Surgical Technique

smith&nephew

IMHS◇

Intramedullary Hip Screw

IMHS Intramedullary Hip Screw Surgical Technique

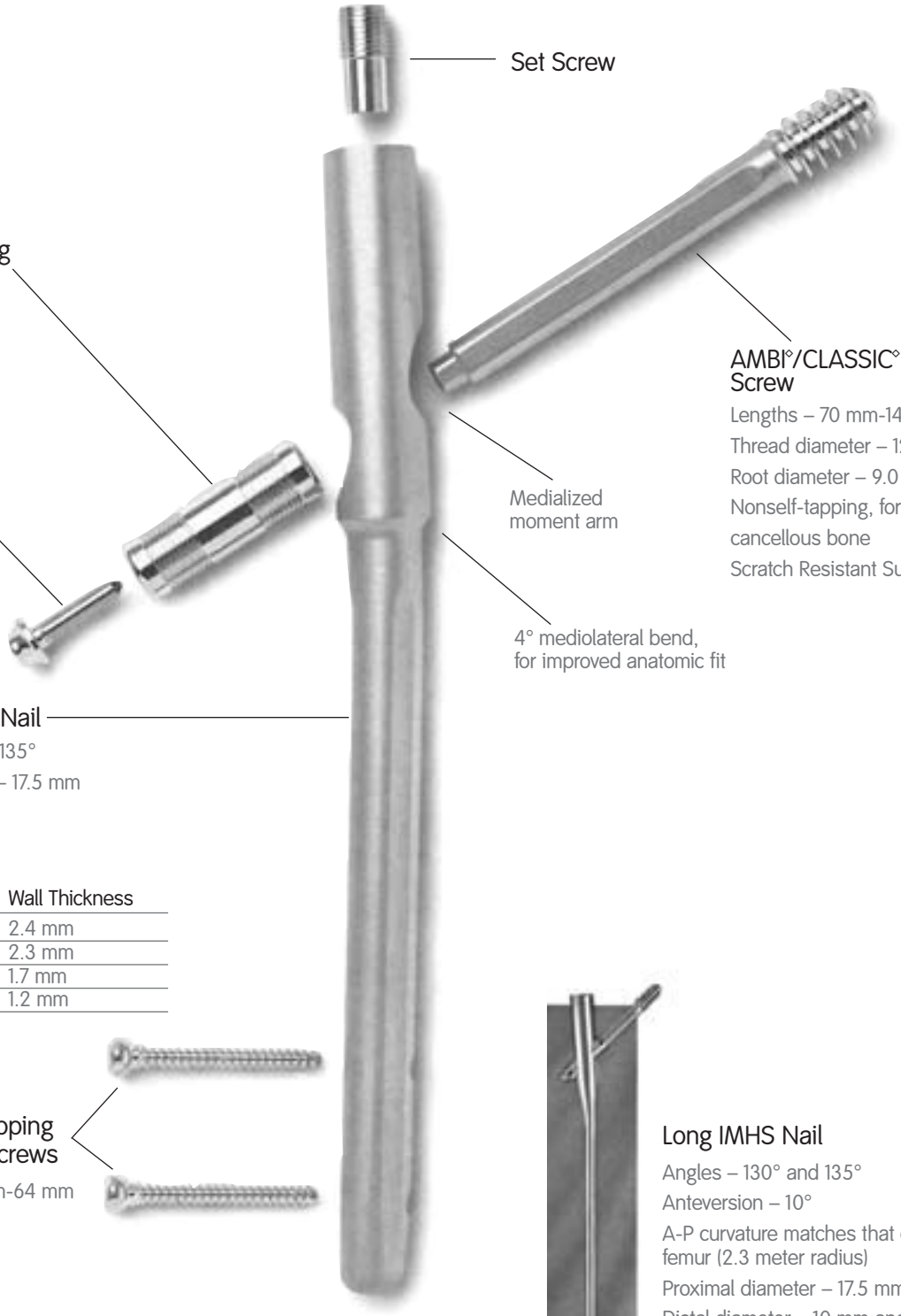
by
Mr. John S. Albert, B.Sc., M.B., F.R.C.S.
The Orthopaedic Department
Norfolk & Norwich Hospital
Brunswick Road
Norwich, England

Contents

Nota Bene

The technique description herein is made available to the healthcare professional to illustrate the author's suggested treatment for the uncomplicated procedure. In the final analysis, the preferred treatment is that which addresses the needs of the specific patient.

Design Features



Set Screw

Keyed Centering Sleeve

Easy sliding

Prevents rotation

AMBI®/CLASSIC® Lag Screw

Lengths – 70 mm-140 mm

Thread diameter – 12.7 mm

Root diameter – 9.0 mm

Nonself-tapping, for cancellous bone

Scratch Resistant Surface (SRS)

AMBI/CLASSIC Compression Screw

Lengths – 19.0 mm and 28.5 mm

Medialized moment arm

4° mediolateral bend, for improved anatomic fit

Standard IMHS Nail

Angles – 130° and 135°

Proximal diameter – 17.5 mm

Length – 21 cm

Universal

Distal Diameter	Wall Thickness
10 mm	2.4 mm
12 mm	2.3 mm
14 mm	1.7 mm
16 mm	1.2 mm

4.5 mm Self-Tapping Cortical Bone Screws

25 lengths – 16 mm-64 mm

Long IMHS Nail

Angles – 130° and 135°

Anteversion – 10°

A-P curvature matches that of the femur (2.3 meter radius)

Proximal diameter – 17.5 mm

Distal diameter – 10 mm and 12 mm

Lengths – 34 cm, 38 cm, and 42 cm

Left/Right nails

Wall thickness – 2.4 mm

Long Intramedullary Hip Screw

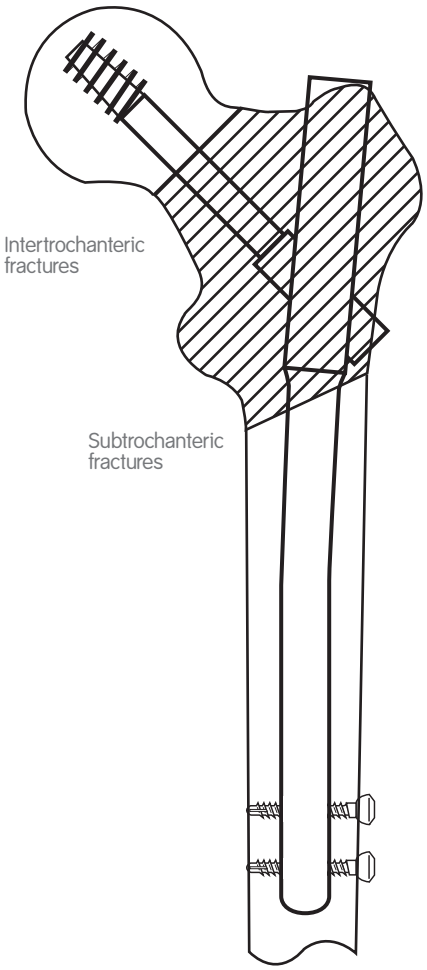
The IMHS Nail

IMHS features a cannulated intramedullary nail with a 4° mediolateral bend to allow for insertion through the greater trochanter. The nail is used with a standard Richards AMBI/CLASSIC Lag Screw (1/2" thread diameter), compression screw, and 4.5 mm locking screws. A sleeve, which is held by a set screw, passes through the intramedullary nail and over the lag screw. The sleeve helps prevent rotation, while allowing the lag screw to slide. The Standard IMHS nail is available in two angles - 130° and 135° - and in four diameters - 10 mm, 12 mm, 14 mm, and 16 mm, to allow a proper fit within the femoral canal. The Standard IMHS nails are all 21 cm in length. IMHS is locked using one or two 4.5 mm locking screws.

The Long IMHS has a distal diameter of 10 mm and 12 mm is available in lengths of 34 cm, 38 cm, and 42 cm. 130° and 135° angles are available as with the Standard IMHS. The Long IMHS nail has a 2.3 meter radius to conform with the natural bow of the femoral shaft and 10° of anteversion to match the angle of the femoral head in relation to the shaft of the femur. Distal locking is carried out using 4.5 mm locking screws.

Both types of IMHS nails have a proximal diameter of 17.5 mm.

Standard IMHS Nail



Indications

Intramedullary Hip Screws (IMHS), provide an intramedullary approach to fractures of the proximal femur and are particularly suited to unstable peritrochanteric fractures, reverse obliquity fractures, and subtrochanteric fractures. The Long IMHS nail is designed for subtrochanteric fractures, comminuted neck and shaft fractures, femur reconstruction following tumor resection, prophylactic nailing of impending pathologic fractures, and leg length discrepancies secondary to femoral fracture.

Specifications

Standard Lag Screw (Proximal)

Major Diameter	12.7mm
Minor Diameter	9.0mm (tapered 6.6 - 9.1)
Thread Length	21.0mm
Lengths	70-140 in 5mm increments
Self Tap	No

Do not use a Super Lag Screw with IMHS (will not pass through nail)

Centering Sleeve (Keyed)

O.D.	12.7mm
I.D.	9mm
Length	38.1mm

Compressing Screw

Hex Diameter	3.5mm
Length	19 & 28.5mm

Set Screw

Hex Diameter	4.0mm

4.5mm Screw (Distal)

Head Diameter	8.0mm
Major Thread Diameter	4.5mm
Minor Diameter	3.2mm
Lengths	16-64 in 2mm increments
Package	1
Self Tap	Yes

*5.0mm RT Screw

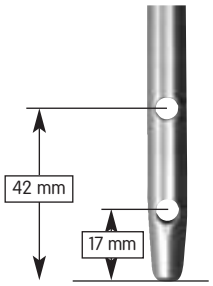
Head Diameter	8.0mm
Major Thread Diameter	5.0mm
Minor Diameter	4.0mm
Hex Diameter	4.0mm

* For additional strength & larger screw use 5.0mm RT screw in distal hole only for long and short nails – Cannot be used in distal slot of Long 12mm distal diameter nails.

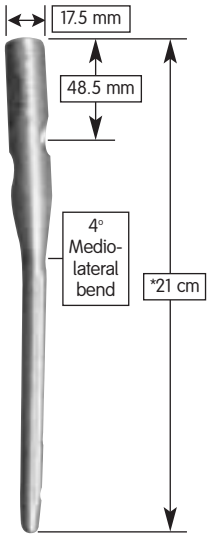
NOTE: When using alternative screws be sure to use hexdriver and drill bit specific to the screw.

Standard IMHS Nail

	10mm	12mm	14mm	16mm
Angles [°]	130/135	130/135	130/135	130/135
Anterior Bow	None	None	None	None
Anteversion [°]	None	None	None	None
Distal Hole Size [mm]	5.5	5.5	5.5	5.5
Distal Slot Width [mm]	None	None	None	None
Driving End (O.D.) [mm]	17.5	17.5	17.5	17.5
Guide Bolt Thread	9/16 - 18 UNF	9/16 - 18 UNF	9/16 - 18 UNF	9/16 - 18 UNF
Lengths [cm]	21	21	21	21
Shaft Diameter (O.D.) [mm]	10	12	14	16
Smallest THRU Diameter [mm]	3.9	5	6.6	8.6
Wall Thickness [mm]	2.5	2.3	1.7	1.3



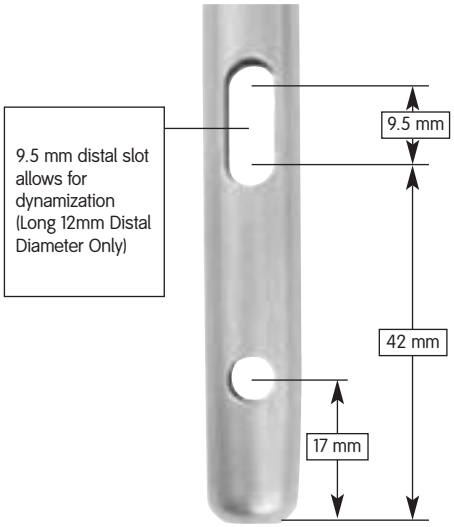
Note: Ball tip guide rods will not pass thru 10mm short and 10mm long nails. Will work for all other diameter nails.



*18cm length made in SPS.

Long IMHS Nail

	10mm	12mm
Angles [°]	130/135	130/135
Anterior Bow	2.3 meter radius	2.3 meter radius
Anteversion [°]	10	10
Distal Hole Size [mm]	5.3	5.3
Distal Slot Width [mm]	—	4.7
Driving End (O.D.) [mm]	17.5	17.5
Guide Bolt Thread	9/16 - 18 UNF	9/16 - 18 UNF
Lengths [cm]	34 38 42	34 38 42
Shaft Diameter (O.D.) [mm]	10	12
Smallest THRU Diameter [mm]	4.1	6
Wall Thickness [mm]	2.5	1.2



Surgical Technique

Preoperative Planning

The operation is performed on a standard fracture table and requires the use of an image intensifier which will produce images in two planes. Apart from standard surgical instruments, a power drill with reaming capability is required.

Before embarking upon the procedure, obtain anteroposterior and lateral views of the proximal one half of the femur, either fluoroscopically at the time of the operation or on a preoperative roentgenogram. Severe deformities of the femoral canal or excessive anterior bowing may preclude the use of an intramedullary device.

Radiographic templates are available. These allow preoperative estimation of the nail's diameter and angle and the lag screw's length.

Patient Positioning and Preparation

In general, the position used for the Intramedullary Hip Screw is similar to that employed for all supine intramedullary nailings of the femur.

Place the patient supine on a standard fracture table. Both feet may rest in a padded foot holder. Use a padded perineal post.

The pelvis must lie in the horizontal position. Adduct the affected femur to allow access to the trochanteric region. With the patient in a supine position, abduct the unaffected limb while adducting the trunk and affected extremity. Tilt the trunk away from the fracture and strap the arm on the same side across the chest of the patient. This is particularly important in obese patients.

Place the uninjured leg either adjacent to the injured side (in the "heel-to-toe" position with the uninjured side lower), or flexed and abducted to allow unimpeded access of the image intensifier between the legs (Figure 1).

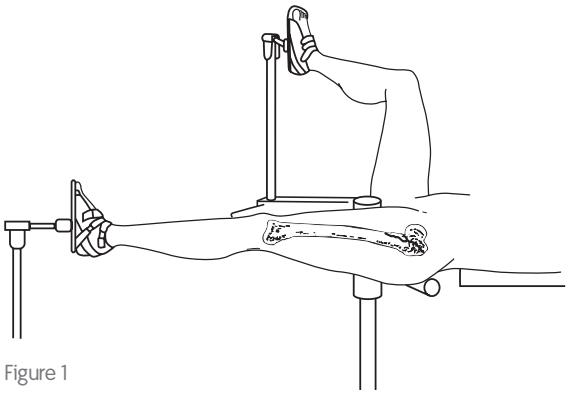


Figure 1

Before the start of the operative procedure, it is important to achieve reduction of the fracture. Peritrochanteric fractures are usually reduced with internal rotation of the femur and traction. Most subtrochanteric fractures are commonly reduced by a small degree of external rotation. Avoid excessive traction of the affected limb. It is especially important to ensure that the head fragment of the femur is reduced to the shaft fragment in the lateral position. In the majority of cases, a satisfactory reduction should be achieved before beginning the operative procedure. If closed reduction is impossible, perform a more extensive operative incision and an open reduction of the fracture.

A successful outcome is unlikely if the implant is inserted into an unreduced fracture. Comminuted peritrochanteric fractures, with loss of the medial cortical buttress including the lesser trochanter, are more likely to result in failure of fixation. In such cases, an intramedullary device may reduce the risk of failure.

NOTE: It is very important to obtain satisfactory images of the fracture and the upper femur, in both the A-P and lateral planes, before beginning the operation.

Prepare the operative field in the usual manner. The sterile field extends from just above the iliac crest to the knee and from beyond the midline anteriorly to the midline posteriorly. Draping is comparable to that of conventional internal fixation of hip fractures. A vertical “sail-type” plastic drape is commonly used because it allows the operative field to be separated from the image intensifier and any unscrubbed personnel.

Surgical Approach

Make a lateral approach, similar to all intramedullary procedures of the femur. Extend the skin incision from the tip of the trochanter proximally for 3-8 cm depending on the size or obesity of the patient (Figure 2). Split the aponeurosis of the gluteus maximus in line with its fibers, from the tip of the trochanter proximally for 5 cm. This brings into view a small fat pad which lies between the tip of the trochanter and the piriformis fossa. Then, split the gluteus medius in the line of its fibers.

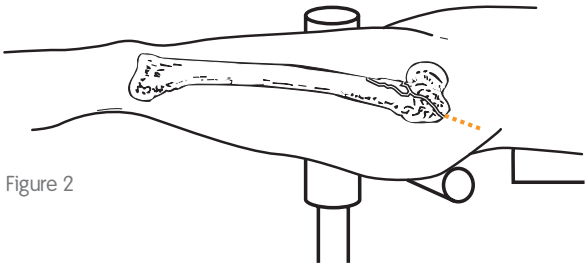


Figure 2

The eventual size of the surgical incision depends on both the obesity of the patient and whether the fracture has been adequately reduced. In the majority of cases, a satisfactory reduction is achieved before the operative procedure is started. If an open reduction is necessary, extend the surgical approach distally to allow an anterior approach to the hip capsule and fracture. Check the adequacy of the open reduction radiographically. It is critical that the head fragment is reduced on the shaft fragment in the lateral plane.

Femoral Preparation

Unlike the standard entry point for femoral nails in the piriformis fossa, insert the IMHS nail through the tip of the greater trochanter. The 4° bend allows this without encroachment of the femoral neck, which may be fractured.

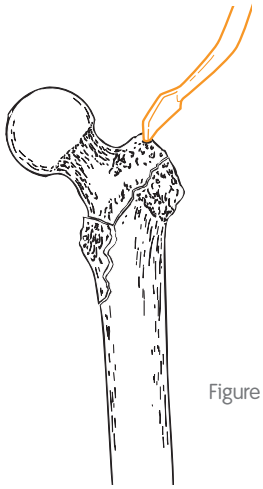


Figure 3

NOTE: The red numbered delta symbols match the numbering system in the sterilization trays. All instruments are numbered in order of use, providing guidance to the O.R. staff in anticipating the surgeon's instrumentation needs.

Following adequate exposure of the tip of the trochanter with the Curved Awl △1, (Figure 3) position the Tissue Protector △2 on the tip of the trochanter and insert a 3.2 mm Tip Threaded Guide Pin △3 through the Tissue Protector's guide pin centering sleeve (Figure 4). Advance the pin down the femoral canal well beyond the subtrochanteric region. Check the position of the pin radiographically in the A-P and lateral planes.

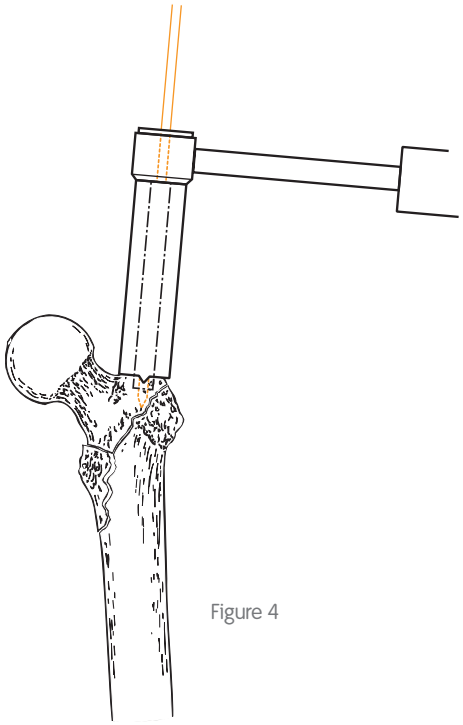


Figure 4

△1 Curved Awl

△2 Tissue Protector

△3 3.2 mm Tip Threaded Guide Pin

Remove the guide pin centering sleeve from the Tissue Protector. Use the Proximal Reamer ④ to open the proximal portion of the femur to 18 mm to accommodate the proximal portion of the nail (17.5 mm). The minimum length of femur that requires reaming is 7 cm. The proximal reamer's positive stop has 3 settings. The "7" setting will ream to 7 cm, the "7.5" setting will ream to 7.5 cm, and the "8" setting will ream to 8.0 cm. Once the positive stop is set, guide the Proximal Reamer over the Guide Pin and through the Tissue Protector and ream until the positive stop meets the outer portion of the Tissue Protector (Figure 5).

In elderly patients with peritrochanteric fractures, the bone of the proximal femur, and in particular the fractured greater trochanter, is often very soft. The tip of the greater trochanter may be opened with the Curved Awl and checked radiographically in the A-P and lateral planes. Then, ream the proximal femur to 18 mm using the Proximal Reamer without the use of a Ball Tipped Guide Pin. Reaming over a 3.2 mm Tip Threaded Guide Pin is optional. If the trochanteric region is very osteoporotic, proximal reaming may be unnecessary.

The IMHS nail is available in four diameters and two angles — 130° and 135°. Using the templates on the preoperative radiograph, estimate the appropriate diameter of the nail and the ideal angle and length for the lag screw. The final decision on the lag screw angle is a matter of experience. The majority of cases will require an angle of 130°.

Use one of the four Trials ⑥ to verify the appropriate nail diameter. Place the appropriate diameter trial on either the Trial Handle ⑤ or the Drill Guide ⑦ . Insert the Trial through the prepared proximal femur to ensure that the implant will fit in the medullary canal. It is preferable to use a smaller diameter implant than one which is tight within the canal.

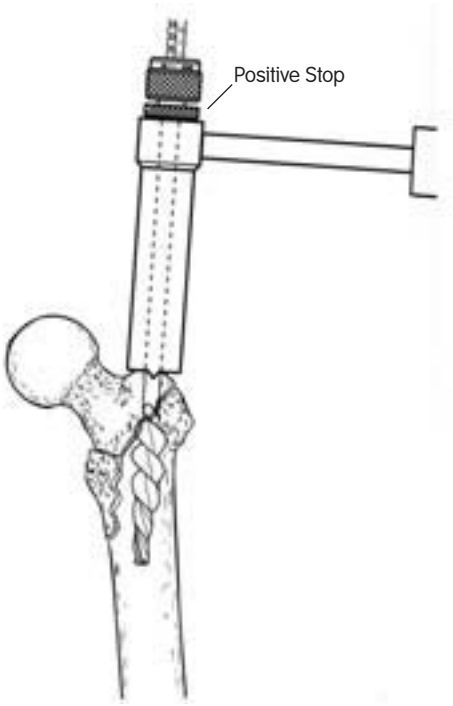


Figure 5


④ Proximal Reamer


⑥ Trial

⑤ Trial Handle

⑦ Drill Guide

Using the Drill Guide and the appropriate Angle Guide Attachment ⑨, insert a guide pin into the femoral head to verify the angle. Refer to the Proximal Targeting section for the proper technique. Always remove the guide pin before removing the trial.

NOTE: There is no trial for the Long IMHS implant. If the canal is narrow and will not accommodate a 10 mm nail, then standard intramedullary reaming should be carried out over a Ball Tipped Guide Rod. The femur should be reamed to 1 mm larger than the nail's diameter. Special attention should be paid to the anterior bow to ensure that a nail of the correct length and orientation, left or right, is used.

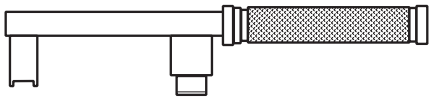


Figure 6

Drill Guide And Nail Assembly

The assembly of the Drill Guide with the chosen nail and the corresponding Angle Guide Attachment is critical. If the Angle Guide Attachment and nail are incorrectly matched, it will be impossible to insert the lag screw. For this reason, it is recommended that you assemble the Angle Guide Attachment to the Drill Guide prior to insertion of the Intramedullary Hip Screw.

First, assemble the Drill Guide to the Drill Guide Handle (Figure 6). Secure the selected Angle Guide Attachment to the Drill Guide with the Angle Guide Attachment Bolt and tighten using the 11/16" Universal Socket Wrench ⑩ (Figure 7).

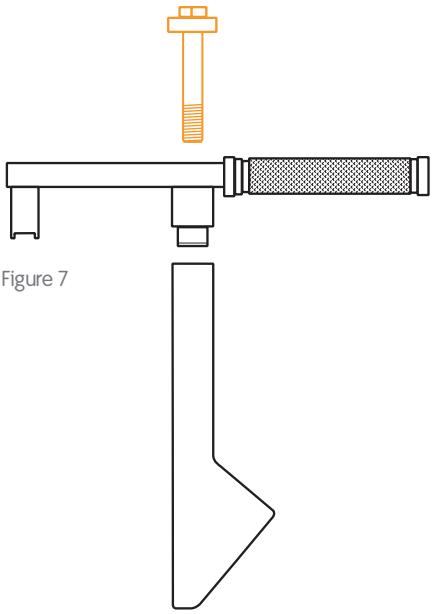
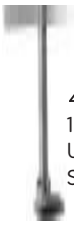


Figure 7

⑨ Angle Guide Attachment



⑩ 11/16" Universal Socket Wrench

Next, attach the appropriate nail to the drill guide assembly with the Drill Guide Bolt (Figure 8). Tighten the bolt using the 11/16" Universal Socket Wrench ⚠10. Then, attach the Driver ⚠8 to the Drill Guide and tighten using the 9/16" Open End Wrench ⚠11 (Figure 9).

Confirm correct assembly by passing the Sleeve Reamer ⚠17 through the Silver Drill Sleeve ⚠12 and the proximal hole of the IMHS nail (Figure 10).

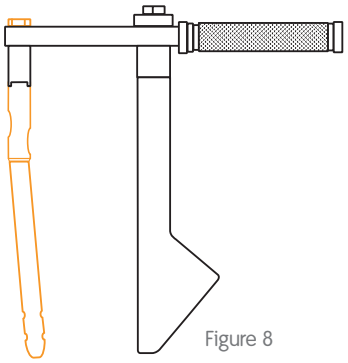


Figure 8

NOTE: When using the Long IMHS nail, make sure the bow is anterior.

Nail Insertion

In most cases, the IMHS nail can be inserted without the use of a guide rod. Insert the tip of the nail into the prepared proximal femur and push it down the shaft. Carry this out under fluoroscopic control. Under no circumstances should the nail and driver assembly be hammered down the femur. If the nail will not pass easily down the canal with simple, gentle twisting movements of the driver assembly, it should be removed and the canal reamed by 1 or 2 mm before reinsertion.

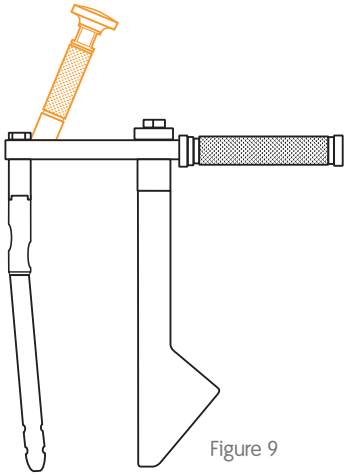


Figure 9

Remove the Driver since this part of the assembly is no longer needed. If the Driver has tightened during nail insertion, the 9/16" Open End Wrench can be used to loosen it. The remainder of the insertion apparatus does not obscure the femoral head on the lateral radiograph.

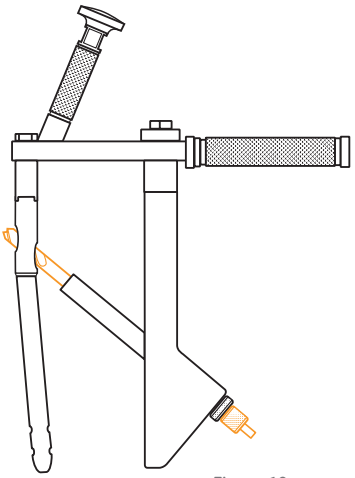


Figure 10

⚠11
9/16"
Open End
Wrench

⚠8
Driver

⚠17
Sleeve
Reamer

Combination
Reamer
(Alternative)

⚠12
Silver Drill
Sleeve

Proximal Targeting

Correct positioning of the nail is critical to ensure that the lag screw will be placed in the center of the femoral head in both A-P and lateral planes.

Two Silver Drill Sleeves are available for use with the Angle Guide Attachment, lengths 14 cm and 16 cm. When the nail is in the correct position, thread the appropriate Drill Sleeve into the Angle Guide Attachment.

Make an incision in the skin to allow the selected size Silver Drill Sleeve to be screwed in until it is flush with the Angle Guide Attachment (Figure 11). Choose the sleeve that comes closest to the lateral cortex without impeding its ability to be completely screwed into the Angle Guide Attachment. Insert the Guide Pin Sleeve 13 until it rests on the lateral cortex of the femur (Figure 12). It is important that the sleeve fit flush against the femur to reduce the likelihood of the guide pin "walking." Using A-P fluoroscopy, estimate the approximate position of the lag screw.

Insert a 3.2 mm Tip Threaded Guide Pin 14 through the Guide Pin Sleeve and into the femoral neck and head. The position of the guide pin, and thus the ultimate position of the lag screw, can now be determined both on A-P and lateral radiographic screening. If any fine adjustments in the nail depth need to be made, withdraw the guide pin and slightly insert or withdraw the IMHS nail until the correct final position is achieved.

The perfect position of the guide pin is in the exact center of the femoral neck and head on both the A-P and lateral views. The pin should certainly lie within the central third of the femoral neck and head on both radiographic views. When the correct position of the guide pin is achieved in both planes, advance it to within 5 mm of the articular surface of the femoral head (Figure 13).

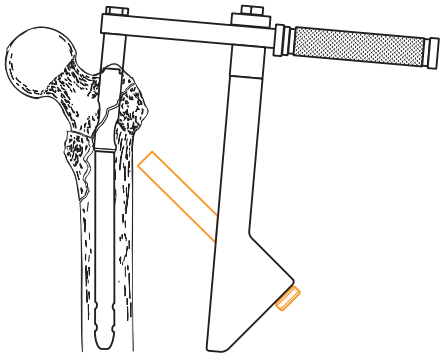


Figure 11

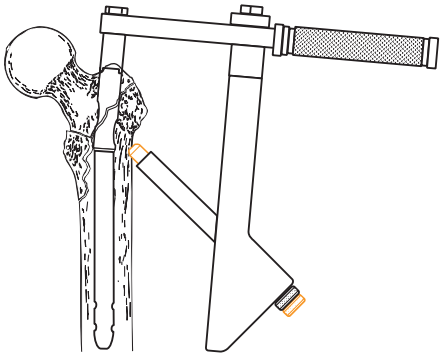


Figure 12

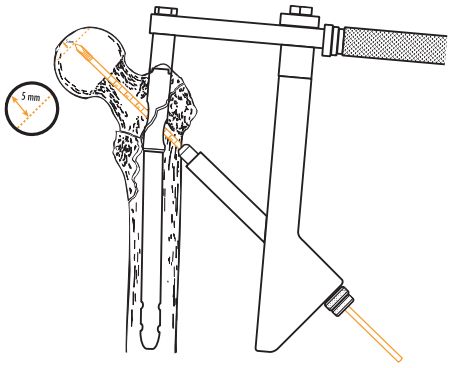


Figure 13

13 Guide Pin Sleeve

14 3.2 mm Tip Threaded Guide Pin

Selecting The Lag Screw

After insertion of the guide pin, remove the Guide Pin Sleeve from the Silver Drill Sleeve so that the lag screw length measurement can be correctly determined. Position the Lag Screw Length Gauge ⚠15 so that it rests against the guide pin and is flush with the Silver Drill Sleeve. Read the length of the lag screw directly from the guide pin (Figure 14).

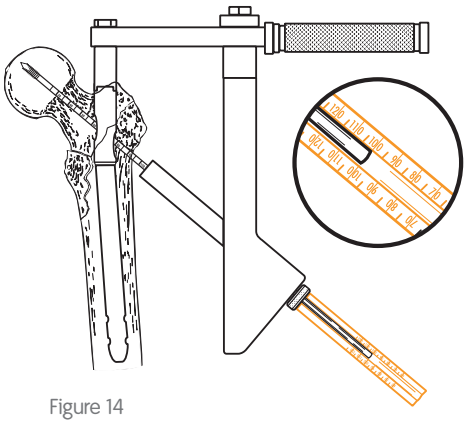


Figure 14

Reaming For The Lag Screw

Use the Lag Screw Shaft Reamer ⚠16 to prepare the femoral neck for the lag screw. The correct depth for reaming is 5 mm less than the length of the guide pin, as previously measured. This will reduce the likelihood of the guide pin being removed with the Reamer. Set the Lag Screw Shaft Reamer to the correct length and advance it through the Silver Drill Sleeve and into the femoral head until the positive stop makes contact with the Silver Drill Sleeve (Figure 15). (If the guide pin is removed with the reamer, reinsert the Guide Pin Sleeve and reintroduce the guide pin without moving the external jig.) Check the position radiographically and remove the Lag Screw Shaft Reamer. Insert the Sleeve Reamer ⚠17 to ream the lateral cortex and metaphysis until the positive stop makes contact with the Silver Drill Sleeve (Figure 16). Remove the Sleeve Reamer.

NOTE: The IMHS Lag Screw/Barrel Reamer can be used to ream for the Lag Screw and Centering Sleeve all in one step.

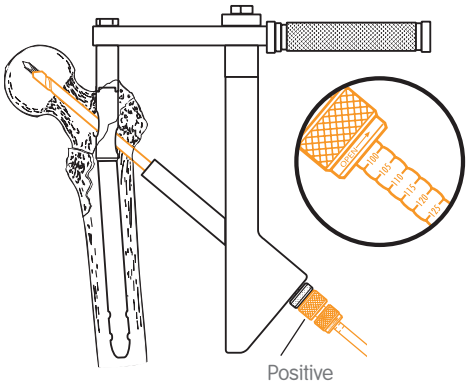


Figure 15

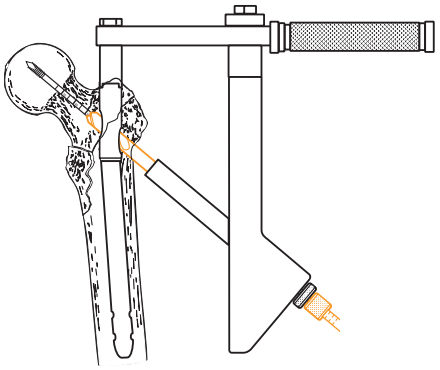


Figure 16

⚠15
Lag Screw
Length
Gauge

⚠16
Lag Screw
Shaft
Reamer

⚠17
Sleeve
Reamer

Combination
Reamer
(Alternative)

Tapping For The Lag Screw

In an osteoporotic femur, tapping is unnecessary. In younger individuals, tapping the femoral neck to prepare for the lag screw is preferred. Otherwise, there may be a tendency for the femoral neck and head fragment to rotate during the insertion of the lag screw. Set the Lag Screw Tap ⚠18 for the same length as the Lag Screw Shaft Reamer (5 mm less than the guide pin measurement) and insert it through the Silver Drill Sleeve (Figure 17).

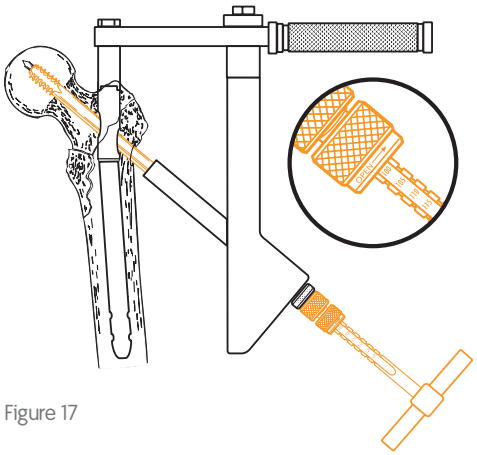


Figure 17

Selection Of The Lag Screw

Use a standard AMBI/CLASSIC Lag Screw. The tip of the lag screw should lie within 5-10 mm of the articular surface of the femoral head, since the bone in this region is denser than in the center of the head. This will make screw cut-out less likely. The length given by the measurement already allows for 5 mm of compression. In most peritrochanteric fractures, compression is only temporarily effective, and is not regarded as necessary.

NOTE: Do not use AMBI/CLASSIC Super Lag Screws. The Super Lag Screws will not pass through the IMHS nail.

⚠18
Lag Screw
Tap

Insertion of Lag Screw, Sleeve, and Set Screw

Assemble an IMHS Centering Sleeve (HN-1200) onto the Lag Screw Insertion Wrench ⚠19 (Figure 18). Attach the appropriate Lag Screw to the Wrench and tighten the Lag Screw Retaining Rod (Figure 19). Snap the Insertion Wrench Handle over the Lag Screw Retaining Rod and onto the shaft of the Wrench (Figure 20).

Insert the entire assembly over the guide pin and through the Silver Drill Sleeve. Advance the lag screw into the proximal femur to the desired level using radiographic control. When the notch on the Wrench's shaft is flush with the edge of the Silver Drill Sleeve and the handle is perpendicular to the axis of the femoral shaft, the screw is correctly positioned for 5 mm of compression (Figure 21).

The handle of the Insertion Wrench must be perpendicular to the axis of the femoral shaft to ensure maximum strength of the lag screw in-situ.

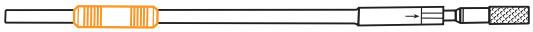


Figure 18

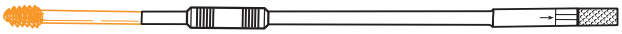


Figure 19

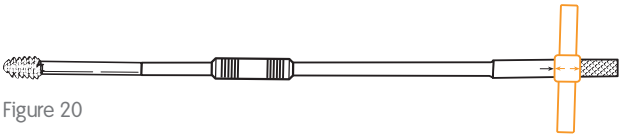


Figure 20

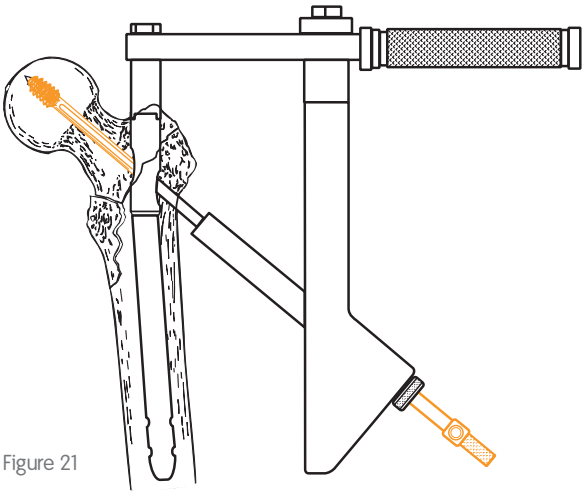


Figure 21

⚠19
Lag Screw Insertion Wrench (Unassembled)

When the lag screw has been inserted to the correct depth, remove the Insertion Wrench Handle, leaving the Wrench Shaft and Lag Screw Retaining Rod attached to the lag screw (Figure 22). Slide the Sleeve Inserter ⚠20 over the Wrench Shaft and up through the Silver Drill Sleeve. Use it to push the Centering Sleeve through the lateral cortex of the femur and into the nail. The sleeve inserter may be tapped with the Slotted Hammer ⚠21 until it contacts the Silver Drill Sleeve (Figure 23). An A-P view with the image intensifier will confirm that the Centering Sleeve is centered within the nail.

Use the Universal Set Screwdriver ⚠22 with the 75 in./lb. Torque Wrench ⚠23 to insert a Set Screw (HN-1202) through the Drill Guide Bolt and into the top of the nail (Figure 24). The set screw will lock into a groove of the Centering Sleeve (Figure 24 Inset). When an audible snap is heard while turning the Torque Wrench, the set screw is firmly secured against the Centering Sleeve. For optimal results, the Torque Wrench and the Universal Set Screwdriver should be in line with the nail as closely as possible. Also, a retorque after a one minute pause ensures maintenance of optimal torque.

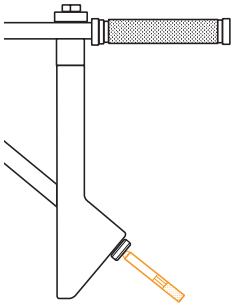


Figure 22

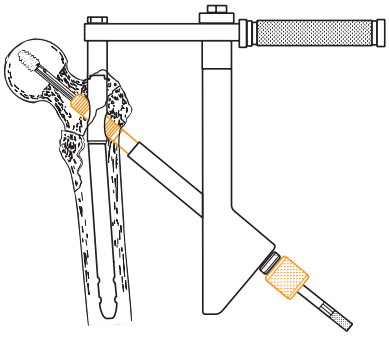


Figure 23

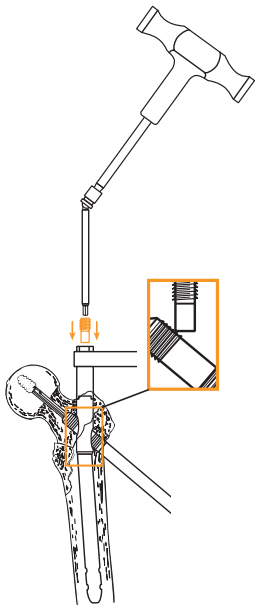


Figure 24

⚠20
Sleeve Inserter

⚠21
Slotted Hammer

⚠22
Universal Set Screwdriver

⚠23
75 in./lb. torque Wrench

Once the Centering Sleeve is secured by the Set Screw, the lag screw will no longer rotate, but it will be able to slide. The Sleeve Inserter, Lag Screw Insertion Wrench, and Silver Drill Sleeve may now be removed.

Polyethylene Nail Caps are available for use in preventing tissue ingrowth in the proximal portion of the nail. After the Set Screw is in place, manually screw the Nail Cap into place.

Distal Targeting for the Standard IMHS

Place the 8.0 mm Green Drill Sleeve 25 through the superior distal hole in the Angle Guide Attachment and push it down to the skin (Figure 25). Make a small incision through the skin, down to the bone, to allow the Green Drill Sleeve to pass through the soft tissue and rest against the femoral shaft. Insert the 3.5 mm Black Drill Sleeve 24 through the Green Drill Sleeve and down to the bone (Figure 26).

It is important to prevent "walking" of the Drill Tip on the curved femoral cortex. The risk of this is reduced by dimpling the lateral cortex and by using a new drill bit for every case. It is also important that the drill sleeves are flush with the femoral cortex. Using the T-Handle Jacob's Chuck 26 to hold a 3.5 mm Trocar 27, insert the Trocar through the Black Drill Sleeve to dimple the lateral cortex. Through the Black Drill Sleeve, drill a hole into the femoral shaft with a 3.5 mm Twist Drill 28 (Figure 27). Once the drill has passed through the lateral femoral cortex, the nail, and the medial femoral cortex, determine bone screw length by measuring directly from the 3.5 mm Twist Drill and the Black Drill Sleeve, or remove the 3.5 mm Twist Drill and the Black Drill Sleeve and insert the Bone Screw Length Gauge 29 through the Green Drill Sleeve. Read the appropriate screw length off the edge of the sleeve (Figure 28).

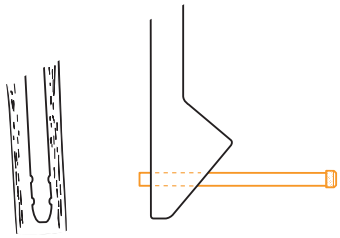


Figure 25

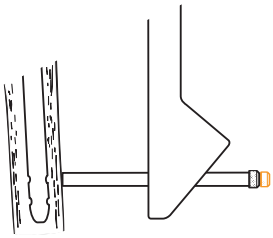


Figure 26

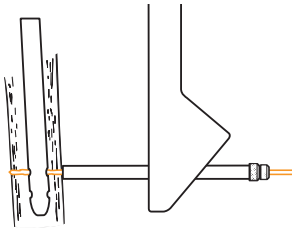


Figure 27

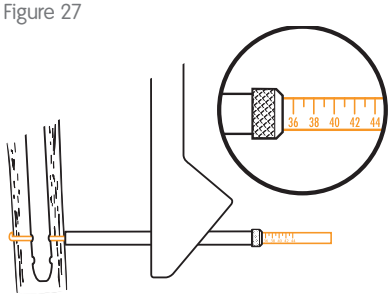


Figure 28

Nail Cap

25 8.0 mm Green Drill Sleeve

24 3.5 mm Black Drill Sleeve

26 T-Handle Jacob's Chuck

27 3.5 mm Trocar

28 3.5 mm Twist Drill

Choose the appropriate 4.5 mm self-tapping bone screw with the Screw Pickup 31. Insert the appropriate screw through the Green Drill Sleeve using the Hexdriver 30 (Figure 29). Advance the screw until the second groove of the Hexdriver reaches the end of the Green Drill Sleeve. Once the screw has been inserted, check the position by lateral radiograph, using the image intensifier to ensure that the screw has passed through the nail.

Repeat the procedure for the inferior distal screw.

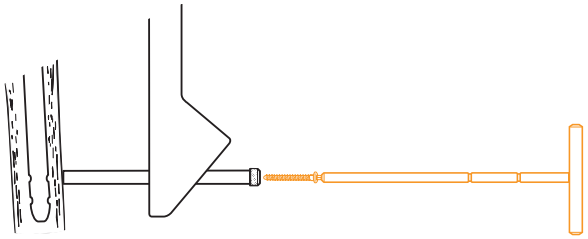


Figure 29

Insertion of the Compression Screw

Release the traction on the injured leg. If desired, compression of the lag screw may now be carried out. Reinsert the Silver Drill Sleeve and Sleeve Inserter in the Drill Guide. Insert the AMBI/CLASSIC Compressing Screw (12-1116) into the lag screw with the Hexdriver and compress it against the Centering Sleeve (Figure 30).

The insertion of the implant is now complete. After final radiographic checking, loosen the Drill Guide Bolt using the 11/16" Universal Socket Wrench. Remove the Drill Guide Assembly.

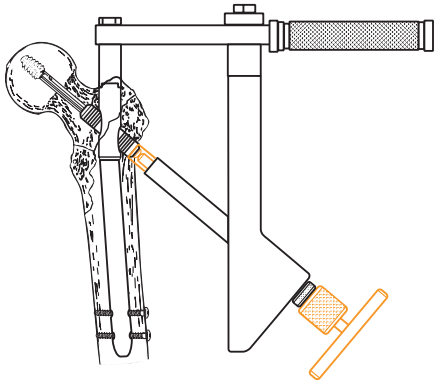


Figure 30

NOTE: The Angle Guide Attachment is not used for distal targeting the 10 mm long nail. Attempting to drill through the Angle Guide Attachment could result in damage to the nail. Distal targeting the 10 mm nail is accomplished using the freehand technique or by using the Cole Radiolucent Drill technique.

29
Bone Screw Length Gauge

31
Screw Pickup

30
Hexdriver

Distal Targeting For The Long IMHS Nail: Freehand Technique

Described by Robert F. Hall, Jr., M.D.
Chairman, Division of Orthopaedic Surgery
Cook County Hospital, Chicago, Illinois

The Long IMHS nail has 10° anteversion built into the proximal Lag Screw hole, thus allowing distal targeting to take place with the image intensifier in a true lateral position. With the image intensifier in the lateral position, scan the distal femur. Adjust the position of the intensifier until the screw holes are perfectly circular. The position of the image intensifier and the rotation of the leg can be adjusted to obtain a true lateral image of the nail.

When the holes are completely circular, center a ring forceps over the proximal hole on the lateral side of the leg. Then introduce a 10 blade within the confines of the ring forceps; make a longitudinal incision along the midline axis of the leg, carrying the incision down to bone. Repeat the procedure on the distal screw hole. Connect the two incisions with an approximately 3 cm long incision, which is carried down to the bone.

Attach the T-Handle Jacob's Chuck to the 3.5 mm Trocar and insert it through the Black Drill Sleeve to dimple the lateral cortex. The risk of the Twist Drill "walking" is reduced by dimpling the lateral cortex and using a new drill bit for each case.

Using the image intensifier, adjust the trocar until the point is centered over the screw hole. Return the image intensifier to the anterior-posterior view and maintain constant pressure on the trocar to prevent skidding. Swing the trocar perpendicular to the axis of the bone.

Adjust the angle on the A-P image so that the trocar will be driven towards the hole in the nail. Now the trocar is lined up both in the lateral and the A-P planes. Using a mallet, drive the trocar to the lateral side of the nail. Remove the T-handled chuck from the trocar and obtain a lateral image of the femur. The trocar should point directly to the center of the hole within the rod. If this is not the case, make adjustments as necessary.

Once proper alignment has been obtained, withdraw the trocar; place the drill in the previously made hole and drill through the rod and opposite cortex. Determine the length of the screw using the Screw Length Gauge. Place the screw in its proper position. Repeat the procedure on the distal screw hole. The last image should be a lateral view, confirming satisfactory placement of the screws.

Closure

Close the proximal operative wound over a suction drain. The fibers of gluteus medius may be carefully approximated and the gluteus maximus aponeurosis closed with a continuous suture. The distal wounds require skin closure only. Finally, apply an impermeable dressing.

Postoperative Instructions

In peritrochanteric fractures with a stable configuration (i.e., where the medial cortical buttress and lesser trochanter remain intact), early full weight bearing is permitted. Mobilize the patient after the removal of the drain, at 24-48 hours, and allow weight bearing as tolerated. In unstable fracture configurations, it is recommended that full weight bearing be deferred for a period of six weeks if possible.

Cole Radiolucent Drill — Abbreviated Technique

Step 1

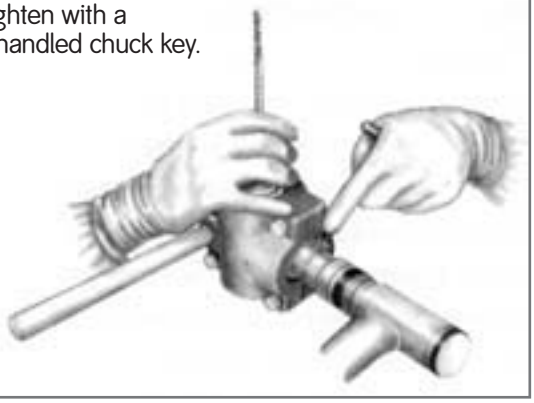
Attach the handle for use as left-handed or right-handed.

Step 2

Select the proper drill bit size and insert tapered end into the drill.

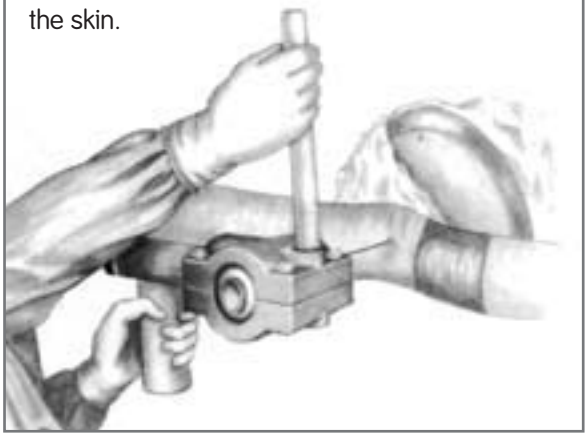
Step 5

Attach power drill to the Cole Radiolucent Drill. Tighten with a T-handled chuck key.



Step 6

Place drill bit onto the skin.

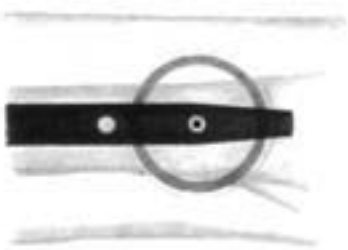


Step 9

Rotate the Cole Radiolucent Drill parallel or in line with the C-arm.

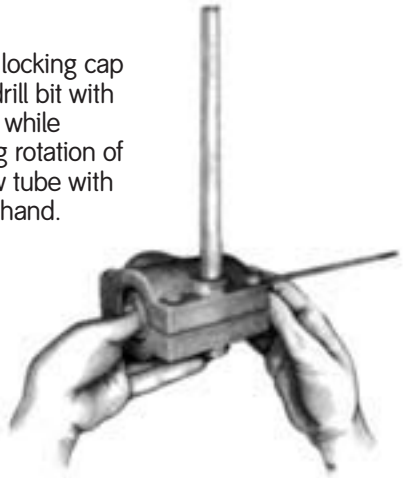
Step 10

Verify concentric position of the drill bit in the hole of the nail and two opaque rings. Drill through bone.



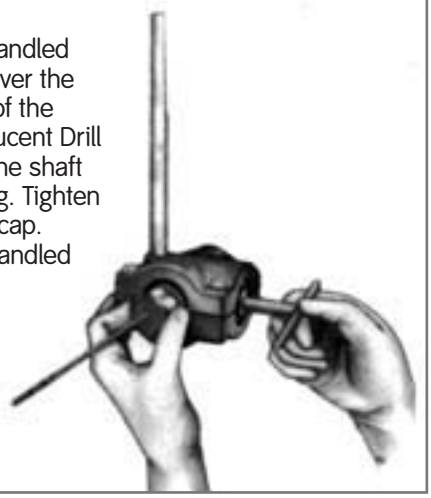
Step 3

Place the locking cap over the drill bit with one hand while preventing rotation of the hollow tube with the other hand.



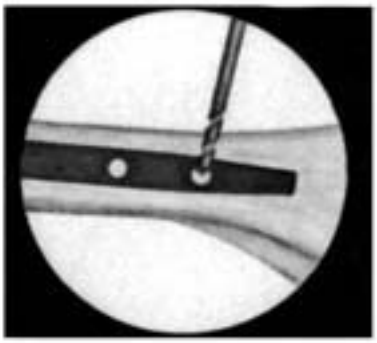
Step 4

Use the T-handled chuck key over the chuck end of the Cole Radiolucent Drill to prevent the shaft from rotating. Tighten the locking cap. Remove T-handled chuck key.



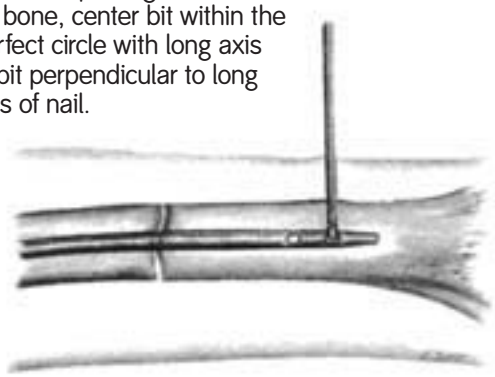
Step 7

Use image intensification to verify placement in the center of the perfect circle.



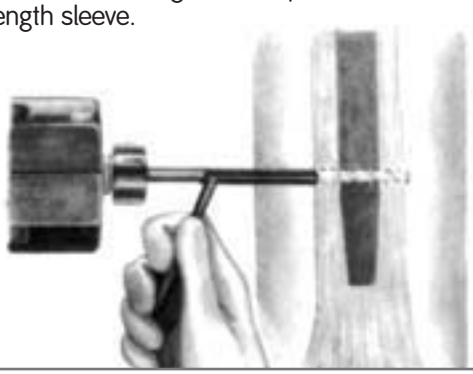
Step 8

After making an incision to bone and placing the drill bit on bone, center bit within the perfect circle with long axis of bit perpendicular to long axis of nail.



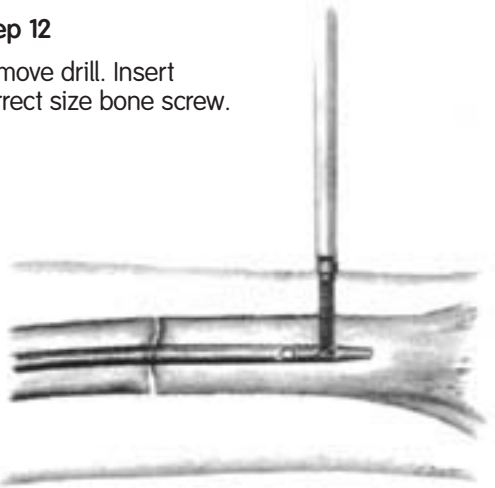
Step 11

After drilling, slide the screw length sleeve over the drill bit. Read correct screw length from top of screw length sleeve.



Step 12

Remove drill. Insert correct size bone screw.



IMHS Removal

Remove both the 4.5 mm distal locking screws with the Hexdriver.

Loosen the Set Screw (HN-1202), using the 75 in./lb. Torque Wrench and Universal Set Screwdriver enough so that the sleeve and lag screw can pass through the nail's hole. The set screw does not have to be fully removed.

Remove the Compressing Screw (12-1116) from the end of the lag screw with the Hexdriver.

Attach the Lag Screw Insertion Wrench onto the lag screw and engage the Stabilizer Bar. The centering sleeve (HN-1200) will come out with the lag screw. Note: If difficulty is expected, use the Round T-Wrench (11-0048) instead of the Insertion Wrench.

Attach the Removal Bolt to the proximal end of the nail using the 11/16" Universal Socket Wrench.

Screw the Driver/Extractor Tube into the end of the Removal Bolt. Use the Slotted Hammer to remove the nail. Note: For difficult cases, attach the R-T Slide Hammer (11-2011) to the removal bolt instead of the Driver/Extractor Tube.

32 Removal Bolt

33 Driver/Extractor Tube

Catalog Information – Implants

IMHS Standard Lag Screws

Thread Diameter: 1/2" (12.7 mm)
Thread Length: 21.0 mm
Root Diameter: 9.0 mm

Cat. No.	Length	Cat. No.	Length
12-1100	55 mm	12-1109	100 mm
12-1101	60 mm	12-1110	105 mm
12-1102	65 mm	12-1111	110 mm
12-1103	70 mm	12-1112	115 mm
12-1104	75 mm	12-1113	120 mm
12-1105	80 mm	12-1114	125 mm
12-1106	85 mm	12-1176	130 mm
12-1107	90 mm	12-1177	135 mm
12-1108	95 mm	12-1178	140 mm

NOTE: Do not use AMBI/CLASSIC 55, 60, or 65 mm lag screws with IMHS. These sizes are too short to work effectively with this device.

AMBI Clip

Cat. No. 12-1115

Compression Screws

Cat. No.	Length	Cat. No.	Length
12-1116	19 mm	12-1117	28.5 mm

4.5 mm Self-Tapping Cortical Bone Screws

Head Diameter: 8.0 mm
Major Thread Diameter: 4.5 mm
Root Diameter: 3.2 mm

Cat. No.	Length	Cat. No.	Length
7112-9216	16 mm	7112-9242	42 mm
7112-9218	18 mm	7112-9244	44 mm
7112-9220	20 mm	7112-9246	46 mm
7112-9222	22 mm	7112-9248	48 mm
7112-9224	24 mm	7112-9250	50 mm
7112-9226	26 mm	7112-9252	52 mm
7112-9228	28 mm	7112-9254	54 mm
7112-9230	30 mm	7112-9256	56 mm
7112-9232	32 mm	7112-9258	58 mm
7112-9234	34 mm	7112-9260	60 mm
7112-9236	36 mm	7112-9262	62 mm
7112-9238	38 mm	7112-9264	64 mm
7112-9240	40 mm		

IMHS Compression Hip Screw

Standard Nails

Cat. No.	Size
7116-3010	10 mm x 21 cm x 130°
7116-3510	10 mm x 21 cm x 135°
HN-3012	12 mm x 21 cm x 130°
HN-3512	12 mm x 21 cm x 135°
HN-3014	14 mm x 21 cm x 130°
HN-3514	14 mm x 21 cm x 135°
HN-3016	16 mm x 21 cm x 130°
HN-3516	16 mm x 21 cm x 135°

Long Nails

Cat. No.	Size
7116-3034R	10 mm x 34 cm x 130°
7116-3034L	10 mm x 34 cm x 130°
7116-3038R	10 mm x 38 cm x 130°
7116-3038L	10 mm x 38 cm x 130°
7116-3042R	10 mm x 42 cm x 130°
7116-3042L	10 mm x 42 cm x 130°
7116-3534R	10 mm x 34 cm x 135°
7116-3534L	10 mm x 34 cm x 135°
7116-3538R	10 mm x 38 cm x 135°
7116-3538L	10 mm x 38 cm x 135°
7116-3542R	10 mm x 42 cm x 135°
7116-3542L	10 mm x 42 cm x 135°
7116-6034L	12 mm x 34 cm x 130°
7116-6034R	12 mm x 34 cm x 130°
7116-6038L	12 mm x 38 cm x 130°
7116-6038R	12 mm x 38 cm x 130°
7116-6042L	12 mm x 42 cm x 130°
7116-6042R	12 mm x 42 cm x 130°
7116-6134L	12 mm x 34 cm x 135°
7116-6134R	12 mm x 34 cm x 135°
7116-6138L	12 mm x 38 cm x 135°
7116-6138R	12 mm x 38 cm x 135°
7116-6142L	12 mm x 42 cm x 135°
7116-6142R	12 mm x 42 cm x 135°

(R and L after Cat. No. indicates right or left.)

IMHS Centering Sleeve & Set Screw

Cat. No.	Description
HN-1200	Centering Sleeve
HN-1202	Set Screw

IMHS Nail Cap

Cat. No. 12-2672

Guide Pin

2.4 mm

Cat. No. 41-0236

Twist Drill

3.5 mm

Cat. No. 7111-0045

Bone Screw Tap for 4.5 mm Self-Tapping Screws

Cat. No. 11-0077

Bone Screw Tap for 4.5 mm Nonself-Tapping Screws

Cat. No. 7111-0070

Bone Screw Length Gauge

Cat. No. 41-3500

Screw Pickup

Cat. No. 7111-5085

Self-Holding Hex Screwdriver

Cat. No. 7111-0026

Hex Screwdriver

Cat. No. 11-5035

Catalog Information – Nail Instruments

⚠1 Curved Awl

Cat. No. 21-6600

⚠2 Tissue Protector

with Guide Pin Centering Sleeve
(for use with the Proximal Reamer)

Cat. No. 7115-2114

⚠3 3.2 mm x 353 mm Tip
⚠14 Threaded Guide Pin

Cat. No. 11-5163

⚠4 Proximal Reamer

Cat. No. 7115-2112

⚠5 Trial Handle

Cat. No. 11-5183

⚠6 Trial

Cat. No.	Size
7115-2110	10 mm
11-5185	12 mm
11-5186	14 mm

⚠7 Drill Guide

(Shown Assembled)
(Consisting of Guide, Handle, Drill Guide Bolt, Angle Guide Attachment Bolt)

Cat. No. 7115-2124

⚠7 **Replacement parts available for Cat. No. 7115-2124:**

Drill Guide Bolt: Cat. No. 7115-2132

⚠7 Angle Guide Attachment Bolt: Cat. No. 7115-2134

Combination Lag Screw and Barrel/Sleeve Reamer

Cat. No. 7115-2136

⚠8 Driver

Cat. No. 11-5160

⚠9 Angle Guide Attachment

Cat. No.	Angle
11-5170	130°
11-5171	135°

⚠10 11/16" Universal Socket Wrench

Cat. No. 11-5177

⚠11 9/16" Open End Wrench

Cat. No. 11-0566

⚠12 Silver Drill Sleeve

Cat. No.	Size
11-5161	14 cm
7115-2116	16 cm

⚠13 Guide Pin Sleeve

Cat. No. 11-5164

⚠3 3.2 mm x 353 mm Tip
⚠14 Threaded Guide Pin

Cat. No. 11-5163

⚠15 Lag Screw Length Gauge

Cat. No. 11-5162

⚠16 Lag Screw Shaft Reamer

Cat. No. 11-5166

⚠17 Sleeve Reamer

Cat. No. 11-5182

⚠18 Lag Screw Tap

Cat. No. 7115-2118

⚠[19] Lag Screw Insertion Wrench Assembly

(Shown Assembled)
(Consisting of Handle, Lag Screw Retaining Rod, Wrench Shaft)

Cat. No. 11-5176

Replacement Retaining Rod for the IMHS Lag Screw Insertion Wrench

Cat. No. 7111-5078

⚠[20] Sleeve Inserter

Cat. No. 11-5165

⚠[21] Slotted Hammer

Cat. No. 11-5175

⚠[22] Universal Set Screwdriver

Cat. No. 7115-2122

⚠[23] 75 in./lb. Torque Wrench

Cat. No. 11-5188

⚠[24] 3.5 mm Black Drill Sleeve

Cat. No. 11-2086

⚠[25] 8.0 mm Green Drill Sleeve

Cat. No. 11-2012

⚠[26] T-Handle Jacob's Chuck

Cat. No. 11-0257

⚠[27] 3.5 mm Trocar

Cat. No. 11-2085

28 3.5 mm Twist Drill
Cat. No. 7115-2128

29 Bone Screw Length Gauge
Cat. No. 7115-2126

30 Hexdriver
Cat. No. 11-2088

31 Screw Pickup
Cat. No. 7111-5085

32 Removal Bolt
Cat. No. 11-5174

33 Driver/Extractor Tube
Cat. No. 11-2008

Lag Screw/Barrel Sleeve Reamer
Cat. No. 7115-2136

Rad Guide
130 Deg. Cat. No. 7115-2138
135 Deg. Cat. No. 7115-2139

Retain Rod for Lag Screw Removal
Cat. No. 7115-2142

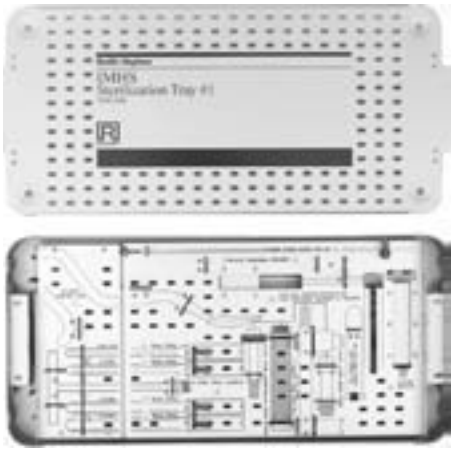
IMHS Guide, 18cm
130 Deg. Cat. No. 7115-2140
135 Deg. Cat. No. 7115-2141
(Not shown)

IMHS Drill Guide Bolt
Cat. No. 7115-2132
(Not shown)

Angle Guide Attachment Bolt
Cat. No. 7115-2134
(Not shown)

IMHS Instrument Sterilizing Case #1
(with Tray Lid and Insert)

Cat. No. 7115-2102



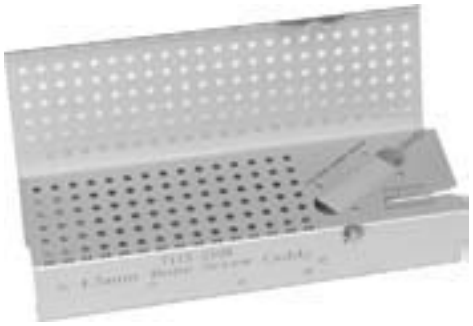
IMHS Instrument Sterilizing Case #2
(with Tray Lid)

Cat. No. 7115-2106

4.5 mm Bone Screw Caddy

NOTE: This caddy holds 6 each of the most widely used bone screw sizes. They are 20–48 mm in 2 mm increments.

Cat. No. 7115-2108



Templates

Standard IMHS Templates
Cat. No. 7118-0342
(Not shown)

Long IMHS Templates
Cat. No. 7118-0298
(Not shown)

Orthopaedics
Smith & Nephew, Inc.
1450 Brooks Road
Memphis, TN 38116
USA

Telephone: 901-396-2121
Information: 1-800-821-5700
Orders/inquiries: 1-800-238-7538

www.smith-nephew.com

The following statement is required by the U.S. FDA: WARNING: This device is not approved for screw attachment or screw fixation to the posterior elements (pedicles) of the cervical, thoracic or lumbar spine.

30013303002 7118-0934 11/04