to fracture the cortex of the phalanx.

4. Record the largest tap size used.

Insert the middle phalanx implant

1. Select the implant size pack based on the largest tap size used in the proximal and middle phalanges.

Note: The proximal phalanx implant is available in two angles: 0° and 10°. Use the appropriate implant in order to achieve the desired alignment as determined by the resection in Step 1 of the “Prepare the pilot holes” section of this technique.

Note: If using the PIP Fusion Implant as a one-piece, do not insert the middle phalanx component.

2. Assemble the HAT-TRICK® Modular Handle and the HAT-TRICK PIP Middle Phalanx Driver.
3. Attach the middle phalanx implant to the driver.
4. Insert the middle phalanx implant into the middle phalanx until the implant is flush with or slightly countersunk in the bone (Figures 11–13).



Figure 11: Assemble the middle phalanx implant to the driver

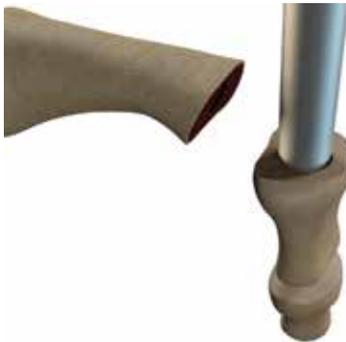


Figure 12: Insert the middle phalanx implant



Figure 13: Implant inserted flush with or slightly countersunk in the bone

Insert the proximal phalanx implant

1. Assemble the HAT-TRICK[®] Modular Handle (REF 72204337) to the appropriate angle specific HAT-TRICK Driver (0° Driver, REF 72204355; 10° Driver, REF 72204356) for proximal phalanx implants (Figure 14).



Figure 14: Attach the proximal phalanx implant to the driver

2. Insert the proximal phalanx implant into the proximal phalanx until the barbs on the top part of the implant reach the osteotomy site (Figures 15 and 16).

Note: For a 10° implant, utilize the laser mark on the 10° driver shaft to achieve the desired orientation



Figure 15: Insert the proximal phalanx implant



Figure 16: Insert the implant until the barbs on the implant reach the osteotomy site.

3. Connect and compress the proximal and middle phalanx implants to complete the fusion (Figures 17 and 18).

Note: If using the Proximal Phalanx Implants as a one piece construct, align the 2.3mm hole in the middle phalanx with the barbed post of the proximal phalanx implant and compress to complete the fusion.



Figure 17



Figure 18. Completed repair

Implant removal

In the unlikely event that the PEEK implant must be removed, use a power saw to cut through the post that connects the implant components at the osteotomy site. Loosen each component and retrieve it. If the components are rigidly fixed, core drill, and then utilize an extractor with reverse threads. Alternatively, a high-speed burr can be used to remove any remaining part of the implant.

Postoperative care*

As with any arthrodesis procedure, a bony fusion is the long-term means of bearing load. The PIP Fusion Implant is designed to hold the bones in apposition to one another during the healing process. Please follow the postoperative instructions below carefully as the PEEK fusion implant is not intended for use under tension or load-bearing conditions.

- 6 weeks: In a postop shoe, crutches, and partial weight bearing as tolerated on heel only.
- 6 to 12 weeks: No postop shoe, weight bear as tolerated with activities limited to walking only.
- >12 weeks: Return to aerobic activities (bike, pool, hiking). No jumping, turning, twisting or high impact sports.
- >16 weeks: Resume athletic activity if no pain.

* The views and opinions expressed for postoperative care are solely those of the surgeon(s) and do not reflect the views of Smith & Nephew, Inc. In no event shall Smith & Nephew, Inc. be liable for any damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or other pecuniary loss) arising out of the use of or inability to use the expressed views.

Ordering information

To order the items used in this technique, call +1 800 821 5700 in the US or contact an authorized Smith & Nephew representative.

Prior to performing this technique, consult the Instructions for Use documentation provided with individual components – including indications, contraindications, warnings, cautions and instructions.

HAT-TRICK[®] PIP Fusion System Components

Cat. No	Description	Qty
72204303	HAT-TRICK PIP Implant Set	
72204366	PIP Fusion Implant Pack, Proximal Phalanx 2.7mm + Middle Phalanx 4.0mm	1
72204367	PIP Fusion Implant Pack, Proximal Phalanx 3.2mm + Middle Phalanx 4.0mm	1
72204368	PIP Fusion Implant Pack, Proximal Phalanx 3.7mm + Middle Phalanx 4.0mm	1
72204369	PIP Fusion Implant Pack, Proximal Phalanx 4.2mm + Middle Phalanx 4.0mm	1
72204370	PIP Fusion Implant Pack, Proximal Phalanx 2.7mm, 10 deg + Middle Phalanx 4.0mm	1
72204371	PIP Fusion Implant Pack, Proximal Phalanx 3.2mm, 10 deg + Middle Phalanx 4.0mm	1
72204372	PIP Fusion Implant Pack, Proximal Phalanx 3.7mm, 10 deg + Middle Phalanx 4.0mm	1
72204373	PIP Fusion Implant Pack, Proximal Phalanx 4.2mm, 10 deg + Middle Phalanx 4.0mm	1
72204594	PIP Fusion Implant Pack, Proximal Phalanx 3.7mm + Middle Phalanx 5.0mm	1
72204595	PIP Fusion Implant Pack, Proximal Phalanx 4.2mm + Middle Phalanx 5.0mm	1
72204596	PIP Fusion Implant Pack, Proximal Phalanx 3.7mm, 10 deg + Middle Phalanx 5.0mm	1
72204597	PIP Fusion Implant Pack, Proximal Phalanx 4.2mm, 10 deg + Middle Phalanx 5.0mm	1
72204307	HAT-TRICK PIP Fusion Instrument Set	
72204355	HAT-TRICK Driver for PIP Proximal Phalanx, 0 degree	1
72204356	HAT-TRICK Driver for PIP Proximal Phalanx, 10 degree	1
72204357	HAT-TRICK Driver for PIP Middle Phalanx	1
72204337	HAT-TRICK Modular Handle	2
72204358	HAT-TRICK PIP 2.7mm Proximal Phalanx Tap	1
72204359	HAT-TRICK PIP 3.2mm Proximal Phalanx Tap	1
72204360	HAT-TRICK PIP 3.7mm Proximal Phalanx Tap	1
72204361	HAT-TRICK PIP 4.2mm Proximal Phalanx Tap	1
72204362	HAT-TRICK PIP 4.0mm Middle Phalanx Tap	1
72204598	HAT-TRICK PIP 5.0mm Middle Phalanx Tap	1
72204386	HAT-TRICK PIP Fusion Instrument Tray	1
71101502	1.6mm Drill Tip Wire	6
72204599	HAT-TRICK PIP 2.3mm Middle Phalanx Drill (disposable)	

Notes

References

1. Angiras AK, Barrett MJ, Silvester D. Smart Toe? Implant Compared with Kirschner Wire Fixation for Hammer Digit Corrective Surgery: A Review of 28 Patients. J Foot Ankle Surg 2012; 51:717-713.

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