

OSS™ Orthopedic Salvage System

Compress® Device

Surgical Technique



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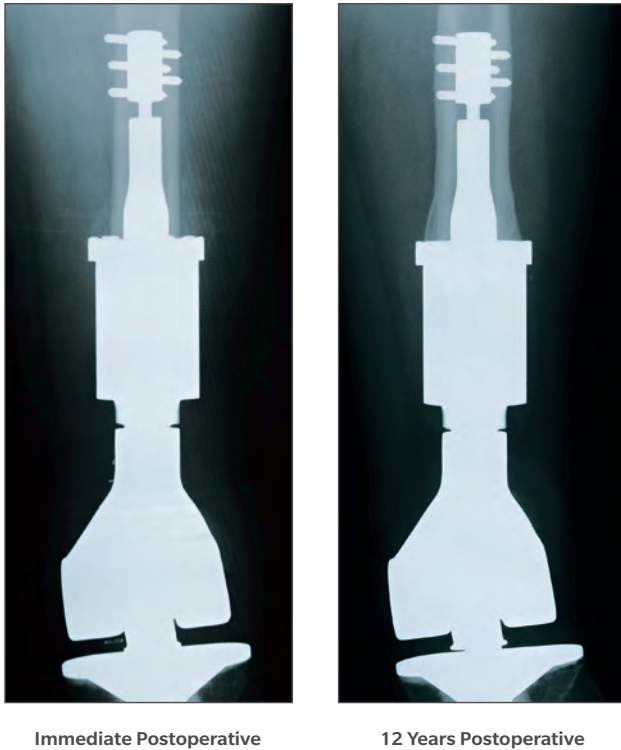


Figure 1

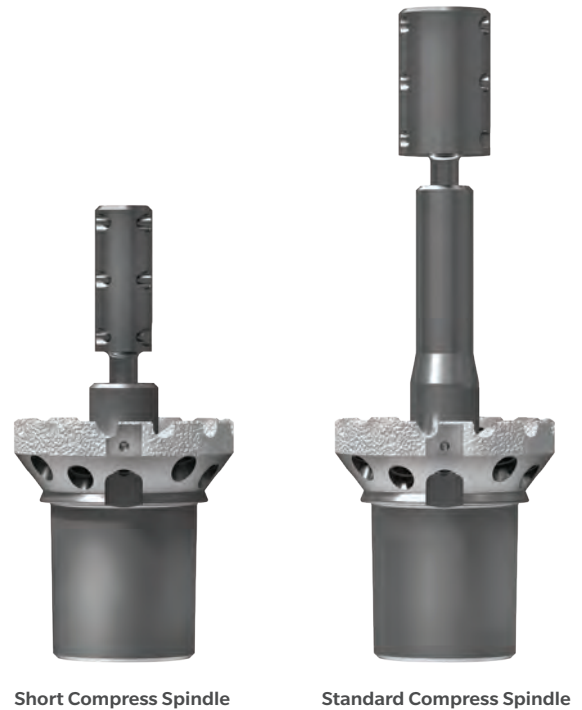


Figure 2

Device Description

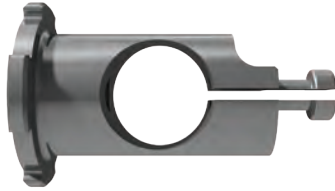
The Compress Device was developed as an alternative method for fixating a segmental construct to host bone, while creating a stable bone-prosthesis interface. Unlike a stemmed construct, the Compress Device was designed to prevent bone resorption by allowing stress sharing via the implant and bone while providing a motion free environment suitable for biologic fixation (Figure 1).

The system is available in two different anchor plug/spindle options: the short Compress Device requiring 45 mm of medullary placement (particularly advantageous for bone loss) and the standard Compress Device requiring 80 mm of medullary placement (Figure 2). The following surgical technique will focus on the standard 80 mm anchor plug/spindle offering.

- ⓘ **Note:** Please reference the IFU for indications and contraindications relating to the Compress Device and OSS implants.
- ⓘ **Note:** While the 9 and 13 hole anchor plugs exist, this technique focuses on 5 hole anchor plugs. If using the 9 or 13 hole anchor plug, additional instrumentation may be required.



Figure 3



For use with the Standard or Short Implants



For use with the Reduced Resection Implants
Part Number 32-481114

Figure 4

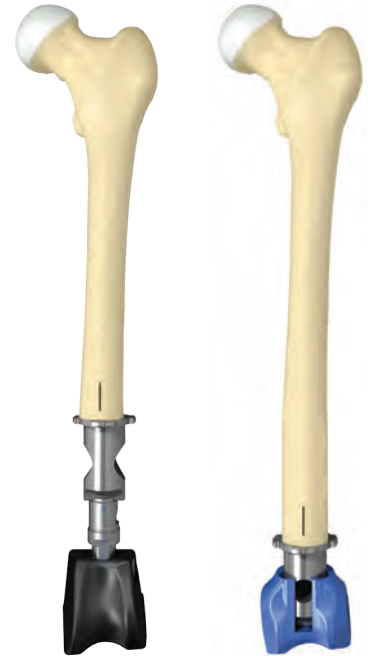


Figure 5

Resection

Utilize the Compress Resection Chart on page 2 to determine the correct implant components needed to recreate the residual femur.

To achieve a proximal or distal femoral resection, begin by making a resection mark and a rotational alignment mark with a cautery device or methylene blue (Figure 3). Using a freehand transverse cut, resect the femur at the reference resection mark.

No Face Adapter Provisional Construct

Following the transverse resection, it is recommended that the no face adapter provisional be attached to segmental provisionals in order to ascertain some semblance of the construct length (Figures 4 and 5). This is suggested at the onset of the surgery because once the holes for the transverse pins are drilled and the anchor plug is secure within the canal, no additional bone may be resected without dramatically altering the original replacement length.

Note: If preparing the bone for use with the Compress reduced resection implants, utilize the no face adapter provisional with the threaded connection rather than the quick connect (32-481114).

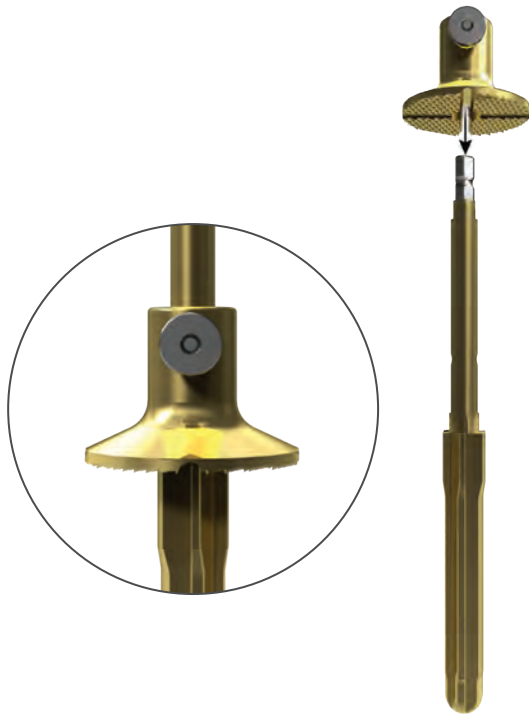


Figure 6

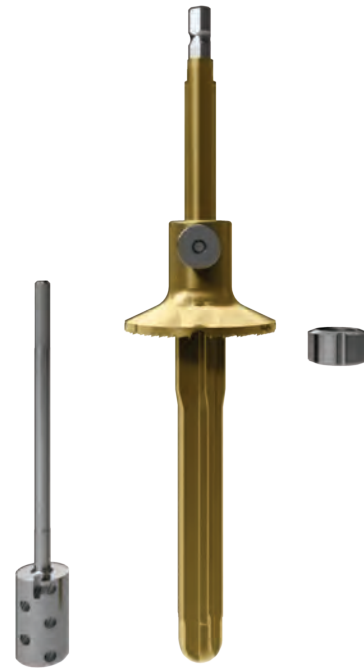


Figure 7

Canal Preparation

After a starter reamer has opened the canal, prepare the femoral canal for implant insertion by using the Compress triple reamers (Figure 6).

When used in conjunction with the modular planers, the triple reamers are preset to the desired reaming depth and prepare for both the anchor plug and centering sleeve diameters (Figure 7). This allows the femoral osteotomy site to be perpendicular to the longitudinal axis of the femoral shaft.

Note: The triple reamer tips protrude past the medullary placement to a depth of 65 mm on the short reamers and 100 mm on the standard reamers.

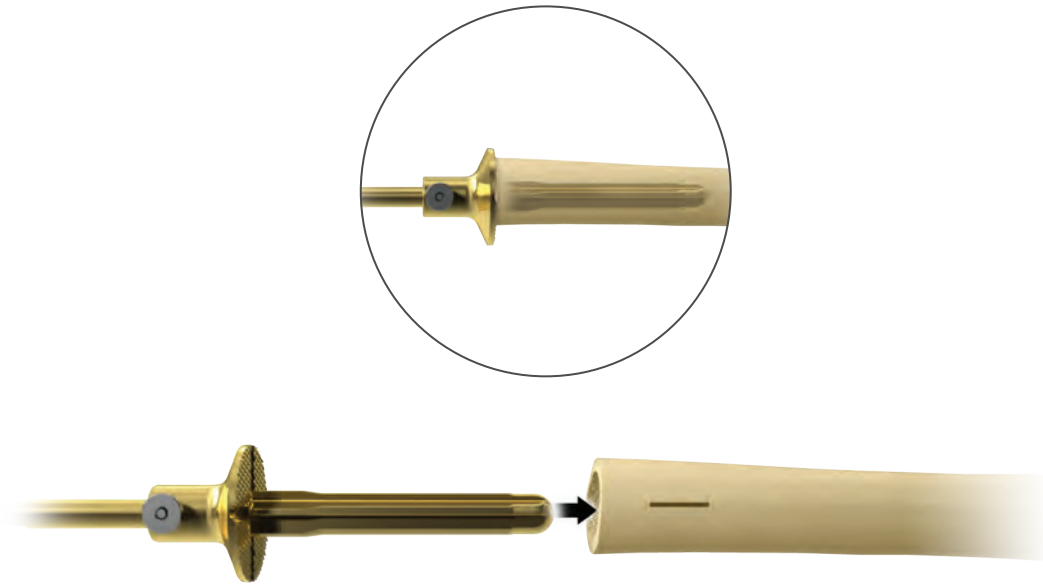


Figure 8

Canal Preparation (cont.)

Sequentially ream with gentle force against the femoral osteotomy site until full circumferential cortical contact at the osteotomy site and centering sleeve location is achieved (Figure 8).

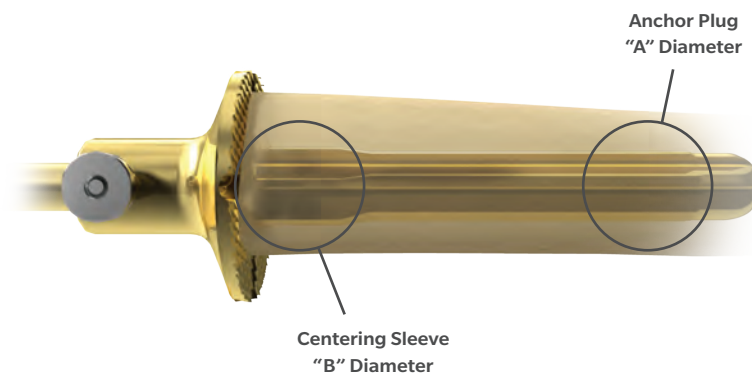


Figure 9

Canal Preparation (cont.)

The "A" diameter of the final triple reamer will determine the anchor plug size and the "B" diameter will determine the centering sleeve size (Figure 9).

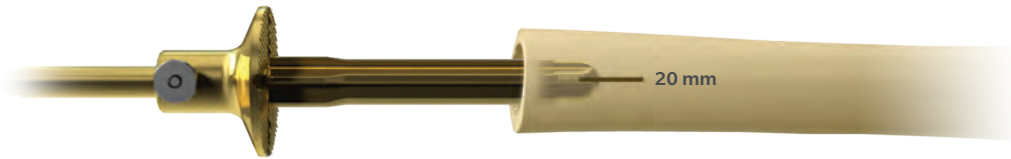


Figure 10

Canal Preparation (cont.)

Note: If the triple reamer provides cortical contact for the anchor plug, but not the centering sleeve, reintroduce sequential triple reamers to a depth of 20 mm at the resection level until cortical contact is achieved (Figure 10). Refer to the Triple Reamer Table for the appropriate anchor plug and centering sleeve diameters.

Triple Reamer Table

Size	Diameters		Use Anchor Plug Diameter	Use Centering Sleeve Diameter
	"A" (mm)	"B" (mm)		
10-12	10	12	10	*
11-13	11	13	10	13
12-14	12	14	12	14
13-15	13	15	12	15
14-16	14	16	14	16
15-17	15	17	14	17
16-18	16	18	16	18
17-19	17	19	16	19
18-20	18	20	18	20
19-21	19	21	18	21
20-22	20	22	20	22
21-23	21	23	20	23
22-24	22	24	22	24

*The diameter of the spindle shaft is 12 mm, no centering sleeve necessary

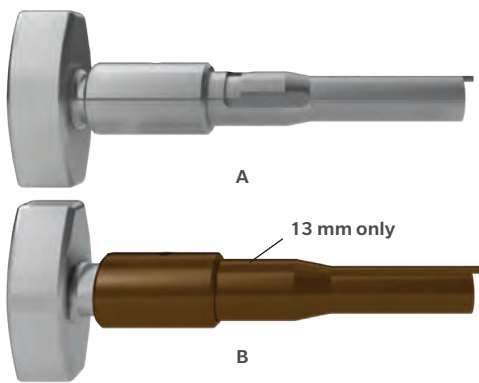


Figure 11

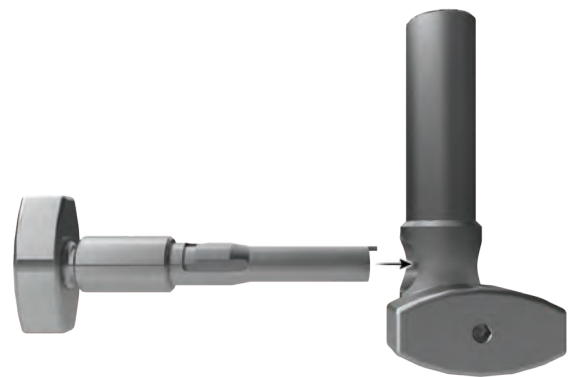


Figure 12

Anchor Plug

Instrumentation Assembly

ⓘ **Important:** There are two distinct anchor plug holders in the Compress instrumentation. The first (Figure 11A) is used without a centering sleeve provisional when the final reamer at the resection level is 12 mm. It is also used with centering sleeve provisionals when the final reamer measures 14 mm through 28 mm.

The second anchor plug holder (Figure 11B) is used only when the final reamer at the resection level measures 13 mm. This 13 mm anchor plug holder is used without a centering sleeve provisional.

Slide the anchor plug holder through the cross bar (Figure 12).

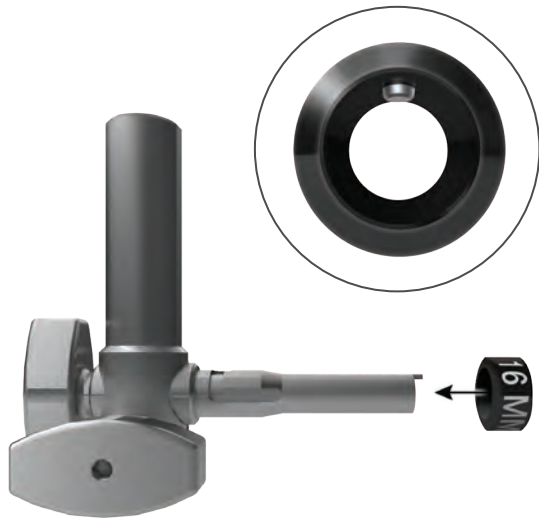


Figure 13



Figure 14

Anchor Plug (cont.)

Slide the centering sleeve provisional (based on the final reamer diameter B in the “Canal Preparation” step) onto the anchor plug holder. Be sure to align the exposed metal nub inside the provisional with the female keyway located on the holder. When the provisional meets the cross bar, lock into place with a clockwise turning motion (Figures 13 and 14). Confirm that the centering sleeve provisional fits snugly within the canal at the osteotomy site.

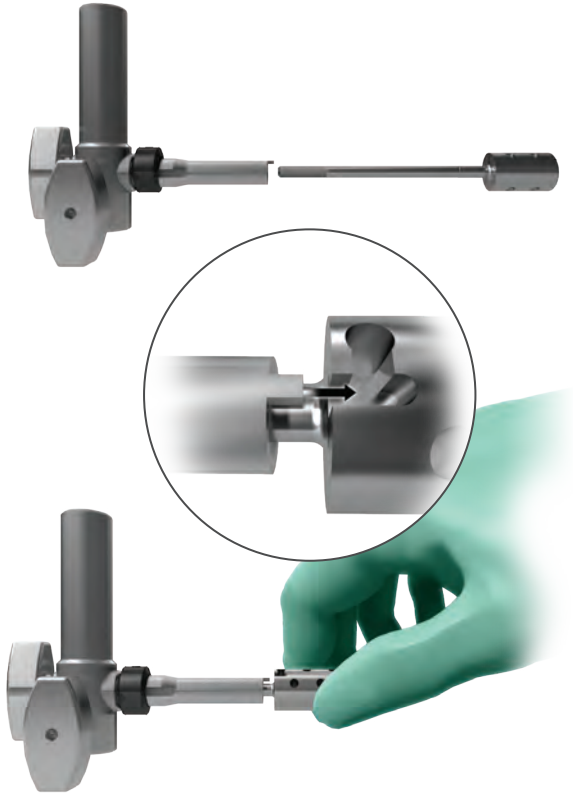


Figure 15



Figure 16

Anchor Plug (cont.)

Slide the anchor plug implant (based on the final reamer diameter A in the “Canal Preparation” step) into the anchor plug holder. Be sure the male tab of the holder fits into the female tab of the anchor plug head (Figure 15). Tighten into position with a clockwise motion of the anchor plug holder knob (Figure 16).

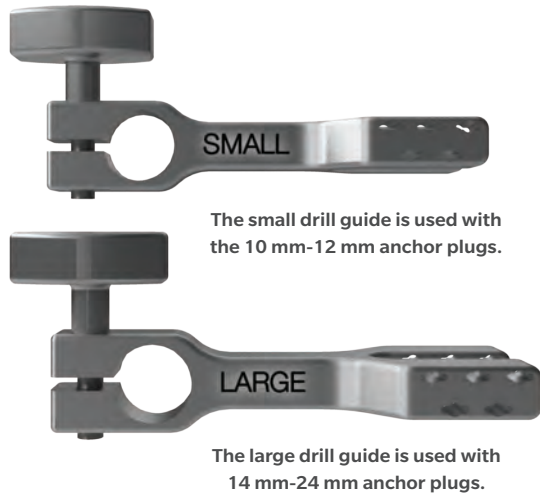


Figure 17

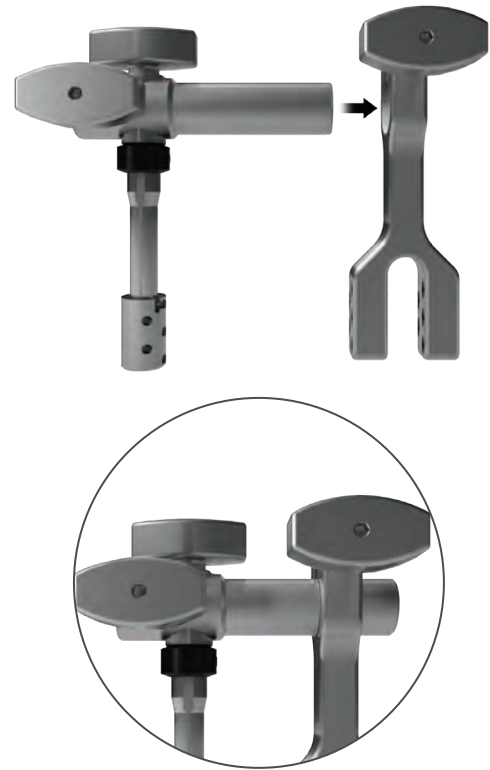


Figure 18

Anchor Plug (cont.)

Choose the appropriate drill guide to match the selected anchor plug (Figure 17).

Place the cross bar through the drill guide (Figure 18).



Figure 19

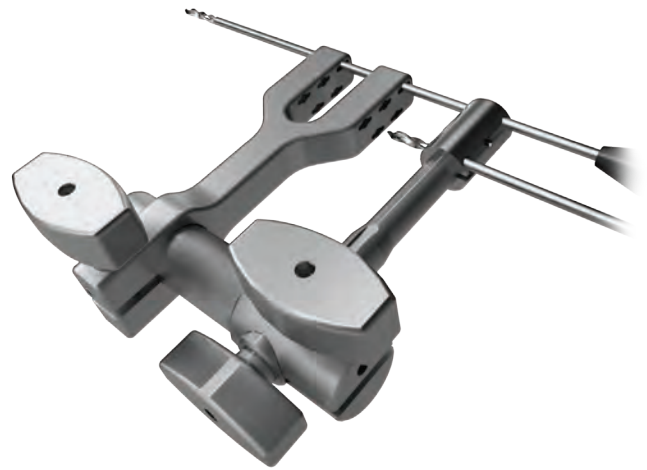


Figure 20

Anchor Plug (cont.)

Instrumentation Assembly Alignment

ⓘ **Note:** All three drill bits and the pin inserter are packaged with each anchor plug.

Align the drill guide with the anchor plug by placing one of the short drill bits through the far upper right hole of both the anchor plug and the drill guide (Figure 19).

Place the other short drill bit through the far upper left hole of both the anchor plug and drill guide (Figure 20).

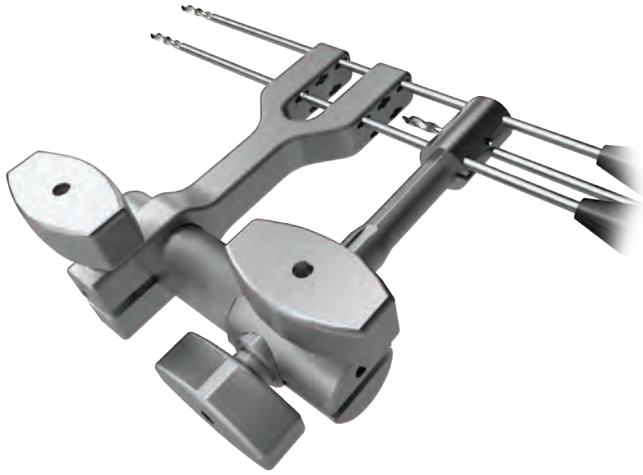


Figure 21

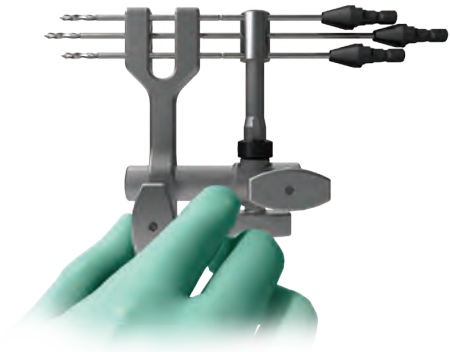


Figure 22

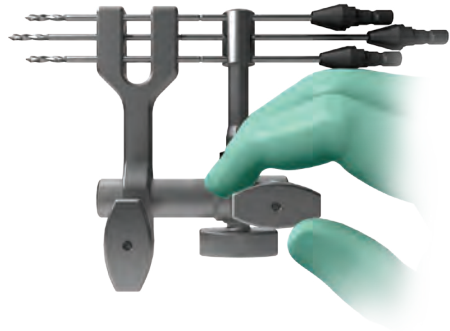


Figure 23

Anchor Plug (cont.)

The long drill bit is positioned through either of the two lower holes in the anchor plug and drill guide (Figure 21).

Once the drill bits are in place, minimize the lateral distance between the drill guide and the anchor plug to optimize targeting once the anchor plug is inserted into the bone (Figure 22). Alternate tightening of both adjustment knobs located on top with a clockwise motion until snug (Figure 23).

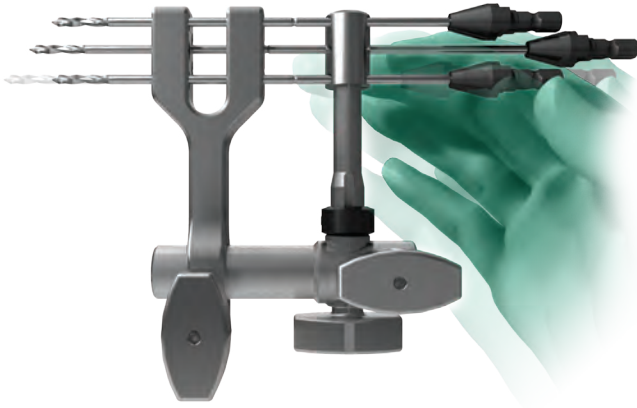


Figure 24

Anchor Plug (cont.)

When the knobs are tight, all three drill bits should slide freely through the alignment holes (Figure 24).

⊖ **Note:** If the drill bits do not slide freely, loosen the top two adjustment knobs and begin the tightening process again.

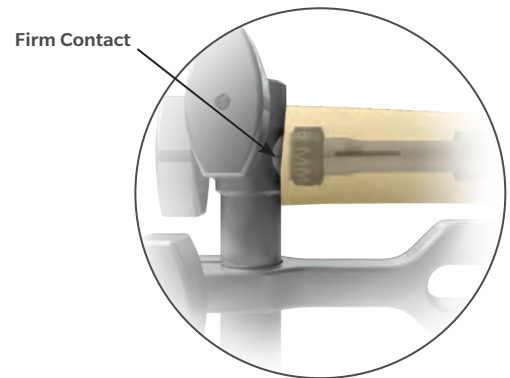
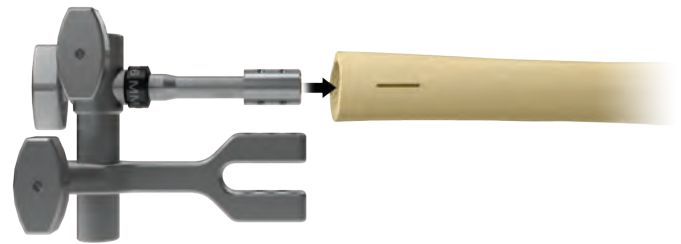


Figure 25

Anchor Plug Implantation

With the drill guide properly aligned with the anchor plug, remove the three drill bits and position the anchor plug into the femoral canal. Make certain that the cross bar is in firm and even contact with the femoral osteotomy site and that the centering sleeve provisional is snug within the canal (Figure 25). Placement of the anchor plug within the medullary canal is non-directional; location is typically dictated by the best exposure and ease of access to the drill guide.

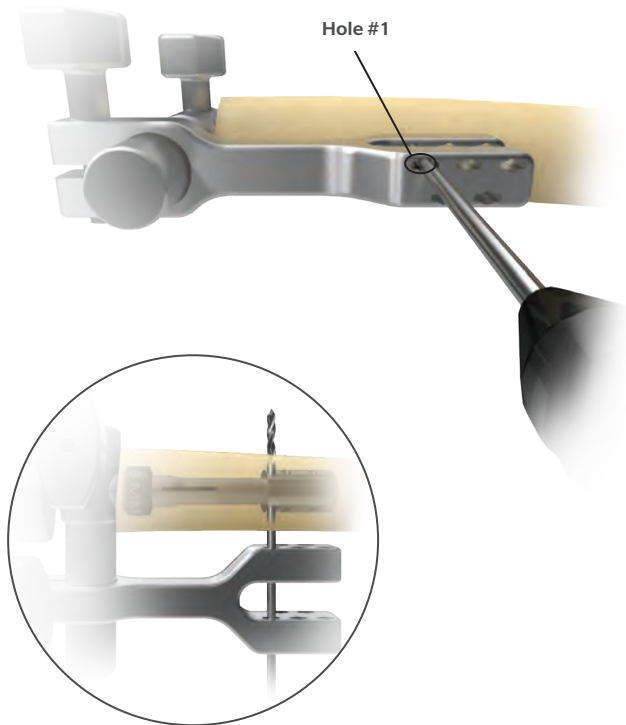


Figure 26

Hold the cross bar and drill guide securely and, without power, run a short drill bit through hole #1 of the drill guide until contacting the bone. At full power drill through both cortices (Figure 26). Leave the short drill bit in place.

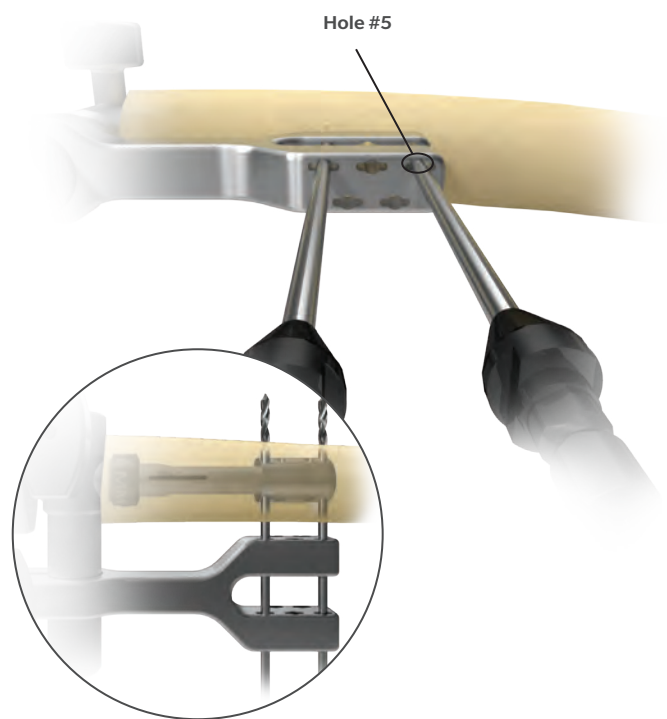


Figure 27

Repeat this procedure with the second short drill bit through hole #5, leaving the short drill bit in place (Figure 27).



Figure 28

Anchor Plug (cont.)

Using the long drill bit, sequentially drill each of the remaining three placement holes. Remove the long drill bit when finished (Figure 28).



Figure 29

Transverse Pins

Transverse Pin Measurement

The hook depth gauge is used to measure the bi-cortical distance for determining the transverse pin length (Figure 29).

Start by loosening knobs 1 and 2 and collapsing the sleeves together.

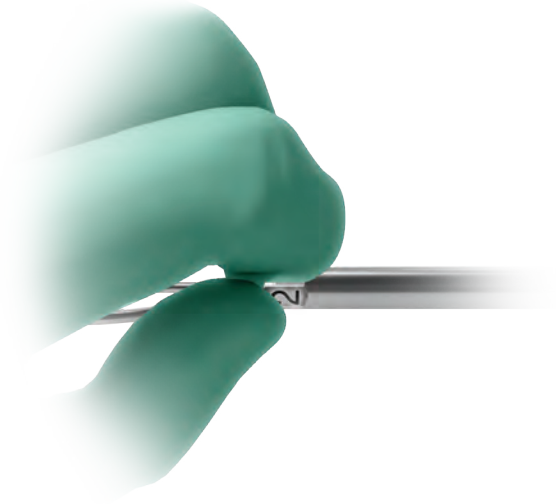


Figure 30

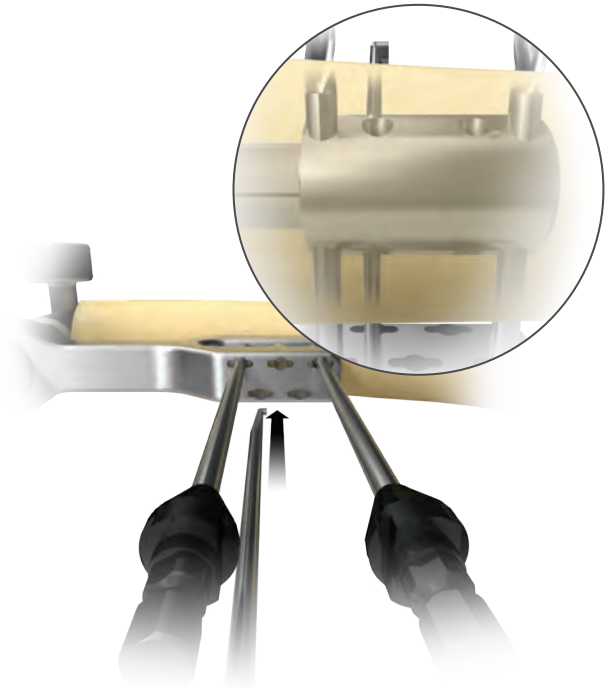


Figure 31

Transverse Pins (cont.)

Tighten knob 2 (Figure 30).

Push the hook through a pre-drilled hole and engage the outer aspect of the far cortex (Figure 31).



Figure 32

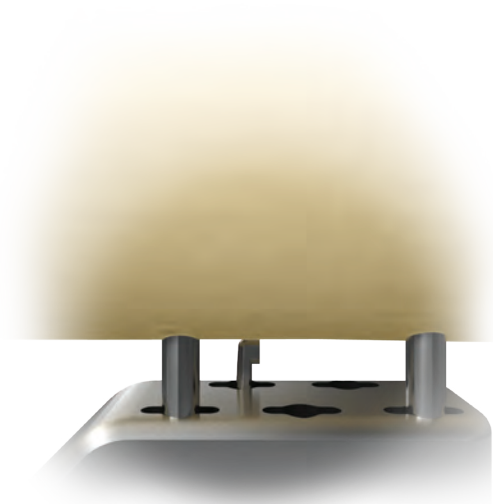


Figure 33

Transverse Pins (cont.)

Collapse the sleeves against the drill guide and tighten knob 1 (Figure 32).

Release the hook from the far cortex, and position the tip firmly against the outer aspect of the near cortex (Figure 33).

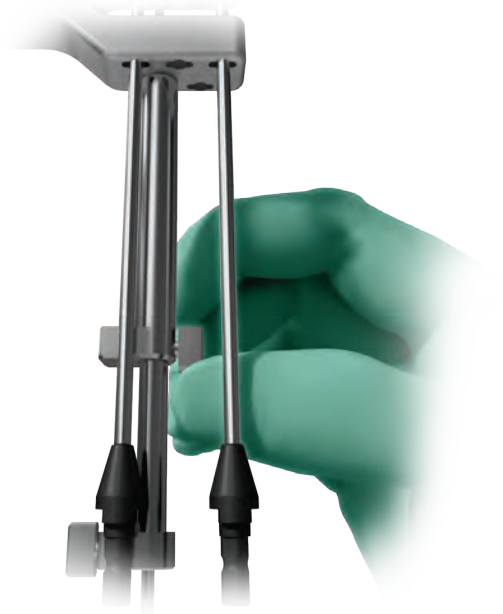


Figure 34

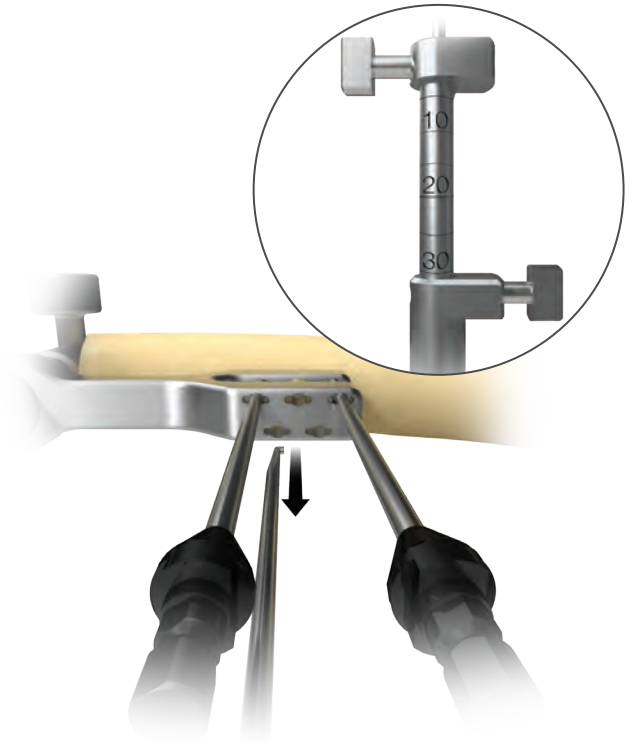


Figure 35

Transverse Pins (cont.)

Loosen knob 2, slide the sleeve against the drill guide and tighten knob 2 (Figure 34).

Transverse Pin Selection

Remove the hook depth gauge from the drill guide and read the bi-cortical distance that appears on the sliding scale (Figure 35).

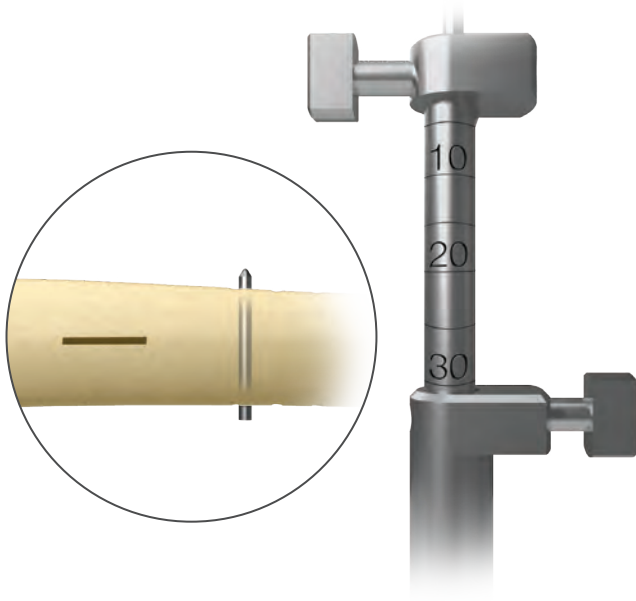


Figure 36

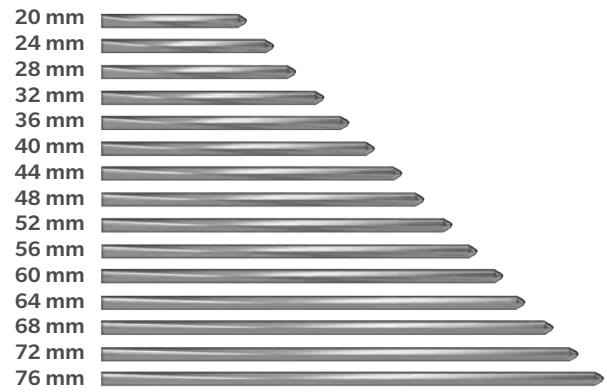


Figure 37

Transverse Pins (cont.)

Based on the depth measurement shown on the sliding scale, add an additional 4 mm to the measurement, and select the transverse pin length that will provide the necessary 2 mm overhang on each side of the cortex (Figure 36).

ⓘ **Note:** Transverse pins are available from 20-76 mm, in 4 mm increments (Figure 37).

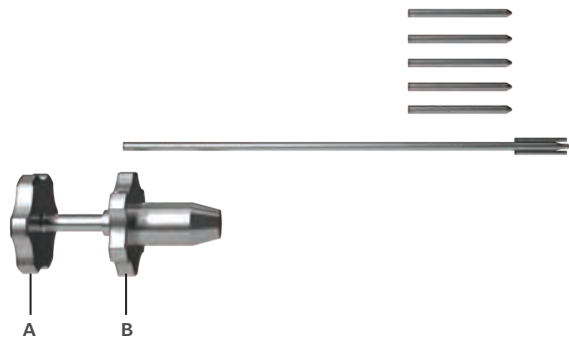


Figure 38

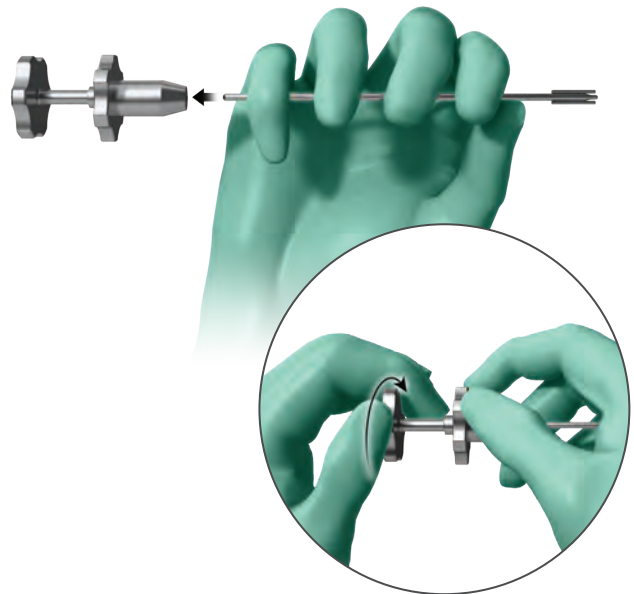


Figure 39

Transverse Pins (cont.)

The pin inserter handle has two components: the impaction head (Figure 38A) and the adjustment knob (Figure 38B).

ⓘ **Note:** Ensure the adjustment knob is loose by turning in a counterclockwise motion; this will ensure that the handle will accept the pin inserter.

Place the threaded end of the pin inserter into the pin inserter handle and tighten with a clockwise turn (Figure 39).



Figure 40

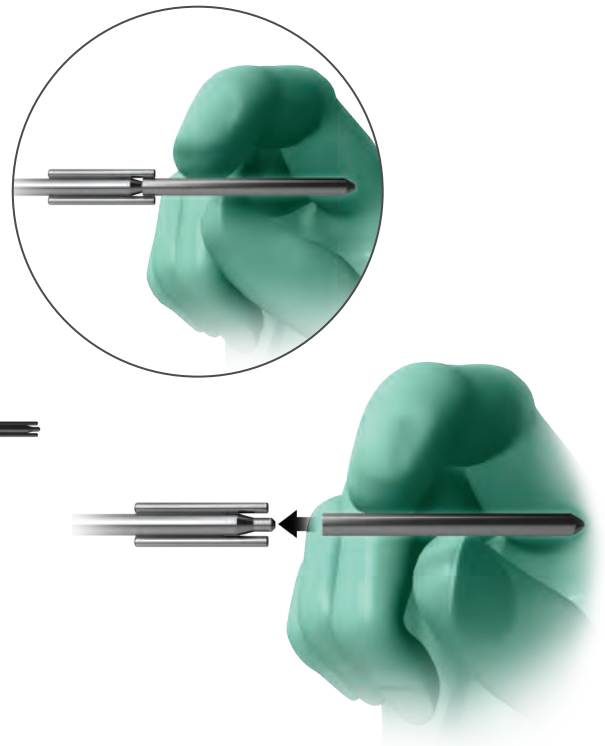


Figure 41

Transverse Pins (cont.)

Tighten the adjustment knob with a clockwise turn until the pin inserter is secure (Figure 40).

Transverse Pin Insertion

Place a transverse pin onto the pin inserter (Figure 41).



Figure 42

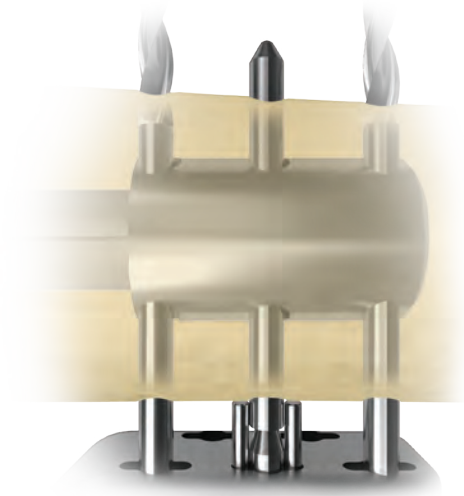


Figure 43

Transverse Pins (cont.)

Guide the pin inserter into one of the three available holes in the drill guide (Figure 42).

Gently tap the impactation head until the pin is properly seated. The pin is properly seated when the tabs on the pin inserter come into contact with the cortex (Figure 43) and a 2 mm overhang is visible on both the inner/outer cortex.

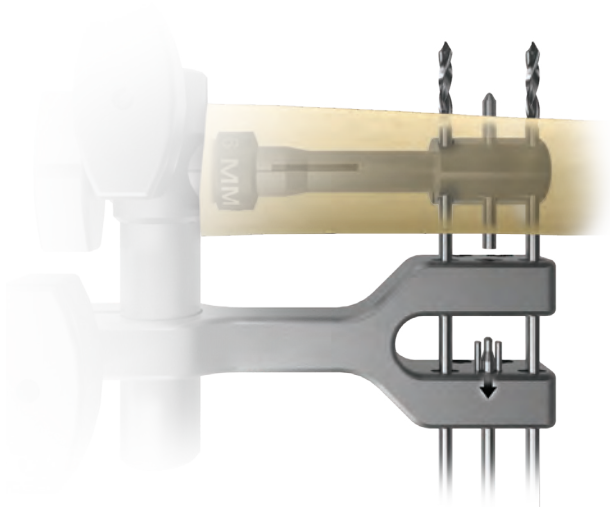


Figure 44

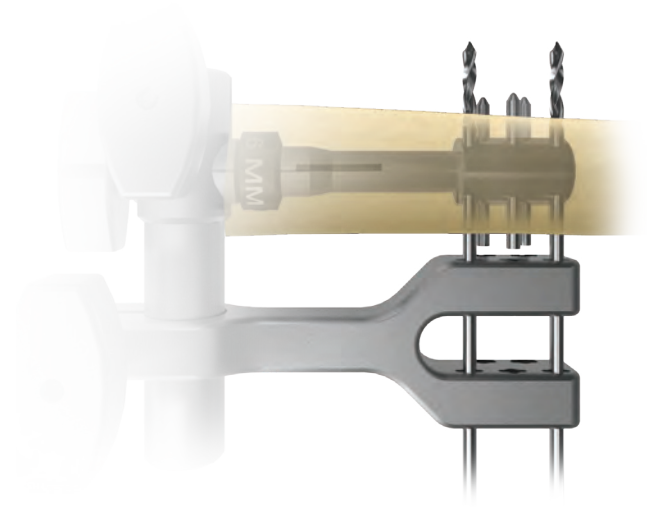


Figure 45

Transverse Pins (cont.)

Pull to remove the pin inserter (Figure 44) and proceed with seating the next two transverse pins (Figure 45).

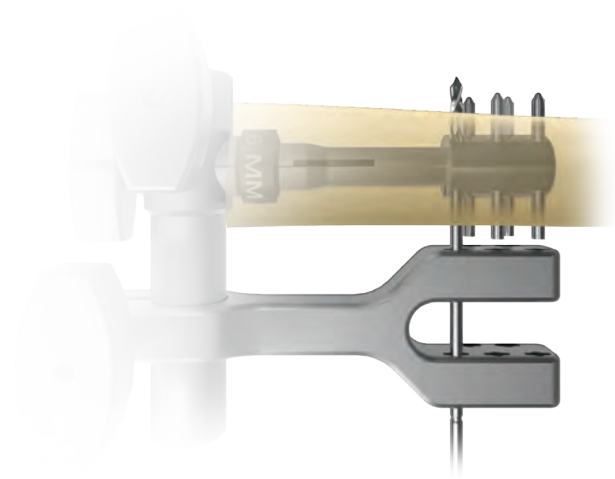


Figure 46

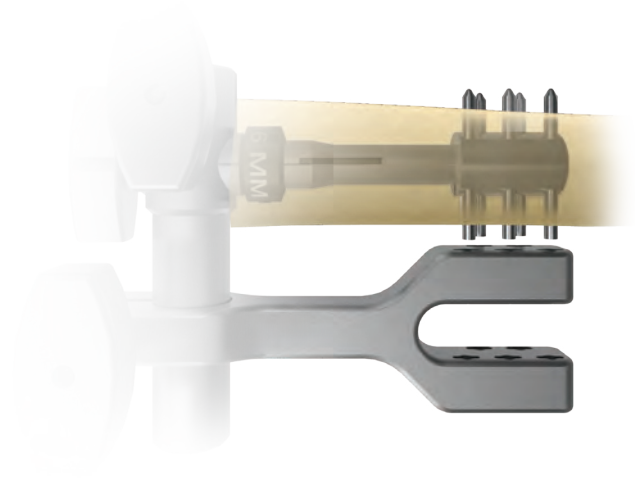


Figure 47

Transverse Pins (cont.)

With the first three transverse pins in place, remove one of the short drill bits and seat the fourth transverse pin (Figure 46).

Remove the final short drill bit and seat the fifth and final transverse pin (Figure 47).

ⓘ **Note:** The transverse pins come packaged with one additional pin that is not required for implantation. The anchor plug only accepts a total of five pins.

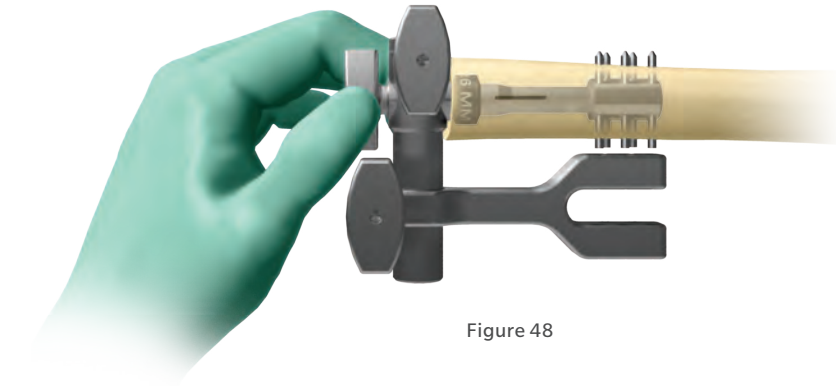


Figure 48

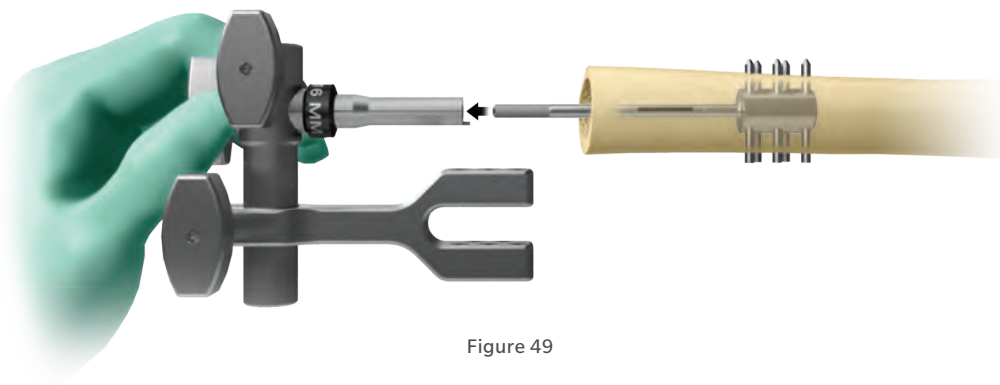


Figure 49

Transverse Pins (cont.)

Loosen the anchor plug holder knob (Figure 48) and remove the drill guide assembly (Figure 49).

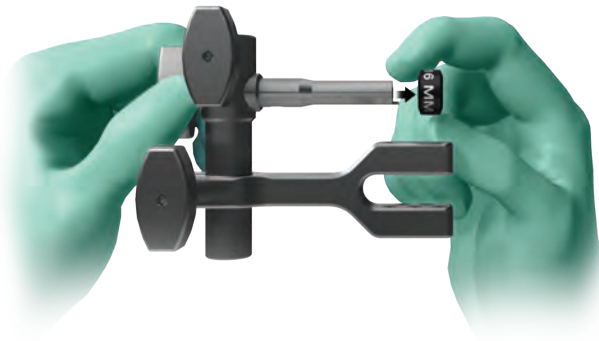


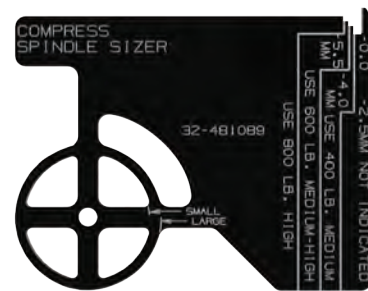
Figure 50

Transverse Pins (cont.)

Remove the centering sleeve provisional from the anchor plug holder (Figure 50). Set the provisional aside, as it will be used later on in the technique.



A



B

Figure 51

Spindle

Diameter Selection

Measure the maximum diameter of the resected bone with a ruler (Figure 51A) or the spindle sizer (Figure 51B).

Note: The ruler may be used to measure for all four spindle sizes (30 mm, 38 mm, 44 mm and 37 x 49 mm elliptical). The spindle sizer measures for the 38 mm spindle (small) and the 44 mm spindle (large).

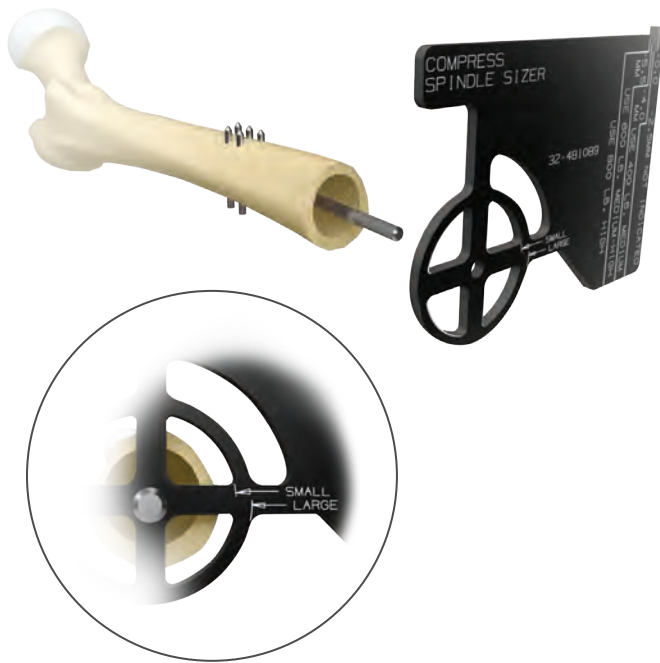


Figure 52



Figure 53

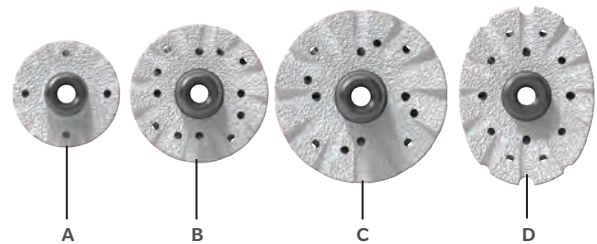


Figure 54

Spindle (cont.)

Place the spindle sizer over the exposed anchor plug traction bar and select the spindle that comes closest to one of the inscribed markings (Figure 52).

The selected implant must be closest to, but larger than, the bone measured in this step (in this instance, a 38 mm spindle would be selected). The implant collar of the spindle should overhang the bone (Figure 53).

Select a spindle based upon the prepared diameter of the osteotomy site.

30 mm Spindle:

Anatomies up to 26 mm in diameter (Figure 54A).

38 mm Spindle:

Anatomies up to 34 mm in diameter (Figure 54B).

44 mm Spindle:

Anatomies up to 40 mm in diameter (Figure 54C).

49 mm x 37 mm Elliptical Spindle:

Anatomies in the metaphyseal flare where the bicortical measurement does not exceed 45 mm (Figure 54D).



Figure 55

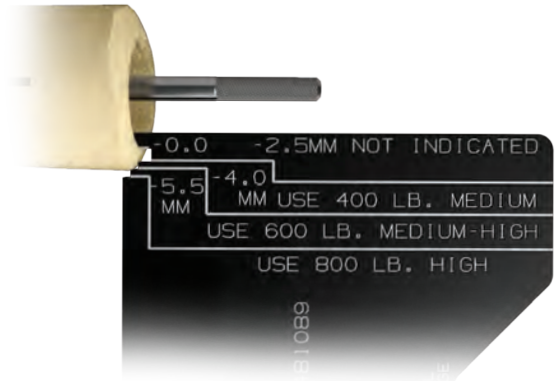


Figure 56

Spindle (cont.)

Measure the cortical thickness along the perimeter of the resection level using a ruler, calipers or the cortical gauge of the spindle sizer (Figure 55). Based on the measurement, reference the Compress Device Force Table to select the appropriate force level that corresponds to the measured thickness.

Note: If using the cortical gauge of the spindle sizer, place the gauge onto the thinnest portion of the cortical wall to determine the appropriate force level (400 lb/600 lb/800 lb) (Figure 56).

Compress Device Force Table for Standard Compress

Cortical* Thickness (mm)	Force Level (lb)
0.0–2.4	Not Indicated*
2.5–3.9	400
4.0–5.4	600
5.5 and above	800

*Cortical thickness less than 2.5 mm is a contraindication for this system.

Note: Cortical thickness should not exceed range anywhere between the anchor plug and the interface.

Note: Any cortical defect between the anchor plug and interface is a contraindication for this system.

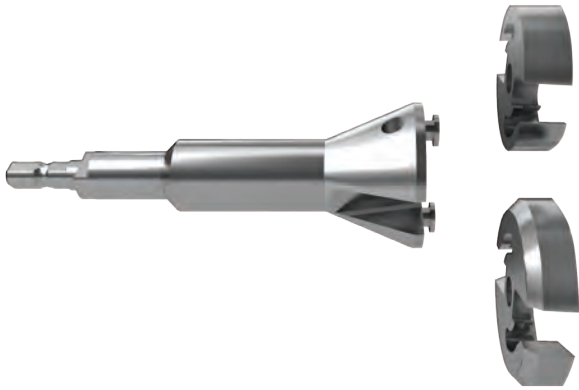


Figure 57

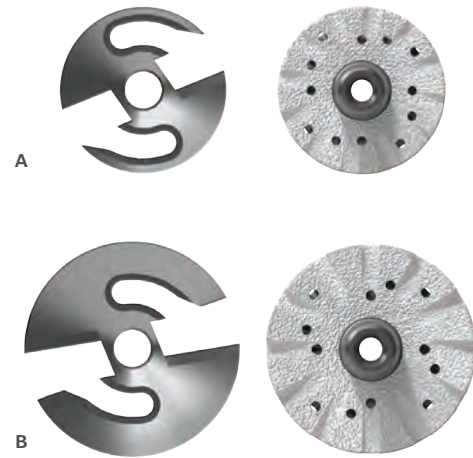


Figure 58

Spindle (cont.)

Face Reaming Assembly

Select the appropriate face reamer blade based on the spindle diameter that was chosen in the previous step (Figure 57).

The small face reamer blade addresses the 30 mm and 38 mm spindles (Figure 58A). The large face reamer blade is used for the 44 mm and elliptical 49 mm x 37 mm spindles (Figure 58B).

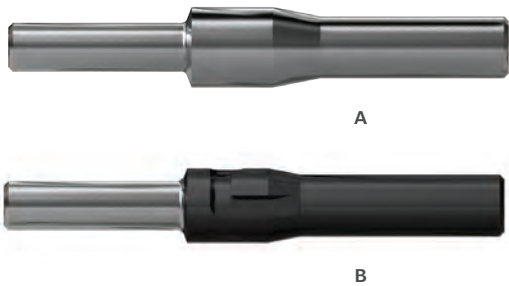


Figure 59

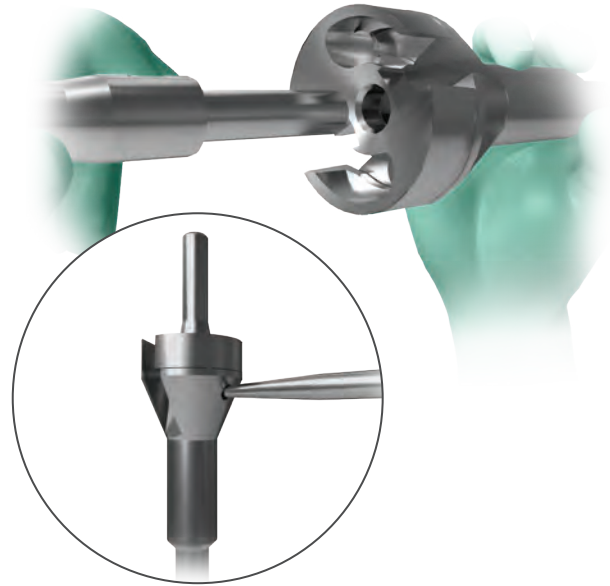


Figure 60

Spindle (cont.)

- Important:** There are two distinct reamer pilots in the Compress instrumentation. The first (Figure 59A) is used without a centering sleeve provisional when the final triple reamer diameter at the resection level measures 12 mm. It is also used with centering sleeve provisionals when the final triple reamer diameter measures 14 mm through 24 mm.
- Important:** The 13 mm reamer pilot (Figure 59B) is used only when the final triple reamer diameter at the resection level measures 13 mm. The reamer pilot is used without a centering sleeve provisional.

Place the face reamer blade over the two retaining tabs located on the reamer body and secure with a clockwise turning motion. Insert the reamer pilot into the face reamer and tighten the side set screw (Figure 60).



Figure 61

Spindle (cont.)

Slide the centering sleeve provisional that was previously used on the anchor plug holder and lock it into place with a clockwise turning motion (Figure 61).

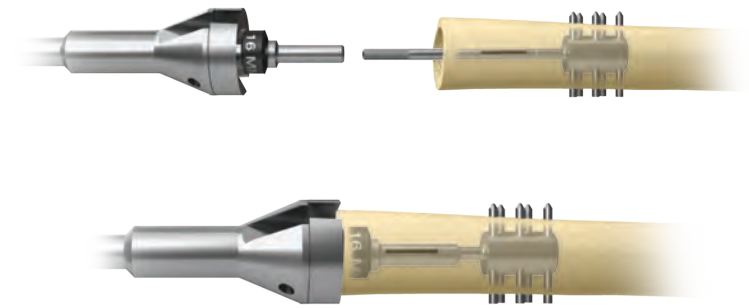


Figure 62

Face Reaming

Slide the face reamer assembly over the exposed anchor plug traction bar and ream the osteotomy site (Figure 62).

ⓘ **Important:** Start power and run at full speed prior to the face reamer contacting the bone. Ream to the mechanical stop.



Figure 63

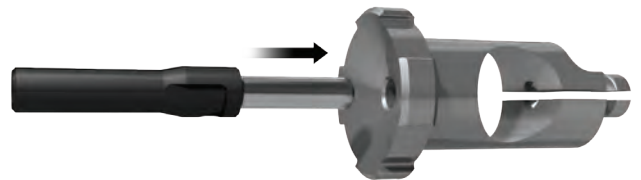


Figure 64

Spindle (cont.)

The bone is contoured to match the spindle and is now ready to accept the face adapter provisional if required (Figure 63).

If trialing is desired, insert the reamer pilot into the end of the face adapter provisional (Figure 64). Place the reamer pilot over the exposed traction bar and assemble the necessary provisionals. Once trialing is complete, remove provisionals.

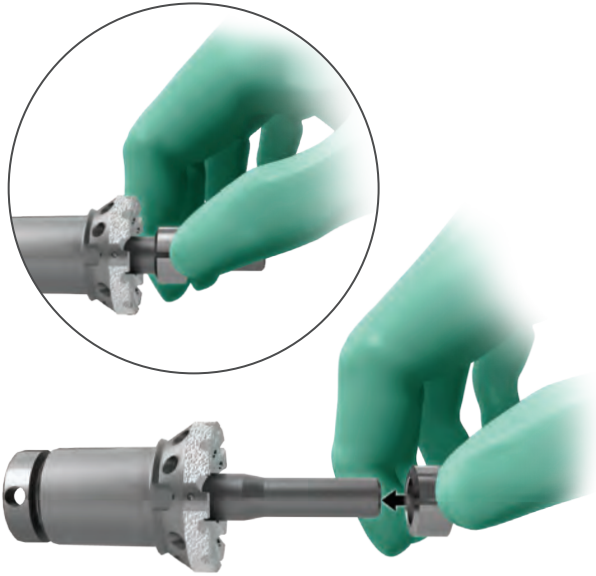


Figure 65

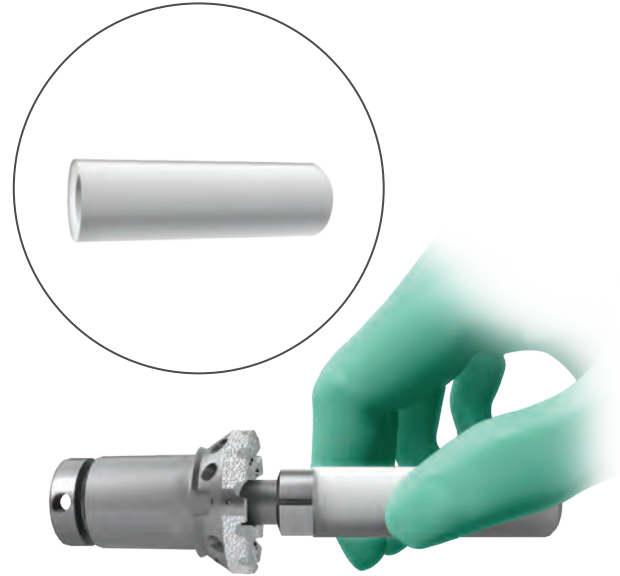


Figure 66

Centering Sleeve/Spindle Assembly

ⓘ Important: All of the spindles have a 12 mm diameter designed into the standard implant. The centering sleeve implants are added to increase this diameter as needed.

Place the centering sleeve implant onto the spindle (Figure 65).

Impact the centering sleeve with the sleeve impactor (Figure 66).

ⓘ Note: The centering sleeve implant should be sized accordingly to fit snug within the canal.

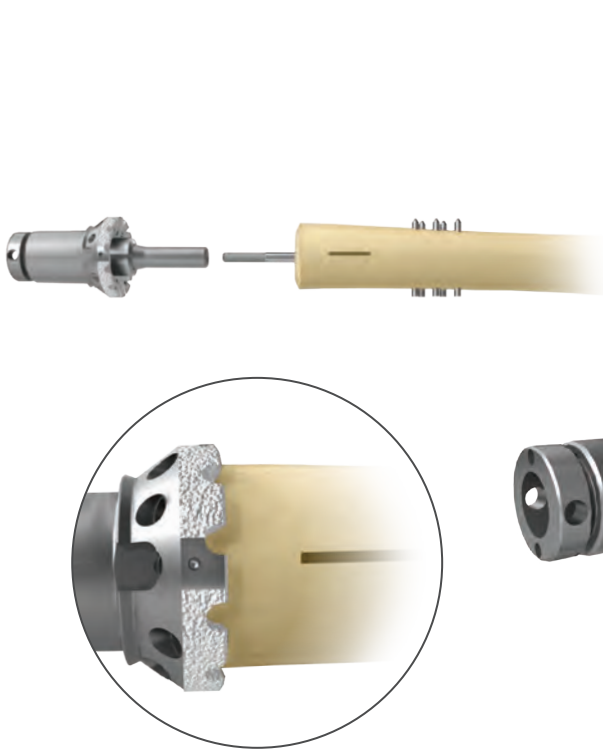


Figure 67



Figure 68

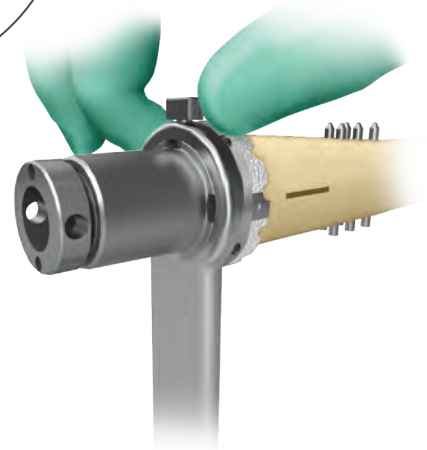


Figure 69

Centering Sleeve/Spindle (cont.)

Slide the spindle over the anchor plug traction bar until it fits snugly against the prepared femoral osteotomy site.

ⓘ **Note:** The centering sleeve must be completely seated within the prepared canal at the bone-implant interface.

The spindle should be aligned anteriorly so that the rotation alignment mark and one of the female spindle slots lines up with the vertical rotational alignment mark made earlier (Figure 67).

Position the anti-torque wrench into two of the female spindle slots and tighten the locking knob (Figures 68 and 69).

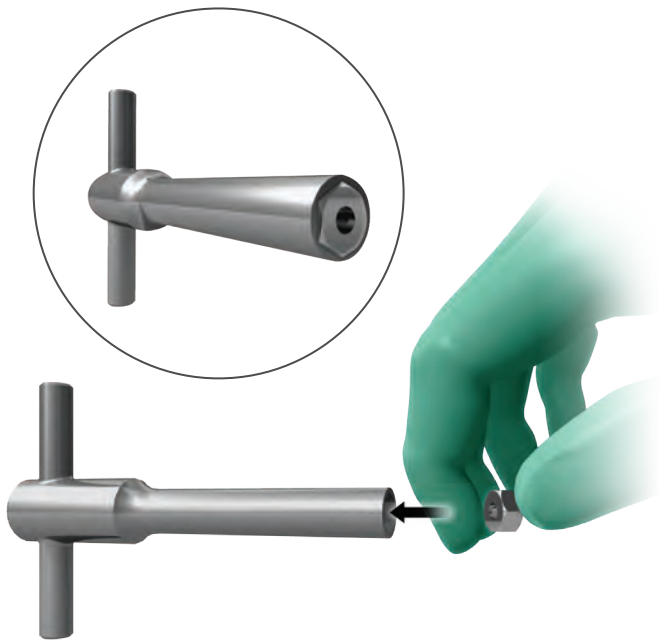


Figure 70

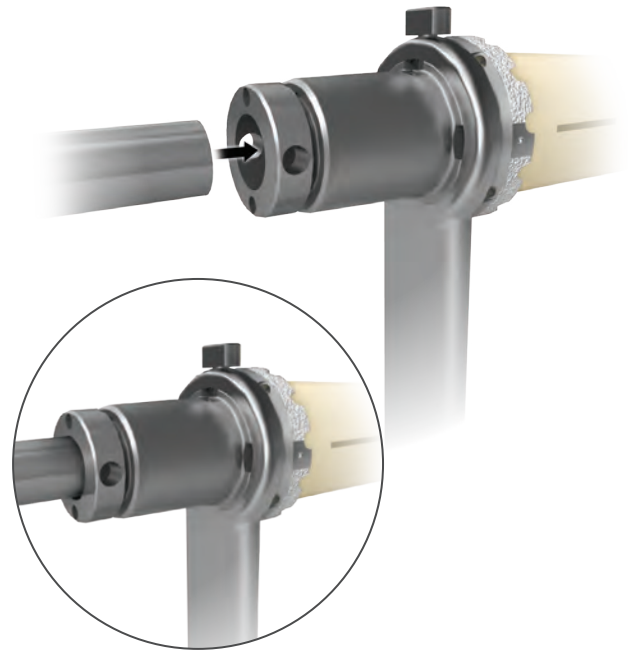


Figure 71

Spindle Implantation

Place the nut into the nut driver and insert onto the exposed anchor plug traction bar in the spindle (Figure 70 and 71).



Figure 72

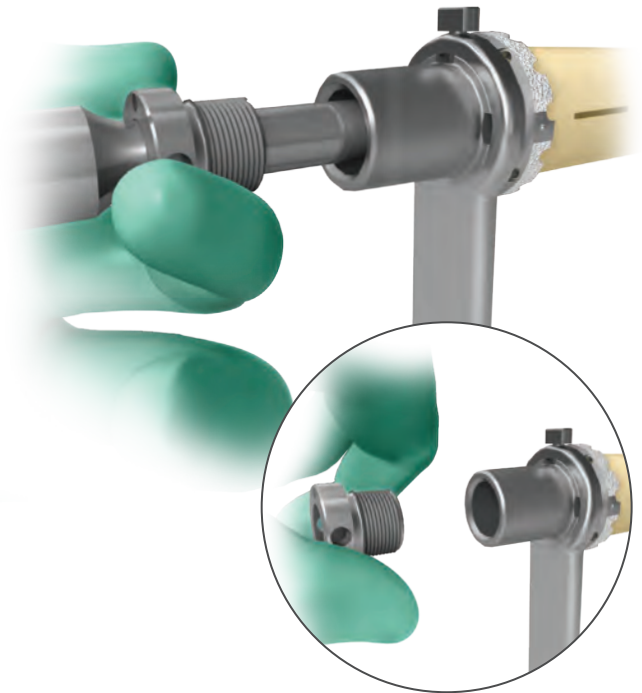


Figure 73

Spindle Implantation (cont.)

Tighten in a clockwise direction with the nut driver, while holding the anti-torque wrench in place until resistance is felt (this is the initial contact of the nut with the washers of the spindle).

Continue to slowly turn the nut driver in a clockwise direction until the compression cap can be manually released or until an additional one-half turn (180 degrees) is achieved, then stop turning. The compression cap should release by hand in a counter-clockwise motion (Figures 72 and 73).



Figure 74



Figure 75

Spindle Implantation (cont.)

ⓘ **Note:** If the compression cap cannot be removed manually after one 180 degree turn, remove the nut driver and place the spanner wrench (Figure 74) into the surface holes of the compression cap and twist off in a counterclockwise direction (Figure 75).

ⓘ **Important:** After the compression cap is removed from the spindle, **DO NOT DISCARD**. Place the compression cap in reserve on the back table until the surgery is completed.

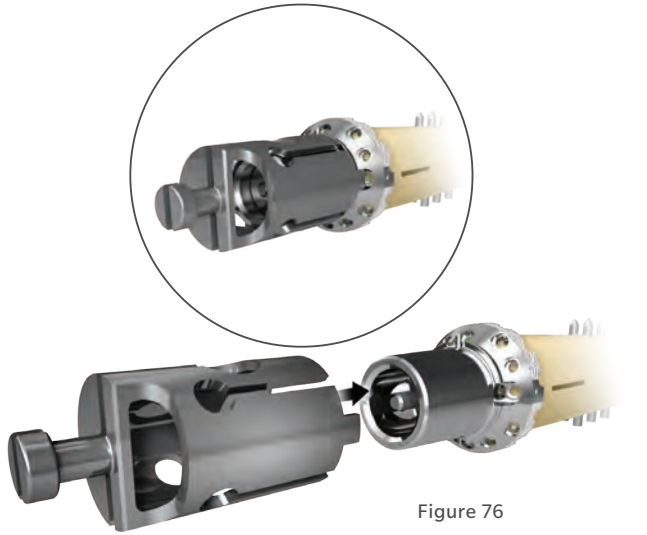


Figure 76



Figure 77



Figure 78

Spindle Implantation (cont.)

Standard Distal Femoral Trialing

Place the 5 cm taper adapter provisional over the spindle taper and assemble the additional provisionals to achieve the correct construct length (Figures 76 and 77).

Reduced Resection Distal Femoral Trialing

When trialing for the Compress 7 cm, 8.5 cm or 10 cm reduced resection implants (proximal or distal) (Figure 78), it is necessary to place the Compress 5 cm taper adapter provisional with the threaded connection (32-481075) over the exposed spindle taper (Figure 79). Place the Compress reduced resection provisional over the no face adapter provisional until the magnets inside the blue provisional engage with the taper adapter provisional (Figure 80).



Figure 79

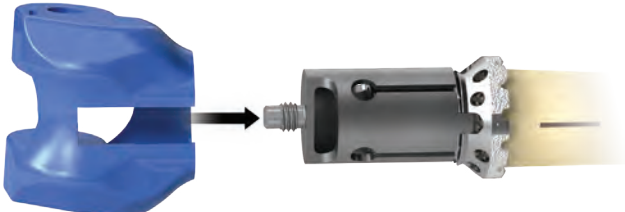


Figure 80

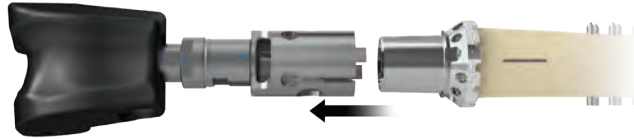


Figure 81

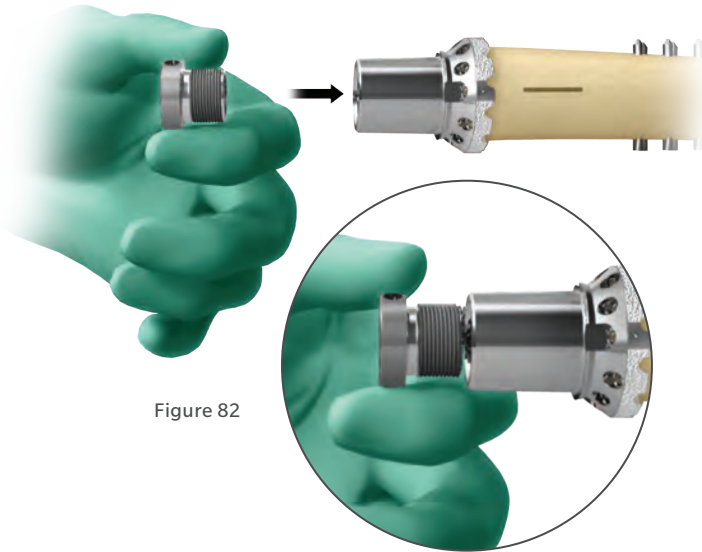


Figure 82

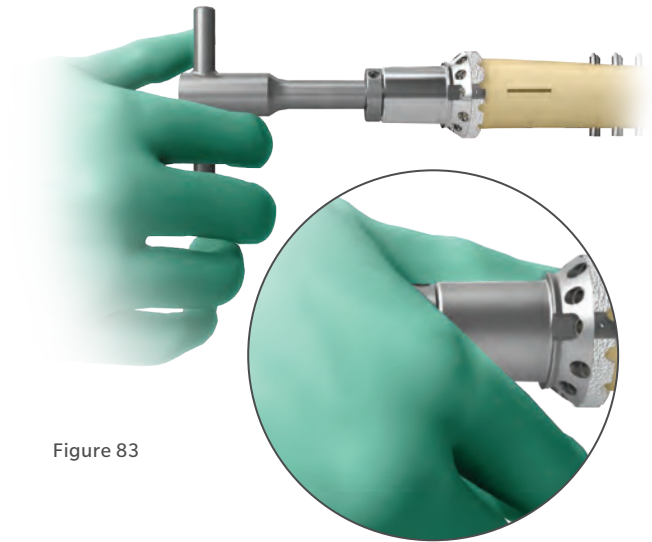


Figure 83

Spindle Implantation (cont.)

Realignment of Spindle

If the spindle alignment needs to be changed, disassociate the provisional and replace the compression cap with firm clockwise manual rotation (Figure 81 and 82).

Reintroduce the nut driver and in a counterclockwise direction and make one full turn (360 degrees) to loosen the nut. Change the rotation of the spindle (Figure 83) and re-start the locking process (beginning with Figure 71).

Pin Drilling and Insertion

The Pin Placement Table specifies which array of holes may be used based on the centering sleeve that was previously selected (Figure 84).

Pin Placement Table





	Spindle Size	Inner Array	Middle Array	Outer Array
	30 mm	13-14 mm Sleeve	-	-
	38 mm	13 mm Sleeve	13-18 mm Sleeve	13-22 mm Sleeve
	44 mm	13 mm Sleeve	13-20 mm Sleeve	13-27 mm Sleeve
	Elliptical (37x49 mm)	13-15 mm Sleeve	13-18 mm Sleeve	13-28 mm Sleeve



Figure 84

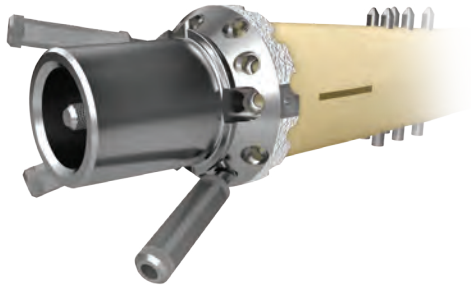


Figure 85



Figure 86

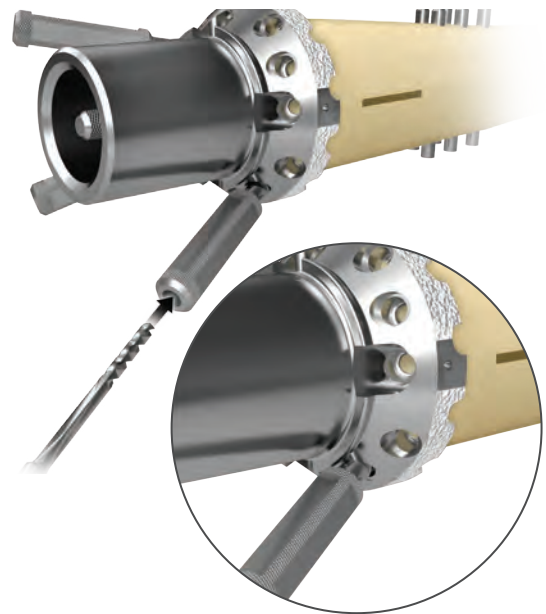


Figure 87

Spindle Implantation (cont.)

Thread the anti-rotation drill guides into the selected holes of the spindle collar until fully seated (Figure 85).

Insert the specially designed drill into each respective drill guide. Start at full power prior to contact and drill until the guides prevent further advancement. Drill to the mechanical stop (Figures 86 and 87).

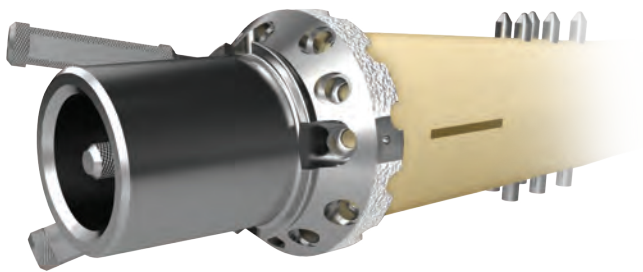


Figure 88

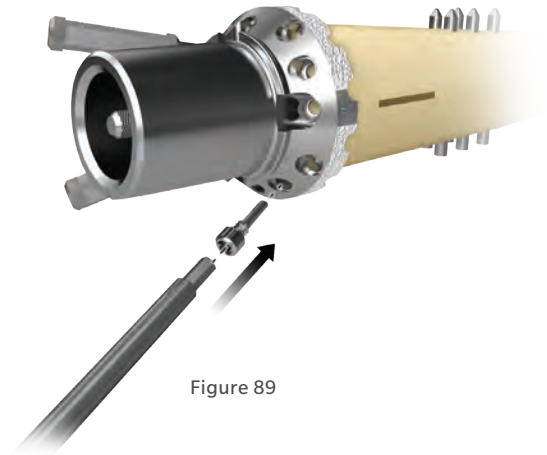


Figure 89

Spindle Implantation (cont.)

Remove the first drill guide, leaving the others in place (Figure 88).

Using the pin driver, insert a pin into the first pre-drilled location and thread the screw until it is fully seated (Figure 89). Repeat for remaining pin locations.

ⓘ **Note:** It is recommended, whenever possible, that a minimum of 3 pins are placed in the spindle collar.

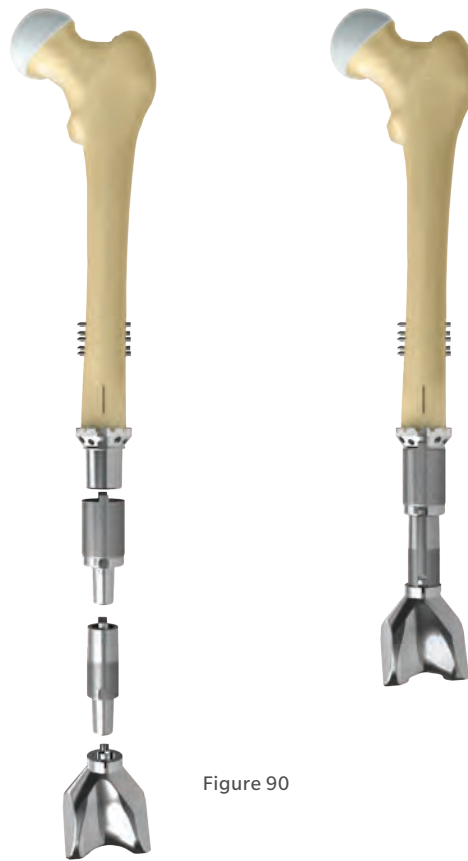


Figure 90

Final Construct Assembly

Without Locking Cap and Screw

After the anti-rotation pins are in place, impact the femoral construct (taper adapter, diaphyseal segment and distal femoral construct) together on the back table. Once the femoral construct is assembled, impact over the spindle taper (Figure 90).

Refer to the Screw Placement Guide for proper placement beginning on page 48.



Figure 91



Figure 92



Figure 93

Final Construct Assembly (cont.)

Optional Locking Cap and Screw

A locking cap and screw are available to mechanically secure the taper adapter or reduced resection femoral components to the spindle.

With the spindle in place, unscrew the locking screw from the locking cap and set the screw aside (Figure 91).

Thread the locking cap into the spindle taper using the nut driver to firmly seat the locking cap (Figures 92 and 93).

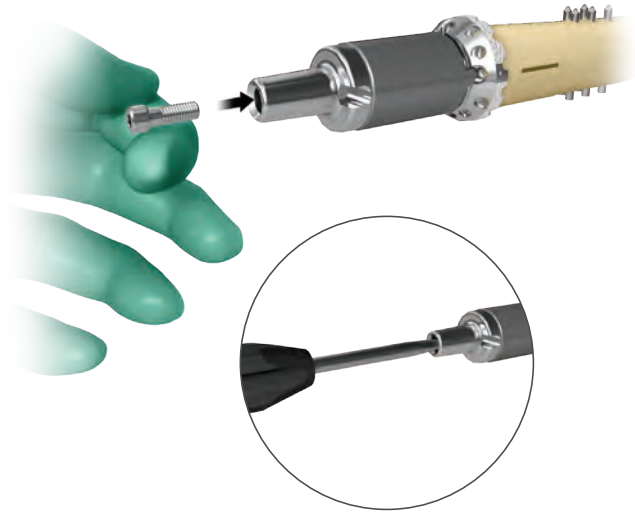


Figure 94



Figure 95

Final Construct Assembly (cont.)

Impact the 5 cm taper adapter over the spindle taper and secure the construct with the locking cap screw (Figure 94).

After the locking cap and screw have been assembled, impact each implant component one at a time, and secure with the corresponding screw (Figure 95).

Refer to the Screw Placement Guide for proper placement beginning on page 48.

Screw Placement Guide

Utilizing Reduced Resection Segmental Distal Femur Replacement

Compress
Spindle (1 cm)

Compress
Locking Cap
(optional)

Compress
Reduced Resection
Segmental Distal
Femur (7 cm)

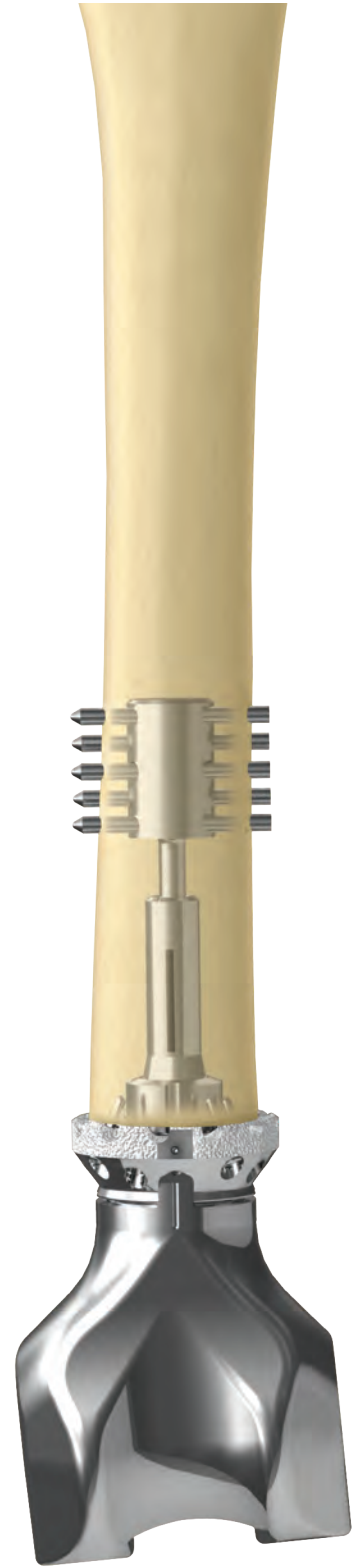
OSS
Small Head /
Small Thread
Locking Screw
(optional)



1 cm

7 cm

(8 cm Replacement
Length is Illustrated)



Screw Placement Guide

Utilizing Taper Adapter for a Distal Femoral Replacement

Compress Spindle (1 cm)

Compress Locking Cap (optional)

OSS / Compress Taper Adapter (5 cm)

OSS Small Head / Small Thread Locking Screw (optional)

OSS Segmental Distal Femur (7 cm)

OSS Large Head / Large Thread Locking Screw



1 cm

5 cm

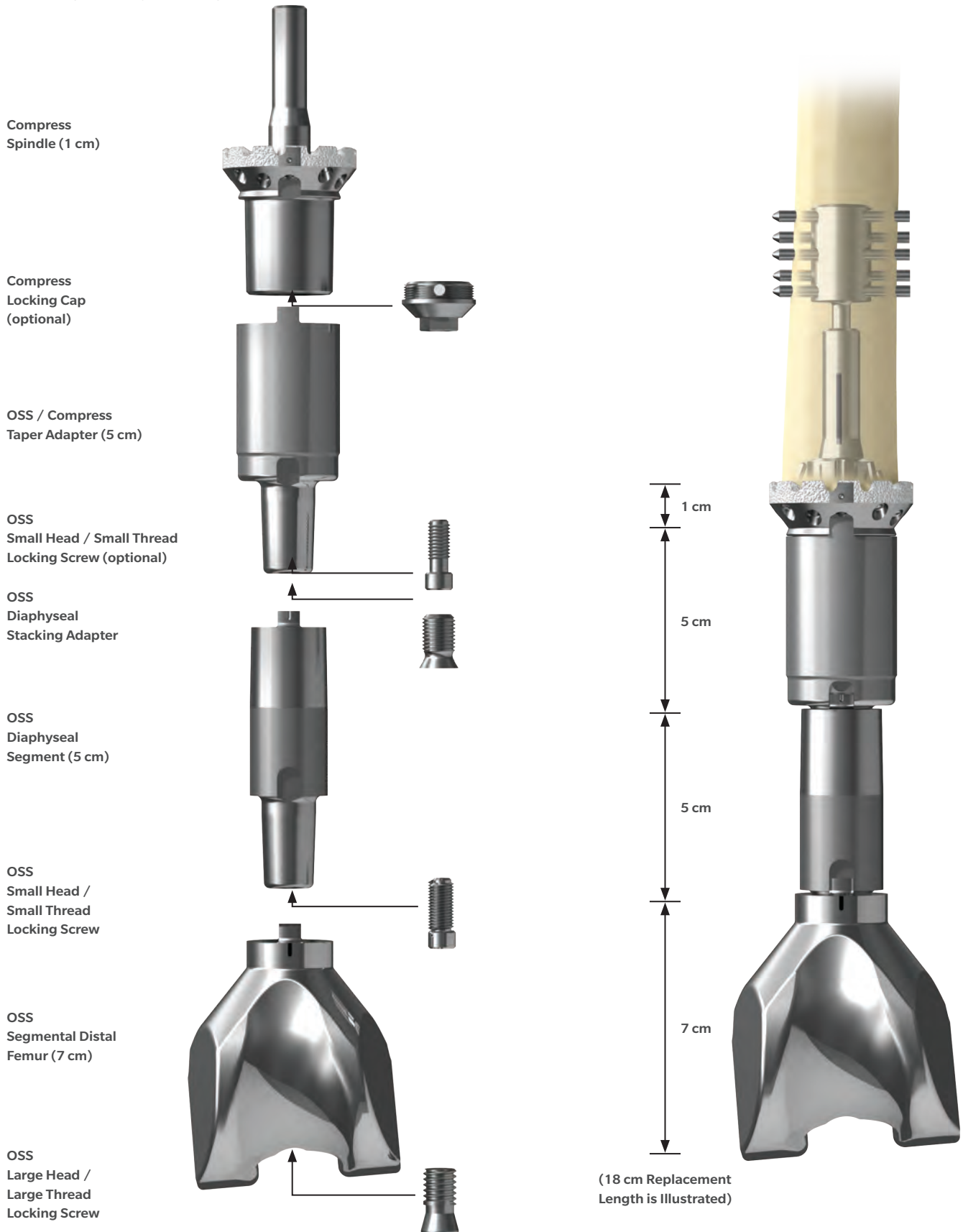
7 cm



(13 cm Replacement Length is Illustrated)

Screw Placement Guide

Utilizing Diaphyseal Segment and Taper Adapter for a Distal Femoral Replacement



Screw Placement Guide

Utilizing Reduced Resection Proximal Femur for a Proximal Femoral Replacement

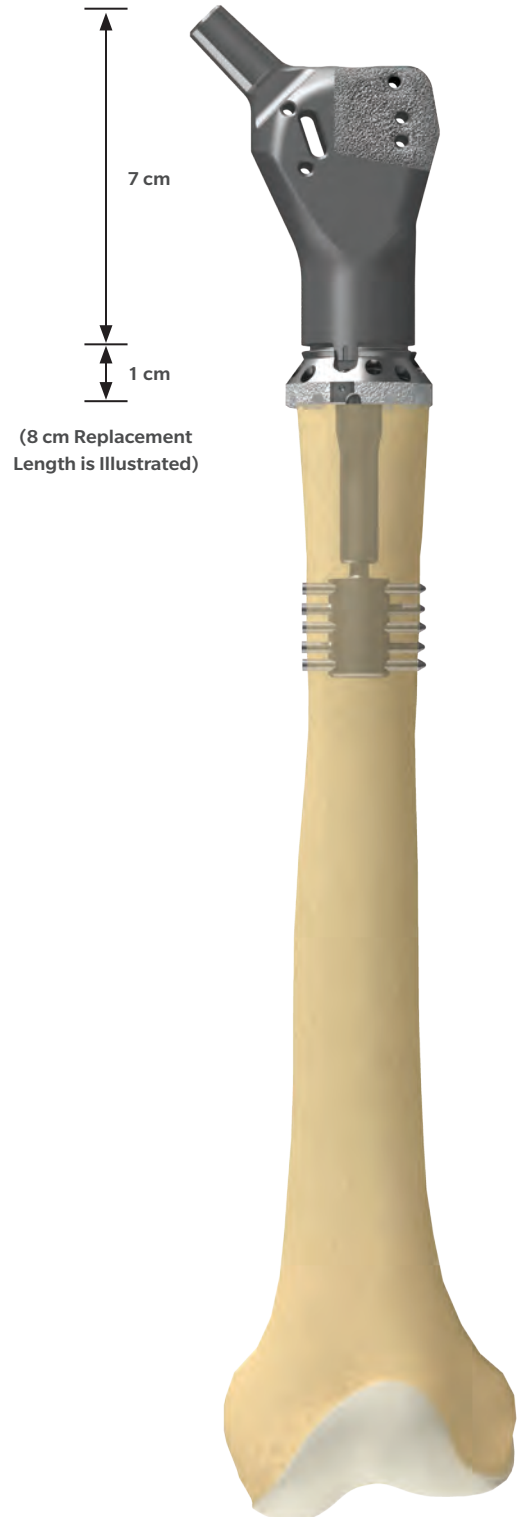
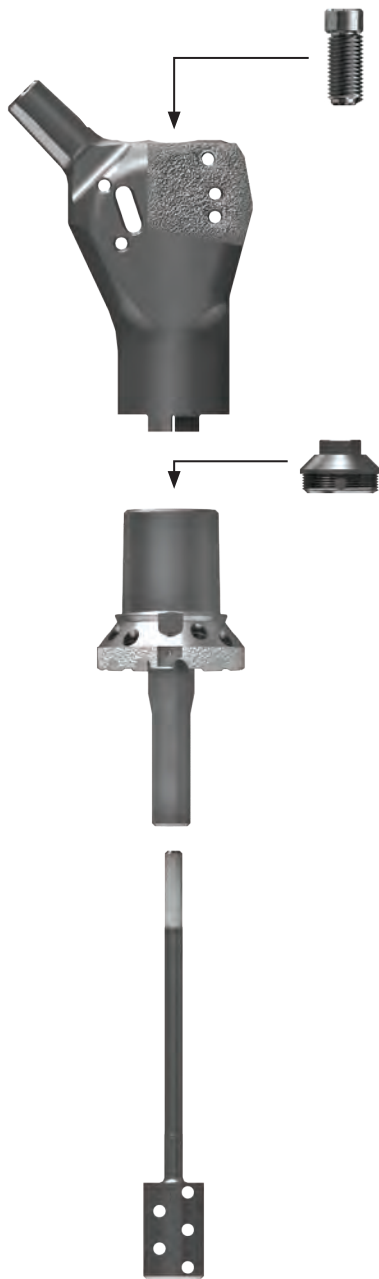
OSS
Small Head /
Small Thread
Locking Screw
(optional)

Compress
Reduced Resection
Proximal Femur
(7 cm)

Compress
Locking Cap
(optional)

Compress
Spindle (1 cm)

Compress
Anchor Plug



Screw Placement Guide

Utilizing Taper Adapter for a Proximal Femoral Replacement

OSS
Large Head /
Large Thread
Locking Screw

OSS
Finn® Style Proximal
Femur (7 cm)

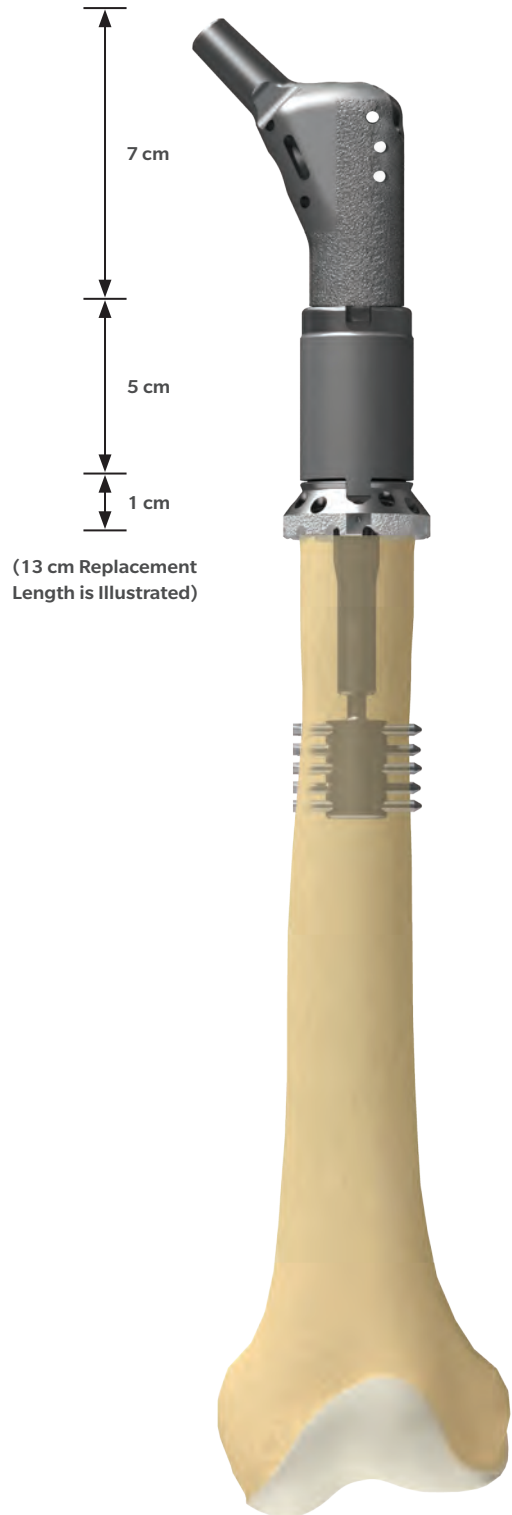
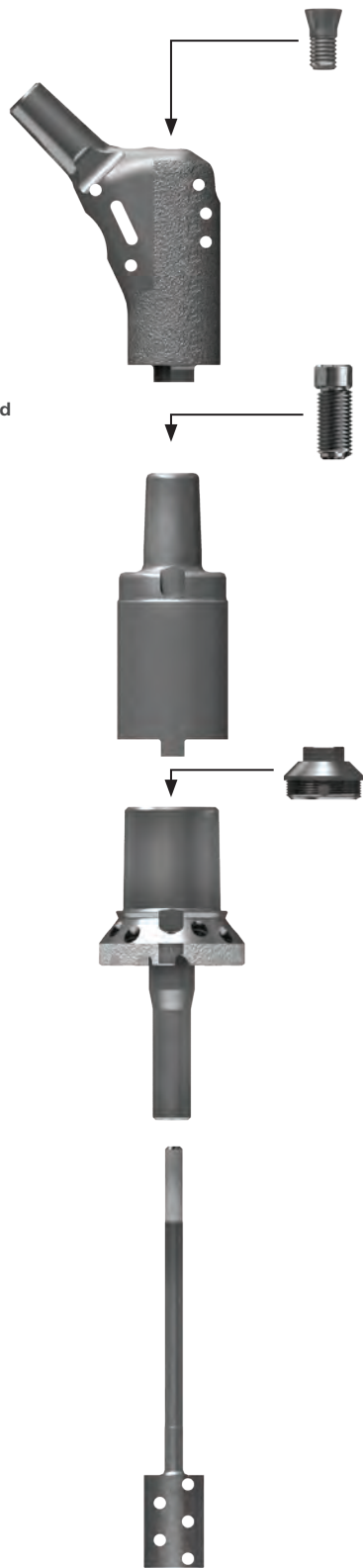
OSS
Small Head / Small Thread
Locking Screw (optional)

OSS / Compress
Taper Adapter (5 cm)

Compress
Locking Cap
(optional)

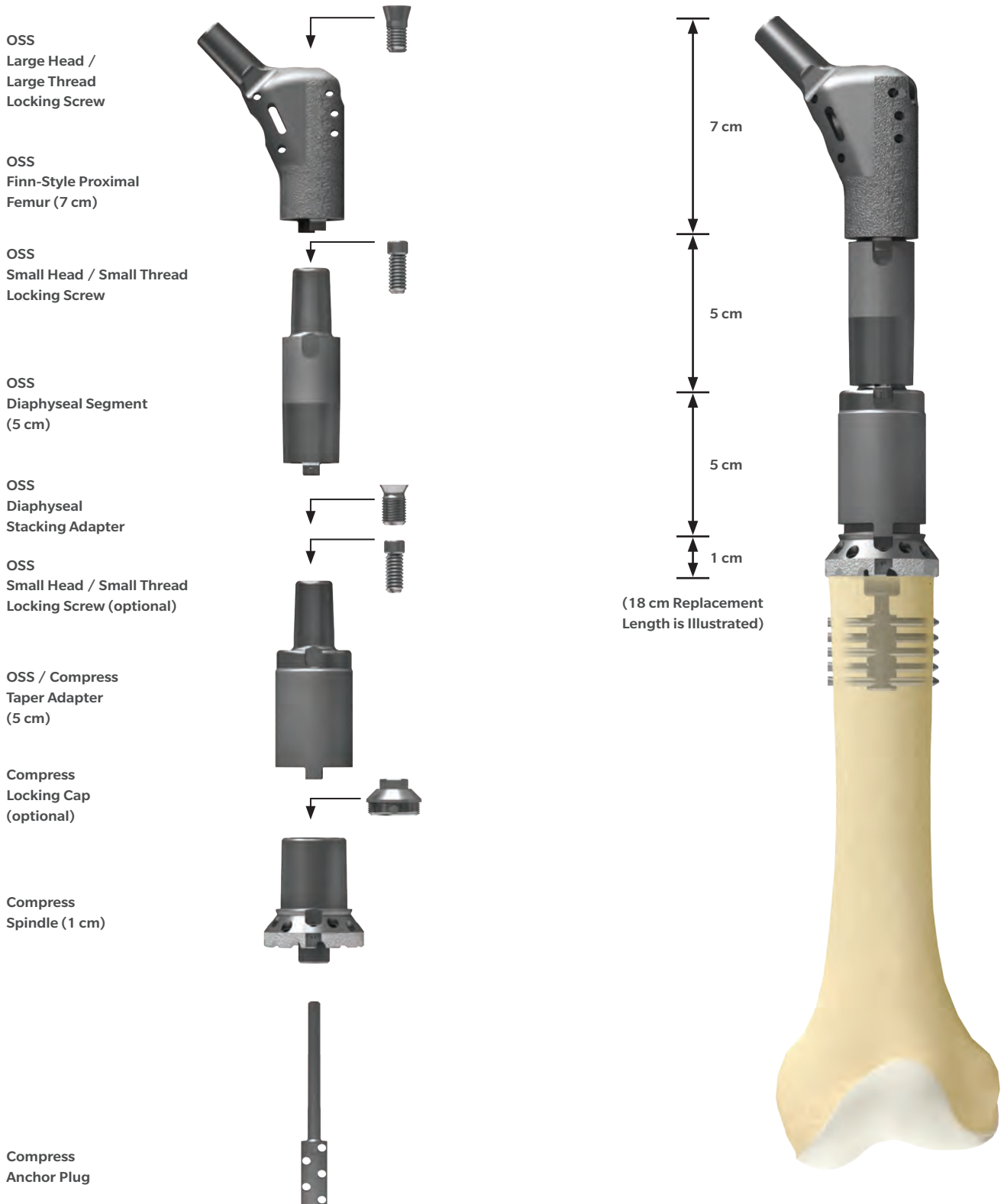
Compress
Spindle (1 cm)

Compress
Anchor Plug



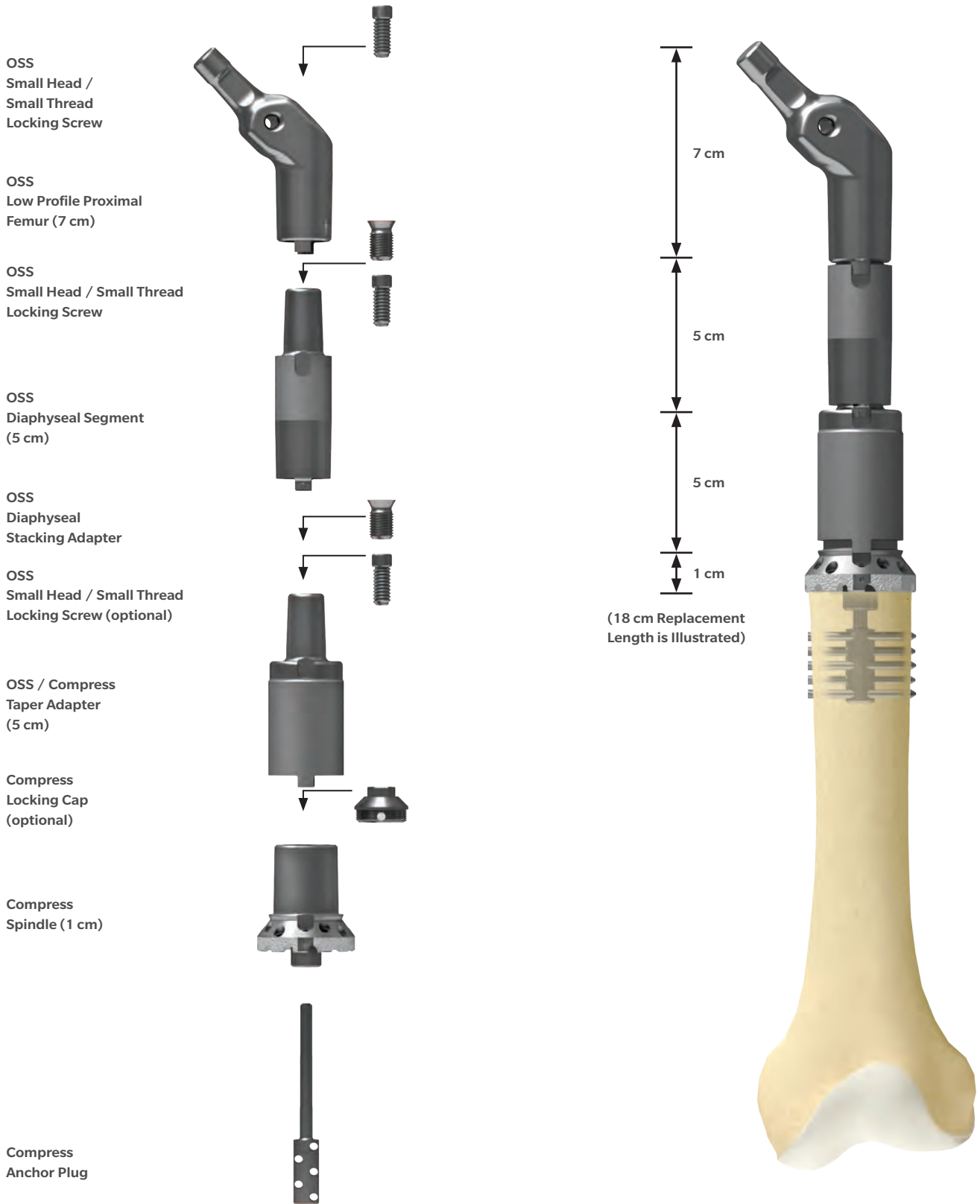
Screw Placement Guide

Utilizing Short Spindle for a Proximal Femoral Replacement



Screw Placement Guide

Utilizing Short Spindle for a Low Profile Proximal Femoral Replacement



Tibial Preparation

To prepare the tibia, reference the surgical steps utilized in the OSS Surgical Techniques.

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