Surgical Technique

smith&nephew

SYNERGY®

Cementless Stem

Comprehensive. Simple. Efficient.

It's easy to understand why SYNERGY° Hip System is one of orthopaedics' great success stories. Surgeons have chosen SYNERGY due to the system's significant advances over previous tapered implants, including its stem geometry, choice of surface treatments, innovative neck design and true dual offsets.

The SYNERGY Hip System also provides the surgeon with a choice of cementless, cemented and fracture management systems that use the same two trays of instrumentation. In addition, the cementless system offers the valuable options of a porous stem, a hydroxyapatite (HA) stem, an HA porous stem and a titanium press-fit stem.

SYNERGY◇ Cementless Stem

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Nota Bene: TThe following technique is for informational and educational purposes only. It is not intended to serve as medical advice. It is the responsibility of treating physicians to determine and utilize the appropriate products and techniques, according to their own clinical judgment, for each of their patients. For more information on the product, including its Indications for Use, contraindications, cleaning, sterilization and product safety information, please refer to the product's label and the Instructions for Use (IFU) for the product.

Introduction

The SYNERGY Tapered Hip System capitalizes on the excellent clinical results of proximal to distal tapered stem designs. All of the stems in the SYNERGY system are implanted with one simple set of surgical instruments.

This surgical technique focuses only on the cementless stems of the SYNERGY Hip System.

SYNERGY cementless femoral stems are available in two circumferential surface finishes: porous coated and porous plus HA. The porous-coated is designed to promote bone ingrowth and three-dimensional interlocking between the implant and the bone. All are available in standard and high offset versions.

All SYNERGY femoral stems are made from high-strength, forged titanium and feature a 3° proximal to distal taper. Parallel and longitudinally arranged flutes on the stems are designed to provide good axial and rotational stability.

The 12/14 taper of SYNERGY stems accepts 22, 26, 28, 32 and 36mm femoral heads in a variety of neck lengths. The circulotrapezoidal neck of SYNERGY stems is smaller in the anterior/posterior direction than most cylindrical necks and is polished. The smaller A/P neck dimension allows for improved prosthesis range of motion.[1,2]* The distal tip of the SYNERGY stem is polished and bullet-shaped, which inhibits bone growth and assists with minimising thigh pain .[4,6]

SYNERGY instrumentation is packaged in two sterilization trays. The instruments are arranged in the sterilization trays in the same order required in surgery. This makes for a simple, straightforward surgical technique.

*Based on computer modeling


Standard Stem
High Offset Stem

Preoperative Planning

The goal of preoperative planning is to determine the correct stem size, level of the femoral neck cut, and proper head and stem offset combination.

Preoperative templating requires at least an anteroposterior radiograph of the pelvis and a lateral radiograph of the affected hip. If the opposite hip is unaffected by disease, it can often provide accurate sizing information for the femoral stem. SYNERGY stems gain immediate, rigid fixation through three-point contact with the femur.[4,7] This is best appreciated by viewing a lateral postoperative radiograph as shown in Figure 1.

As can be seen in Figure 1, the stem has direct contact with hard cortical bone at three points: proximally at the posterior aspect of the femur, anteriorly in the midsection of the stem, and posteriorly above the polished distal tip of the stem.[4,7]

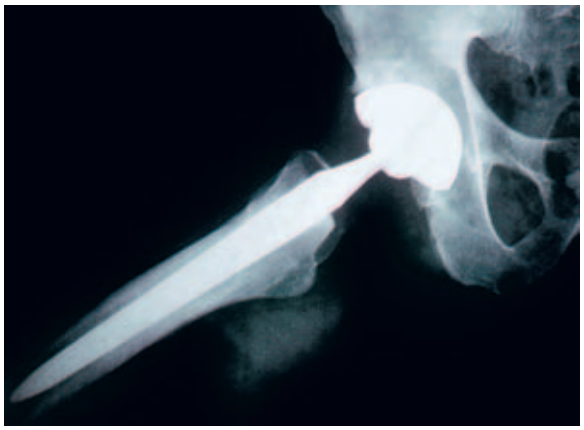


Figure 1
Postoperative lateral radiograph of a porous-coated SYNERGY stem showing 3-point fixation

To determine if a patient has a leg length discrepancy, the anteroposterior radiograph should be used. Draw a line tangential to both of the ischia or both of the obturator foramens. This line should extend out until it contacts the medial cortex of bone on both femurs. If the patient's legs are of equal length, the line that has been drawn will contact both femurs at the same level. If the patient's legs are of unequal length, the lines will contact the femurs at different levels along the femur. Select a reference point along the femur, such as the bottom of the lesser trochanter. The distance between the line that has been drawn and the reference point on both femurs is measured. The difference in these measurements indicates the patient's leg length discrepancy. This technique is shown in Figure 2.

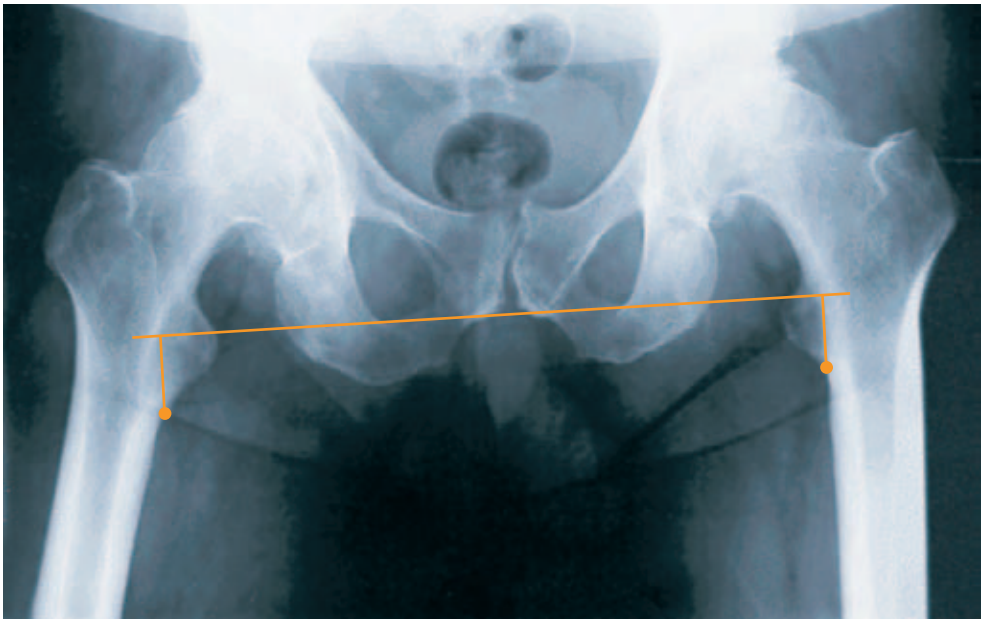


Figure 2
Anteroposterior radiograph demonstrating leg length inequality

Preoperative Planning

NOTE: Using this method of templating for leg length discrepancy assumes the patient has a normal, symmetrical pelvis and has neutral limb positioning.

Intraoperatively, leg length restoration can be verified by measuring the distance between a pin in the iliac wing and a mark on the greater trochanter before hip dislocation. This measurement should be recorded. It is compared later in surgery to a measurement using the same reference points after the implant trials are in place.

Another method of leg measurement consists of the surgeon placing the foot of the affected limb on top of the unaffected limb. The relative position of one knee to another is then analyzed. This second method is slightly less accurate than the previously mentioned technique; however, both methods provide a reasonable degree of accuracy in restoring limb length equality.

When determining which size SYNERGY stem to use, the anteroposterior and the lateral radiographs should be templated. Using the anteroposterior radiograph, place the femoral templates over the proximal femur of both the affected and unaffected hips. The junction of the lateral femoral neck and greater trochanter serves as a good reference point for placement of the X-ray templates. Place a mark at this junction and in the center of the femoral head. Align the lateral shoulder of the prosthesis with the mark at the junction. Find the appropriate stem that fits and fills the proximal femur and whose neck length matches the center of the femoral head. This is demonstrated in Figure 3.

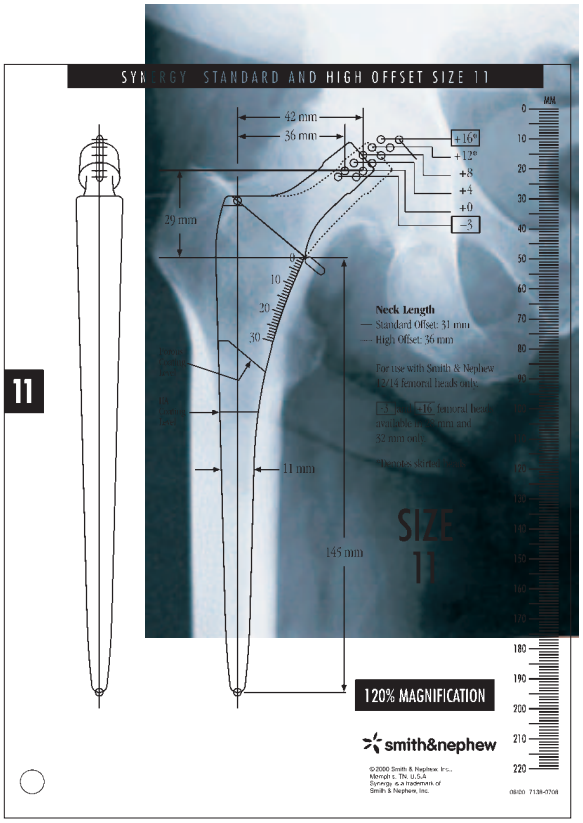


Figure 3
Anteroposterior radiograph demonstrating proper templating of a femur

It is important to check that the stem fits properly into the femur on the lateral radiograph. As stated earlier, it is the lateral radiograph that shows best where three-point fixation will occur.

A properly implanted porous-coated SYNERGY◇ stem that provides both normal leg length and offset is shown in Figure 4.

Figure 4
Anteroposterior radiograph of a properly implanted porous-coated SYNERGY stem

Stem Specifications

For use with Smith & Nephew 12/14 femoral heads only

Stem Size	Neck Angle	Conical Cross Section	Stem Length	A-P* Width	M-L* Width
8**	131°	8mm	120mm	12mm	27mm
9	131°	9mm	135mm	13mm	28mm
10	131°	10mm	140mm	14mm	29mm
11	131°	11mm	145mm	15mm	30mm
12	131°	12mm	150mm	16mm	31mm
13	131°	13mm	155mm	17mm	32mm
14	131°	14mm	160mm	18mm	33mm
15	131°	15mm	165mm	19mm	34mm
16	131°	16mm	170mm	21mm	35mm
17	131°	17mm	175mm	22mm	36mm
18	131°	18mm	180mm	23mm	38mm
19**	131°	20mm	185mm	24mm	39mm
20**	131°	21mm	190mm	25mm	40mm

Neck Height mm When Femoral Head Component Selected Is:						
Size	-3	+0	+4	+8	+12	+16
8**	25	27	29	32	35	37
9	26	28	30	33	35	38
10	26	28	31	33	36	39
11	27	29	32	34	37	39
12	28	30	32	35	37	40
13	28	30	33	35	38	41
14	29	31	33	36	39	41
15	30	32	34	37	39	42
16	30	32	35	37	40	43
17	31	33	35	38	41	43
18	32	33	36	39	41	44
19**	32	34	37	39	42	44
20**	33	35	37	40	43	45

Neck Offset mm When Femoral Head Component Selected Is:						
Size	-3	+0	+4	+8	+12	+16
8**	31	34	37	40	43	46
9	32	34	37	40	43	46
9 HO	38	40	43	46	49	52
10	33	35	38	41	44	47
10 HO	39	41	44	47	50	53
11	34	36	39	42	45	48
11 HO	40	42	45	48	51	54
12	34	37	40	43	46	49
12 HO	40	43	46	49	52	55
13	35	37	40	43	46	49
13 HO	41	43	46	49	52	55
14	36	38	41	44	47	50
14 HO	44	46	49	52	55	58
15	37	39	42	45	48	51
15 HO	45	47	50	53	56	59
16	37	40	43	46	49	52
16 HO	45	48	51	54	57	60
17	38	40	43	46	49	52
17 HO	46	48	51	54	57	60
18	39	41	44	47	50	53
18 HO	47	49	52	55	58	61
19**	40	42	45	48	51	54
20**	40	43	46	49	52	55

Neck Length mm When Femoral Head Component Selected Is:						
Size	-3	+0	+4	+8	+12	+16
8**	26	29	33	37	41	45
9	27	30	34	38	42	46
9 HO	31	34	38	42	46	50
10	28	30	34	38	42	46
10 HO	32	35	39	43	47	51
11	28	31	35	39	43	47
11 HO	33	36	40	44	48	52
12	29	32	36	40	44	48
12 HO	33	36	40	44	48	52
13	30	32	36	40	44	48
13 HO	34	37	41	45	49	53
14	30	33	37	41	45	49
14 HO	36	39	43	47	51	55
15	31	34	38	42	46	50
15 HO	37	40	44	48	52	56
16	31	34	38	42	46	50
16 HO	37	40	44	48	52	56
17	32	35	39	43	47	51
17 HO	38	41	45	49	53	52
18	33	36	40	44	48	57
18 HO	38	41	45	49	53	57
19**	33	36	40	44	48	52
20**	34	37	41	45	49	53

* This measurement is for the HA stems. The porous-coated stems have 0.5mm additional thickness

** These stem sizes are only available in the porous-coated version and by special request

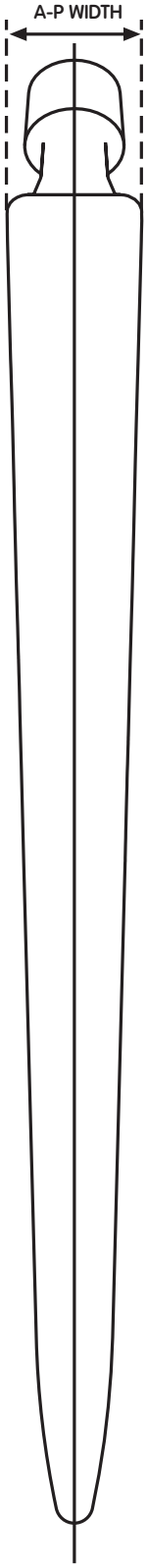
Not Actual Size

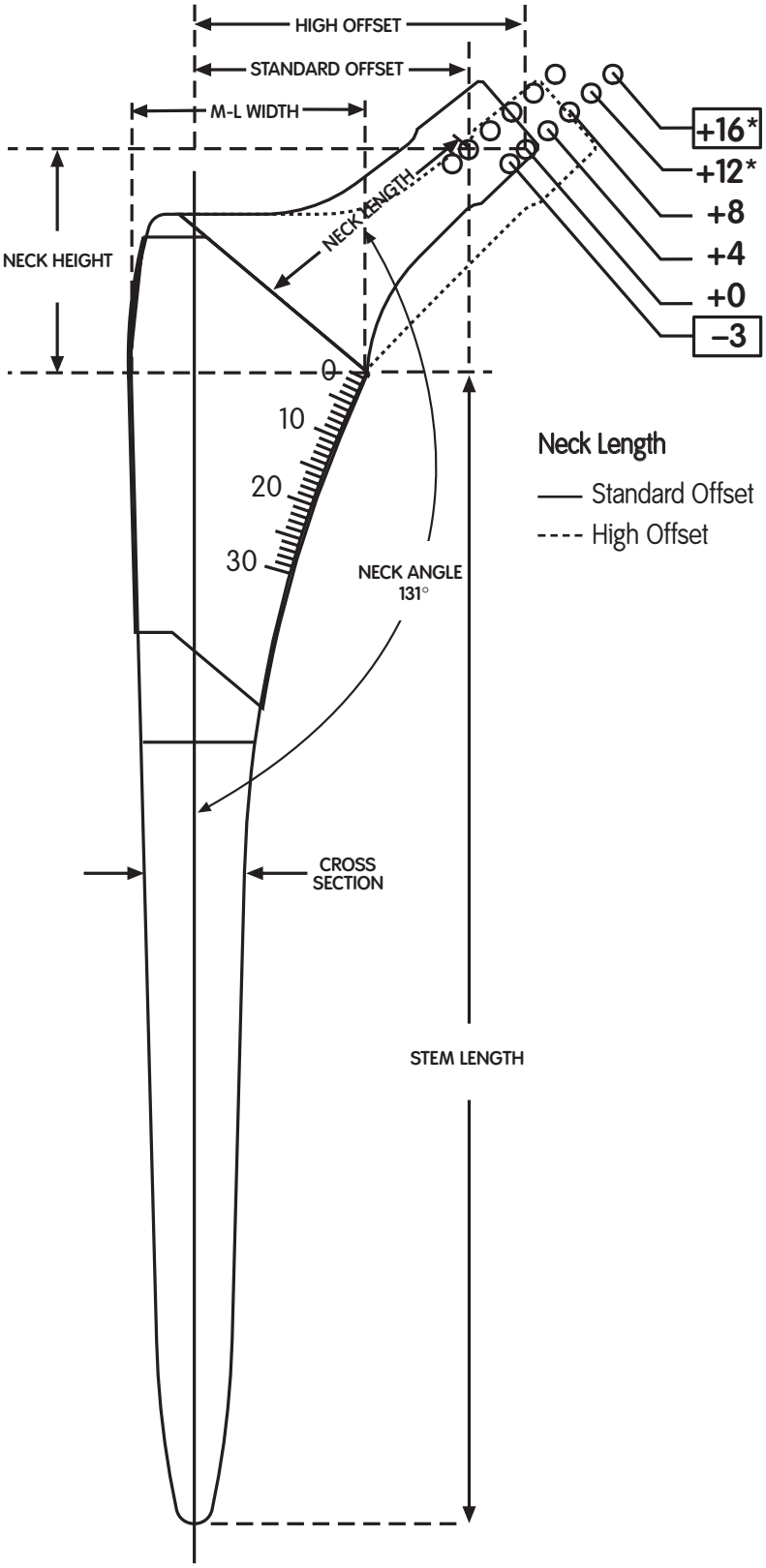
For use with Smith & Nephew 12/14 femoral heads only.

-3 CoCr and OXINIUM® femoral heads available in 28, 32 and 36mm only.

+16 CoCr and OXINIUM femoral heads available in 28 and 32mm only.

* Denotes skirted heads (except 36mm)

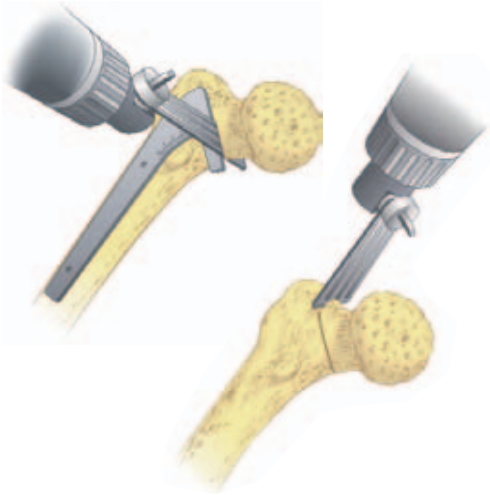




NOTE: For illustration purposes only. Surgical templates are available by contacting your Smith & Nephew representative or Customer Service.

Short Technique

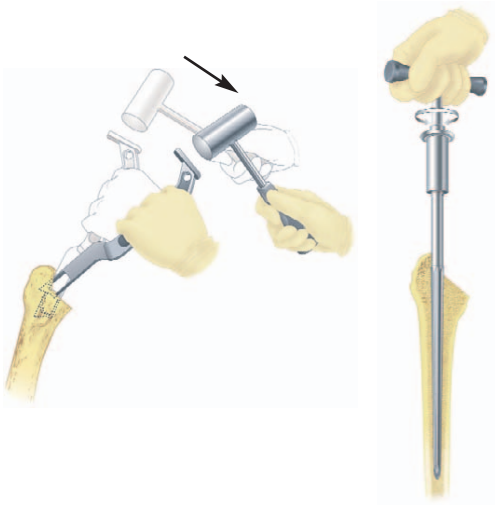
1. Femoral Osteotomy



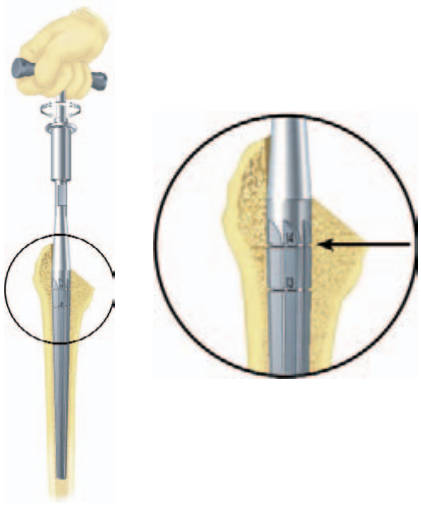
2. Acetabular Preparation

If acetabular reconstruction is required, prepare the acetabulum using the surgical technique for the intended acetabular component.

3. Canal Preparation



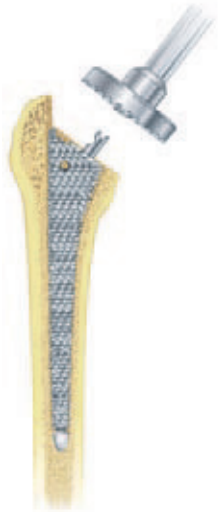
4. Femoral Reaming



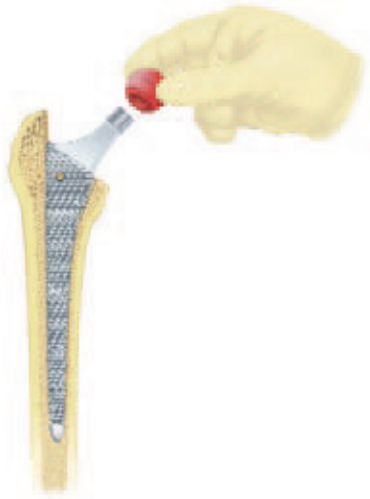
5. Broach Assembly/Disassembly

6. Femoral Broaching

7. Calcar Preparation (optional)



8. Trialing

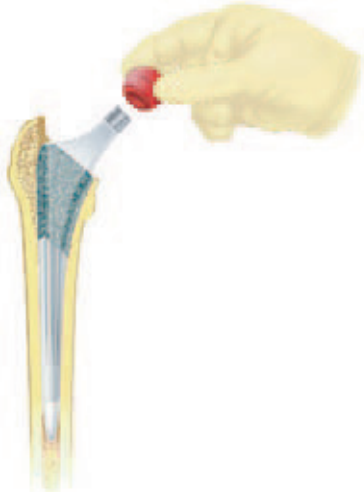


9. Stem/Impactor Assembly

10. Stem Insertion

CAUTION:
Do not use the Stem Inserter Pommel as a stand alone instrument, either for stem insertion or removal

11. Final Trial Reduction



12. Femoral Head Assembly

Surgical Technique

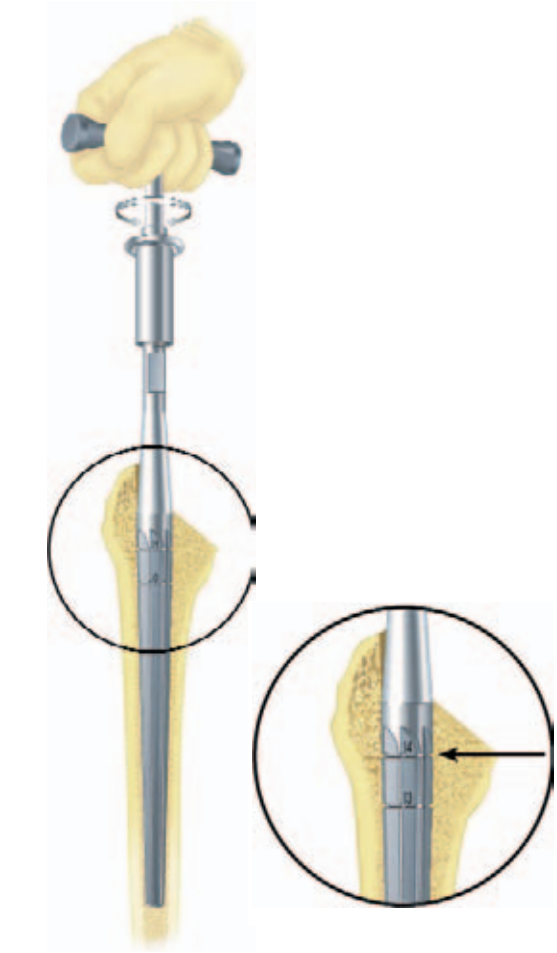
Femoral Osteotomy
The point of the femoral neck resection should be marked with electrocautery corresponding to both the preoperative templating and the intraoperative measurement. Prior to the resection of the femoral head, assemble the broach, trial neck and trial femoral head corresponding to the implant that was templated. Place this trial stem on the femur to verify that the center of the prosthetic head aligns with the center of the femoral head. This will confirm that the level of the femoral neck resection is appropriate and will re-establish the desired leg length and offset of the proximal femur. Osteotomize the femoral neck.

Prepare Acetabulum
If acetabular reconstruction is required, prepare the acetabulum using the surgical technique for the intended acetabular component.

Open Femoral Canal
Remove remnants of the femoral neck and open the medullary canal using the box osteotome.

Femoral Canal Preparation
Use the canal finder and modular T-handle for initial femoral reaming.

NOTE: It is important to stay lateral with both the box osteotome and canal finder. Care should be taken to ensure that the initial reaming tract into the femur is in neutral alignment with the femoral axis.



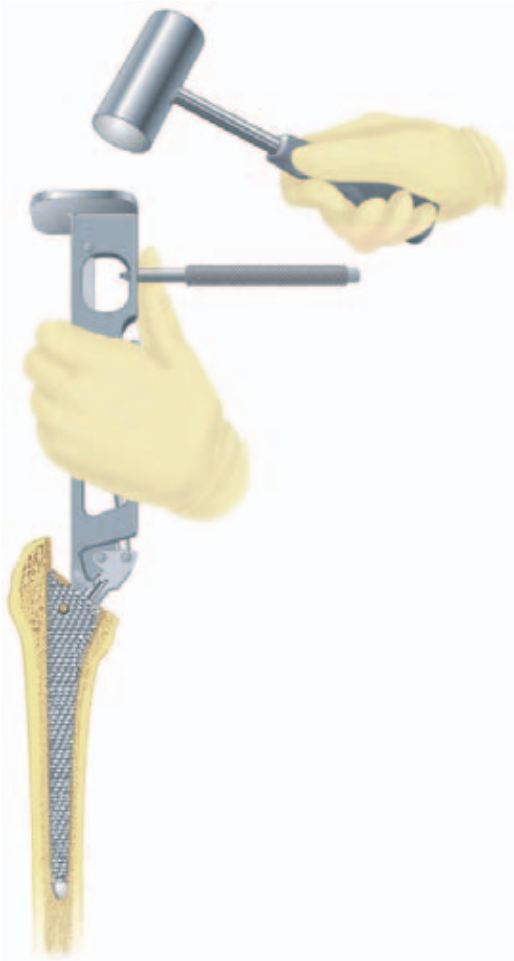
Femoral Reaming
Continue to enlarge the femoral canal sequentially using the femoral reamers. Each reamer is marked with two or three lines. Stop reaming when the mark on the reamer associated with the templated stem size is even with the medial femoral neck resection or endosteal bone resistance is encountered. If reaming becomes difficult before reaching the templated stem size, consider using a stem size smaller than the templated stem size.

NOTE: It is important to stay lateral with the femoral reamers to ensure that the canal is being opened in neutral alignment with the femoral axis.

OPTIONAL: If utilizing fully toothed broaches, a broach-only technique can be performed.

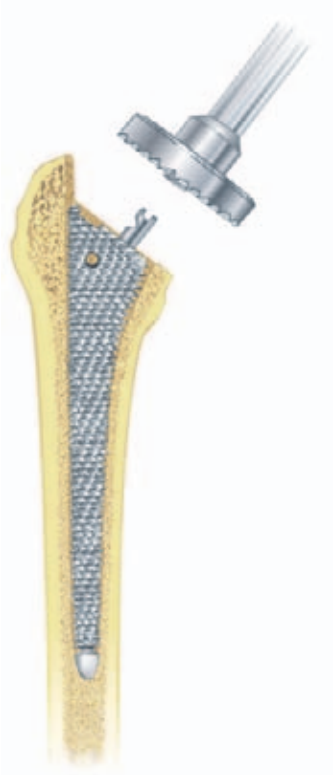
Broach Assembly/Disassembly
Assemble the broach to the broach handle by placing the broach post in the clamp. Use the thumb to lock the clamp onto the broach. A modular anteversion handle can be assembled to the broach handle to provide version control.

Disassemble the broach from the broach handle by placing two fingers (index and middle) in the rectangular slot. Apply pressure to the release bar by squeezing the two fingers toward the thumb resting on the medial side of the broach handle frame.

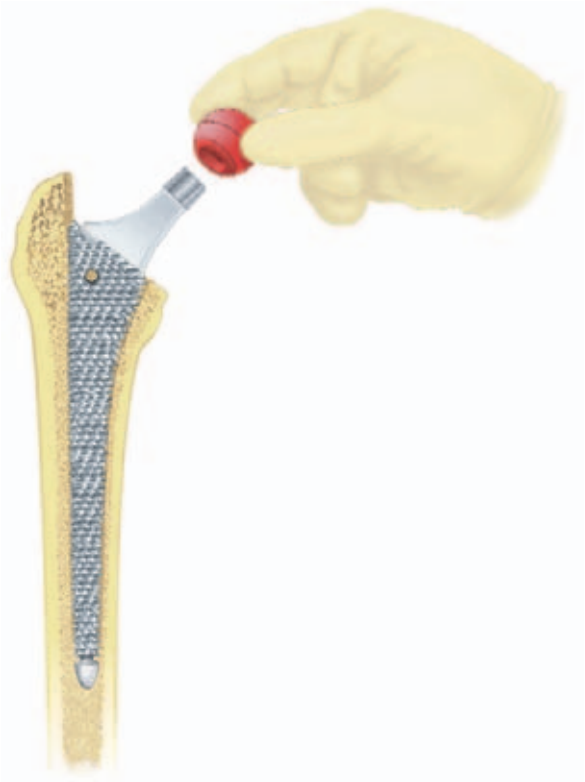


Femoral Broaching
Start the broaching procedure along the axis of the femur with a broach at least two sizes smaller than the last reamer used. Sequential broaching should then be carried out to the templated stem size. Stop broaching when the top of the last broach is slightly below the level of the resected femoral neck to facilitate calcar reaming.

NOTE: Care should be taken not to force a broach that is too large into the femur. Consideration should be given to using a stem size smaller than the size templated. This helps avoid intraoperative fractures of the femur.



Calcar Preparation
With the final broach fully seated, remove the broach handle. Place the calcar reamer over the post of the broach and machine the femoral neck for optimal implant collar/femoral neck contact.

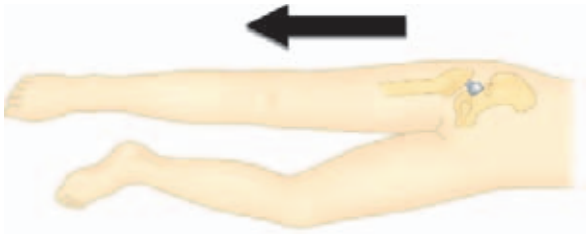


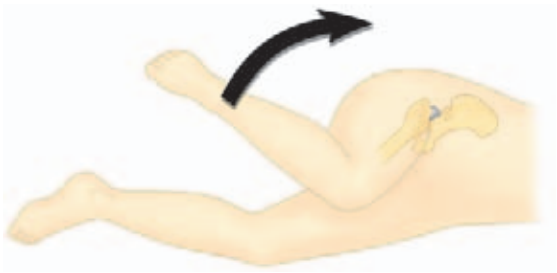
Trial Reduction
Place the standard or high offset trial neck (as determined by templating) onto the broach post. Select the trial femoral head of desired diameter and neck length. Measure the distance between the mark at the lesser trochanter and the center of the trial femoral head. This number should correspond to the preoperative and intraoperative measurements. Adjustments in neck length and/or offset can be made at this time.

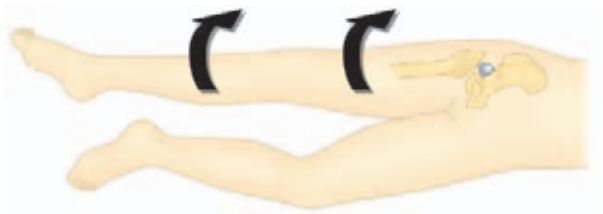
If trialing for a unipolar or bipolar, trial according to the appropriate technique for the selected device.

Femoral Head and Neck Length Options					
Trial Color	22mm	26mm	28mm	32mm	36mm
Green	—	—	-3	-3	-3
Yellow	+0	+0	+0	+0	+0
Red	+4	+4	+4	+4	+4
White	+8	+8	+8	+8	+8
Blue	+12*	+12*	+12*	+12*	+12
Black	—	—	+16*	+16*	—

* Denotes skirted heads







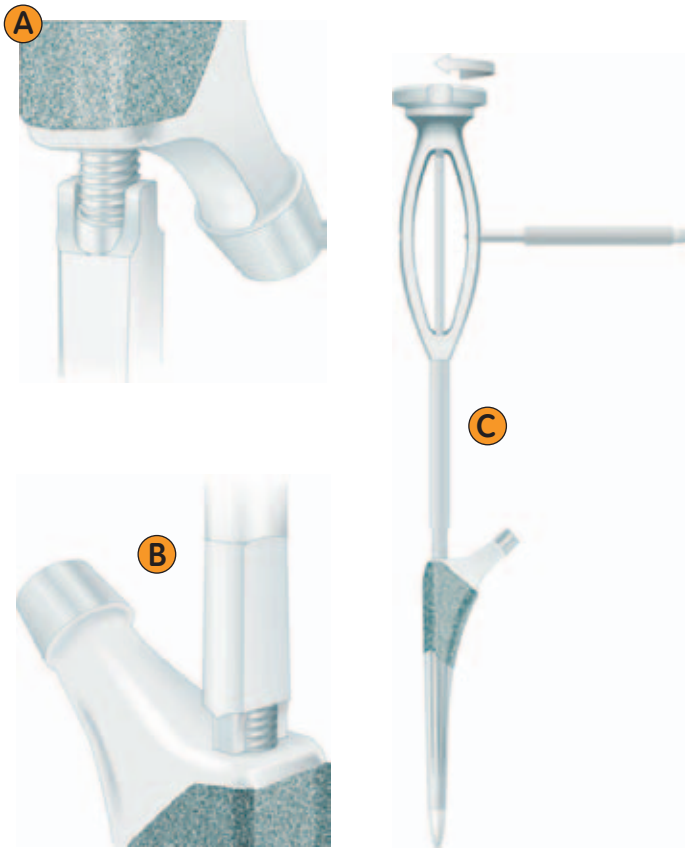
Trial Reduction
Reduce the hip and evaluate in the following ways:

Soft tissue tension
Some shuck is normal when applying a longitudinal distraction force to the hip. Shuck should not be excessive, and the hip should not dislocate.

Anterior stability
Place the leg in full adduction, full extension and hyperextension, while exerting an external rotation force. If the hip cannot be fully extended, it may be too tight. If it dislocates easily, it is too loose and impingement must be addressed or component malposition exists.

Posterior stability
Place the leg in neutral adduction and 90° flexion. Gradually rotate internally. If it dislocates with minimal internal rotation, it is too loose and impingement must be addressed or component malposition exists.

Sleep position
Place the leg in the “sleep position” with the operated leg semiflexed, adducted and internally rotated over the other leg. Apply axial force to try to dislocate. This position represents a dangerously unstable position that may be adopted by a patient sleeping on their nonoperated side.



Stem/Impactor Assembly
Place the stem inserter pommel through the stem inserter frame and stand upright so that the threaded tip is pointed up (A). Screw the implant onto the threaded tip as far as possible.

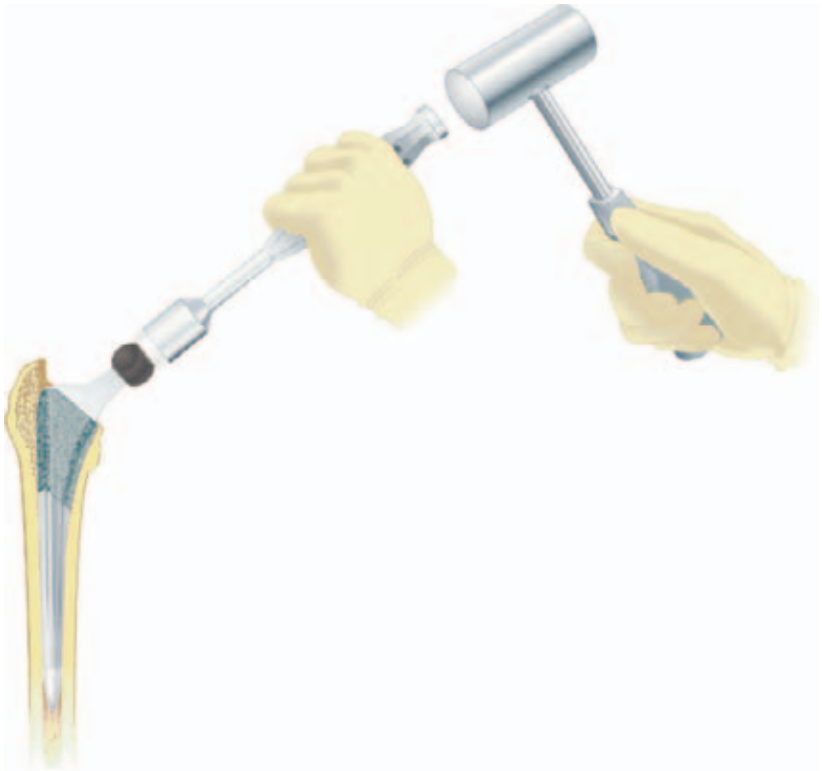
Flip the assembly over so that the stem tip is now pointing down (B). Engage the frame tines into the slots adjacent to the threaded hole on the stem. Screw the pommel until assembly is secure (C).

Stem Insertion
Insert the selected femoral stem into the canal. Apply hand pressure and rotate the stem into the correct position. Use gentle mallet blows to seat the stem to the position of the neck resection. Check stem stability.

If the implant has stopped moving with gentle mallet blows and is not completely seated, remove the stem and repeat the same size reaming and broaching steps.

CAUTION: Do not use excessive force to seat the stem.

Final Trial Reduction
A final trial reduction may be performed at this time using trial femoral heads.



Femoral Head Assembly
Clean and dry the neck taper with a clean, sterile cloth. Place the prosthetic femoral head on the neck taper and firmly impact with the femoral head impactor and a mallet several times.

Catalog

SYNERGY Porous Plus HA Stem

Size	Length	Standard Cat. No.	High Offset Cat. No.
8	120mm	71309008	—
9	135mm	71309009	71309109
10	140mm	71309010	71309110
11	145mm	71309011	7139111
12	150mm	71309012	7130-9112
13	155mm	71309013	71309113
14	160mm	71309014	71309114
15	165mm	71309015	71309115
16	170mm	71309016	71309116
17	175mm	71309017	71309117
18	180mm	71309018	71309118

SYNERGY Porous-Coated Stem
Titanium 6Al-4V

Size	Length	Standard Cat. No.	High Offset Cat. No.
8*	120mm	71306608	—
9	135mm	71306609	71306109
10	140mm	71306610	71306110
11	145mm	71306611	71306111
12	150mm	71306612	71306112
13	155mm	71306613	71306113
14	160mm	71306614	71306114
15	165mm	71306615	71306115
16	170mm	71306616	71306116
17	175mm	71306617	71306117
18	180mm	71306618	71306118
19*	185mm	71926107	—
20*	190mm	71926108	—

* Available by special request

Catalog

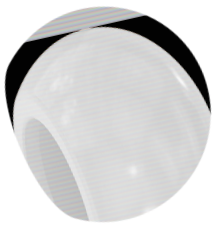
OXINIUM° Femoral Heads 12/14 Taper

Neck Length	22mm	26mm	28mm	32mm	36mm	40mm	44mm
–4	—	—	—	—	—	71342340 & sleeve 71344245	71342344 & sleeve 71344245
–3	—	—	71342803	71343203	71343603	—	—
+0	71342200	71342600	71342800	71343200	71343600	71342340 & sleeve 71344247	71342344 & sleeve: 71344247
+4	71342204	71342604	71342804	71343204	71343604	71342340 & sleeve 71344248	71342344 & sleeve 71344248
+8	71342208	71342608	71342808	71343208	71343608	71342340 & sleeve 71344249	71342344 & sleeve 71344249
+12	71342212	71342612	71342812	71343212	71343612	—	—
+16	—	—	71342816	71343216	—	—	—

CoCr Femoral Heads 12/14 Taper

Cobalt Chromium

Neck Length	22mm	26mm	28mm	32mm	36mm	40mm	44mm
–4	—	—	—	—		71342640 & sleeve 71344245	71342644 & sleeve 71344245
–3	—	—	71302803	71303203	71303603	—	—
+0	71302200	71302600	71302800	71303200	71303600	71342640 & sleeve 71344247	71342644 & sleeve: 71344247
+4	71302204	71302604	71302804	71303204	71303604	71342640 & sleeve 71344248	71342644 & sleeve 71344248
+8	71302208	71302608	71302808	71303208	71303608	71342640 & sleeve 71344249	71342644 & sleeve 71344249
+12	71302212	71302612	71302812	71303212	71303612	—	—
+16	—	—	71302816	71303216	—	—	—



BIOLOX® Delta Heads 12/14 Taper

Neck Length	32mm	36mm	40mm
–3	—	—	—
+0	76539160	76539165	71346004
+4	76539161	76539166	71346005
+8	76539162	76539167	71346006
+12	—	76539153	—
+16	—	—	—

Femoral Instrumentation Tray No. 1
Cat. No. 71366201

Osteotomy Guide
Cat. No. 71364000

Box Osteotome

Size	Cat. No.
Small	71364002
Large	71364003

Canal Finder
Cat. No. 71364001

T-Handle

Cat. No. 71364006

Tapered Reamer

Size	Cat. No.
8-9-10	71366209
11-12	71366211
13-14	71366213
15-16	71366215
17-18	71366217

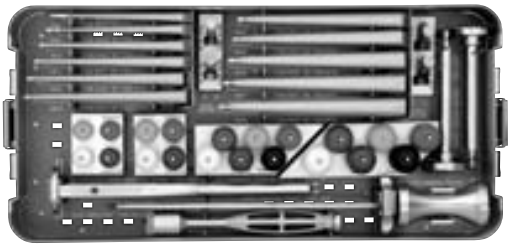
Broach Handle

(2 Per Set)

Cat. No. 71364007

Anteversion Handle

Cat. No. 71364012



Femoral Instrumentation Tray No. 2
Cat. No. 71366203

Fully Toothed Broach	
Size	Cat. No.
8	71366708
9	71366709
10	71366710
11	71366711
12	71366712
13	71366713
14	71366714
15	71366715
16	71366716
17	71366717
18	71366718

Stem Inserter Frame
Cat. No. 71364008

Stem Inserter Pommel
Cat. No. 71364011

Trial Neck

Size	Standard Cat. No.	High Offset Cat. No.
8-13	71366408	71366508
14-18	71366414	71366514

Calcar Reamer

Size	Cat. No.
Small	71364004
Large	71364005

Femoral Head Impactor

Cat. No. 71364009

Slap Hammer Weight

Cat. No. 71364010

Trial Femoral Head 12/14 Taper

Neck Length	Color Code	22mm Optional	26mm Optional	28mm	32mm Optional	36mm Optional
-3	Green	——	——	71352803	71353203	71343603
+0	Yellow	71352200	71352600	71352800	71353200	71343600
+4	Red	71352204	71352604	71352804	71353204	71343604
+8	White	71352208	71352608	71352808	71353208	71343608
+12	Blue	71352212	71352612	71352812	71353212	71343612
+16	Black	——	——	71352816	71353216	——

Implant Constructs

SYNERGY
Cementless Stem

Femoral Heads	Modular Femoral Heads and Sleeve
OXINIUM®	Titanium Modular Head Sleeves 12/14 Taper
Cobalt Chrome	OXINIUM Modular Femoral Heads
BIOLOX® Delta Ceramic	Cobalt Chrome Modular Femoral Heads

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