

# PediNail™ Pediatric Femoral Nail

## SURGICAL TECHNIQUE





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## INDICATIONS

The OrthoPediatics PediNail™ System is designed for use in pediatric and small stature adult patients to address femoral shaft fractures, subtrochanteric femur fractures, ipsilateral neck/shaft fractures, prophylactic nailing of impending pathologic fractures, nonunions, malunions, and fixation of femurs that have been surgically prepared (osteotomy) for correction of deformity.

Additional indications include simple long bone fractures, severely comminuted fractures, spiral fractures, large oblique and segmental fractures, polytrauma and multiple fractures, reconstruction following tumor resection and bone grafting, supracondylar femur fractures, bone lengthening and shortening, fixation of fractures that occur in and between the proximal and distal third of the long bones being treated.

The OrthoPediatics PediNail™ System is available in 7mm, 8mm, 9mm, and 10mm diameters and lengths from 20cm to 42cm depending on the nail diameter.

Screw interlocking options are available both proximally and distally.

### Proximal Locking Options:

- The proximal locking options for the 7mm nail include a single 4.5mm screw placed from the greater trochanter to the lesser trochanter and a single 4.5mm reconstruction screw placed into the femoral neck.
- The proximal locking options for the 8mm nail include a single 4.5mm screw placed from the greater trochanter to the lesser trochanter and a single 4.5mm reconstruction screw placed into the femoral neck.
- The proximal locking options for the 9mm nail include a single 4.5mm screw placed from the greater trochanter to the lesser trochanter and a single 4.5mm reconstruction screw placed into the femoral neck. In addition, the proximal locking options for the 9mm nail include a single transverse 4.5mm screw distal to the greater/lesser and reconstruction screw.
- The proximal locking options for the 10mm nail include a single 4.5mm screw placed from the greater trochanter to the lesser trochanter and a single 4.5mm reconstruction screw placed into the femoral neck. In addition, the proximal locking options for the 10mm nail include a single transverse screw distal to the greater/lesser and reconstruction screw.

### Distal Locking Options:

- The distal locking options for the 7mm nail include a single anterior to posterior 4.0mm locking screw and two lateral to medial 4.0mm locking screws.
- The distal locking options for the 8mm nail include a single anterior to posterior 4.5mm locking screw and two lateral to medial 4.5mm locking screws.
- The distal locking options for the 9mm nail include a single anterior to posterior 4.5mm locking screw and two lateral to medial 4.5mm locking screws.
- The distal locking options for the 10mm nail include a single anterior to posterior 4.5mm locking screw and two lateral to medial 4.5mm locking screws.

**1** Note: The 4.0mm locking screw is only used for distal locking of the 7mm nail.

## PREOPERATIVE PLANNING

Effective preoperative planning allows the surgeon to predict the impact of different interventions in order to perform the correction in the most accurate and safest manner. Optimal intramedullary nail fit, landmarking for entry point, entry angle, and assessment of alignment and rotation can be evaluated through preoperative radiographic analysis. Preoperative planning also allows the surgeon to have the appropriate implants available at the time of surgery.

The objectives of preoperative planning include:

1. Determination of anticipated nail diameter and nail length.
2. Establishment of appropriate anatomic landmarks, including the greater and lesser trochanters and physes.

The overall objective of preoperative planning is to enable the surgeon to gather anatomic parameters which will allow accurate intra-operative placement of the implant.

## NAIL SIZE SELECTION

Choosing the appropriate nail diameter and length are crucial to a successful surgical procedure. When selecting the diameter of the intramedullary nail to be used, it is not necessary to fill the entire intramedullary canal to achieve a tight isthmic fit with the nail. Generally speaking, an 8mm diameter nail is sufficient for most children and adolescents. In smaller patients, a 7mm nail may be used, and in larger patients a 9mm or 10mm nail may be used.

- ❶ *Note: The 7mm and 8mm nails do not allow for proximal transverse locking bolt fixation. This should be taken into consideration when preoperatively planning.*

Choosing the length of the nail can be done intraoperatively using the nail measuring gauge. After passing the 2.7mm Ball Tipped Reaming Rod into the distal fragment, a direct measurement can be made with the Nail Measuring Guide.

Alternatively, use the OrthoPediatrics PediNail templates to estimate nail length and diameter. To estimate nail diameter, place the template on the AP or lateral x-ray of the femur and measure the diameter of the medullary canal at the isthmus.

To estimate nail length, place the template on the AP x-ray of the uninjured femur and select the appropriate nail length based on patient anatomy.

Additionally, the 2.7mm Ball Tipped Reaming Rod and the 2.0mm Guide Insertion Wire can be used to measure nail length, since they are equal in length (810mm). With either of the rods in place (gently seated in the distal femoral metaphysis), a measurement can be taken by placing the other rod adjacent to the rod inside the canal. Using a hemostat, clip the second rod (the one outside the femoral canal) at the end of the rod extending from the canal. Use the measuring gauge on the inside surface of the sterilization lid.

- ❷ *Note: When selecting nail size, consider canal diameter, fracture pattern, patient anatomy and postoperative protocol.*

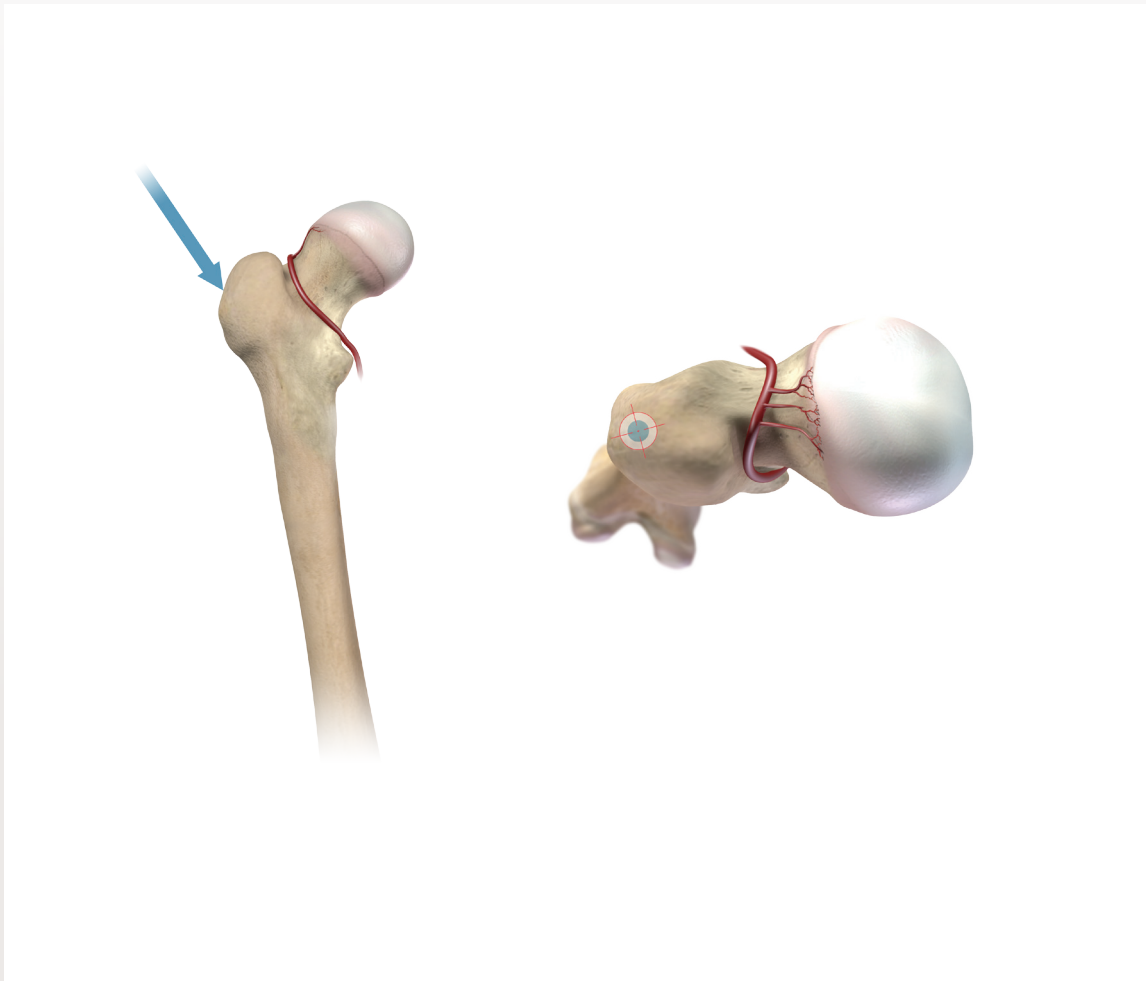
Templates are available in 115% magnification in which the image is enlarged 15% to correspond to typical radiographic magnification; however, variations in magnification levels are common.

## ENTRY POINT AND ENTRY ANGLE

The PediNail™ intramedullary nail system is designed for use with a lateral trochanteric entry point for two reasons:

1. To avoid the piriformis fossa and subsequently the blood vessels of the medial circumflex artery supplying blood to the head of the femur, thus reducing the likelihood of iatrogenic femoral head avascular necrosis.
2. To avoid tethering the trochanteric growth plate, decreasing the risk of femoral neck narrowing and hip valgus.

The 15° proximal bend allows the entry point to be approximately 1 finger breadth lateral to the tip of the greater trochanter. The entry angle is measured from the entry point to a point inferior to the lesser trochanter (Figure 1).



**FIGURE 1:** Entry point and entry angle

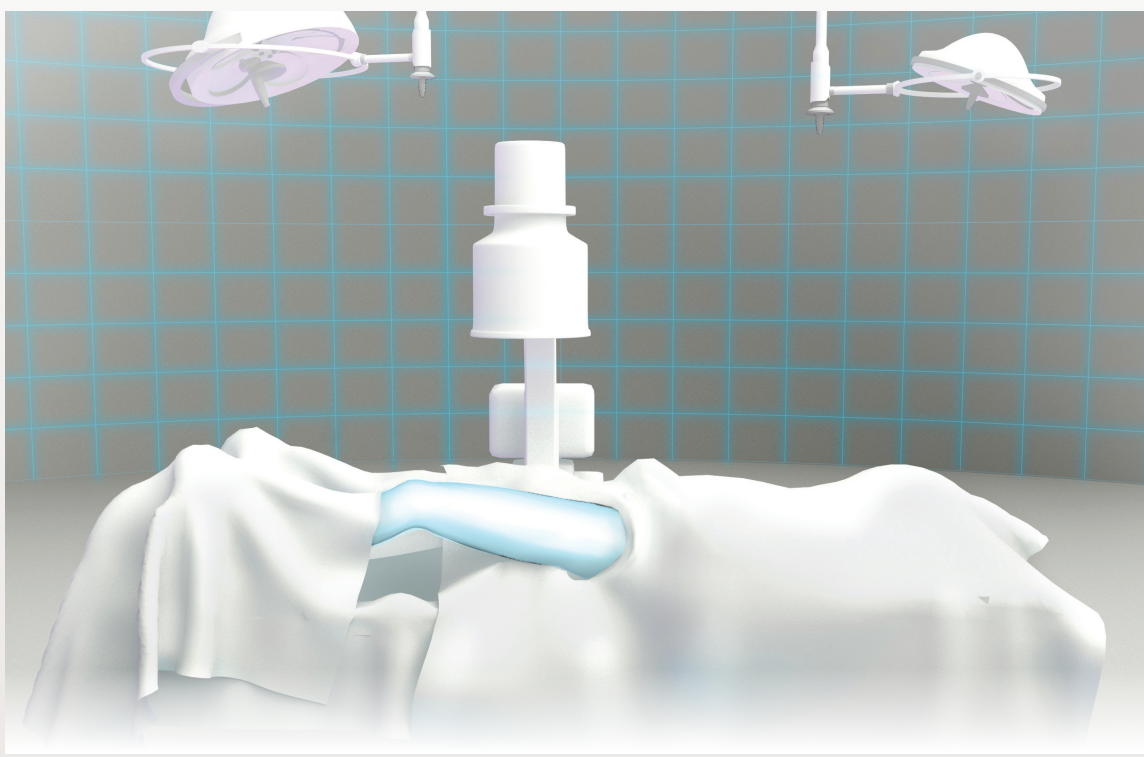


## PATIENT POSITIONING

First, place the patient on a fracture table in the supine position.

Apply traction to the affected limb using a well-padded boot. Slightly externally rotate the limb to match the proximal fragment which tends to externally rotate slightly when the patient is positioned on the fracture table. Prep and drape the lower extremity using split sheets to allow circumferential access to the thigh. Cover the image intensifier with a sterile drape to visualize the hip and femur (Figure 2).

The proximal femur can be best visualized by arcing the image intensifier so the beam is directed from posteromedial to anterolateral. This allows the surgeon to see the externally rotated proximal femur in a non-rotated AP projection.



**FIGURE 2:** Patient positioning

- 1** *Note: Alternatively, the patient may be positioned supine on a radiolucent table. The limb (or both limbs in the case of bilateral procedures) can be prepared and draped free. This facilitates simultaneous irrigation and debridement of open femur fractures, bilateral derotation osteotomy, or fixation of an ipsilateral tibial fracture.*

*In order to bring the fracture out to length, an assistant may be required to apply manual traction.*

## 1 APPROACH

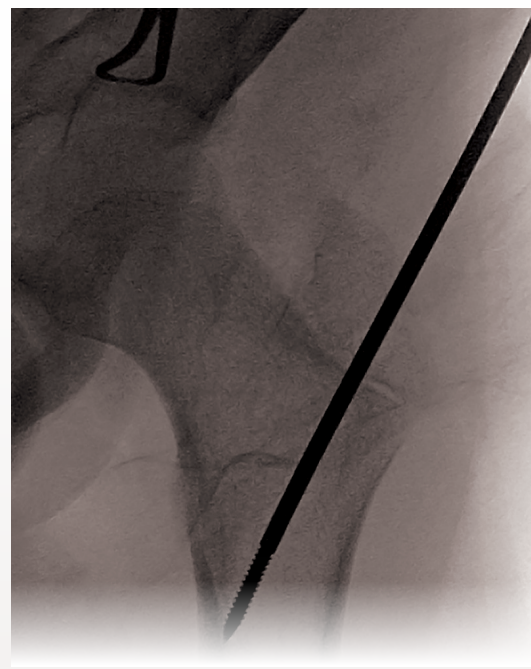
Place the 3.2mm Threaded Tipped Guide Wire percutaneously through the lateral aspect of the greater trochanter at a point approximately halfway between the tip of the trochanter and the trochanteric physis (Figure 3).

Drive the 3.2mm Threaded Tipped Guide Wire under power with a drill through the trochanteric physis and into the medullary canal up to, but not through, the medial aspect of the proximal femur at an angle inferior to the lesser trochanter.

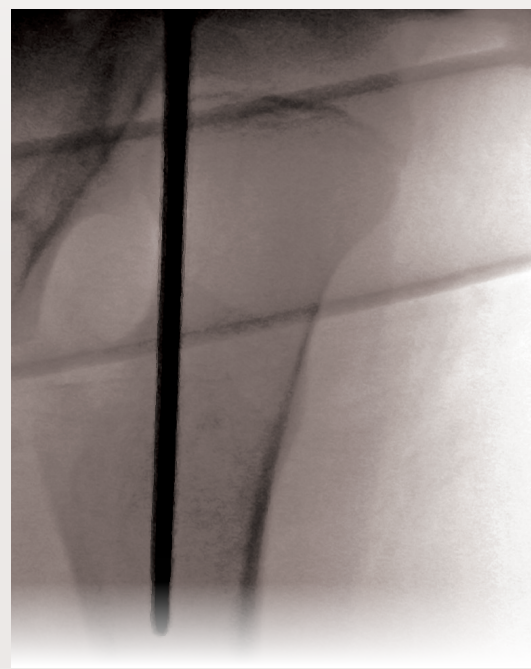
The 3.2mm Threaded Tipped Guide Wire should be 1.0-1.5cm distal to the lesser trochanter at an angle of 10-15° from the femoral shaft axis.

Check a lateral radiograph to insure that the 3.2mm Threaded Tipped Guide Wire is in the center of the femoral canal and is not inserted too shallow or too steep

- 1 *Note: Inspect pins and wires for any damage prior to use. Utilizing damaged instruments may adversely affect the outcome of the procedure.*

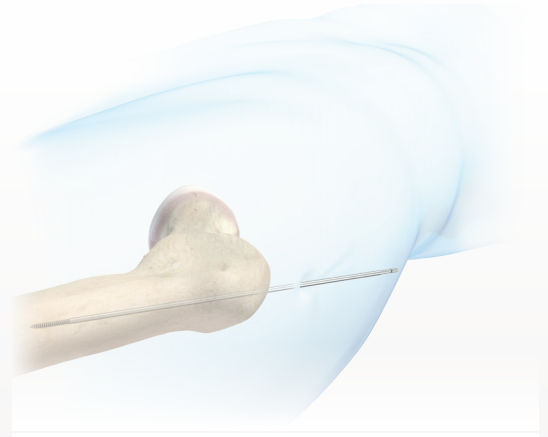


**FIGURE 3:** Insert Guide Wire into lateral aspect of greater trochanter



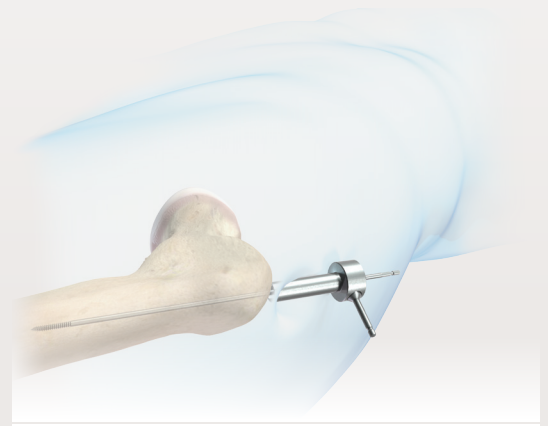
**FIGURE 4:** Lateral radiograph to ensure position in center of femoral canal

Create a 1.5cm incision proximal to the 3.2mm Threaded Tipped Guide Wire entry site, passing the scalpel adjacent to the guide wire, down to the trochanter (Figure 5).



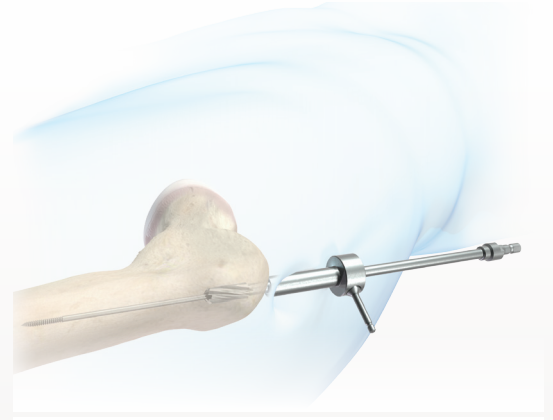
**FIGURE 5:** 1.5cm incision proximal to the 3.2mm Threaded Tipped Guide Wire entry site

Place either a 10mm or a 12mm Tissue Protector over the 3.2mm Threaded Tipped Guide Wire and into the soft tissue to protect the surrounding skin and soft tissue while using the opening reamer (Figure 6).



**FIGURE 6:** Place Tissue Protector over the 3.2mm Threaded Tipped Guide Wire and into soft tissue

Advance the 9.5mm Cannulated Entry Reamer over the 3.2mm Threaded Tipped Guide Wire through the trochanter into the femoral canal (Figures 7-9).



**FIGURE 7:** Advance 9.5mm Cannulated Entry Reamer over 3.2mm Threaded Tipped Guide Wire



**FIGURE 8:** AP radiograph to confirm placement in femoral canal and starting point

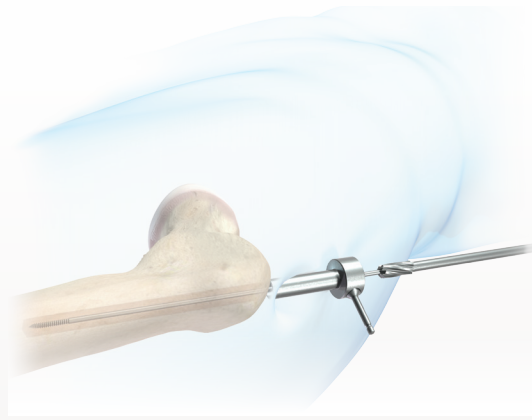
**CAUTION:**

*Do not advance the guide wire or entry reamer past the medial femoral cortex.*



**FIGURE 9:** AP radiograph to check reamer

Withdraw the 9.5mm Cannulated Entry Reamer, leaving the 3.2mm Threaded Tipped Guide Wire in place in the proximal femur (Figure 10).



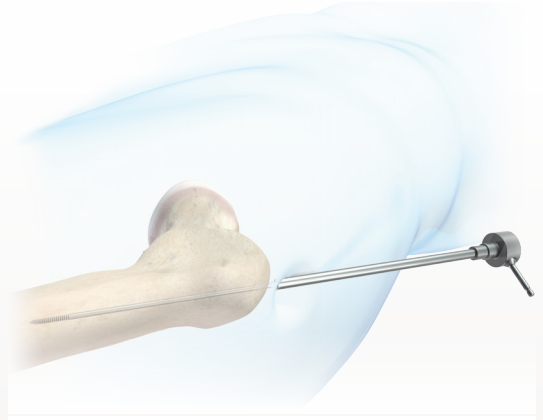
**FIGURE 10:** Withdraw 9.5mm Cannulated Entry Reamer

- 1 Note: If the 3.2mm Threaded Tipped Guide Wire appears to be lodged in the 9.5mm Cannulated Entry Reamer, use the Obturator to ensure that the Guide Wire remains in place upon removal of the reamer.
- 2 Note: Refer to Section 3: Reaming Technique (Reamer Use Guidelines).

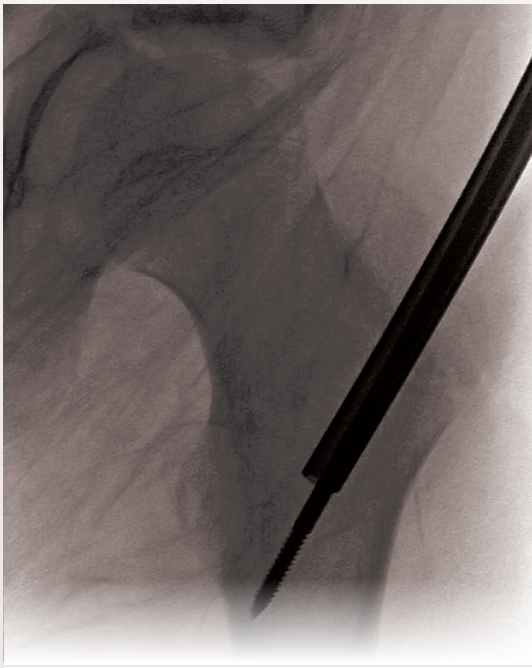


Replace the 10 or 12mm Tissue Protector with the 7mm Exchange Tube (Figure 11).

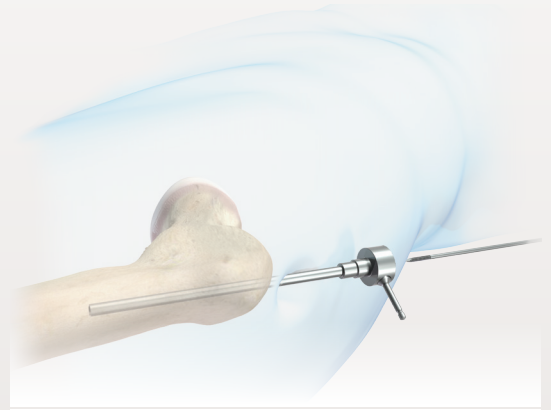
Place the 7mm Exchange Tube into the femoral canal and withdraw the 3.2mm Threaded Tipped Guide Wire (Figures 12 & 13).



**FIGURE 11:** Replace Tissue Protector with 7mm Exchange Tube

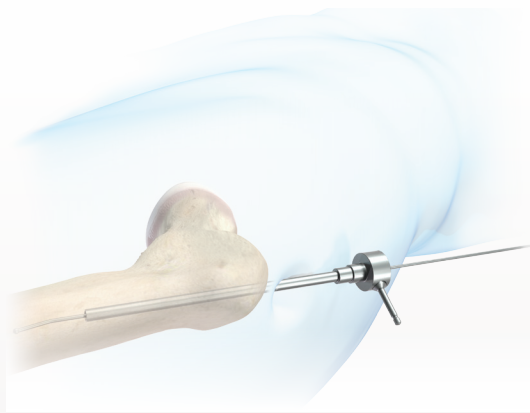


**FIGURE 12:** Verify placement of 7mm Exchange Tube



**FIGURE 13:** Leave Exchange Tube in place and withdraw the guide wire

Leaving the 7mm Exchange Tube in place, insert the 2.7mm Ball Tipped Reaming Rod (Figure 14). Check placement on radiograph (Figure 15).

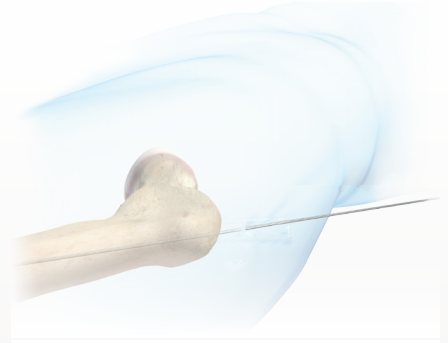


**FIGURE 14:** Insert 2.7mm Ball Tipped Reaming Rod

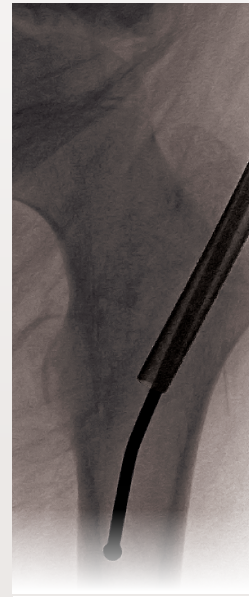


**FIGURE 15:** Check placement on radiograph

Advance the 2.7mm Ball Tipped Reaming Rod to the femur to the level of the fracture (Figure 16). Using a radiograph, verify placement of the Ball Tipped Reaming Rod (Figures 17a & 17b).



**FIGURE 16:** Pass 2.7mm Ball Tipped Reaming Rod to the level of the fracture



**FIGURE 17a:** Check for placement at the level of the fracture



**FIGURE 17b:** Check for placement at the level of the fracture



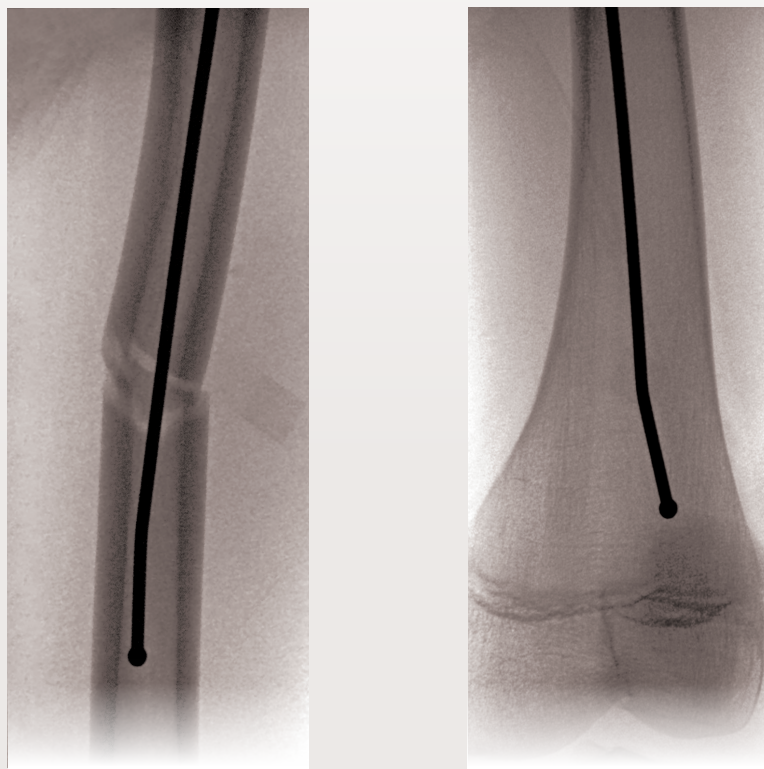
Remove the 7mm Exchange Tube and reduce the fracture. If it is difficult to pass the 2.7mm Ball Tipped Reaming Rod across the fracture site, use the Reduction Tool to assist in passing the 2.7mm Ball Tipped Reaming Rod.

After the fracture is reduced, pass the 2.7mm Ball Tipped Reaming Rod into the distal femur and impact it into the lateral femoral metaphysis to a depth of approximately 1cm proximal to the distal femoral physis (Figures 18a & 18b).

- 1 Note: Verify placement using AP and ML fluoroscopy to ensure 2.7mm Ball Tipped Reaming Rod is in the distal fragment.

**CAUTION:**

*Do not advance 2.7mm Ball Tipped Reaming Rod into physis or joint space.*



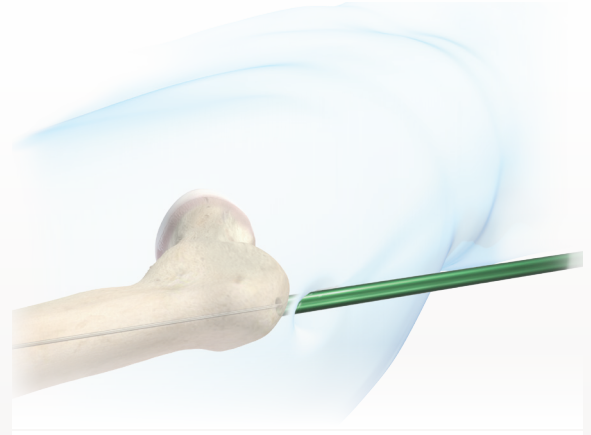
**FIGURES 18a & 18b:** Pass 2.7mm Ball Tipped Reaming Rod into the distal femur

## 2 MEASURING

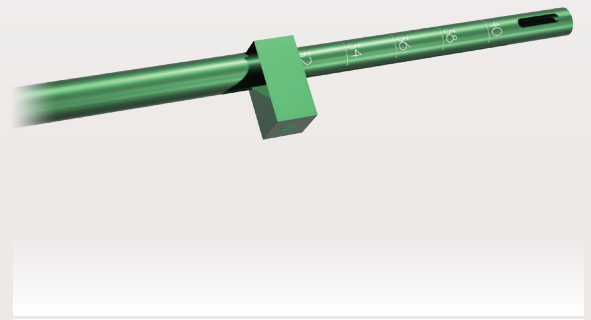
Prior to reaming, measure for the nail. When determining nail length, take care to accommodate for any distraction at the fracture site as well as the position of the 2.7mm Ball Tipped Reaming Rod or guide wire in the distal femur to avoid penetration of the distal femoral physis by the nail.

Place the Measurement Gauge over the 2.7mm Ball Tipped Reaming Rod (Figures 19 & 20).

- 1 *Note: It is advisable to verify nail length using a second measurement method (i.e. two equal length reaming rods or confirmation with nail scale, found on the inside of tray lid). If the guide wire is not visible in the window, the 42mm length nail should be selected.*



**FIGURE 19:** Place Measurement Guide over 2.7mm Ball Tipped Reaming Rod

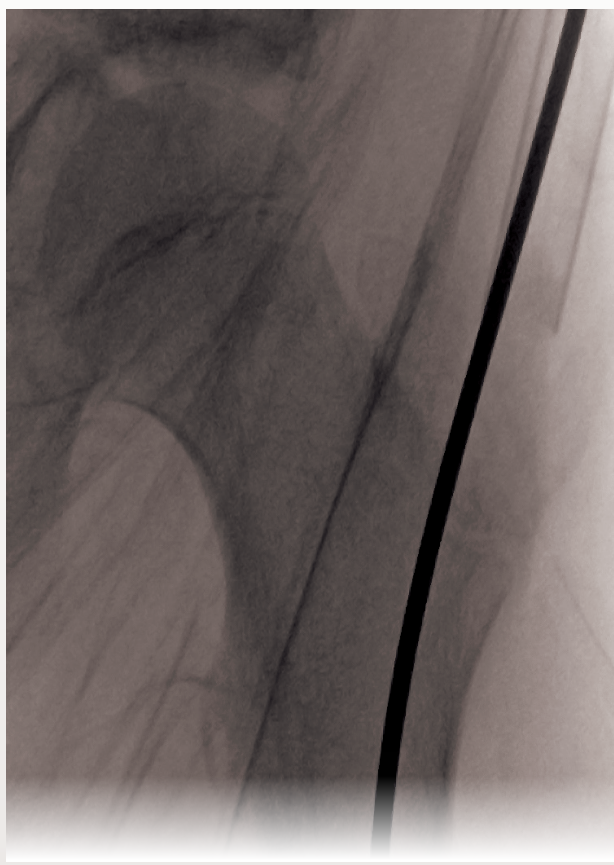


**FIGURE 20:** Measure for nail

Insert the Measurement Gauge into the reamed hole to the appropriate depth. Keep in mind that the nail will usually be countersunk approximately 5mm (Figure 21).

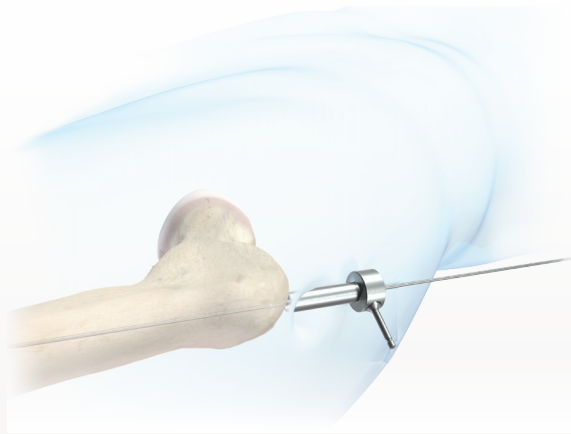
Select a potential nail. Use the desired nail length to assess the nail diameters that could be used.

<u>Nail Length</u>	<u>Nail Diameter</u>
20cm - 30cm Standard	7mm
32cm - 38cm XL	7mm
24cm - 36cm Standard	8mm
38cm - 42cm XL	8mm
28cm - 38cm Standard	9mm
40cm - 42cm XL	9mm
30cm - 42cm Standard	10mm



**FIGURE 21:** Insert Measurement Gauge into reamed hole

Protect the skin at the incision site by sliding the Soft Tissue Protector over the 2.7mm Ball Tipped Reaming Rod and passing it down into the soft tissue (Figure 22).



**FIGURE 22:** Protect skin at incision site with Soft Tissue Protector

### 3

#### REAMING TECHNIQUE (REAMER USE GUIDELINES)

For most patients, utilize the flexible shaft with detachable side cutting reamer heads from 7.5mm to 12.0mm.

Under power, advance the reamer into the femoral canal. Keep advancing the reamer the entire length of the femur in a forward motion, up and down the entire length of the femur.

**CAUTION:**

- *ALWAYS FORWARD. Use power tool in the forward setting at all times.*
- *ALWAYS ON. Do not stop the power tool.*

Using fluoroscopy, confirm that the reamer has reached the distal end of the 2.7mm Ball Tipped Reaming Rod.

- ① *Note: Frequently clean the reamer flutes to prevent clogging.*

If the reamer becomes stuck in the femoral canal, grasp the 2.7mm Ball Tipped Reaming Rod with a large needle holder or vise grip and withdraw it 1 to 2cm while attempting to advance the reamer under power. If the reamer continues to be immovable, grasp the reaming rod with a large needle holder or vise grip and using a mallet tap on the vise grip in a retrograde manner in order to remove the reamer and guide wire together.

**CAUTION:**

*Never reverse the reamer, as this could lead to reamer shaft failure.*

Switch to the detachable side cutting reamers at size 7.5mm and continue reaming to desired diameter.

- ② *Note: It is not necessary to “fill” the canal or to continue reaming until “chatter” is noted. Appropriate selection of nail diameter is not dependent upon getting a tight fit in the isthmus of the femur.*

**CAUTION:**

*Do not ream past the distal bend in the 2.7mm Reaming Rod, as this may cause the reamer to bind and/or rupture.*

**WARNING:**

*When performing a femoral osteotomy, to reduce the likelihood of pulmonary emboli, prepare the osteotomy prior to reaming or create vent holes in the femur.*

**CAUTION:**

*For 6mm, 6.5mm, 7.0mm one piece front cutting reamers:*

- *Start with the 6mm reamer and go up in 0.5mm increments.*
- *Do not use in hard cortical bone.*
- *Recommended to over-ream 1 to 1.5mm over desired implant diameter.*

Place the Exchange Tube over the 2.7mm Ball Tipped Reaming Rod and insert into the reamed femoral canal (Figure 23). Verify placement on radiograph (Figure 24).

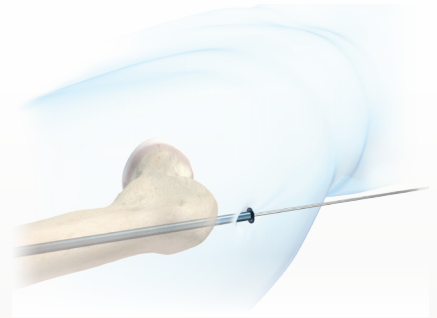
Remove the 2.7mm Ball Tipped Reaming Rod and replace with the 2.0mm Guide Insertion Wire (Figures 25a & 25b).

Remove the Exchange Tube.

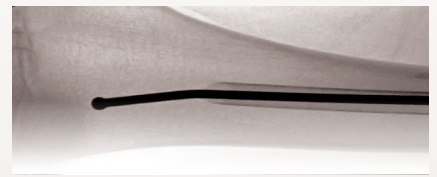
- 1 *Note: Removal of the 2.7mm Ball Tipped Reaming Rod without placement of the Exchange Tube or 2.0mm Guide Insertion Wire may result in loss of reduction.*

**CAUTION:**

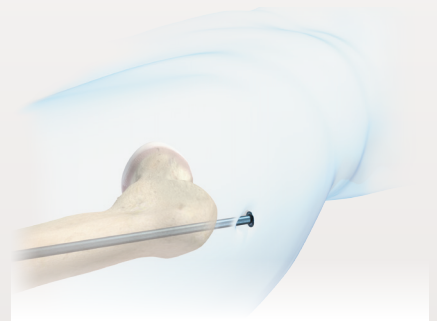
*If nail is implanted over 2.7mm Ball Tipped Reaming Rod, the reaming rod will not be able to be removed.*



**FIGURE 23:** Place Exchange Tube over Ball Tipped Reaming Rod



**FIGURE 24:** Verify placement



**FIGURE 25a:** Remove Ball Tipped Reaming Rod



**FIGURE 25b:** Insert 2.0mm Guide Insertion Wire

## 4 NAIL PLACEMENT

Attach the pre-selected nail to the Targeting Device with the Attachment Bolt (Figures 26a & 26b).

**CAUTION:**

*Be certain that the attachment bolt remains tight throughout the impaction process. Failure to do so may lead to bolt breakage.*

**CAUTION:**

*Attachment Bolt is a single-use device. It may be used to perform a bi-lateral procedure on a single patient.*



**FIGURES 26a & 26b:** Attach nail to Targeting Device with Attachment Bolt

- 1 Note: Use the Ball Hex Driver to perform final tightening of components prior to insertion of the nail.

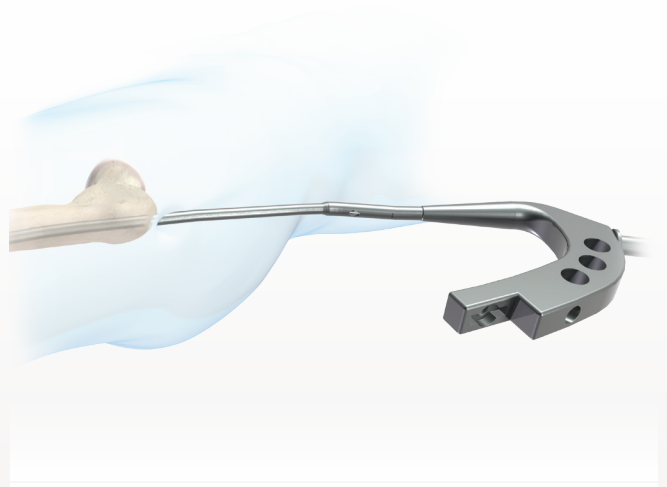
Prior to insertion of the nail, check alignment to ensure accurate targeting of the nail through the jig. Insert the outer and inner guide tubes and drill bit and make sure the drill bit is in line with the interlocking holes in the nail (Figure 27).

Attach the Impaction Rod to the threaded hole in the targeting device for impaction of the nail.

- 1 *Note: Be certain that the impaction rod is fully seated with the flange on the impaction rod resting on the targeting guide. Maintain tightness and flange to targeting guide contact throughout the impaction process.*

Carefully pass the nail over the 2.0mm Guide Insertion Wire and into the femoral canal to maintain location of the canal opening and to ease in insertion of the nail. Be sure that the nail slides freely over the guide wire to prevent advancement of the guide wire distally. Using controlled strikes with the mallet, drive the nail into the distal femur.

- 2 *Note: If advancement of the nail is difficult, remove the nail and ream another 0.5mm. It is common to over ream the canal by 1-1.5mm.*



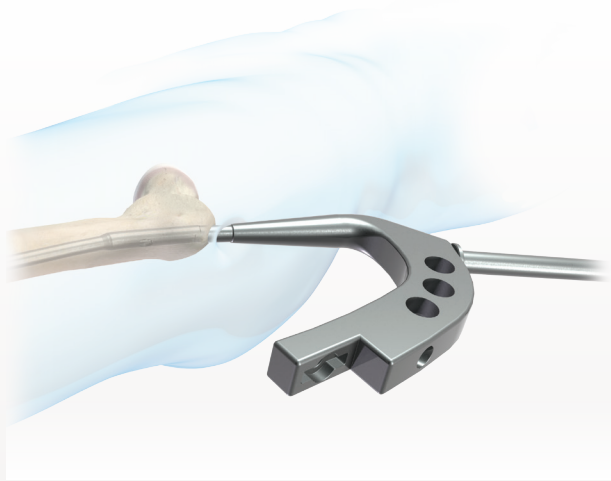
**FIGURE 27:** Confirm that nail is oriented correctly



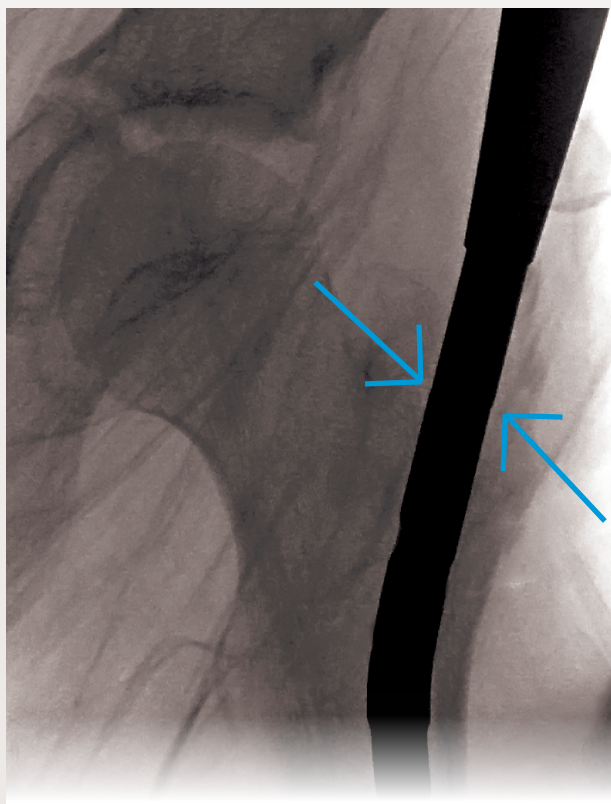
Impact the nail to approximately 5mm below the level of the trochanter but proximal to the trochanteric physis.

After the nail is inserted to the appropriate depth, remove the 2.0mm Guide Insertion Wire (Figures 28 & 29).

- 1 *Note: Failure to remove Smooth Guide Wire may result in instrumentation damage and metal debris.*



**FIGURE 28:** Impact the nail



**FIGURE 29:** Check position of nail impaction

## 5 PROXIMAL INTERLOCKING

Insert the Outer Guide Tube and Inner Guide Tubes into the Targeting Device and push down to the skin (Figure 30).

- 1 *Note: Do not apply excessive force to the targeting construct or targeting might be compromised.*

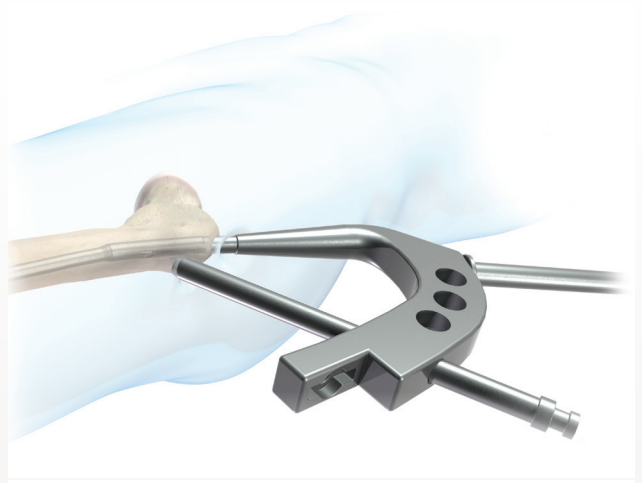
Mark the skin with the drill sleeves and make a longitudinal incision. Bluntly dissect down to bone.

- 2 *Note: Carefully remove the inner C-springs and clean thoroughly. Be sure to replace the inner C-springs after cleaning. If the inner C-springs are missing from the guide tubes, the tubes will not be self-retaining.*

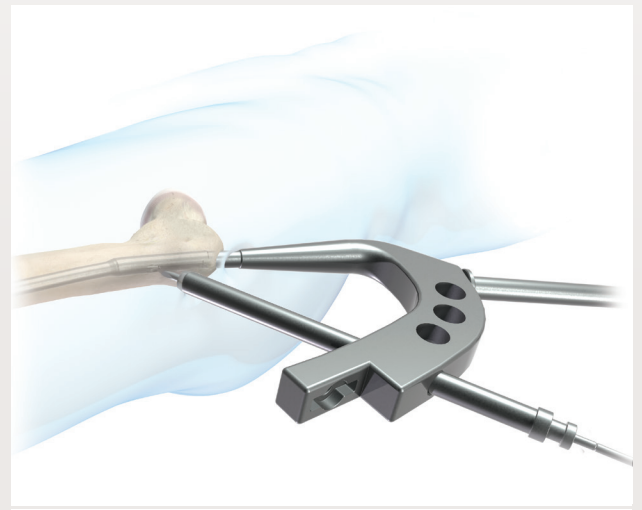
Make sure the inner and outer guide tubes are advanced to the lateral cortex of the femur. Failure to do so will effect proximal screw measurement and insertion.

Blue Guide Tubes = 3.5mm  
Green Guide Tubes = 4.5mm

Optional: Use the Trocar and light blows with a mallet to make a notch in the lateral cortex of the femur. This is done to ensure that the drill bit does not slip off the cortex ("skyve") while drilling (Figure 31).



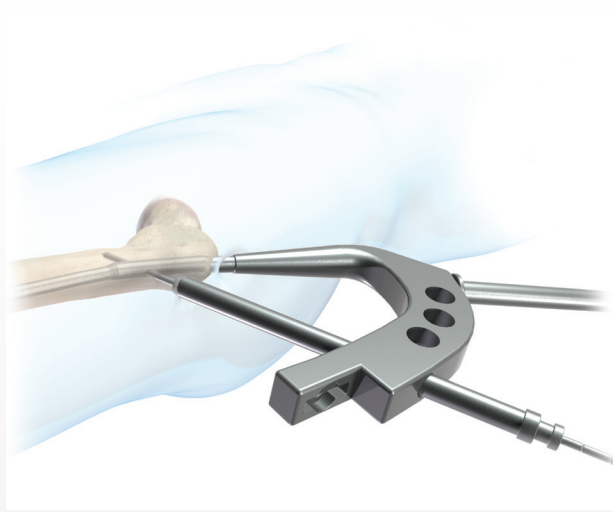
**FIGURE 30:** Insert Outer Guide Tube and Inner Guide Tube into Targeting Device



**FIGURE 31:** Use Trocar and Mallet to make a notch in lateral cortex (Optional)

Remove the central trocar and insert the 3.2mm Calibrated Drill Bit. Drill through the near cortex (Figure 32).

When the far cortex is reached, stop and measure from the calibration on the drill bit.



**FIGURE 32:** Insert Calibrated Drill Bit through the near cortex

Advance the 3.2mm Drill Bit through the far cortex. Detach the drill bit from the drill and leave in place while selecting the appropriate screw.

Remove the 3.2mm Drill Bit and inner guide tube. Insert the screw through the outer guide tube and into the bone. Tighten the screw and remove the outer drill sleeve.

Verify screw position and length on AP and lateral image intensification (Figure 33).

- 1 *Note: If it is necessary to re-engage the screwdriver into the screw head, it is recommended that the Inner Guide Tube is reinserted into the Targeting Device first.*



**FIGURE 33:** Verify screw position and length

If a recon screw is to be used, place the outer and inner drill sleeves into the appropriate guide and make a skin incision in line with the trajectory of the guide.

Advance the drill sleeves through the soft tissue, onto the bone. Be sure to notch the cortex with the trocar before drilling.

Drill with the calibrated 3.2mm Drill Bit and measure. Insert the appropriate length screw (Figure 34).

If resistance is encountered during screw insertion, remove the screw and drill the outer cortex with the 4.5mm drill. Insert the screw.



**FIGURE 34:** Preparation of recon screw

## 6 DISTAL INTERLOCKING

Distal interlocking is carried out using the free hand technique (Figure 35).

Check rotation and length carefully prior to placing interlocking screws by examining the patient and examining the fracture site radiographically.

Place the image intensifier so that the interlocking hole makes a perfect circle in the center of the fluoroscopy monitor screen (Figure 36).



**FIGURE 35:** Free hand perfect circle distal interlocking



**FIGURE 36:** Verify position of perfect circle with drill bit

Make an incision over the center of the hole on either the anterior or lateral distal thigh depending on which interlocking hole has been selected. Dissect bluntly through the soft tissue down to bone and position the drill bit over the center of the hole. Drill through both cortices and disconnect the drill bit from the drill. Check radiographically to ensure that the drill bit has passed through the nail.

Remove the drill bit from the hole and insert the depth gauge. Slide the hook of the depth gauge through the drilled hole and grab the far cortex with the hook. Slide outer sleeve against the near cortex and measure.

Measure for the screw. Leaving the depth gauge in place, select the appropriate screw.

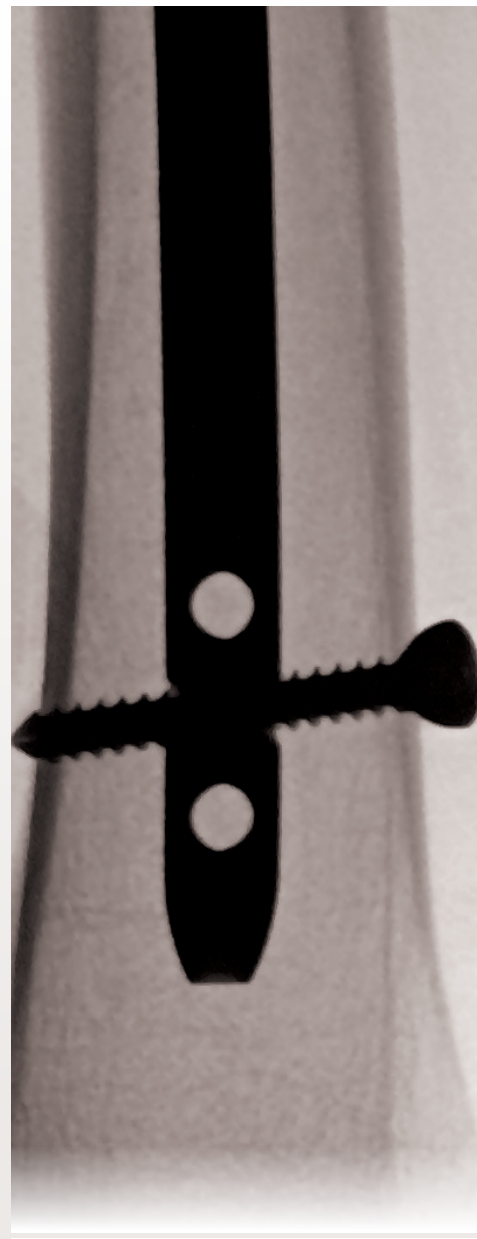
When the appropriate screw is ready, remove the depth gauge and insert the screw through the outer guide tube. Check the screw for proper placement and length on AP and lateral image intensification. Verify radiographically (ML/AP) that screw is in distal locking hole of nail (Figure 37).

Repeat if two distal screws are desired.

If using a 4.0mm distal locking screw, utilize the 2.9mm Short Drill Bit. If using a 4.5mm distal lock screw, utilize the 3.2mm Short Drill Bit.

If an End Cap is desired, reinsert the 2.0mm Guide Insertion Wire into the proximal portion of the nail. (This can be done before or after the targeting arm is removed.) Place the End Cap onto the Cannulated Screwdriver and pass it over the 2.0mm Guide Insertion Wire. Screw the End Cap into the nail.

- ① *Note: The 0mm End Cap is not cannulated and must be inserted without the 2.0mm Smooth Guide Wire.*
- ② *Note: Do not final tighten End Cap with cannulated T-handle. Do not impact cannulated T-handle. Perform final tightening with Ball Hex Driver.*



**FIGURE 37:** Check the screw for proper placement and length

## 7

## CLOSURE AND POST-OPERATIVE CARE

Confirm position of the nail and all locking screws. After confirmation is complete, remove the targeting device. Check for motion at the fracture site and rotational stability.

Irrigate and close the surgical wounds in layers.

If adequate fixation has been achieved, no cast immobilization is required. The patient can be allowed toe-touch weight bearing or weight bearing as tolerated on crutches or a walker depending on the patient size and fracture stability.



## 8

## NAIL REMOVAL

- ① *Note: For nail removal, the Bullet Tipped Extractor or Extraction Bolt may be used. The Bullet Tipped Extractor is not standard in the PediNail™ set. If the Bullet Tipped Extractor is to be used, contact Customer Service prior to nail removal.*
- ② *Note: If a 0mm End cap is used, it must be removed prior to inserting the Guide Wire.*
- ③ *Note: The Bullet Tipped Extractor and the Extraction Bolt undergo significant stress when removing intramedullary nails. It is recommended that these items be used once and discarded.*

Intramedullary nail removal, if desired, should be deferred, if possible, until after closure of the trochanteric physis (usually by age 13 to 14). For nail removal, position the patient supine on a radiolucent table with the hip and limb prepared and draped. Alternatively, the patient can be positioned in a lateral decubitus position to facilitate management of the soft tissue.

Make an incision through the scar created when inserting the nail. Bluntly dissect down to the greater trochanter. Place the 2.0mm Guide Insertion Wire, or any 2.0mm K-wire of adequate length, into the proximal end of the nail. Check position in both the AP and lateral planes (Figure 38).

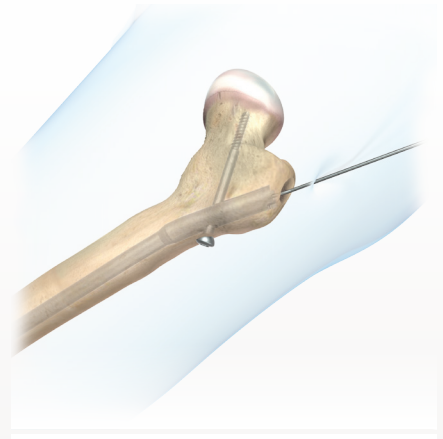
If necessary, advance the 9.5mm Cannulated Rigid Reamer over the guide wire to the nail in order to remove bone or fibrous tissue over the proximal end of the nail (Figure 39).

**WARNING:**

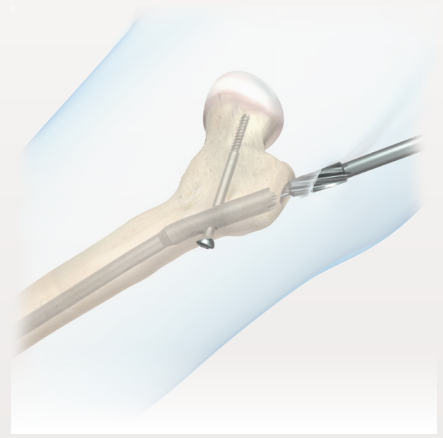
*Do not allow reamer to contact metal implant.*

- ④ *Note: Do not impact Cannulated T-handle driver.*

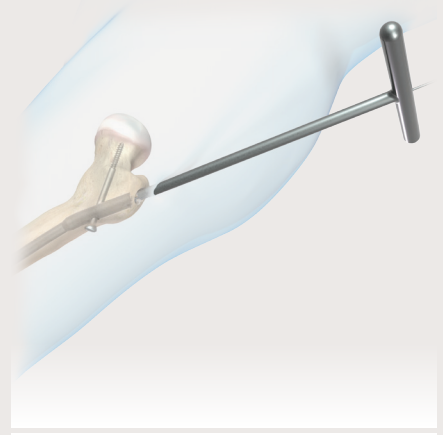
If End Cap is in place, advance the 2.0mm Guide Insertion Wire through the hole in the End Cap and nail and pass the Cannulated Screwdriver over the Guide Wire to the End Cap. Remove after engaging the End Cap (Figure 40).



**FIGURE 38:** Place 2.0mm wire



**FIGURE 39:** If necessary, remove bone or fibrous tissue



**FIGURE 40:** Remove end cap

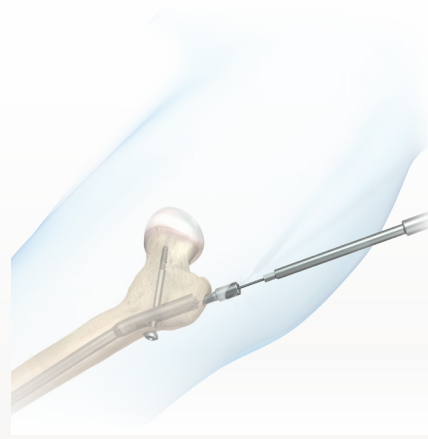


Pass the Extraction Adapter over the 2.0mm Guide Insertion Wire (Figure 41).

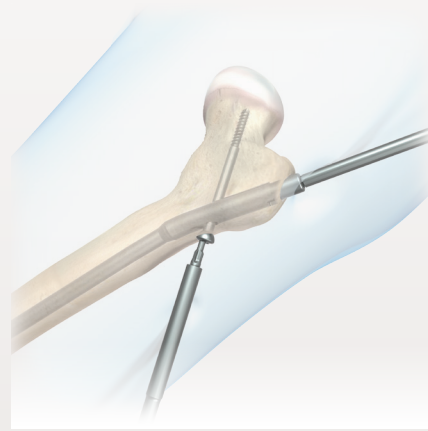
- 1 *Note: Ensure that the Extraction Adapter is tight to avoid fracture of the nail.*

Remove all proximal and distal locking screws (Figure 42).

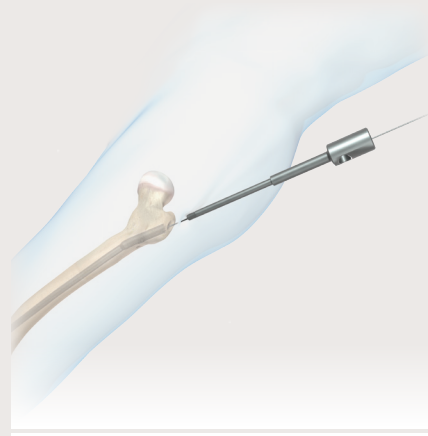
Remove the 2.0mm Guide Insertion Wire (Figure 43).



**FIGURE 41:** Pass Extraction Adapter



**FIGURE 42:** Remove locking screws

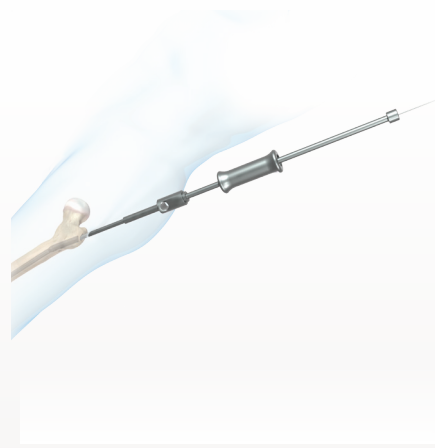


**FIGURE 43:** Remove Guide Insertion Wire

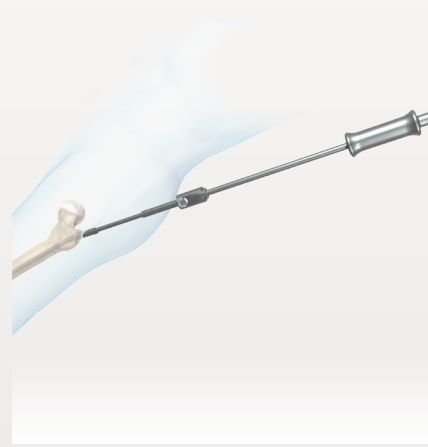
Attach the Slap Hammer to the Extraction Adapter (Figure 43).

Gently extract the nail using the Slap Hammer and Extraction Adapter (Figure 44).

Irrigate the wounds and close in the usual fashion.



**FIGURE 43:** Attach the Slap Hammer



**FIGURE 44:** Gently extract the nail

## LEFT FEMUR IMPLANT

Item Number	Qty	Description	Length (mm)
10-1500-071	1	7mm x 20cm Pediatric Femoral IM Nail	200
10-1500-072	1	7mm x 22cm Pediatric Femoral IM Nail	220
10-1500-073	1	7mm x 24cm Pediatric Femoral IM Nail	240
10-1500-074	1	7mm x 26cm Pediatric Femoral IM Nail	260
10-1500-075	1	7mm x 28cm Pediatric Femoral IM Nail	280
10-1500-076	1	7mm x 30cm Pediatric Femoral IM Nail	300
10-1500-081	1	8mm x 24cm Pediatric Femoral IM Nail	240
10-1500-082	1	8mm x 26cm Pediatric Femoral IM Nail	260
10-1500-083	1	8mm x 28cm Pediatric Femoral IM Nail	280
10-1500-084	1	8mm x 30cm Pediatric Femoral IM Nail	300
10-1500-085	1	8mm x 32cm Pediatric Femoral IM Nail	320
10-1500-086	1	8mm x 34cm Pediatric Femoral IM Nail	340
10-1500-087	1	8mm x 36cm Pediatric Femoral IM Nail	360
10-1500-091	1	9mm x 28cm Pediatric Femoral IM Nail	280
10-1500-092	1	9mm x 30cm Pediatric Femoral IM Nail	300
10-1500-093	1	9mm x 32cm Pediatric Femoral IM Nail	320
10-1500-094	1	9mm x 34cm Pediatric Femoral IM Nail	340
10-1500-095	1	9mm x 36cm Pediatric Femoral IM Nail	360
10-1500-096	1	9mm x 38cm Pediatric Femoral IM Nail	380

## CASE &amp; TRAY

01-1500-0307	1	PediNail Implant Base Left	--
01-1500-0308	1	PediNail Implant Tray Left	--
01-1500-0302	1	PediNail Lid	--

## LEFT XL FEMUR IMPLANT

Item Number	Qty	Description	Length (mm)
10-1500-077	1	7mm x 32cm Pediatric Femoral IM Nail	320
10-1500-078	1	7mm x 34cm Pediatric Femoral IM Nail	340
10-1500-079	1	7mm x 36cm Pediatric Femoral IM Nail	360
10-1500-080	1	7mm x 38cm Pediatric Femoral IM Nail	380
10-1500-088	1	8mm x 38cm Pediatric Femoral IM Nail	380
10-1500-089	1	8mm x 40cm Pediatric Femoral IM Nail	400
10-1500-090	1	8mm x 42cm Pediatric Femoral IM Nail	420
10-1500-097	1	9mm x 40cm Pediatric Femoral IM Nail	400
10-1500-098	1	9mm x 42cm Pediatric Femoral IM Nail	420
10-1500-101	1	10mm x 30cm Pediatric Femoral IM Nail	300
10-1500-102	1	10mm x 32cm Pediatric Femoral IM Nail	320
10-1500-103	1	10mm x 34cm Pediatric Femoral IM Nail	340
10-1500-104	1	10mm x 36cm Pediatric Femoral IM Nail	360
10-1500-105	1	10mm x 38cm Pediatric Femoral IM Nail	380
10-1500-106	1	10mm x 40cm Pediatric Femoral IM Nail	400
10-1500-107	1	10mm x 42cm Pediatric Femoral IM Nail	420

## CASE & TRAY

01-1500-0405	1	PediNail XL Implant Base Left	--
01-1500-0406	1	PediNail XL Implant Tray Left	--
01-1500-0302	1	PediNail Lid	--

## RIGHT FEMUR IMPLANT

Item Number	Qty	Description	Length (mm)
10-1500-021	1	7mm x 20cm Pediatric Femoral IM Nail	200
10-1500-022	1	7mm x 22cm Pediatric Femoral IM Nail	220
10-1500-023	1	7mm x 24cm Pediatric Femoral IM Nail	240
10-1500-024	1	7mm x 26cm Pediatric Femoral IM Nail	260
10-1500-025	1	7mm x 28cm Pediatric Femoral IM Nail	280
10-1500-026	1	7mm x 30cm Pediatric Femoral IM Nail	300
10-1500-031	1	8mm x 24cm Pediatric Femoral IM Nail	240
10-1500-032	1	8mm x 26cm Pediatric Femoral IM Nail	260
10-1500-033	1	8mm x 28cm Pediatric Femoral IM Nail	280
10-1500-034	1	8mm x 30cm Pediatric Femoral IM Nail	300
10-1500-035	1	8mm x 32cm Pediatric Femoral IM Nail	320
10-1500-036	1	8mm x 34cm Pediatric Femoral IM Nail	340
10-1500-037	1	8mm x 36cm Pediatric Femoral IM Nail	360
10-1500-041	1	9mm x 28cm Pediatric Femoral IM Nail	280
10-1500-042	1	9mm x 30cm Pediatric Femoral IM Nail	300
10-1500-043	1	9mm x 32cm Pediatric Femoral IM Nail	320
10-1500-044	1	9mm x 34cm Pediatric Femoral IM Nail	340
10-1500-045	1	9mm x 36cm Pediatric Femoral IM Nail	360
10-1500-046	1	9mm x 38cm Pediatric Femoral IM Nail	380

## CASE &amp; TRAY

01-1500-0311	1	PediNail Implant Base Right	--
01-1500-0315	1	PediNail Implant Tray Right	--
01-1500-9316	1	PediNail Screw Caddy Lid	--

## RIGHT XL FEMUR IMPLANT

Item Number	Qty	Description	Length (mm)
10-1500-027	1	7mm x 32cm Pediatric Femoral IM Nail	320
10-1500-028	1	7mm x 34cm Pediatric Femoral IM Nail	340
10-1500-029	1	7mm x 36cm Pediatric Femoral IM Nail	360
10-1500-030	1	7mm x 38cm Pediatric Femoral IM Nail	380
10-1500-038	1	8mm x 38cm Pediatric Femoral IM Nail	380
10-1500-039	1	8mm x 40cm Pediatric Femoral IM Nail	400
10-1500-040	1	8mm x 42cm Pediatric Femoral IM Nail	420
10-1500-047	1	9mm x 40cm Pediatric Femoral IM Nail	400
10-1500-048	1	9mm x 42cm Pediatric Femoral IM Nail	420
10-1500-051	1	10mm x 30cm Pediatric Femoral IM Nail	300
10-1500-052	1	10mm x 32cm Pediatric Femoral IM Nail	320
10-1500-053	1	10mm x 34cm Pediatric Femoral IM Nail	340
10-1500-054	1	10mm x 36cm Pediatric Femoral IM Nail	360
10-1500-055	1	10mm x 38cm Pediatric Femoral IM Nail	380
10-1500-056	1	10mm x 40cm Pediatric Femoral IM Nail	400
10-1500-057	1	10mm x 42cm Pediatric Femoral IM Nail	420

## CASE & TRAY

01-1500-0407	1	PediNail XL Implant Base Right	--
01-1500-0408	1	PediNail XL Implant Tray Right	--
01-1500-0302	1	PediNail Lid	--

## IM NAIL END CAP

Item Number	Qty	Description	Length (mm)
10-1500-000	1	IM Nail End Cap 0mm	--
10-1500-0005	1	IM Nail End Cap 5mm	--
10-1500-0010	1	IM Nail End Cap 10mm	--
10-1500-0015	1	IM Nail End Cap 15mm	--
10-1500-0020	1	IM Nail End Cap 20mm	--

## 4.0MM CORTICAL SCREW

10-1500-2015	2	4.0mm x 15mm Cortical Screw	15
10-1500-2020	2	4.0mm x 20mm Cortical Screw	20
10-1500-2025	2	4.0mm x 25mm Cortical Screw	25
10-1500-2030	2	4.0mm x 30mm Cortical Screw	30
10-1500-2035	2	4.0mm x 35mm Cortical Screw	35
10-1500-2040	2	4.0mm x 40mm Cortical Screw	40
10-1500-2045	2	4.0mm x 45mm Cortical Screw	45
10-1500-2050	2	4.0mm x 50mm Cortical Screw	50
10-1500-2055	2	4.0mm x 55mm Cortical Screw	55
10-1500-2060	2	4.0mm x 60mm Cortical Screw	60

## 4.5MM CORTICAL SCREW

10-1500-3016	2	4.5mm x 16mm Cortical Screw	16
10-1500-3018	2	4.5mm x 18mm Cortical Screw	18
10-1500-3020	2	4.5mm x 20mm Cortical Screw	20
10-1500-3022	2	4.5mm x 22mm Cortical Screw	22
10-1500-3024	2	4.5mm x 24mm Cortical Screw	24
10-1500-3026	2	4.5mm x 26mm Cortical Screw	26
10-1500-3028	2	4.5mm x 28mm Cortical Screw	28
10-1500-3030	2	4.5mm x 30mm Cortical Screw	30
10-1500-3032	2	4.5mm x 32mm Cortical Screw	32
10-1500-3034	2	4.5mm x 34mm Cortical Screw	34
10-1500-3036	2	4.5mm x 36mm Cortical Screw	36
10-1500-3038	2	4.5mm x 38mm Cortical Screw	38
10-1500-3044	2	4.5mm x 44mm Cortical Screw	44
10-1500-3046	2	4.5mm x 46mm Cortical Screw	46

#### 4.5MM CORTICAL SCREW CONTINUED

Item Number	Qty	Description	Length (mm)
10-1500-3048	2	4.5mm x 48mm Cortical Screw	48
10-1500-3050	2	4.5mm x 50mm Cortical Screw	50
10-1500-3055	2	4.5mm x 55mm Cortical Screw	55
10-1500-3060	2	4.5mm x 60mm Cortical Screw	60
10-1500-3065	2	4.5mm x 65mm Cortical Screw	65
10-1500-3070	2	4.5mm x 70mm Cortical Screw	70
10-1500-3075	2	4.5mm x 75mm Cortical Screw	75
10-1500-3080	2	4.5mm x 80mm Cortical Screw	80
10-1500-3085	2	4.5mm x 85mm Cortical Screw	85

#### 4.5MM CORTICAL RECON SCREW

10-1500-4045	2	4.5mm x 45mm Cortical Recon Screw	45
10-1500-4050	2	4.5mm x 50mm Cortical Recon Screw	50
10-1500-4055	2	4.5mm x 55mm Cortical Recon Screw	55
10-1500-4060	2	4.5mm x 60mm Cortical Recon Screw	60
10-1500-4065	2	4.5mm x 65mm Cortical Recon Screw	65
10-1500-4070	2	4.5mm x 70mm Cortical Recon Screw	70
10-1500-4075	2	4.5mm x 75mm Cortical Recon Screw	75
10-1500-4080	2	4.5mm x 80mm Cortical Recon Screw	80
10-1500-4085	2	4.5mm x 85mm Cortical Recon Screw	85
10-1500-4090	2	4.5mm x 90mm Cortical Recon Screw	90
10-1500-4095	2	4.5mm x 95mm Cortical Recon Screw	95
10-1500-4100	2	4.5mm x 100mm Cortical Recon Screw	100

#### SCREW CADDY

01-1500-9315	1	PediNail Screw Caddy	--
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## TISSUE PROTECTORS

Item Number	Qty	Description	Length (mm)
01-1500-007	1	7mm Exchange Tube	--
01-1500-010	1	10mm Tissue Protector	--
01-1500-012	1	12mm Tissue Protector	--

## REAMER HEADS

01-1500-075	1	7.5mm IM Reamer Head	--
01-1500-080	1	8.0mm IM Reamer Head	--
01-1500-085	1	8.5mm IM Reamer Head	--
01-1500-090	1	9.0mm IM Reamer Head	--
01-1500-095	1	9.5mm IM Reamer Head	--
01-1500-100	1	10.0mm IM Reamer Head	--
01-1500-105	1	10.5mm IM Reamer Head	--
01-1500-110	1	11.0mm IM Reamer Head	--
01-1500-115	1	11.5mm IM Reamer Head	--
01-1500-120	1	12.0mm IM Reamer Head	--

## REAMER SHAFTS

01-1500-008	1	9.5mm Cannulated Entry Reamer	
01-1500-060	2	Flexible IM Reamer Shaft	--
01-1500-0160	1	6.0mm One Piece Flexible Reamer Shaft	--
01-1500-0165	1	6.5mm One Piece Flexible Reamer Shaft	--
01-1500-0170	1	7.0mm One Piece Flexible Reamer Shaft	--

## DRILLS

01-1500-021	2	2.9mm Short Drill	--
01-1500-024	2	3.2mm Short Drill	--
01-1500-9015	2	3.2mm Calibrated Drill Bit	--
01-1500-9016	1	4.5mm Calibrated Drill Bit	--

## GUIDE WIRES

Item Number	Qty	Description	Length (mm)
11-1500-002	1	2.0mm Guide Insertion Wire	--
11-1500-006	1	2.7mm x 81cm Ball Tipped Reaming Rod	--

## GUIDE TUBES

21-1500-9006	2	Outer Guide Tube	--
21-1500-9007	2	4.5mm Guide Tube	--
21-1500-9008	2	3.2mm Guide Tube	--

## HEX DRIVERS

01-1500-9017	1	3.5mm Hex Driver Long Shaft	--
01-1500-9019	1	Ball Hex Driver	--
01-1500-9020	1	3.5mm Hex Driver Short Shaft	--
01-1500-026	1	T-Handle Hex Driver for Targeting Device	--

## MISCELLANEOUS INSTRUMENTS

Item Number	Qty	Description	Length (mm)
11-1500-001	2	3.2mm Threaded Tipped Guide Wire	--
01-1500-008	1	9.5mm Entry Reamer	--
01-1500-014	1	Nail Measuring Gauge	--
01-1500-034	1	Mini Q/C Chuck	--
01-1500-035	1	Depth Gauge Long (10-100mm)	--
01-1500-036	1	T-Handle Wire Inserter	--
01-1500-9011	1	IM Reducer	--
01-1500-9014	1	Trocar	--
01-1030-001	1	AO Q/C Handle	--
11-1500-005	1	Exchange Tube	--
01-1500-018	1	Slotted Mallet	--
01-1500-9012	1	Impaction Rod	--
01-1500-9013	1	Slap Hammer	--
01-1500-9018	1	Extraction Adapter	--
01-1500-9000	1	Modular Targeting Device	--
21-1500-9005	1	Targeting Device Attachment Bolt	--
01-1500-9304	1	PediNail Instrument #1 Base	--
01-1500-9305	1	PediNail Instrument #1 Tray	--
01-1500-9301	1	PediNail Instrument #2 Base	--
01-1500-9302	1	PediNail Lid	--

**CAUTION:** Federal law restricts this device to sale by or the order of a Physician.

**CAUTION:** Devices are supplied Non-Sterile. Clean and sterilize before use according to instructions.

**CAUTION:** Implants components are single-use. Do not reuse.

**CAUTION:** The device is not approved for screw attachment or fixation to the posterior elements (pedicles) of the cervical, thoracic or lumbar spine

**CAUTION:** Only those instruments and implants contained within this system are recommended for use with this technique. Other instruments or implants used in combination or in place of those contained within this system is not recommended.

**This technique has been provided by one of our medical advisors only as guidance and it is not intended to limit the methods used by trained and experienced surgeons.**

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