Natural-Hip™ System

Surgical Technique

Addressing surgical concerns comprehensively

zimmer
Confidence in your hands®

Natural-Hip System Surgical Technique

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Table of Contents

Introduction

The *Natural-Hip*™ System is a complete family of stems designed to achieve enhanced fixation and address thigh pain. This system has more than a decade of proven clinical success and appeals to those surgeons who prefer the technical features of an anatomical stem with the surgical simplicity of a straight stem.

This surgical technique is for use with the:

- *Natural-Hip* Porous-coated Stem (press-fit)
- *Natural-Hip* Porous HA-coated Stem (press-fit)
- *Natural-Hip* Premier Stem (press-fit/cemented)
- *Natural-Hip* LD Stem (press-fit/cemented)
- *Natural-Hip* CoCr Stem (cemented)

The *Natural-Hip* Porous-coated Stem has *Cancellous-Structured Titanium*™ (*CSTI*™) Porous Coating and is available in nine collared/collarless sizes in left/right configurations. The *Natural-Hip* Porous HA-coated Stem has *Cancellous-Structured Titanium* Porous Coating with a plasma-sprayed coating of hydroxyapatite. It is available in seven collared/collarless sizes in left/right configurations. The *Natural-Hip* Premier Stem is a nonporous titanium alloy stem, while the *Natural-Hip* LD Stem is a nonporous cobalt-chromium stem; both are available in seven collared, symmetrical sizes. The *Natural-Hip* CoCr Stem is a nonporous cobalt-chromium alloy stem, and is available in nine collared, symmetrical sizes.

Natural-Hip Stems are available in standard, short neck, and offset versions in a variety of sizes. The offset version will lateralize the stem an additional 6mm-7mm compared to the standard stem.

This technique manual is written as a standard open procedure; however, this prosthesis may be implanted using any of a number of minimally invasive techniques, including a muscle-sparing approach. For other instrumentation and technique options, contact your Zimmer representative.

Preoperative Planning

Effective preoperative planning allows for optimal femoral stem fit, as the level of femoral resection, prosthetic neck length, and femoral component offset can be evaluated through preoperative radiographic analysis, allowing one to perform the joint restoration in the most accurate and safest manner. Preoperative planning also allows the surgeon to have the appropriate implants available at surgery.

The overall objective of preoperative planning is to determine the anatomic parameters that will allow acurate intraoperative placement of the femoral implant. The specific objectives include:

1. Determination of leg length
2. Establishment of appropriate abductor muscle tension and femoral offset
3. Determination of the anticipated component sizes

Preoperative planning requires at least two radiographic views of the involved femur: an anterior/posterior (A/P) view of the pelvis centered at the pubic symphysis, and a frog leg lateral view on an 11x17-inch cassette. Both views should show at least eight inches of the proximal femur. In addition, one may request an A/P view of the involved side with the femur internally rotated. This image compensates for naturally occurring femoral anteversion and provides a more accurate representation of the true medial-to-lateral dimension of the metaphysis.

Magnification of the femur will vary depending on the distance from the x-ray source to the film, and the distance from the patient to the film. The *Natural-Hip* System templates use 18% magnification, which is near the average magnification on most clinical radiographs.

X-rays from large or obese patients may have magnification greater than 18% because the patients' osseous structures are farther away from the surface of the film. Similarly, x-rays from smaller patients may have magnification less than 18%. To better determine the magnification of any radiograph, use a standardized marker at the level of the femur.

Determination of Leg Length

Determining the preoperative leg length is essential for restoration of the appropriate leg length during surgery. For most patients, preoperative leg lengths are not equal. An A/P pelvic radiograph often gives enough documentation of leg length inequality to proceed with surgery. If more information is needed, a scanogram or CT evaluation of leg length may be helpful.

To compare leg lengths, draw a reference line across the inferior points of the ischial tuberosities. Then measure the distance from both the left and right lesser trochanter to the reference line (Fig. 1). The difference in the measurement between each side is the radiographic leg length discrepancy. Alternatively, use the distance between the tip of the greater trochanter and the reference line. One may now determine the appropriate correction, if any, to be achieved during surgery.

Determination of Abductor Muscle Tension and Femoral Offset

After establishing the desired postoperative leg length, consider the abductor muscle tension. If the patient has increased offset due to an exceptionally long or varus femoral neck, insertion of an implant with a lesser offset will, in effect, medialize the femoral shaft and may lead to laxity of the abductor muscles. In patients with a significantly varus neck/shaft angle, wherein the center of rotation of the femoral head lies well below the top of the greater trochanter, it is often necessary to seat the implant very low, or near the top of the lesser trochanter. An oblique acetabular liner will add an additional 3mm of offset. If more offset is necessary, one may use a varus-angled modular neck. In most cases, a stable construct can be achieved by using these measures without having to increase the leg length. Implanting a 36mm or 40mm diameter head will yield an acetabular liner with an additional 3mm of offset, but will add approximately 2mm in length. Long and extra-long neck lengths may be associated with soft-tissue instability, and should be used if the previous measures are insufficient.

Occasionally, a patient may have an unusually large preoperative offset or a severe varus deformity, and there may be difficulty in restoring the offset. In such cases, lengthening the limb will increase the tension in the abductors, which is especially useful when the involved hip is short. Another option is to osteotomize and advance the greater trochanter to eliminate the slack in the abductor muscles. Technical variations in the placement of the acetabular components can also reduce the differences in offset.

Fig 1

Acetabular Component Templating

Superimpose the acetabular templates sequentially on the A/P pelvic radiograph with the acetabular component in approximately 40° of abduction. Optimize the range of motion and hip stability by placing the socket in approximately 35-45° of abduction. Compare sizes to estimate which acetabular component will provide the best fit for maximum coverage. In most cases, the largest component possible will provide the best fit. Ensure that the outside diameter is not too large to seat completely in the acetabulum. Refer to the Zimmer *Trilogy*® or *Converge*® Acetabular System surgical technique for further details on acetabular reconstruction.

The position and thickness of the acetabular component will influence the optimum femoral neck length to be used. Mark the acetabular size and position, and the center of the head on the radiographs. Place the femoral template over the acetabular template on the radiograph in order to match the femoral component with the desired acetabular component and to estimate the femoral component size and head/neck length necessary to achieve the correct leg length.

Femoral Component Templating

The specific objectives in templating the femoral component include:

1. Determining the anticipated size of the implant to be inserted
2. Determining the height of the implant in the femur and the location of the femoral neck osteotomy

To determine the femoral implant size and appropriate position, select the femoral template that fits both the proximal and distal femur, and equalizes the leg lengths. Place the template over the A/P radiograph and move it proximally and distally until the axis of the implant neck is in line with the axis of the patient's femoral neck on the radiograph. Refer to the center of the femoral head, marked earlier during acetabular templating, and center the outline of the *Natural-Hip* Stem in the femoral canal, ensuring that the canal is filled to the medial cortical wall (Fig. 2). Choose a template in the largest possible size that will not violate the medial calcar, and place it over the lateral radiograph to verify that the stem size chosen in the A/P plane also fits in the lateral plane.

Note: The *Natural-Hip* System templates incorporate 15° of neck anteversion for greater accuracy when using typical A/P and lateral radiographs.

In order to re-establish femoral leg length, one must determine the level of the femoral neck cut. On the template, identify the resection line that crosses the femoral neck slightly proximal to the lesser trochanter (Fig. 2). Lines are indicated for 5mm, 10mm, 15mm, and 20mm. The femoral neck should be cut shorter for a varus hip, and longer for a valgus hip. This allows the 130° neck/shaft angle of the *Natural-Hip* Stem to fit most clinical scenarios.

Center the femoral template over the femoral shaft and neck in order to determine the anatomic head/neck length (Fig. 2). Select the head and neck options that will properly restore the offset and most closely re-establish the center of rotation.

Six head diameters (22mm-44mm) are available for use with the *Natural-Hip* System. In patients with an average sized acetabulum, consider a femoral head with an intermediate diameter, such as 28mm or 32mm. This allows one to select an acetabular component with an outside diameter small enough to seat completely in the bone without sacrificing polyethylene liner thickness.

In special circumstances, such as the treatment of a smaller patient, a patient with congenital hip dysplasia, or a patient with little acetabular volume, a 22mm diameter head must be used to allow for adequate polyethylene thickness.

Implant sizing

Implant sizing is dimensionally the same for the *Natural-Hip* Porous-coated Stem and *Natural-Hip* Porous HA-coated Stem and for the *Natural-Hip* CoCr Stem, *Natural-Hip* Premier Stem, and *Natural-Hip* LD Stem.

The *Natural-Hip* Reamers and Broaches are sized to prepare the femur to accept a corresponding size *Natural-Hip* Porous-coated Stem and *Natural-Hip* Porous HA-coated Stem for press-fit implantation; they will also prepare the femur to accept a corresponding size *Natural-Hip* CoCr Stem, *Natural-Hip* Premier Stem, and *Natural-Hip* LD Stem for cemented implantation. When a *Natural-Hip* Premier Stem or *Natural-Hip* LD Stem is used for press-fit implantation, a smaller cavity must be prepared to ensure an optimal 1mm press-fit. This is accomplished by using the *Natural-Hip* Premier Press-fit Reamers and Broaches.

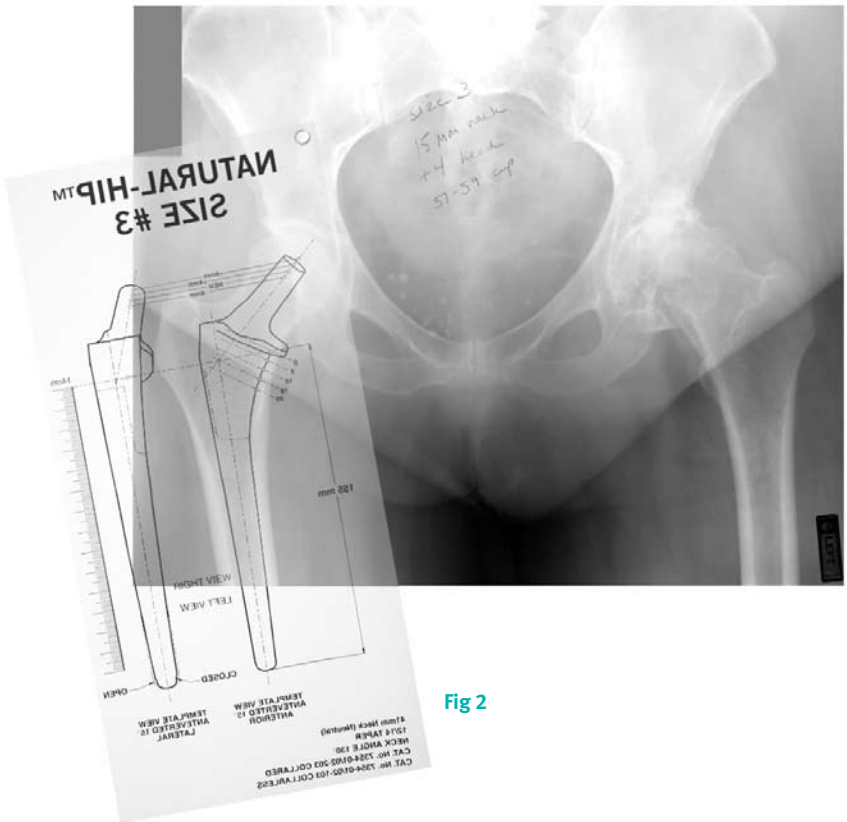


Fig 2

Surgical Technique

Patient Positioning

Place the patient in the lateral position so that a straight line can be drawn from the tip of the shoulder through the most superior point of the iliac crest to the tip of the greater trochanter (Fig. 3). It is critical that the patient be securely stabilized in this position with adequate anterior and posterior support for the chest. Several hip positioning instrumentation sets are available to provide this stability. The traditional Charnley approach with the patient in the supine position may also be used.

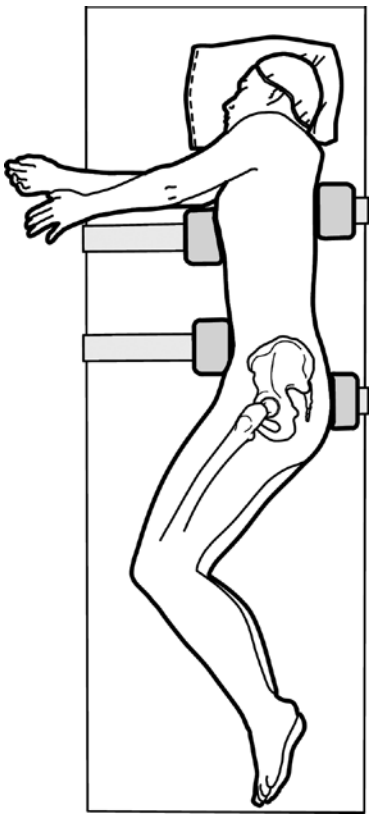


Fig 3

Incision

The *Natural-Hip* System can be implanted using a variety of surgical approaches based on the personal preference, whether conventional or minimally invasive, including the posterior, posterolateral, anterolateral, straight lateral, or transtrochanteric approaches.

Exposure of the Hip Joint

Develop the exposure of the posterior capsule with the leg in internal rotation. The key landmark for division of the short external rotators is the tendon of the piriformis muscle. This tendon runs parallel to the posterior border of the gluteus medius and can be readily palpated as it approaches the posterior superior portion of the greater trochanter. Retract the gluteus medius superiorly and identify the tendon of the piriformis.

Determination of Leg Length

Establish landmarks and obtain measurements before dislocating the hip so that a comparison of leg length and femoral shaft offset can be obtained post reconstruction. From this comparison, adjustments can be made to achieve the goals established during preoperative planning.

Osteotomy of the Femoral Neck

Instruments used:

- Universal Femoral Neck Osteotomy Guide
- Oscillating saw

Hold the leg in internal rotation by flexing the knee 90° and pointing the lower leg toward the ceiling. Align the Universal Femoral Neck Osteotomy Guide with the long axis of the femur and position the short "0mm" reference line at the proximal level of the lesser trochanter (Fig. 4).

Fig 4

Select the femoral neck length as determined in preoperative planning (5mm, 10mm, 15mm, or 20mm). Use electrocautery to mark the correct angle of the osteotomy cut at the selected slot on the Universal Femoral Neck Osteotomy Guide, or use an oscillating saw to start the femoral neck cut through the slot (Fig. 5). The osteotomy cut is performed in two steps. From the mark, make the first cut perpendicular to the femoral neck and extending laterally to the medial edge of the greater trochanter. Make the second cut parallel to the femoral shaft and as close as possible to the medial edge of the greater trochanter (Fig. 6).

Fig 5

Prepare the acetabulum using personal choice from either the Zimmer *Trilogy* or *Converge* Cup System family. Contact your Zimmer representative to obtain the appropriate surgical technique.

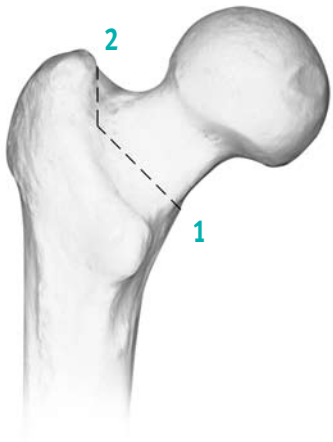


Fig 6

Femoral Reaming

Instruments used:

- *Natural-Hip* Reamers or *Natural-Hip* Premier Press-fit Reamers
- Universal Zimmer Detachable Fitting
- *Natural-Hip* Reamer Stop and Handle
- Jaws Retractor
- Large spoon-shaped curette
- Power driver

The *Natural-Hip* Reamers are tapered, proportionally sized, and self-centering with blunt tips and include a Universal Zimmer Detachable Fitting to allow for power reaming. The *Natural-Hip* Reamer Stop and Handle have a left/right configuration with a calcar stop to ensure proper reaming depth.

Note: If press-fitting a *Natural-Hip* Premier Stem or *Natural-Hip* LD Stem, the proportionally sized, conical *Natural-Hip* Premier Press-fit Reamers with bullet tips must be used.

After preparing the acetabulum, flex the knee to 90° and internally rotate the leg. Place a small Jaws Retractor under the proximal portion of the cut femur to lift the femur and retract the posterior tissue.

Use the smallest reamer to initiate access to the medullary canal. Orient the reamer laterally against the greater trochanter to ensure that the reamer removes any remaining lateral femoral neck and enters the medullary canal in the neutral position (Fig. 7). Proper alignment of the reamer along the axis of the femoral shaft is important to ensure correct component positioning.

Fig 7

Ream until the reamer automatically stops at the level of the osteotomy/calcar cut (Fig. 8). To ensure proper reaming depth and avoid distal fractures, the calcar stop should fully engage the calcar at the level of the osteotomy/calcar cut. Continue to ream sequentially to the second-to-last size templated during preoperative planning (e.g., stop reaming at a size 5 if templated a size 6), or until resistance is encountered.

Note: In THA cases with sclerotic or Type A bone, the ream/broach surgical technique may be employed to ensure that proper sizing of the femoral canal is achieved. In this technique, each reamer is sequentially followed by the corresponding size broach until the second-to-last templated size broach is inserted.

Fig 8

Femoral Broaching

Instruments used:

- Fully-toothed *Natural-Hip* Broaches or *Natural-Hip* Premier Press-fit Broaches
- Universal Trigger Broach Holder
- Mallet
- Alignment Rod

Fully-toothed *Natural-Hip* Broaches are available in left/right configurations with a proximal anterior buildup to recreate the natural anatomy of the femur. Each *Natural-Hip* Broach is approximately 1mm smaller than the femoral prosthesis at the anterosuperior segment to help ensure an optimal press-fit.

Note: If press-fitting a *Natural-Hip* Premier Stem or *Natural-Hip* LD Stem, the fully-toothed, symmetrical *Natural-Hip* Premier Press-fit Broaches must be used to effectively prepare the proximal femur for a 1mm press-fit.

Starting with the broach that is one size smaller than the templated size, attach the broach to the Universal Trigger Broach Holder.

Orient the broach laterally toward the greater trochanter in an anteverted position (Fig. 9) by aligning the posterior face of the broach parallel to the posterior cortex of the femoral neck to match the patient's normal anteversion (Fig. 10).

Note: If the surgery is performed using a posterior surgical approach, attach an Alignment Rod to the right or left hole in the Universal Trigger Broach Holder and align it to the patient's posterior ankle/foot to obtain approximately 15° of anteversion (Fig. 11).

Fig 9

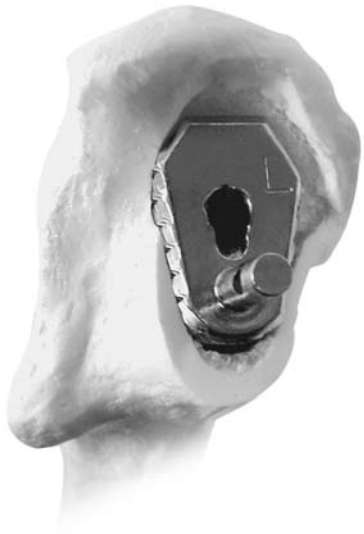


Fig 10

Fig 11

Continue broaching until the *Natural-Hip* Broach is countersunk 2mm below the osteotomy/calcar cut. The final size broach (e.g., size 6 if templating a size 6) should completely fill the proximal calcar region (as much as possible); and be stable with no visible signs of movement when rotated with the Universal Trigger Broach Holder (Fig. 12).

Note: If the patient has Type A bone and the broach appears rotationally unstable, the surgeon may taper ream and broach line to line (e.g., if a size 6 is templated, taper ream a size 6 and follow with a size 6 broach). If the patient has Type C bone, a larger size reamer/broach should be used (e.g., if a size 6 is templated, ream to size 5, broach to size 5, ream to size 6, broach to size 6). Broaching in Type C bone should only be perfomed using fully-toothed broaches.

Note: If the broach firmly engages the medial cortex, it should NOT be seated deeper and a larger size should NOT be attempted.

The optional Universal Implant Slaphammer Tool with the Broach Adapter may be used for final seating or removal of the *Natural-Hip* Broach from the femoral canal (Fig. 13).

Leave the final broach in place and remove the Universal Trigger Broach Holder. This broach will be used for the calcar planing process.

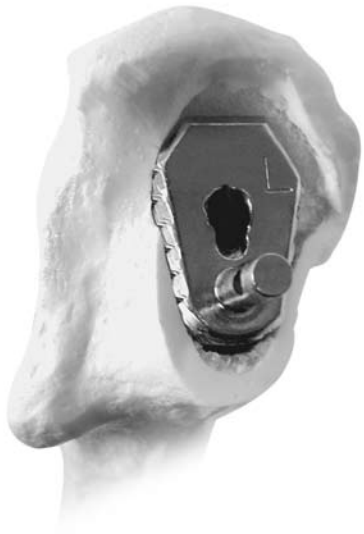


Fig 12

Fig 13

Calcar planing

Instruments used:

- Fully-toothed *Natural-Hip* Broach or *Natural-Hip* Premier Press-fit Broach
- *Natural-Hip* Calcar Planer
- Power driver
- Metal ruler
- Mallet

Check that the broach is countersunk 2mm below the osteotomy/calcar cut and position the small or large *Natural-Hip* Calcar Planer over the trunnion of the broach (Fig. 14). Plane the calcar flush with the broach face to help ensure proper seating of the collar on the proximal calcar.

Remove osteophytes and any residual lateral femoral neck. Use a metal ruler to measure the amount of remaining femoral neck above the lesser trochanter. Any undesired residual femoral neck can be shortened by further countersinking the broach and planing the calcar until the preoperatively planned length is achieved.

Fig 14

Trial Reduction

Instruments used:

- *Natural-Hip* CoCr Head/Neck Adapters
- *Natural-Hip* Porous Head/Neck Adapters
- Femoral Head Provisionals
- Fully-toothed *Natural-Hip* Broach or *Natural-Hip* Premier Press-fit Broach

If desired, the broach may be left in place for trial reduction or open the *Natural-Hip* Femoral Prosthesis. If the broach is used, attach the appropriate Head/Neck Adapter onto the trunnion (Fig. 15). If a *Natural-Hip* Porous-coated Stem or *Natural-Hip* Porous HA-coated Stem will be implanted, *Natural-Hip* Porous Head/Neck Adapters, available in standard, short neck, and offset versions, must be used. If a *Natural-Hip* CoCr Stem, *Natural-Hip* Premier Stem, or *Natural-Hip* LD Stem will be implanted, *Natural-Hip* CoCr Head/Neck Adapters, available in standard, short neck, and offset versions, must be used.

Fig 15

Select the appropriate Femoral Head Provisional size with the correct offset and seat it on the Head/Neck Adapter (Fig. 16). Femoral Head Provisionals are available in 22mm, 26mm, 28mm, 32mm, 38mm, and 44mm diameters with different offset options. Please refer to the *Natural-Hip* Leg Length/Neck Length/Neck Offset Reference Chart on page 18.

Fig 16

Femoral Implantation

Instruments used:

- *Natural-Hip* Implant Holder
- Threaded Rod
- Non-threaded Rod
- Alignment Rod
- Universal Implant Slaphammer Tool
- Porous/HA Adapter
- CoCr/Premier/LD Adapter
- Universal Distal Sizer Handle
- Universal Distal Sizer Tip
- Mallet
- Universal Impactor Handle
- Universal Impactor Head
- Femoral Head Provisional
- Head Impactor

Press-fit Technique

For press-fit implantation, the *Natural-Hip* Stems are designed to fit line-to-line distally with the appropriate reamers and broaches, and achieve a proximal press-fit of approximately 1mm.

Select the correct size stem based on the final broach size used and attach the stem to the *Natural-Hip* Implant Holder (Fig. 17). For the *Natural-Hip* Porous-coated and Porous HA-coated Stems, insert the Threaded Rod through the Implant Holder and into the stem. For the *Natural-Hip* Premier and LD Stems, insert the Non-threaded Rod. Insert the stem into the canal and advance the stem by hand.

Fig 17

Position the stem laterally toward the greater trochanter in an anteverted position by **aligning the posterior face of the stem parallel to the posterior cortex of the femoral neck.** Attach the Alignment Rod to the *Natural-Hip* Implant Holder. The Alignment Rod provides approximately 15° of anteversion when in line with the patient's flexed leg (Fig. 18). Final anteversion should match the patient's natural anteversion as well as the orientation of the final broach.

Using a mallet, moderately impact the stem into the femoral canal until the collar contacts the calcar (Fig. 19). For a collarless stem, impact the stem until the proximal edge of the porous coating is at the level of the calcar.

The optional Universal Implant Slaphammer Tool may also be used to impact the stem. Select the appropriate adapter and attach it to the slaphammer tool; use the Porous/HA Adapter for the *Natural-Hip* Porous-coated and Porous HA-coated Stems, and the CoCr/Premier/LD Adapter for the *Natural-Hip* Premier and LD Stems. With the Implant Holder and appropriate rod in place, attach the Universal Implant Slaphammer Tool and adapter to the rod (Fig. 20), and use the slaphammer to impact the stem until fully seated. Additional impaction blows may be necessary to fully seat the stem; however, do not use excessive impaction force.

Fig 18

Fig 19

Fig 20

Cemented Technique

For cemented implantation, the *Natural-Hip* Stem sizes are designed to correspond to the *Natural-Hip* Reamers and Broaches while achieving approximately 1.5mm-2.5mm of cement mantle.

Adjust the Universal Distal Sizer Handle by sliding the calcar stop to the mark for the selected stem size. Attach the largest possible Universal Distal Sizer Tip (10mm-19mm) to the end of the Universal Distal Sizer Handle (Fig. 21).

Calibrate the size of the distal femoral canal by inserting the assembled Universal Distal Sizer Handle/Tip into the canal until the calcar stop contacts the calcar (Fig. 22).

Select the largest possible distal centralizer (9mm-19mm) (7351-30-009/019), and attach it to the selected stem with one fin pointed laterally.

Insert the appropriately sized cement restrictor into the femur 2cm below the tip of the stem. Brush, irrigate, and dry the femoral canal, and insert a sponge into the femoral canal until the bone cement is ready to be injected.

After mixing the bone cement, remove the sponge from the femoral canal. Extrude the bone cement into the canal, filling the canal distal to proximal. This technique is critical to avoid embolization of debris such as air and bone marrow. Pressurize the proximal bone cement using a pressurizing nozzle or a finger.

Fig 21

Fig 22

Select the *Natural-Hip* Stem size based on the final broach size used. Attach the stem to the Implant Holder (Fig. 23). Insert the Non-threaded Rod through the Implant Holder and into the stem, then slide the assembly into the femoral canal until the collar contacts the calcar.

Position stem laterally toward the greater trochanter in an anteverted position by aligning the posterior face of the stem parallel to the posterior cortex of the femoral neck (Fig. 24). Attach the Alignment Rod to the Implant Holder. The Alignment Rod provides approximately 15° of anteversion when in line with the patient's flexed leg (see Fig. 19 on page 14). Final anteversion should match the patient's natural anteversion.

Remove excess bone cement. Leave the Implant Holder and rod in place and continue to apply pressure until the bone cement is almost set. Remove the Implant Holder and rod from the stem, and clean up any remaining bone cement.

Fig 23

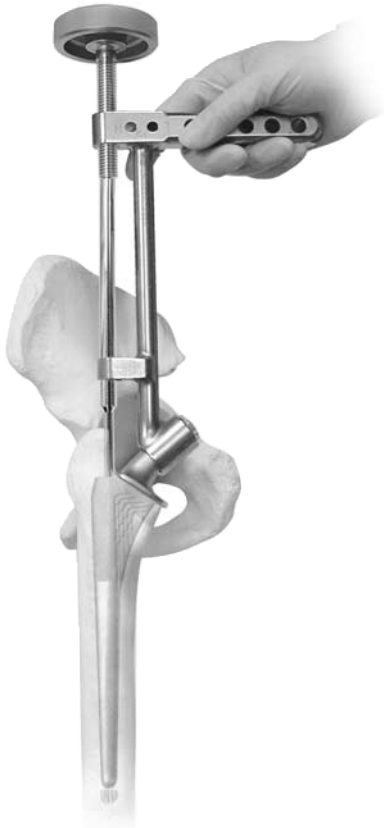


Fig 24

Attachment of the Femoral Head

Select the appropriate femoral head.* Refer to the *Natural-Hip* Leg Length/ Neck Length/Neck Offset Reference Chart on page 20 for an overview of the different heads and their respective dimensions.

Note: Ceramic heads cannot be used with the *Natural-Hip* LD Stem.

Remove the taper protector from the stem taper (Fig. 25). Apply the corresponding Femoral Head Provisional onto the stem taper, and perform a trial reduction to assess joint stability, range of motion, and restoration of leg length and offset.

When the appropriate femoral head size is confirmed, remove the Femoral Head Provisional.

Attach the Universal Impactor Handle to the Universal Impactor Head.

Check to ensure that the 12/14 taper on the stem is clean and dry. Place the selected femoral head onto the taper and secure it firmly by twisting it and striking it once with the impactor assembly (Fig. 26). Proper engagement of the taper mechanism occurs only with the force of a single blow. Additional blows may either disrupt the engagement of the Morse-type taper or threaten femoral fracture. Test the security of the head fixation by trying to remove the head by hand.

Note: Do not impact the femoral head onto the taper before driving in the prosthesis as the femoral head may loosen during impaction.

Reduce the hip, and assess leg length, range of motion, stability, and abductor tension once more. Inspect the acetabulum and joint to ensure that no residual material, osteophytes, or debris remain in the wound and articulating surface.

Wound Closure

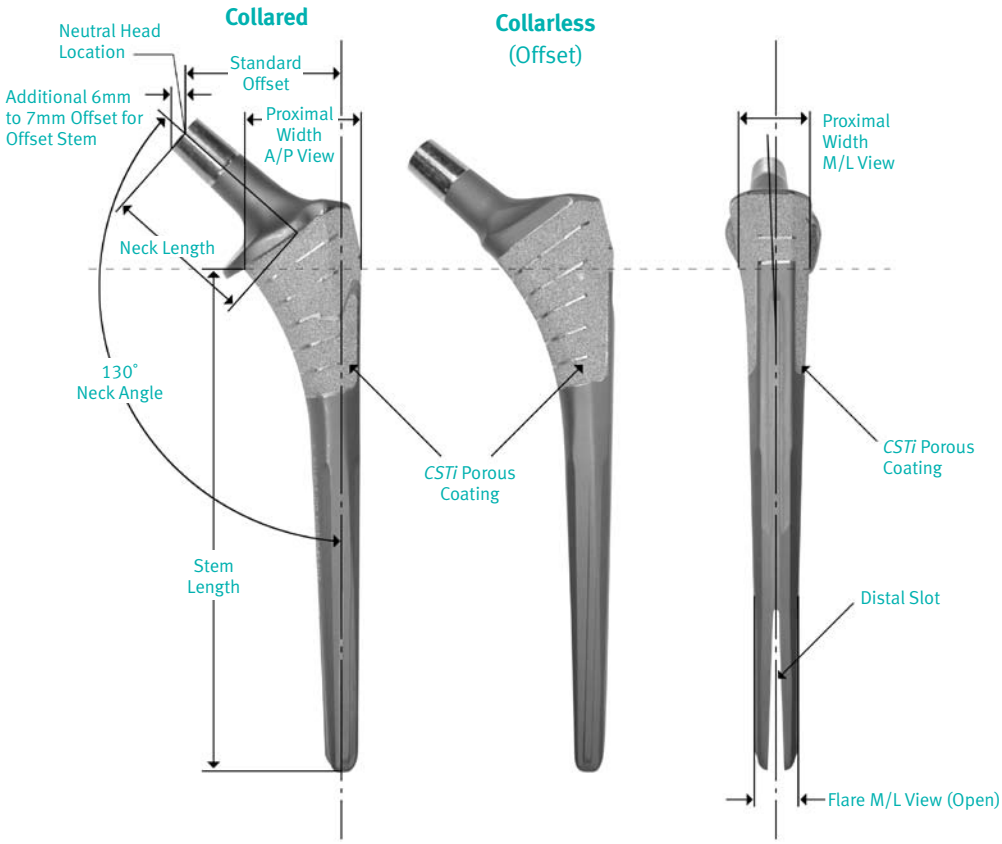
After obtaining hemostasis, insert a *Hemovac*® Wound Drainage Device and close the wound in layers according to the surgical approach employed.

Fig 25

Fig 26

* View the www.productcompatibility.zimmer.com website for a current list of composite components.

Natural-Hip Porous-Coated Stems Implant Specifications and Dimensions



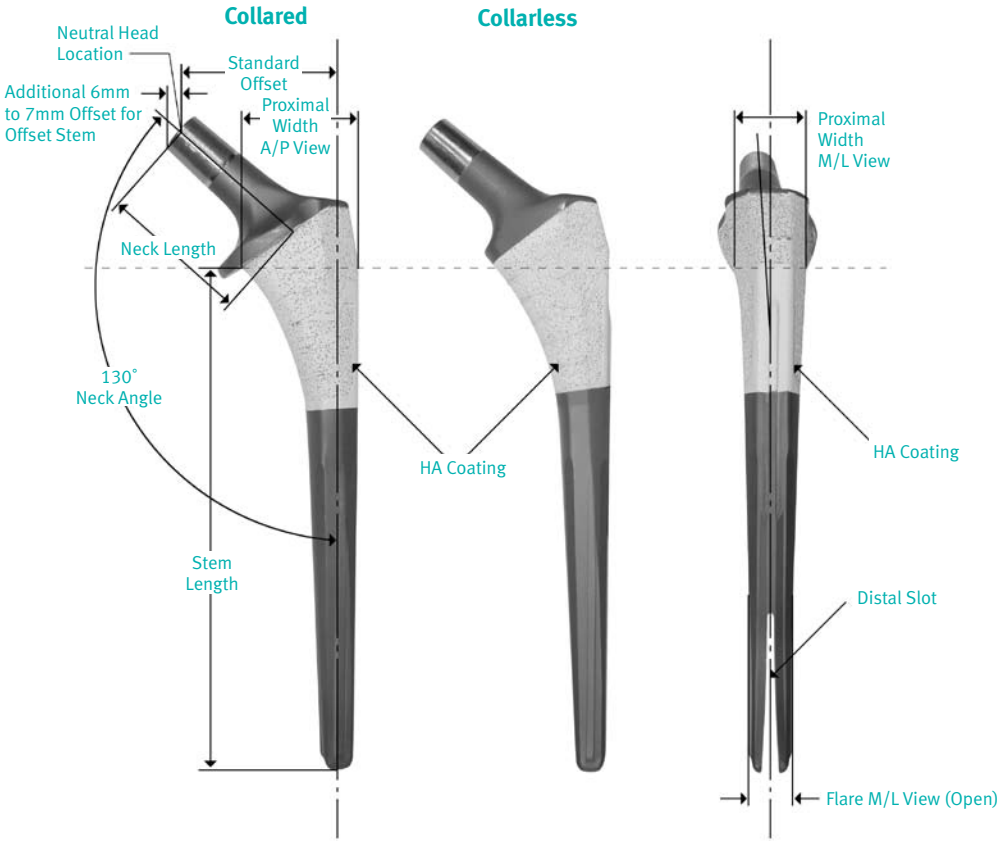
Stem Size	Reamer/ Broach Size	Stem Length (mm)	Neck Length (mm)	Standard Neck Offset (mm)	Additional Offset Neck Offset (mm)‡	Prox. Width M/L View (mm)	Prox. Width A/P View (mm)	Distal Diameter (mm) (Closed)	Flare M/L View (mm) (Open)
00	00	115	33	36	—	18	27	8.5	10.5
0	0	125	37	40	46*	19	29	9.0	11.0
1	1	135	37	40	46*	20	31	9.5	11.5
2	2	145	37	40	46*	21	33	10.5	13.5
3	3	155	41	43	50*	22	35	11.0	14.0
4	4	165	41	43	50*	23	37	11.5	14.5
5	5	175	41	43	50*	24	39	12.0	16.0
6	6	185	41	43	50*	25	41	13.0	17.0
7	7	195	41	43	—	26	43	14.0	18.0

‡ Standard set of *Natural-Hip* Instrumentation is used with the *Natural-Hip* Porous Offset Head/Neck Adapters.

‡ Surgical Technique for the *Natural-Hip* Offset Stem is the same as if placing a *Natural-Hip* Standard Stem.

* Offset provides an additional 6-7mm more than the standard offset. The *Natural-Hip* Offset Stem was designed to meet the needs of the patient with a varus hip. The offset stem shifts the head medially and slightly distal, lateralizing the hip and duplicating offset and length in the contralateral extremity.

Natural-Hip Porous HA-Coated Stems Implant Specifications and Dimensions



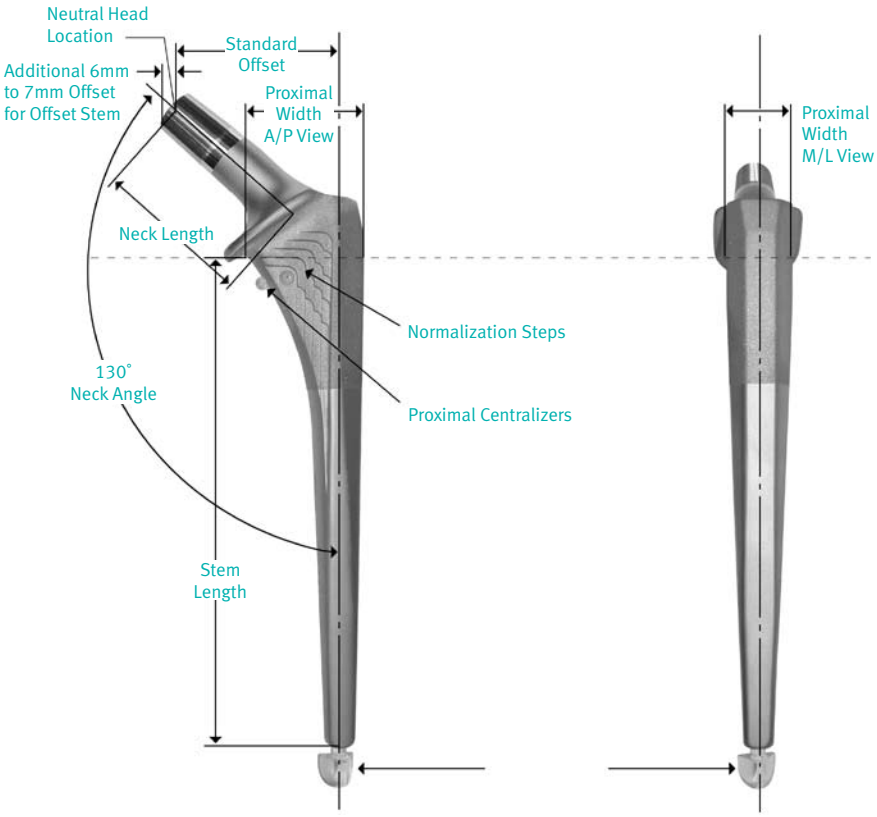
Stem Size	Reamer/ Broach Size	Stem Length (mm)	Neck Length (mm)	Standard Neck Offset (mm)	Additional Offset Neck Offset (mm)‡	Prox. Width M/L View (mm)	Prox. Width A/P View (mm)	Distal Diameter (mm) (Closed)	Flare M/L View (mm) (Open)
0	0	125	37	40	46*	19	29	9.0	11.0
1	1	135	37	40	46*	20	31	9.5	11.5
2	2	145	37	40	46*	21	33	10.5	13.5
3	3	155	41	43	50*	22	35	11.0	14.0
4	4	165	41	43	50*	23	37	11.5	14.5
5	5	175	41	43	50*	24	39	12.0	16.0
6	6	185	41	43	50*	25	41	13.0	17.0

‡ Standard set of *Natural-Hip* Instrumentation is used with the *Natural-Hip* Porous Offset Head/Neck Adapters.

‡ Surgical Technique for the *Natural-Hip* Offset Stem is the same as if placing a *Natural-Hip* Standard Stem.

* Offset provides an additional 6-7mm more than the standard offset. The *Natural-Hip* Offset Stem was designed to meet the needs of the patient with a varus hip. The offset stem shifts the head medially and slightly distal, lateralizing the hip and duplicating offset and length in the contralateral extremity.

Natural-Hip CoCr Stems Implant Specifications and Dimensions



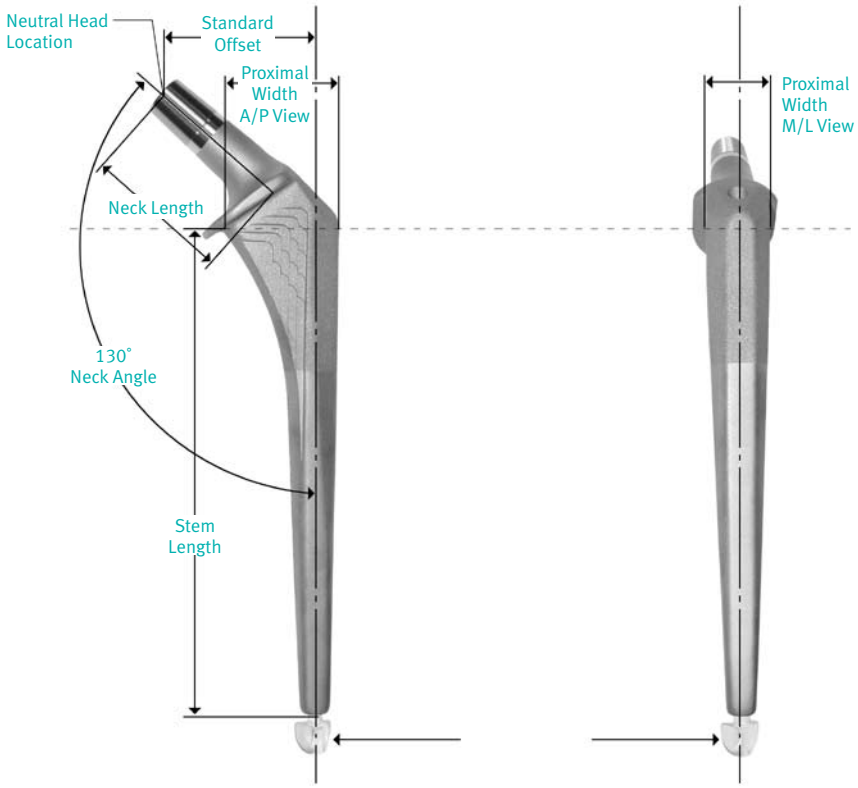
Stem Size	Reamer/ Broach Size	Stem Length (mm)	Neck Length (mm)	Standard Neck Offset (mm)	Additional Offset Neck Offset (mm)‡	Prox. Width M/L View (mm)	Prox. Width A/P View (mm)	Distal Diameter (mm)
00	00	105	33	36	—	14	26	7.0
0	0	110	37	40	46*	16	27	7.0
1	1	120	37	40	46*	17	29	7.5
2	2	130	37	40	46*	18	31	8.5
3	3	140	41	43	50*	19	33	9.0
4	4	150	41	43	50*	20	35	9.5
5	5	160	41	43	50*	21	37	10.0
6	6	170	41	43	50*	22	39	10.5
7	7	180	41	43	—	23	41	11.0

‡ Standard set of *Natural-Hip* Instrumentation is used with the *Natural-Hip* Porous Offset Head/Neck Adapters.

‡ Surgical Technique for the *Natural-Hip* Offset Stem is the same as if placing a *Natural-Hip* Standard Stem.

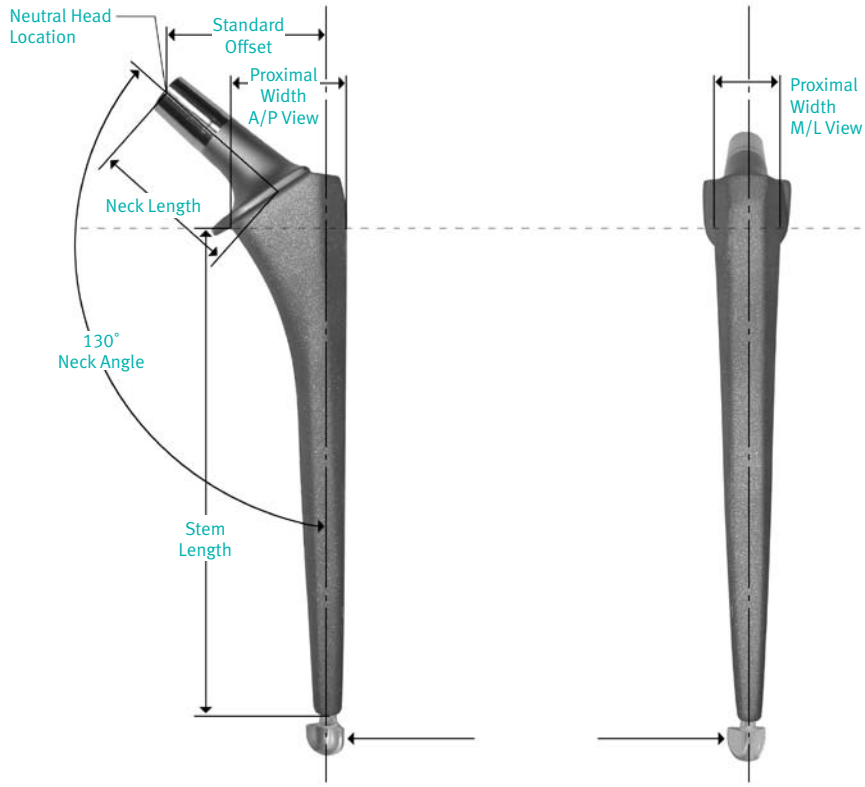
* Offset provides an additional 6-7mm more than the standard offset. The *Natural-Hip* Offset Stem was designed to meet the needs of the patient with a varus hip. The offset stem shifts the head medially and slightly distal, lateralizing the hip and duplicating offset and length in the contralateral extremity.

Natural-Hip Premier Stems Implant Specifications and Dimensions



Stem Size	Reamer/Broach Size	Stem Length (mm)	Neck Length (mm)	Standard Neck Offset (mm)	Prox. Width M/L View (mm)	Prox. Width A/P View (mm)	Distal Diameter (mm)
0	0	110	37	40	16	27	7.0
1	1	120	37	40	17	29	7.5
2	2	130	37	40	18	31	8.5
3	3	140	41	43	19	33	9.0
4	4	150	41	43	20	35	9.5
5	5	160	41	43	21	37	10.0
6	6	170	41	43	22	39	10.5

Natural-Hip LD Stems Implant Specifications and Dimensions



Stem Size	Reamer/Broach Size	Stem Length (mm)	Neck Length (mm)	Standard Neck Offset (mm)	Prox. Width M/L View (mm)	Prox. Width A/P View (mm)	Distal Diameter (mm)
0	0	110	37	40	16	27	7.0
1	1	120	37	40	17	29	7.5
2	2	130	37	40	18	31	8.5
3	3	140	41	43	19	33	9.0
4	4	150	41	43	20	35	9.5
5	5	160	41	43	21	37	10.0
6	6	170	41	43	22	39	10.5

Please refer to package insert for complete product information, including contraindications, warnings, precautions, and adverse effects.

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