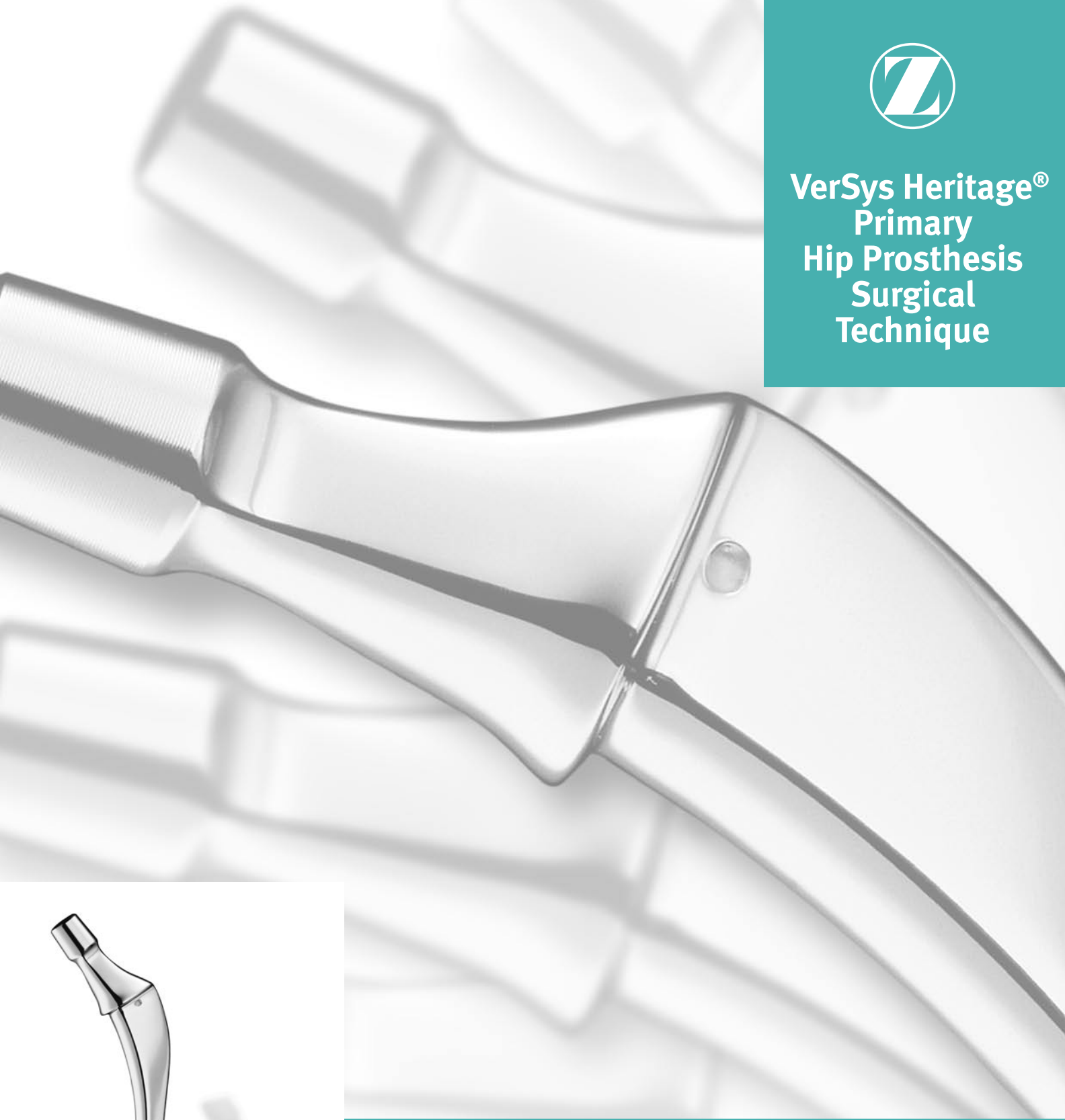
VerSys Heritage® Primary Hip Prosthesis Surgical Technique



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Surgical Technique For *VerSys Heritage* Primary Hip Prosthesis

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Table of Contents

Design Philosophy

The *VerSys*® Hip System cemented prosthesis is designed to optimize placement and fixation of the femoral stem. The rasp system allows preparation of a bony bed into which any of the cemented components can be inserted. The *VerSys Heritage* stem has been designed to fit within the envelope of the rasp to allow a cement mantle of at least 1mm at all locations around the stem. The shape of the *VerSys Heritage* stem is similar to Sir John Charnley's original, polished, flat-back stem with parallel anterior and posterior surfaces, thus creating a rectangular geometry. While remaining true to Charnley's original flat-back prosthesis, the *VerSys Heritage* stem has a modified taper design at the distal tip, which reduces the strain to the distal cement mantle.[1] The option of standard and extended offset provides for anatomical restoration and soft tissue stability without increasing leg length.

Preoperative Planning

The key to successful implantation is precise preoperative planning to reconstruct the joint in the most accurate and appropriate manner. The overall objective of this phase is to enable the surgeon to determine anatomic parameters that allow accurate intraoperative placement of the femoral implant.

Specifically, the objectives of preoperative planning include:

1. Determination of leg length by osteotomizing the neck at the proper level,
2. Establishment of appropriate abductor muscle tension and femoral offset,
3. Determination of anticipated component sizing and placement, and
4. Determination of lateralization into the trochanteric bed to achieve neutral alignment of the implant.

In femoral templating, (Fig.1) magnification of the size of the femur will vary depending on the distance from the x-ray source to the film, and the distance from the femur to the film. The *VerSys Heritage* templates use standard 20 percent magnification, which is close to the average magnification on most clinical x-rays. Larger patients or more obese patients may have magnification greater than 20 percent because their osseous structures are farther away from the film. To determine the magnification of any x-ray film, use a standardized marker at the level of the femur when exposing the x-ray film.

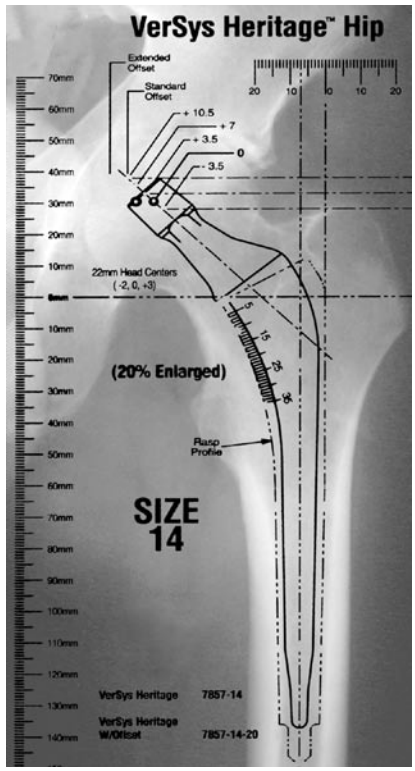


Fig. 1

1. Test data on file at Zimmer.

Establish the center of rotation of the acetabulum by placing the acetabular template onto the anterior/posterior (A/P) x-ray. Overlay the femoral template onto the A/P x-ray so the midline of the implant is aligned over the anatomical axis of the femoral medullary canal. Then move the template superiorly or inferiorly so the prosthetic head level marked +0mm is superimposed on the center of the rotation of the previously templated acetabulum. Correct leg length discrepancy accordingly. Preoperative x-rays may be used to template the distance from the lesser trochanter to the center of rotation of the opposite hip if it is normal. Choose the appropriate size of stem so that the rasp profile fills the femur up to the endosteal cortices. On the lateral view, the rasp profile should also fill the canal up to the endosteal cortex.

The *VerSys Heritage* Prostheses are available in both standard and extended offset options. This enables proper restoration of joint kinematics in varus hips without increasing the leg length. Femoral templates are available for each of the seven standard offset implants (sizes 11-17) and are color coded by system family. The color red designates that the *VerSys Heritage* stem is part of the *VerSys* Hip System cemented family. The four templates in the middle range of sizes (sizes 13-16) are marked to show the head centers for both the standard and extended offsets. No extended offset is provided for sizes 11, 12, and 17.

When the template is properly superimposed, mark the location of the medial starting point of the neck osteotomy on the x-ray. Head centers for each head-neck combination are shown in 3.5mm increments from -3.5mm to +10.5mm (depending on head diameter). By using the "STANDARD" (+0) level to determine the level of the osteotomy cut, the surgeon has the option of using either a standard (+0) head or one that is 3.5mm shorter or 3.5mm longer than the standard (+0) without having to use a femoral head with a metal skirt. If more length is needed, two additional femoral heads are available, +7mm and +10.5mm longer than the standard (+0) neck length. These heads (with the two longest neck lengths) have metal skirts that reduce the range of motion and may increase the risk of impingement, which may in turn increase the risk of subluxation, dislocation, and long-term loosening.

The *VerSys Heritage* components are manufactured from a forged, cobalt-chrome alloy with adequate strength to allow for a smaller A/P dimension in the neck, which increases the range of motion.

Surgical Technique

Approach

Exposure can be achieved through a variety of methods. The *VerSys Heritage* implant can be inserted with equal ease using a posterolateral, anterolateral, straight lateral, or transtrochanteric approach.

For any of these approaches, position the patient on the operating table in the true lateral position. This position must be accurately determined and firmly maintained. The precise orientation of the acetabular component is facilitated by relating to this position as well as the bony landmarks of the pelvis. Flex the contralateral hip and knee at approximately 45 degrees, assuring that the leg is well padded and secured to the table.

Determination of Leg Length

Establish landmarks and obtain measurements before dislocation of the hip so that a comparison of leg length and femoral offset can be made after reconstruction to achieve the goals established during preoperative planning. There are several methods to measure leg length. One method is to place one pin in the iliac wing and another pin parallel to the first pin in the greater trochanter. Then measure the distance between them. This measurement is done with the leg in the neutral position, a position which can be reproduced after the new implant has been inserted.

The proximal pin is left in place while the trochanteric pin is removed and the pin site marked with cautery to make replacement easy at the time of remeasurement. Zimmer also offers a device called the Joint Ruler (Fig. 2) that will measure leg length. A 1/8-inch, Steinman pin is inserted superior to the acetabular rim at the 1 o'clock position for an anterior approach and 11 o'clock position for a posterior approach. The femur is marked using an *ECT*® screw (3.5mm diameter x 10mm length) or by marking with an electro-cautery device. The small end of the Joint Ruler is secured by sliding it over the Steinman pin. The ruler is then aligned with the femoral marking and a measurement is taken and recorded.

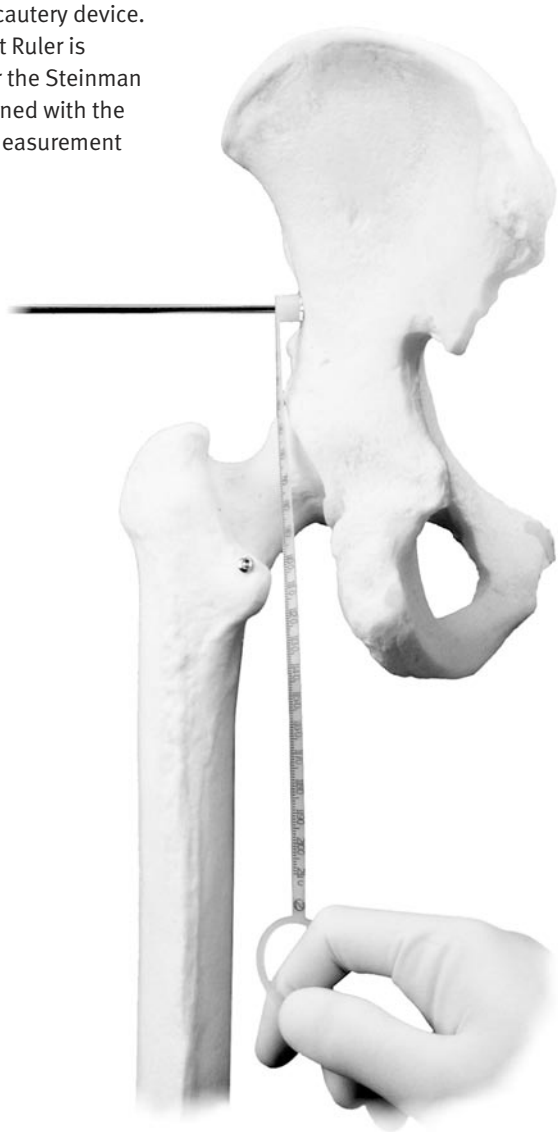


Fig. 2

Osteotomy of the Femoral Head

Dislocate the femoral head and establish good visualization of the upper femur. Place the Osteotomy Guide* from the *VerSys Heritage* System over the anterior or posterior aspect of the femur (Fig. 3), depending on the approach. Position the guide based on the preoperative planning, and at the predetermined distance from the superior border of the lesser trochanter. The longitudinal axis of the guide should be parallel to the longitudinal axis of the femur.

The hole labeled “STD” refers to the standard offset implants and “EXT” to the extended offset implants. All holes on the Osteotomy Guide refer to the +0 head center.

Use a ruler to measure the distance from the lesser trochanter to the center of rotation of the natural femoral head. The tip of the greater trochanter should coincide with the cut out on the lateral edge of the osteotomy guide.

Mark the level of the neck osteotomy with either a saw or methylene blue. Note that the angle of the osteotomy cut is 50 degrees to the long axis of the femur (Fig. 4). The neck osteotomy should be made with a reciprocating saw and cut in the neutral plane.

Fig. 3

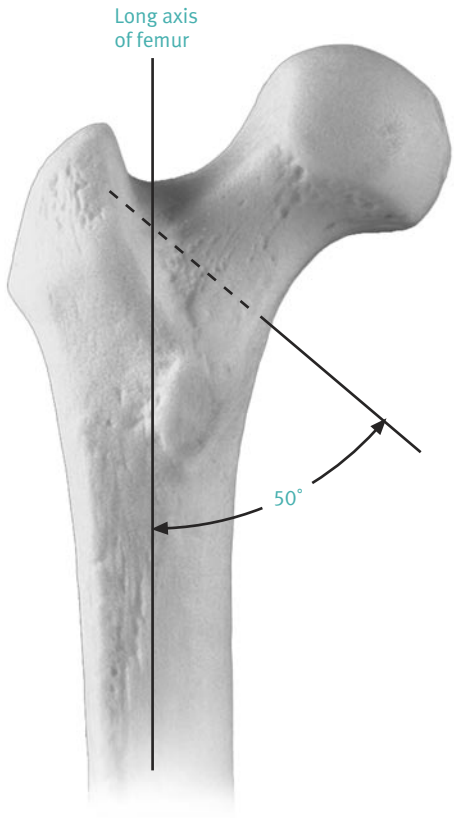


Fig. 4

* The *VerSys Heritage* Osteotomy Guides are marked with “VH” for easy identification.

Preparation of the Femur

After removing osteophytes, particularly anterior osteophytes that may limit post-operative flexion, use the Box Osteotome and/or the Trochanteric Reamer to remove the medial portion of the greater trochanter and lateral femoral neck. Usually, the lateral corner of the Box Osteotome is placed in the piriformis fossa (Fig. 5). After removing this cortical bone, insert the Tapered Awl to open the medullary canal (Fig. 6).

Fig. 5

Fig. 6

Find the center of the femoral canal by reaming just anteriorly and medially to the trochanteric fossa. Use a powered Trochanteric Reamer to ream laterally toward the greater trochanteric bone so that the rasp can be placed in a neutral varus/valgus alignment (Fig. 7).

Use the *VerSys* System Rasps when preparing the canal for a *VerSys Heritage* implant.

Fig. 7

Do not use the Large Metaphyseal or Enhanced Taper Rasps when performing a cemented procedure. These rasps are engraved with an "LM" or "ET" near the trunnion for easy identification. Also, there is no need to use the Rasp Alignment Tip for the cemented *VerSys Heritage* implants. The threads on the tip can be left uncovered when rasping the canal (Fig. 8).

Fig. 8

Antevert the femoral rasp by approximately 15 degrees when driving it into the medullary canal. This amount of femoral rasp anteversion matches the natural anteversion and increases hip stability. If the natural femoral neck is significantly anteverted, the posterior aspect of the rasp may actually contact the posterior cortex.

Start with a rasp 1-2 sizes smaller than the implant size selected during templating. The rasp should advance with each moderate tap of the mallet (Fig. 9). Do not tap the rasp again once it has stopped advancing.

Fig. 9

Rasp the femoral canal with sequentially incremental rasp sizes until adequate resistance is obtained and the cortical envelope is filled. With the *VerSys Heritage* cemented implants, it is helpful to countersink the rasp 3-4mm. This will help make enough room in the medullary canal for the next larger size rasp. Advancing a rasp to the level of the medial neck cut prepares at least a 1mm space for cement when the same size stem is inserted to that level (Fig. 10). In the occasional heavy patient with a narrow medullary canal, it is advisable to ream the canal to accommodate a stem size of 13 or greater. Sizes 11 and 12 should not be implanted in active, heavy patients.

Fig. 10

Calcar Planing (Not Recommended for *VerSys Heritage*)

Calcar planing is neither necessary nor desirable with the *VerSys Heritage* implant, as this stem does not have a traditional collar designed to rest on the cut surface of the neck. The *VerSys Heritage* stem has a minimized collar which will usually fit within the bony confines of the canal and may rest on the posterior medial neck of the upper femur. This prominence helps the surgeon define the end point of the prosthetic insertion, and also acts as an insertion guide to promote accurate alignment and centralization.

Trial Reduction

Modular Cone Collar Provisionals are specially designed for the *VerSys Heritage* so they can duplicate the proximal geometry of this implant with its 50-degree collar angle. Affix the Cone Collar Provisional and appropriate length head to the rasp trunnion and reduce the hip to determine joint stability, leg length, and range of motion (Fig. 11). Observe the relationship between the center of the femoral head and the top of the greater trochanter with the Cone Collar Provisional to confirm the preoperative plan. Note the soft tissue tension. Also confirm whether the pre-operative goal for leg length has been achieved.

Fig. 11

Measurements should be repeated, measuring from the superior border of the lesser trochanter to the center of the prosthetic head and/or from the previously placed Steinman pin in the ilium to that in the greater trochanter. Mark the location of the minimized collar with reference to the cut bony surface so that this position can be duplicated during stem insertion.

The *VerSys Heritage* standard offset Cone Collar Provisionals which are marked with “VH” for easy identification are available as follows: one for stem size 11, one for stem sizes 12 and 13, one for stem sizes 14 and 15, and one for stem sizes 16 and 17. The extended offset Cone Collar Provisionals which are marked with “VH EXT” for easy identification are available as follows: one for stem size 13, one for stem sizes 14 and 15, and one for stem size 16.

Sizing and Preparation of the Canal

Prepare the canal with pulsatile lavage irrigation and dry it thoroughly. Place a distal cement restrictor at a depth to allow 1.5-2cm of cement below the tip of the prosthesis (as detailed in Chart A).

A distal centralizer is recommended for distal stem centralization. The diameter of the femoral canal at the level of the distal centralizer can be accurately assessed using the IM Sizers with 1mm increments from 10mm to 16mm (Chart B details approximate size of canel for each rasp size). These are provided in the *VerSys* Hip System general instrument case.

Fig. 12

The sizers have marks in 5mm increments that indicate the depth of the distal centralizer measured from the medial calcar for each stem size. The sizer should pass easily to a depth approximately 1cm distal to the anticipated stem length (Fig. 12). Select the distal centralizer that is the same size as the largest sizer that fits easily into the canal to the required depth.

The distal centralizer's inner diameter has a slight taper through its length. Before attaching the distal centralizer to the stem, apply a thin layer of cement to the distal tip or fill the hole of the centralizer with cement. This will provide a good bond between the stem and distal centralizer. When attaching the centralizer, introduce the tip of the stem through the opening on the flat side of the centralizer (Fig. 13). Advance the centralizer on the stem tip with a minimum force until it comes to rest in its final position. The centralizer does not need to be twisted or forced onto the stem.

Fig. 13

Chart A

Stem Size	Stem Length*	Depth to which Cement Plug should be Inserted*
11	120mm	140mm
12	125mm	145mm
13	130mm	150mm
14	135mm	155mm
15	140mm	160mm
16	145mm	165mm
17	150mm	170mm

* All measurements are from the medial calcar.

Chart B

Rasp Size	Approx Size of Canal Created by Rasp*
11	9mm
12	10mm
13	11mm
14	12mm
15	13mm
16	14mm
17	15mm

* This is the approximate size of the canal created by each rasp at the level of the distal centralizer.

Preparation for the Proximal Centralization Sleeve (Optional)

An optional U-shaped piece of polymethylmethacrylate specifically designed for the *VerSys Heritage* stem is packaged separately from the stem. This centralizer should be seated onto the medial proximal aspect of the stem, abutting against the minimized collar (Fig. 14). When fully engaged, the proximal centralizer will lock into the anterior/posterior dimples on the implant. Attach it at the same time the distal centralizer is positioned, placing doughy cement on the proximal aspect of the stem. The main body of the stem should be protected from the operating team's gloved hands while the centralizers are attached.

It is recommended that the original plastic cover on the stem be kept on the body of the stem while the proximal and distal centralizers are applied, and until just before insertion so that the polished stem surface remains untouched until placed into the cement bed in the canal (Fig. 15).

Fig. 14

Fig. 15

Cement Introduction and Stem Insertion

Clean and dry the previously plugged femoral canal. When the cement has attained a doughy consistency, inject the cement into the canal and firmly compress it (Fig. 16).

Check to ensure that the 12/14 neck taper is clean and dry. The femoral head is placed on the taper with a twisting motion until it locks onto the taper. Then impact it with one firm strike of the mallet. Check the security of the head by trying to remove it by hand.

During stem insertion, the stem axis should be parallel to the longitudinal axis of the femur. No extraction hole is necessary because the *VerSys Heritage* Hip is a polished stem, which can be disimpacted from its surrounding cement mantle by removing cement from the proximal lateral portion of the stem and striking the minimized collar in a retrograde fashion.

Fig. 16

Insert the stem with the insertion device to within 1cm of the neck cut (Fig. 17). Then remove excess cement to provide a clear view of the final seating. Continue seating the implant until the minimized collar duplicates the position identified and marked during trial reduction with the cone collar and rasp composite (Fig. 18).

Fig. 17

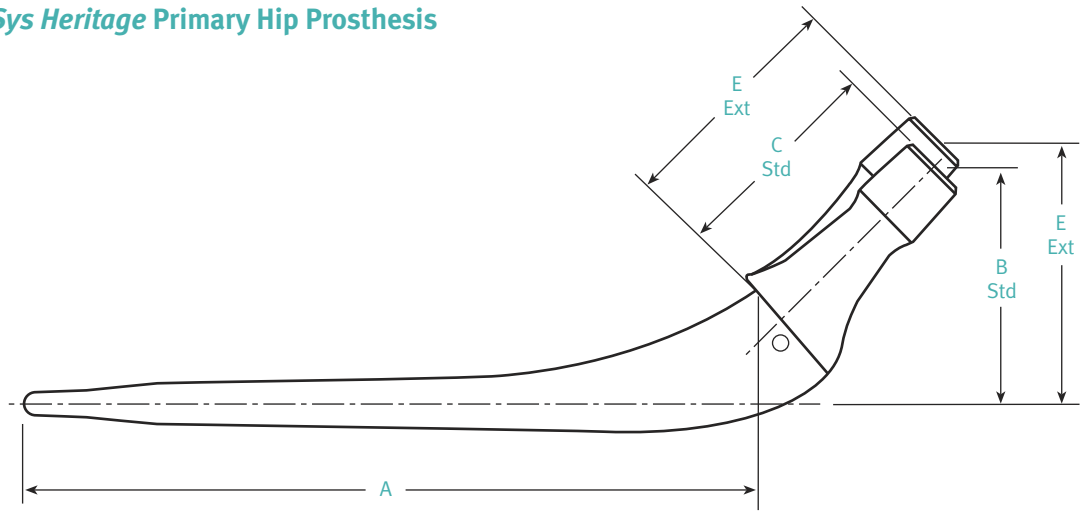
Note: Impacting the stem driver while inserting the implant with an assembled head may cause the femoral head to loosen. Test the security of the head fixation by trying to remove the head by hand once the implant is seated. One sharp strike using the femoral head impactor and mallet should be used to ensure the femoral head is seated on the taper.

After insertion, hold the prosthesis by the neck, or use a femoral head impactor to hold the prosthesis in place. This prevents the inadvertent application of torsional forces on the prosthesis while the cement is hardening. The minimized collar often rests on part of the posterior medial cortex of the cut neck, but this is not intended to be load bearing through collar-calcar contact.

After the cement has completely hardened, reduce the hip. Then check range of motion, stability, leg length, and soft tissue tension. Finally, close the wound layers appropriately.

Fig. 18

VerSys Heritage Primary Hip Prosthesis



Standard Offset

VerSys Heritage Primary Prod. No.	Stem Size	A Stem Length (mm)	B Offset (mm) When Head/Neck Component Selected is: -3.5	0	+3.5	+7	+10.5	C Neck Length (mm) When Head/Neck Component Selected is: -3.5	0	+3.5	+77	+10.5	Average Cement Mantle Thickness (mm)
7857-11	11	120	33	36	38	41	43	26	30	33	37	40	1.0
7857-12	12	125	36	39	41	44	46	28	32	35	39	42	1.5
7857-13	13	130	36	39	41	44	46	28	32	35	39	42	1.75
7857-14	14	135	39	42	44	47	49	33	36	40	43	47	2.0
7857-15	15	140	39	42	44	47	49	33	36	40	43	47	2.0
7857-16	16	145	42	45	47	50	52	37	40	44	47	51	2.0
7857-17	17	150	42	45	47	50	52	37	40	44	47	51	2.0

Extended Offset

VerSys Heritage Primary Prod. No.	Stem Size	A Stem Length (mm)	D Offset (mm) When Head/Neck Component Selected is: -3.5	0	+3.5	+7	+10.5	E Neck Length (mm) When Head/Neck Component Selected is: -3.5	0	+3.5	+77	+10.5	Average Cement Mantle Thickness (mm)
7857-13-20	13	130	41	44	46	49	51	31	35	38	42	45	1.75
7857-14-20	14	135	44	47	49	52	54	35	39	42	46	49	2.0
7857-15-20	15	140	44	47	49	52	54	35	39	42	46	49	2.0
7857-16-20	16	145	47	50	52	55	57	39	43	46	50	53	2.0

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