SURGICAL TECHNIQUE

PROXIMAL FEMUR NAIL OR SUBTROCHANTERIC AND TROCHANTERIC NAIL **(SSTN/STFN)**

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Proximal Femur nail or Subtrochanteric and Trochanteric Nail (SSTN/STFN) SSTN Short and SSTN Long

Surgical Technique

SSTN Short

SSTN Long

Table of contents

Image intensifier control

Warning
This description is not sufficient for immediate application of the instrumentation. Instruction by a surgeon experienced in handling this instrumentation is highly recommended.

Indications / Contraindications

Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Short

Indications

- Pertrochanteric fractures
- Intertrochanteric fractures
- High subtrochanteric fractures

Contraindications

- Low subtrochanteric fractures
- Femoral shaft fractures
- Isolated or combined medial femoral neck fractures

Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Long

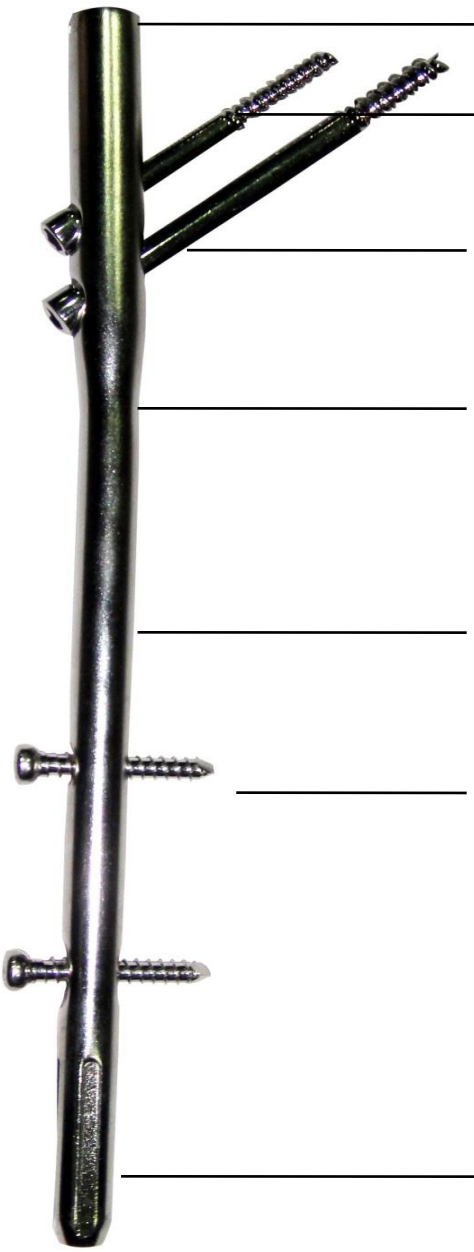
Indications

- Low and extended subtrochanteric fractures
- Ipsilateral trochanteric fractures
- Combination of fractures (trochanteric area / shaft)
- Pathological fractures

Contraindications

- Isolated or combined medial femoral neck fractures

Implant for Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Short



Proximal diameter 14mm

6.0mm Bolt(Cannulated) Femoral Neck Screw
Lengths 50mm–120mm (Diff 5mm)
For true rotational stability

8.0mm Bolt(Cannulated) Femoral Neck Screw
Lengths 50mm–120mm (Diff 5mm)

Degree of Nail 125°/130°/135°/140°

Distal diameters of 10, 11, and 12mm

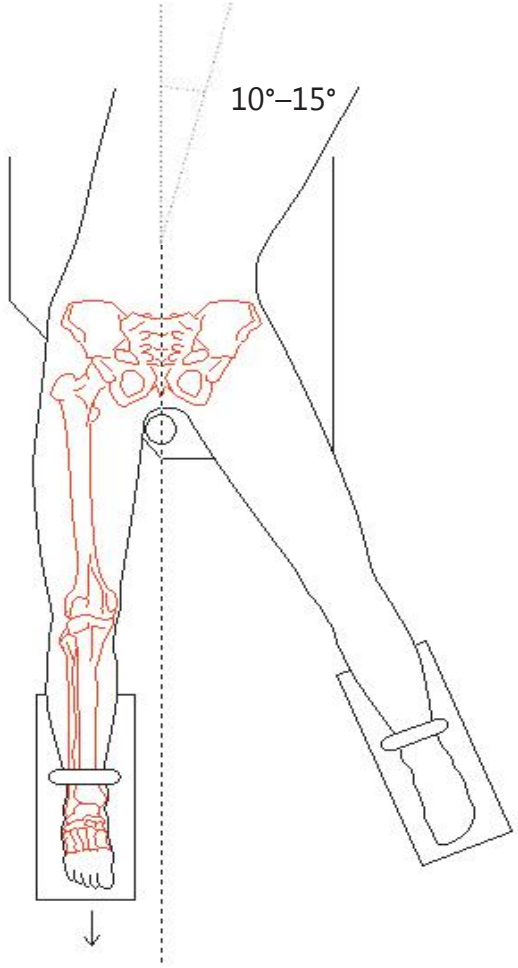
5.0mm Locking Bolt
Lengths 18mm–96mm (Diff 2mm)
A choice of static or dynamic interlocking (Dynamization: 5mm)
Distal Locking with Distal JIG

Flexible distal nail end (length: 30mm) minimizes stress concentration
The SSTN Short is available in Titanium and Stainless Steel
Total length: 24cm standard

Preparation

Patient positioning

Position patient supine on an extension table or a radiolucent operating table. Position the C-arm of the image intensifier in such a way that it can visualize the proximal femur exactly in the lateral and AP planes. For unimpeded access to the medullary cavity, abduct the upper part of the body by about 10–15° to the contralateral side (or adduct the affected leg by 10–15°).



Determine Degree of Nail

Take an AP X-ray of the unaffected side preoperatively. Determine the Degree of Nail using a goniometer or the preoperative planning template.

SSTN Short is available in 125°/130°/135°/140°.

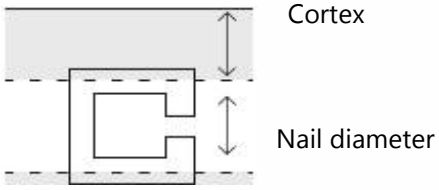
Reduce fracture

If possible, carry out closed reduction of the fracture under image intensifier control.

Exact reduction and secure fixation of the patient to the operating table are essential for easy handling and a good surgical result.

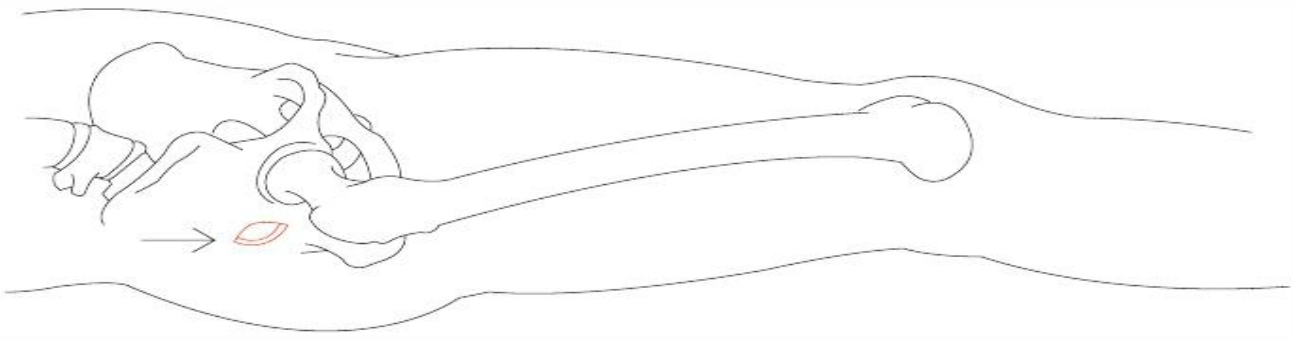
Determine nail diameter

Under image intensifier control, place the Measuring Device on the femur and position the square marking over the isthmus. If the transition to the cortex is still visible to the left and right of the marking, the corresponding nail diameter may be used.



Approach

Palpate the greater trochanter. Make a 5cm incision approximately 5cm to 8cm proximal from the tip of the greater trochanter. Make a parallel incision in the fasciae of the gluteus medius and split the gluteus medius in line with the fibres.



Surgical Technique for Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Short

Determine nail insertion point and insert Guide Wire

In the AP view, the nail insertion point is normally found on the tip or slightly lateral to the tip of the greater trochanter in the curved extension of the medullary cavity.

The medio-lateral angle of the implant amounts to 6º. This means that the 2.8mm Guide Wire must be inserted laterally at an angle of 6º to the shaft. The guide wire can be inserted either manually with the Universal Chuck with T-Handle or with the COMPACTTM AIR DRIVE II and the quick coupling for Kirschner wires.

In lateral view, place the guide wire in the centre of the medullary cavity to a depth of about 15cm. Percutaneous technique: Insert guide wire through the Protection Sleeve and the Drill Sleeve. Then remove the drill sleeve.

Note:
To ensure correct position of guide wire, position a nail ventrally on the femur and check radiographically.

Opening of the femur- with Awl

Open the femur or enlarge the entry point with the Reverse Awl. Use the Tissue Protector to spare soft tissues. Drive the awl over the guide wire into the femur until the marking on the awl shaft is level with the trochanter tip.

Remove protection sleeve and guide wire. Dispose of the guide wires, do not reuse them.

Assemble JIG and Nail

The nail diameter and Degree of Nail has already been determined during preparations for surgery.

To attached Degree JIG to Main JIG with Connecting Bolt.

To attached Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Short Nail to Main JIG with Conical Bolt.

Note
Check that the Connecting is correctly and well tightened to the nail. Do not over tighten.

Insertion of Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Short

Carefully insert the nail manually as far as possible into the femoral opening. Slight twisting hand movements help insertion. If the nail cannot be inserted, select a smaller size nail diameter.

Insertion can be supported by light blows with the synthetic Hammer on the mounted protection shield of the insertion handle.

Caution:
Avoid unnecessary use of force and only hit the protection plate. In smaller medullary canals, ream the distal part to at least 10mm. It is important that the nail is always tightly connected to the insertion handle.

Insertion of femoral neck Bolt and 2.0mm Gide Pin

Insert these screws using the 6.0mm Main Sleeve, 2.0mm Guide Sleeve 2.0mm Guide Pin, 6.0mm Drill Sleeve, Trocar and 6.0mm Drill Bit(Cannulated).

Note:
The position of the nail can be verified by placing a guide wire on the surface of the insertion handle. The position of the end of the nail can be checked by inserting a wire through the insertion handle.

To ensure the correct ante version of the implant, an additional guide wire can be inserted ventral to the femoral neck into the femoral head.

Insertion of Guide Pin for femur nake 6.0mm Bolt

Choose a position in the caudal area of the femur head so that both proximal Bolt can be inserted. Insert the Guide Pin 2.0mm deeper into the femoral head than the planned femoral head Bolt. The final position of the guide wire should be in the lower half of the femoral neck. In lateral view, the wire should be positioned in the centre of the femoral neck.

Make a stab incision and insert the 6.0mm Main Sleeve through the JIG to the bone. Mark the femur and remove the trocar.

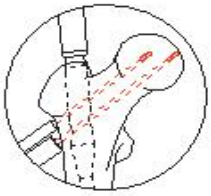
Insert a 2.0mm Guide Pin through the 2.0mm Guide Pin, check direction and position under image intensifier in AP and lateral views.

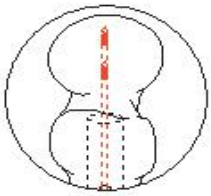
Note:
If the nail has to be repositioned, remove Guide Pin, Guide Sleeve, Main Sleeve and drill sleeve. The nail can now be repositioned by rotation, deeper insertion or partial retraction. Then reinsert the drill sleeve system and Guide Pin.

Approx. 15–20mm shorter than the caudal Guide Pin.

Insertion of Guide Pin for femur nake 8.0mm Bolt

Insert the 8.0mm Main Sleeve through the JIG to the bone. Mark the femur and remove the trocar. Then remove the trocar and insert a second, insert a 2.5mm Guide Pin through the 2.5mm Guide Sleeve, check direction and positioned at least 20mm medial of the fracture line and 5mm deeper than the planned hip pin, but approximately 15–20mm less deep than the planned femoral neck Bolt.





Note:
The use of a Guide Pin is essential to avoid rotation. As only the femoral neck Bolt has a load-bearing function, the Guide Pin should always be 15–20mm shorter than the femoral neck Bolt.

Drill hole for 8.0mm Bolt(Cannulated)

Advance the Cannulated 8.0mm Drill Bit over the 2.5mm Guide Pin trough 8.0mm Drill Sleeve. Drill to the stop (maximum drilling depth: 45mm). As the tip of the 8.0mm Bolt is self-tapping, usually no further drilling and tapping is needed.

In hard or young bone, further drilling and tapping with the Cannulated 6.0mm Tap is recommended up to the length of the Bolt with 6.0mm T-Handle Drill Tap.

Measure length of 8.0mm Bolt(Cannulated)

It is recommended to start with the insertion of the hip pin to prevent possible rotation of the medial fragment when inserting the femoral neck Bolt.

Remove the 8.0mm Drill sleeve, measure the Length of the Bolt through the Depth Gauge to the Main Sleeve and determine the length of the required Bolt. The length of this pin is indicated on the Depth Gauge and calculated to end 5mm before the tip of the Guide Pin.

Insertion of 8.0mm Bolt(Cannulated)

Use the 5.0mm Cannulated Hexagonal Screwdriver to insert the selected 8.0mm Bolt over the guide wire to the stop.

Remove and discard the 2.5mm Guide Pin of the hip pin.

If required more tighten/fixation of Bolt use 5.0mm solid Hexagonal Screwdriver.

Caution:
Do not insert the hip pin with undue force. Ensure that the lateral end of the hip pin clearly protrudes from the lateral cortex. Check under image intensification that hip pin is not inserted too far.

Drill hole for 6.0mm Bolt(Cannulated)

Advance the Cannulated 6.0mm Drill Bit over the 2.0mm Guide Pin trough 8.0mm Drill Sleeve. Drill to the stop (maximum drilling depth: 45mm). As the tip of the 6.mm Bolt is self-tapping, usually no further drilling and tapping is needed.

In hard or young bone, further drilling and tapping with the Cannulated 6.0mm Tap is recommended up to the length of the Bolt with 6.0mm T-Handle Drill Tap.

Measure length of 6.0mm Bolt(Cannulated)

It is recommended to start with the insertion of the hip pin to prevent possible rotation of the medial fragment when inserting the femoral neck Bolt.

Remove the 6.0mm Drill sleeve, measure the Length of the Bolt through the Depth Gauge to the Main Sleeve and determine the length of the required Bolt. The length of this pin is indicated on the Depth Gauge and calculated to end 5mm before the tip of the Guide Pin.

Insertion of 6.0mm Bolt(Cannulated)

Use the 5.0mm Cannulated Hexagonal Screwdriver to insert the selected 6.0mm Bolt over the guide wire to the stop.

Remove and discard the 2.0mm Guide Pin of the hip pin.

If required more tighten/fixation of Bolt use 5.0mm solid Hexagonal Screwdriver.

Caution:
Do not insert the hip pin with undue force. Ensure that the lateral end of the hip pin clearly protrudes from the lateral cortex. Check under image intensification that hip pin is not inserted too far.

Drill hole for distal Locking(with Proximal JIG)

Distal locking is usually performed with a single locking bolt. For static interlocking Subtrochanteric fractures may be double-locked..

Make a stab incision and insert the 4.0mm Drill Bit through Main sleeve through the locking hole selected in the JIG to the bone.

Remove the Trocar and drill through both Main Sleeve, 4.0mm Drill Sleeve cortices using the 4.0mm Drill Bit. Read off the length of the required locking bolt directly from the drill marking. Ensure that the Main Sleeve and 4.0mm Drill Sleeve has good bone contact.

Alternative length measuring

Remove the 4.0mm Drill Sleeve and determine the bolt length with the Depth Gauge for Locking 5.0mm Bolts.

Insertion of locking bolt

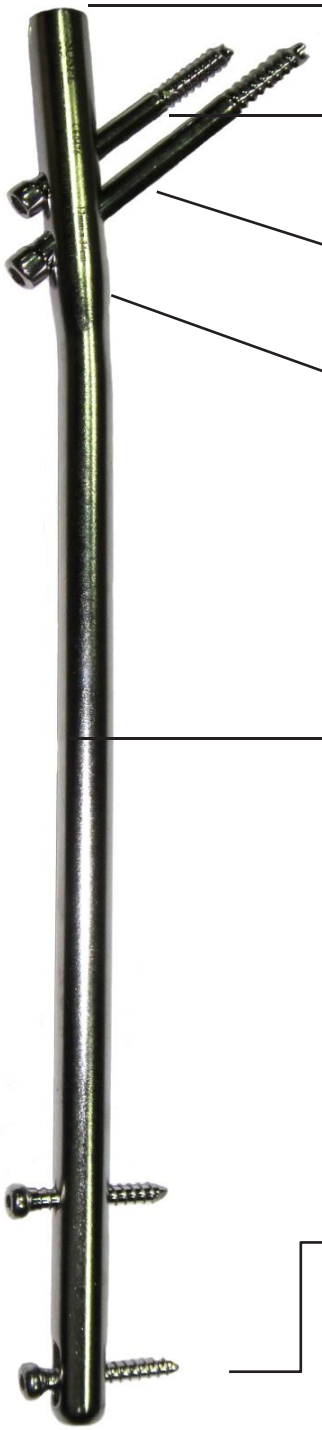
Insert the 5.0mm locking bolt through the Main Sleeve using the 4.0mm Hexagonal Screwdriver .

Remove the protection sleeve and the Main JIG.

Insertion of End Cap

Align the End Cap with the nail axis using the 4.0mm hexagonal screwdriver in order to prevent tilting. Screw the end cap completely onto the nail until its collar touches the proximal end of the nail. In order to avoid losing the end cap and to facilitate insertion, the end cap can also be inserted through the Main Sleeve.

Implant for Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Long



Proximal diameter 14mm

6.0mm Bolt(Cannulated) Femoral Neck Screw
Lengths 50mm–120mm (Diff 5mm)
For true rotational stability

8.0mm Bolt(Cannulated) Femoral Neck Screw
Lengths 50mm–120mm (Diff 5mm)

Degree of Nail- 135°

Distal diameters of 10, 11, and 12mm

5.0mm Locking Bolt
Lengths 18mm–96mm (Diff 2mm)
A choice of static or dynamic interlocking (Dynamization: 5mm)
Distal Locking Free Hand

The Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Long is available in Titanium and Stainless Steel
Total length: 30cm To 44cm(Diff 2.0mm)
Standard- (Left & Right)

Preparation

This surgical technique is based on the Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Short surgical technique. In order to follow the correct procedure, please refer to the respective steps in the standard technique. This part only shows the steps regarding insertion and distal interlocking of the Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Long which differ from the standard technique.

Directives for medullary reaming

Reduction

Insert the reduction system, consisting of a T-handle, a flexible Shaft , a Reaming Rod and a Reduction Head into the medullary canal, and reduce the fragments under image-intensifier control.

After reduction, remove the reduction system, and leave the reaming rod in the medullary cavity.

Medullary reaming

The reaming rod is already in the medullary canal, if the reduction has been achieved by means of the reduction system.

For initial reaming, the flexible shaft is usually equipped with the 8.5mm Reamer Head.

Ream to the desired Dia reaming in 0.5mm increments.

Important:
Remove the reaming rod before locking the Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Short Nail.

Assemble Instrument

Please refer to the Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Shot surgical technique.

Note:
Choose the appropriate nail for the left or right leg.

Insert Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) long Proximal Femoral Nail

If no reaming has been performed, the Guide Wire may help nail insertion, but is usually not necessary. Carefully insert the nail manually as far as possible into the femur opening. Slight twisting hand movements help insertion. If necessary, insertion can be supported by light hammering blows.

Insert the Exactor Rod with Adopter into the Conical Bolt and the nail of correct Diameter and length into the nail support. Check that the wings are engaged in the nail correctly so that the nail curvature corresponds to the curvature of the femur to be treated (LEFT or RIGHT) and tighten the locking Exactor Rod using the Impactor inserted in the holes in the Rod.

Caution:
Avoid unnecessary use of force and only hit the hammer guide or the protection plate. Do not hit the most proximal end of the guide wire.
If too much force is needed for insertion, the nail should be removed and the femur shaft should be reamed again.
It is important that the nail is always tightly connected to the insertion handle. This has to be checked especially after hammering.

Note:
DO NOT DIRECT HAMMER ON THE MAIN JIG.
ATTACHED ADOPTER WITH CONICAL BOLT.

Insertion Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Long of femur neck Bolt

Please refer to the Proximal Femur nail or Subtrochanteric and Trochanteric nail (SSTN/STFN) Short technique and choose the 135° JIG angle of the chosen nail.

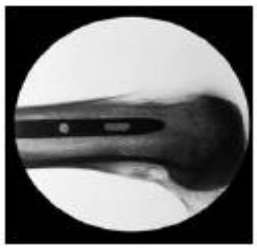
Distal locking(FREE HAND)

Distal locking is usually performed with two locking bolts.

For Static interlocking position the caudal bolt at the proximal end of the locking slot.

For Dynamic interlocking position it at the distal end of the locking slot. If immediate dynamization is required, only use the caudal locking slot.

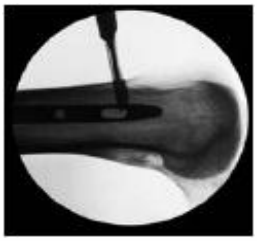
Oblique (incorrect)



Round (correct)

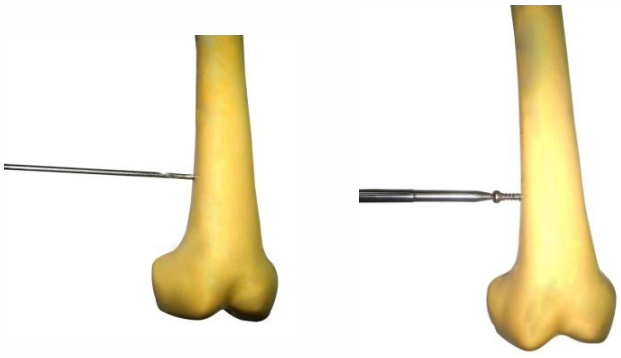
Under image intensification, insert the tip of the 4.0mm Drill Bit into the incision and place the bit oblique to the X-ray beam until the tip is centered in the locking hole. Tilt the drive until the drill bit is in line with the beam and appears as a radio-opaque solid circle in the centre of the outer ring. The drill bit will nearly fill in the locking hole image. Hold the drill in this position and drill through both cortices.
Measure the needed locking bolt length using the Depth Gauge, adding 2–4mm to the reading to ensure thread engagement in the far cortex.

Insert the bolt using the 4.0mm Hexagonal Screwdriver. Repeat the procedure for the second distal locking bolt. For static inter- locking place the 5.0mm locking Bolt at the proximal end of the locking slot, for dynamic interlocking at the distal end to allow dynamization.



Determine incision point

Centre drill bit in locking hole



Note:
If the Radiolucent Drive Mark II is not available, perform distal interlocking in standard freehand technique using the 4.0mm Drill Bit.

Insert End Cap

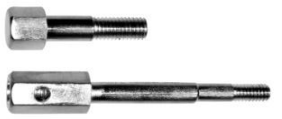
Please refer to the PFN standard surgical technique

Instrument

Awl

Proximal Remer

Trocar



Conical Bolt & (Jig Holding Bolt)

Main Jig

130* and 135* Degree Jig

Main Sleeve 8.0mm, 6.0mm and 4.0mm

Drill Sleeve 8.0mm, 6.0mm and 4.0mm

Drill Bit 8.0mm, 6.0mm and 4.0mm

Screw Driver

Exactor set, Hammer And Adopter

Depth Gauge

Spanner

2.0mm and 2.5mm Guide Wire

Tissue Protractor Sleeve

Instrument Set Box

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