SURGICAL TECHNIQUE

S-ROM®
TOTAL HIP SYSTEM

DePuy
a Johnson & Johnson company

NOTHING COMPARES

Distal Sizing

Distal Reamer Selection for Straight Stems		
Stem Size (mm)	Final Distal Reamer (mm)	Color Code
9 x 14	9 or 9.5	Silver
11 x 16	11 or 11.5	Gold
13 x 18	13 or 13.5	Green
15 x 20	15 or 15.5	Blue
17 x 22	17 or 17.5	Black
19 x 24	19 or 19.5	Brown

Sizing begins with the distal stem selected. The distal size dictates the basic proximal or cone size range for the final proximal sleeve which always starts at a base of 5 mm larger.

Cone Sizing*

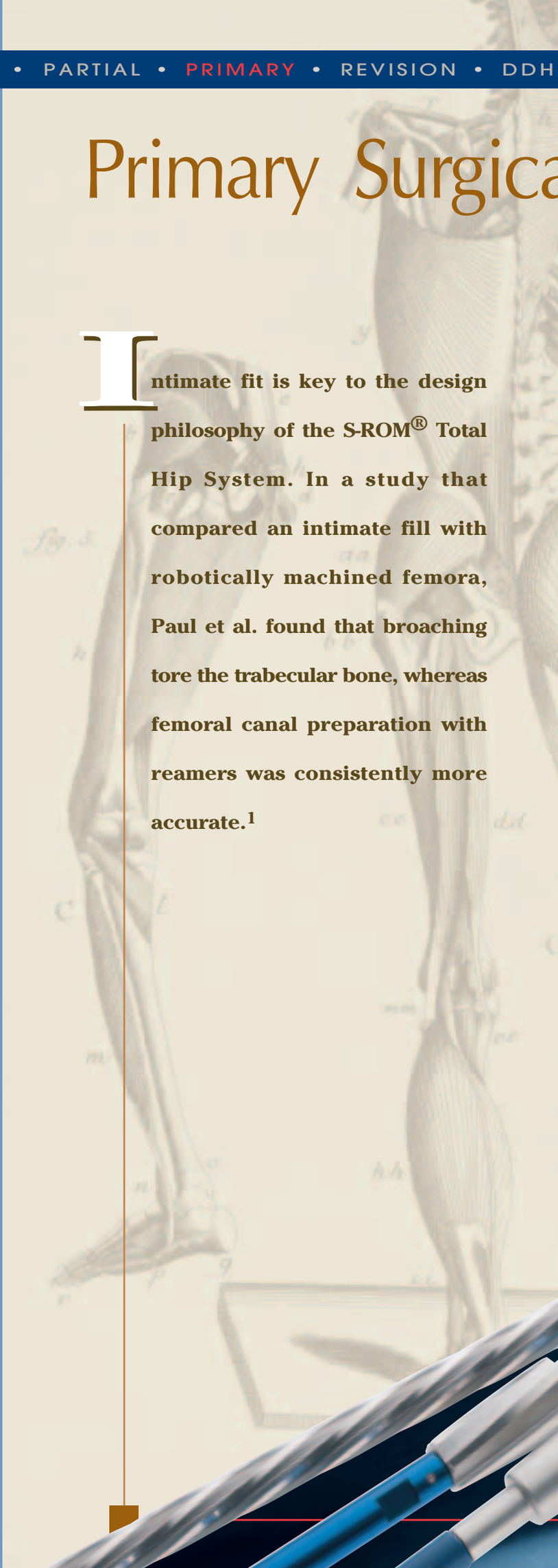
Stem Sizing		Outer Sleeve Diameter			
Distal Diameter (mm)	Proximal Diameter (mm)	(B)	(D)	(F)	Oversize (mm)
9	*14*	17	19	21	na
11	*16*	19	21	23	25
13	*18*	21	23	25	27
15	*20*	23	25	27	29
17	*22*	25	27	29	31
19	*24*	27	29	31	35
21	*26*	29	31	35	na
15		B	D	F	over
		23 (mm)	25 (mm)	27 (mm)	29 (mm)

For example, if the final distal stem is a 15, then cone reamers will begin with the smallest of the "20" proximal series, that is, 20 B. Each successive cone reamer — B, D, and F — will add an additional +3, +2, and +2 mm to the 20-mm dimension. Thus for a "20," the final outer sleeve diameters for B, D, and F are 23, 25, and 27 mm. Oversize options (which add +9 mm) are also available in some sizes.

* S-ROM stems have been sized by the inside diameter of the proximal sleeve to assure precise mating of stem and sleeve. The chart above shows the stem's actual distal diameter and how it correlates with a range of proximal sleeve sizes.

Primary Surgica

Intimate fit is key to the design philosophy of the S-ROM® Total Hip System. In a study that compared an intimate fill with robotically machined femora, Paul et al. found that broaching tore the trabecular bone, whereas femoral canal preparation with reamers was consistently more accurate.[1]



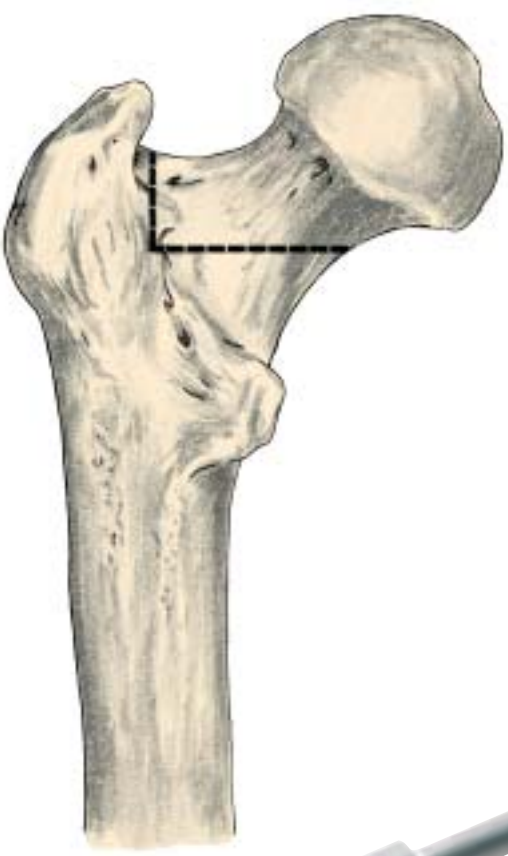
al Technique

The philosophy of the S-ROM Total Hip System is to machine the canal in order to achieve an accurate fit that distributes load evenly and encourages rotatory stability. While extensive modularity is available within the System, the insertion of a primary hip is fairly straightforward, involving preparation of the distal stem, proximal cone, and triangle miller. The following is a surgical technique guide for primary applications with sizing and modularity information on the left and right panels for easy reference.

[1] *Paul, H.A., Bargar, W.L., Mittlestadt, B., et al.: Development of a surgical robot for cementless total hip arthroplasty.* Clin. Orthop. Rel. Res. *285: 57–66, December 1992.*

Neck Resection

Perform a preliminary resection of the femoral neck, using a femoral neck resection template as a guide. The hole in the neck of the resection template is located at the center of the femoral head. The notch on the medial aspect of the template indicates the most distal point for making the neck resection. You may select a higher, more conservative neck osteotomy. Final neck preparation is performed later in the procedure.



Opening the Femoral Canal

2.

Open the femoral canal by penetrating the superior femoral cortex with the step starter drill. Enter the medullary canal by employing the starter drill, beginning at the posterior margin of the junction of the neck resection and the complementary cut at the trochanteric fossa.

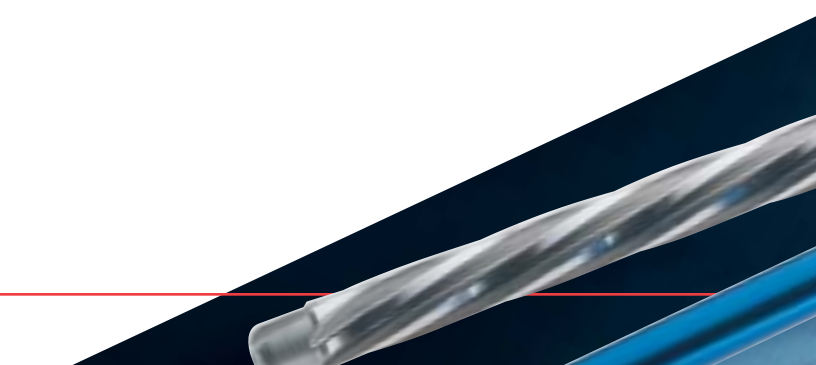
When appropriate, use a box osteotome to further open the neck trochanteric junction in order to guard against varus positioning of the reamers. To further protect against varus positioning, the box osteotome can be used to remove additional bone from the medial aspect of the greater trochanter.

Distal Reaming

3.

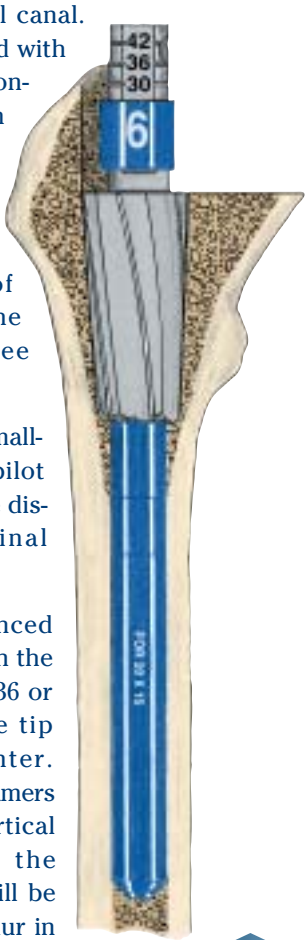
A full complement of cylindrical, blunt-nosed distal reamers is available, starting at 8 mm and growing in half-millimeter increments to 21 mm. The surgeon can begin axial reaming with the smallest reamer and work up sequentially until cortical contact is achieved. In keeping with preoperative planning, the final straight reamer should correspond to, or be a half millimeter larger than, the minor diameter of the selected femoral stem. (See Distal Sizing on left.)

The appropriate reamer depth has been established when the witness mark on each distal reamer aligns with the tip of the greater trochanter.



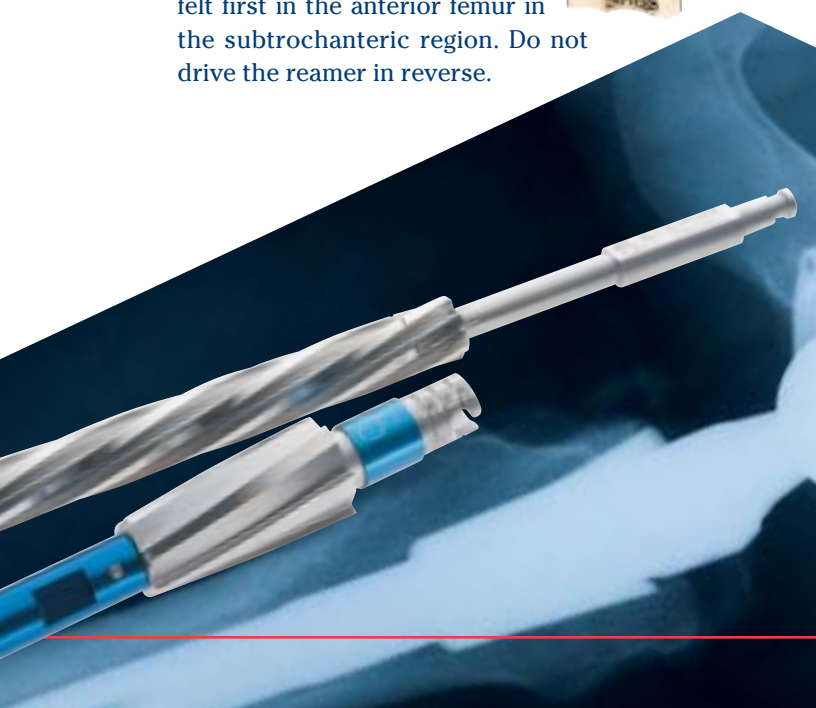
Cone Reaming

Upon completion of distal reaming, prepare the proximal or "cone" portion of the final sleeve to be implanted. A set of color-coded cone reamers is available for preparing the proximal anterior/posterior metaphyseal canal. All cones are clearly marked with the corresponding stem configurations. The distal stem size selected in step 3 dictates the basic proximal or cone size range for the final sleeve. The proximal geometry adds 5 mm of diameter to the size of the selected distal stem. (See Cone Sizing on left.)

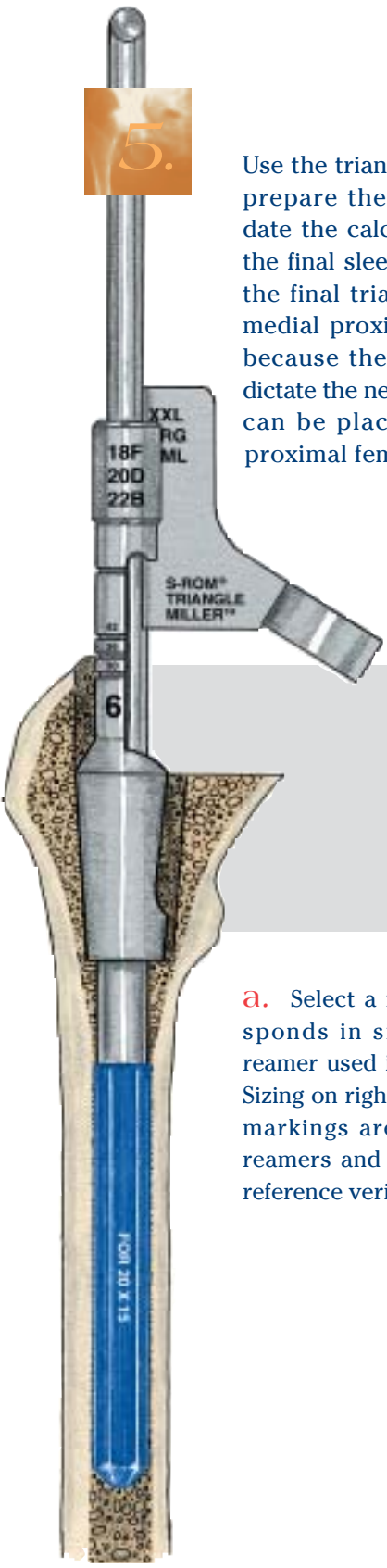


To cone ream, attach the smallest cone reamer, B, to a pilot shaft marked with the same distal diameter as the final implant.

The cone reamer is advanced until the witness marking on the desired neck length — 30, 36 or 42 mm — aligns with the tip of the greater trochanter. Successively larger cone reamers D and F are used until cortical contact is achieved in the proximal femur. Contact will be felt first in the anterior femur in the subtrochanteric region. Do not drive the reamer in reverse.



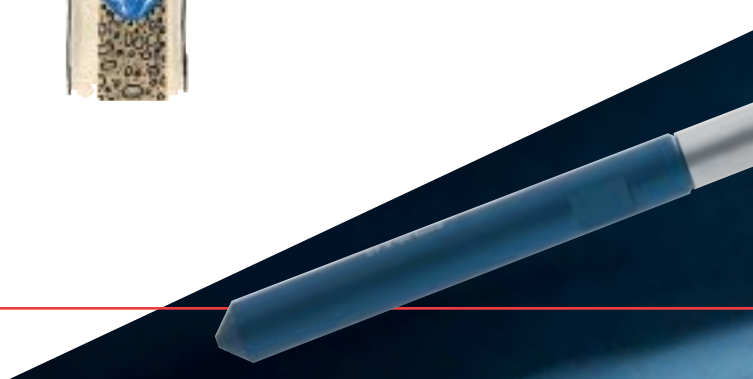
Calcar Triangle Milling



5.

Use the triangle miller assembly to prepare the femur to accommodate the calcar triangle portion of the final sleeve. In most instances, the final triangle is placed in the medial proximal femur. However, because the placement does not dictate the neck version, the triangle can be placed anywhere in the proximal femur.

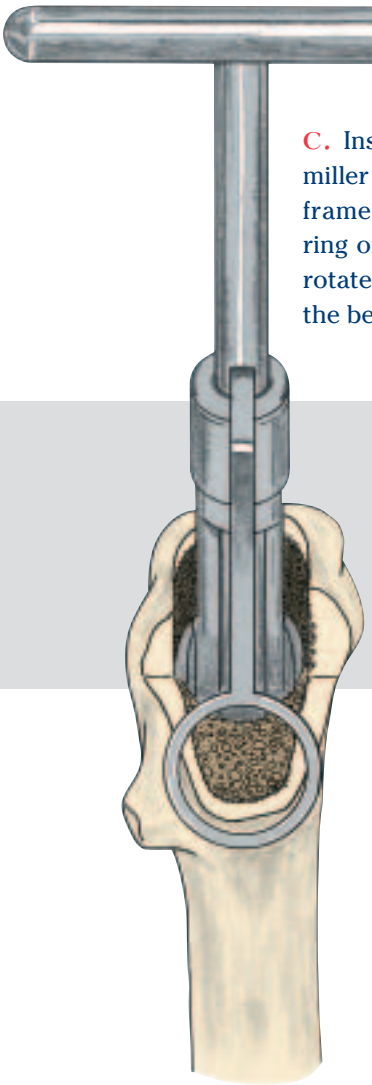
a. Select a miller shell that corresponds in size to the final cone reamer used in step 4. (See Triangle Sizing on right.) Single-digit numeric markings are also found on cone reamers and miller shells for cross reference verification.



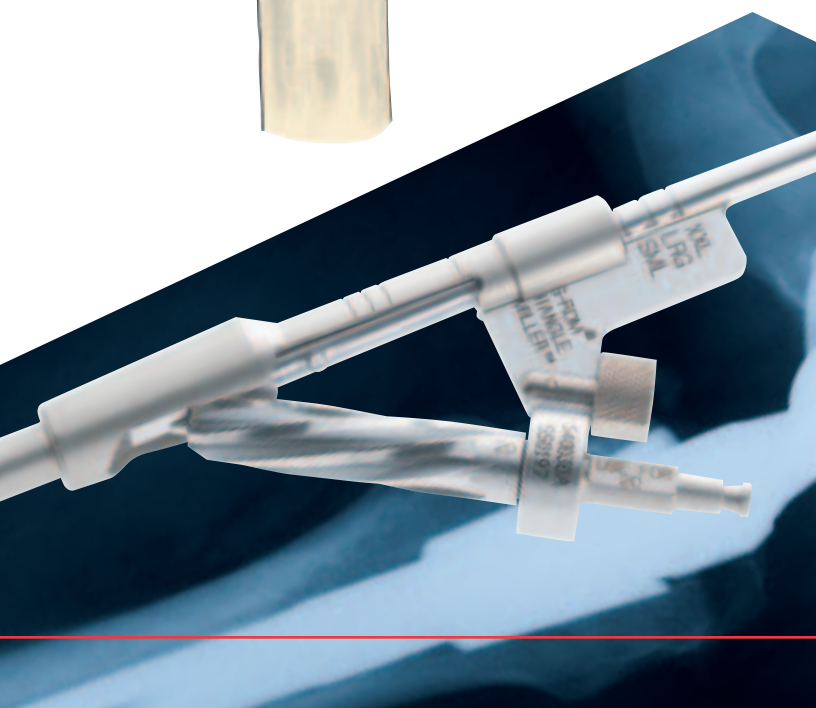
Calcar Triangle Milling

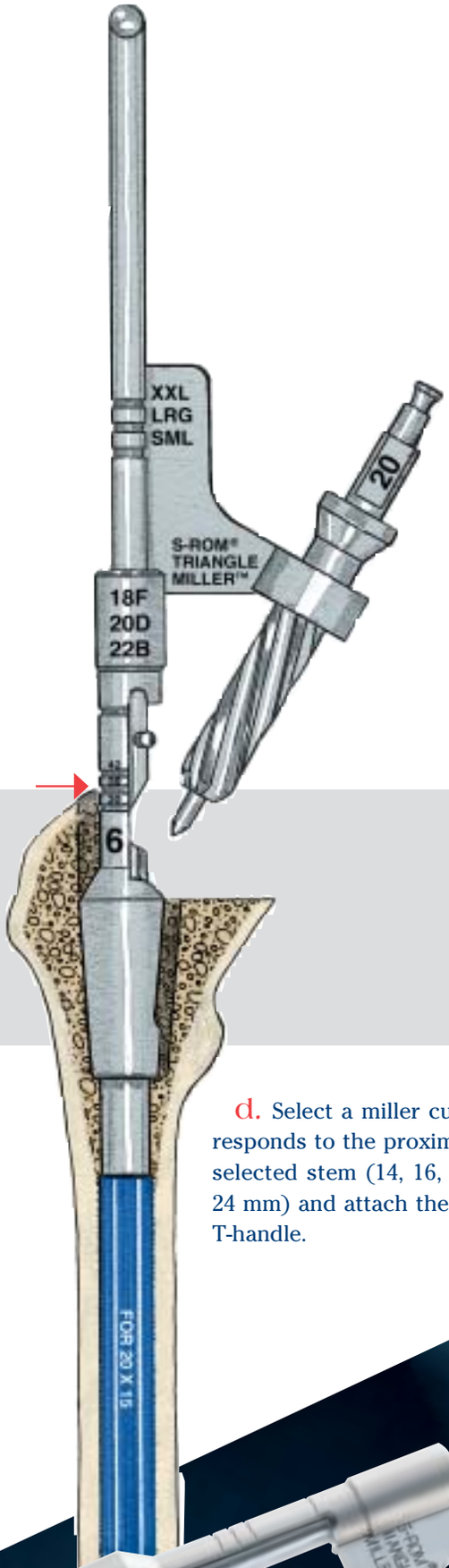
continued

b. Attach the miller shell to the same size pilot shaft that was used in step 4.

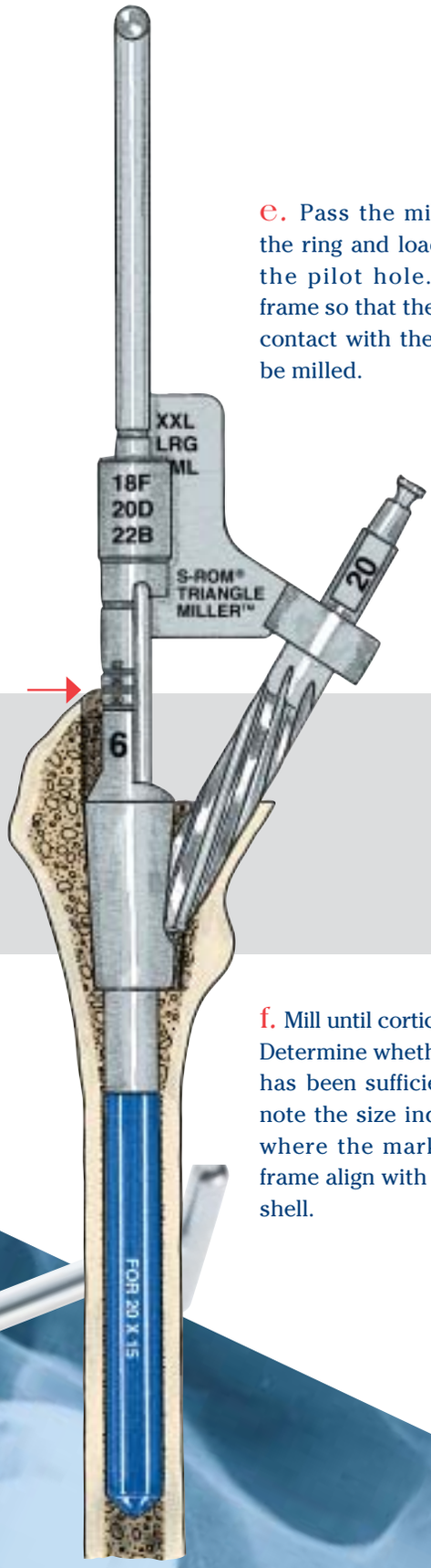


c. Insert the miller frame into the miller shell and gently introduce the frame into the femoral canal. The ring of the miller frame can now be rotated so that it is positioned over the best available host bone.





d. Select a miller cutter that corresponds to the proximal size of the selected stem (14, 16, 18, 20, 22, or 24 mm) and attach the cutter to the T-handle.



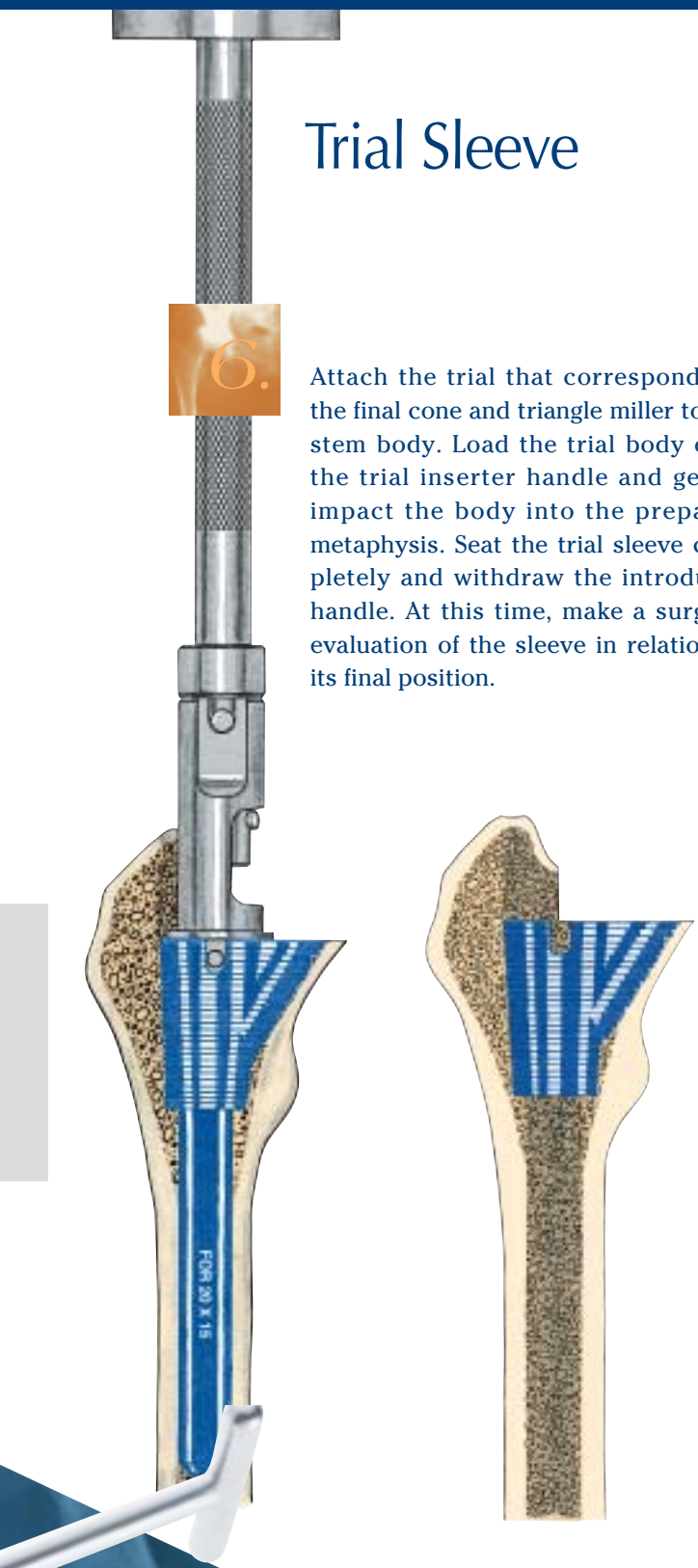
e. Pass the miller cutter through the ring and load the cutter tip into the pilot hole. Lower the miller frame so that the miller cutter makes contact with the cancellous bone to be milled.

f. Mill until cortical bone is contacted. Determine whether the cortical bone has been sufficiently exposed. Then note the size indicated (red arrow) where the markings on the miller frame align with the top of the miller shell.

Trial Sleeve

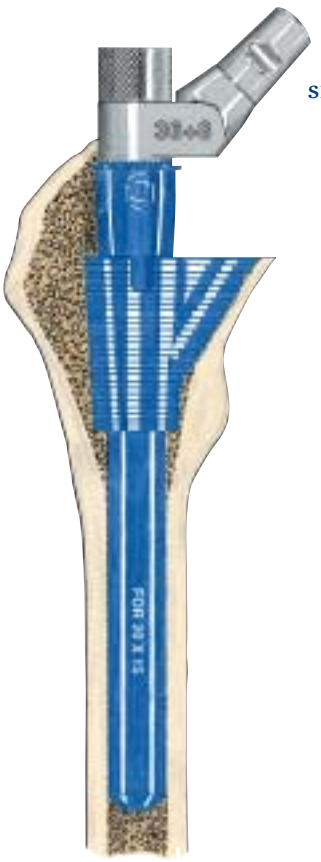
6.

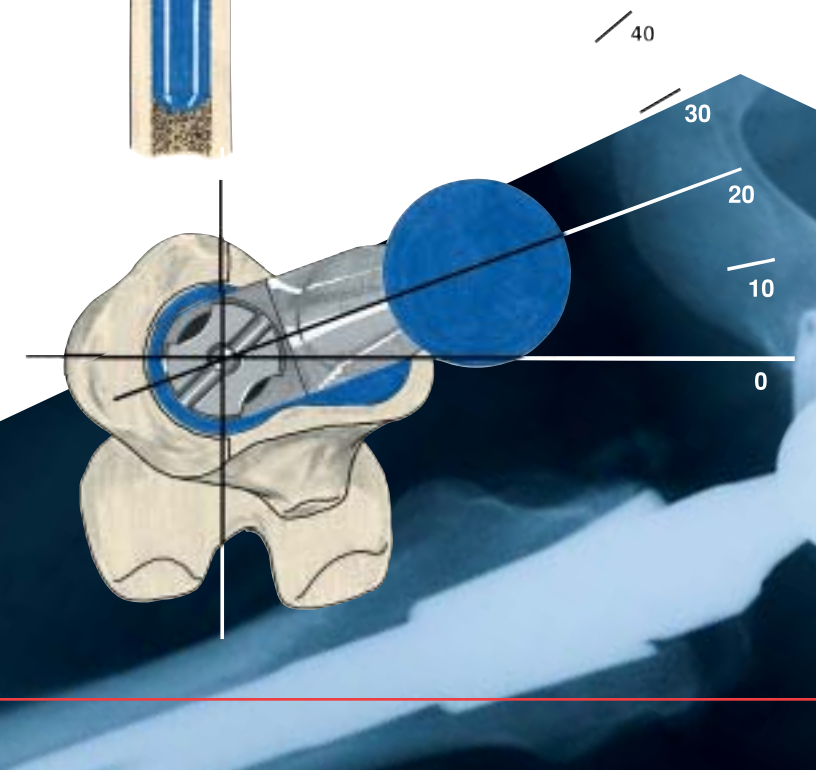
Attach the trial that corresponds to the final cone and triangle miller to the stem body. Load the trial body onto the trial inserter handle and gently impact the body into the prepared metaphysis. Seat the trial sleeve completely and withdraw the introducer handle. At this time, make a surgical evaluation of the sleeve in relation to its final position.



Trial Implant

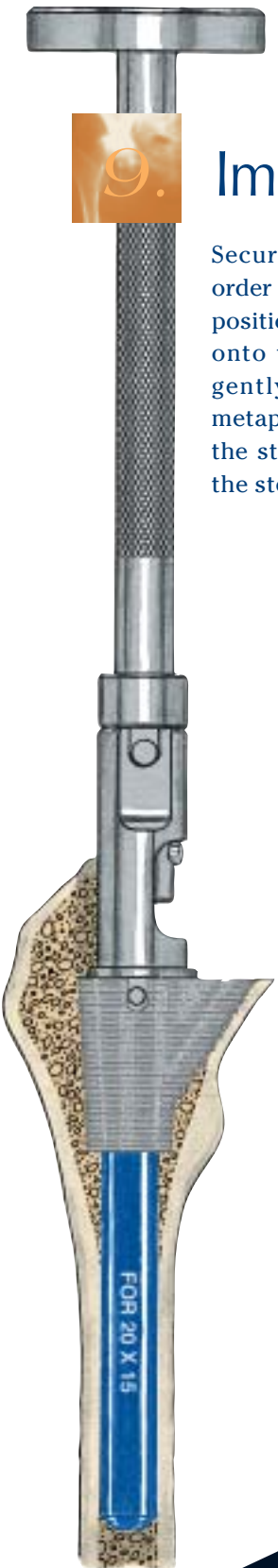
Select and assemble the stem trial with the chosen neck style and length. Introduce the trial stem through the trial sleeve, which remains in its established position. The trial neck assembly allows the surgeon to select the stem version independently of the position of the metaphyseal trial sleeve. Each click on the trial stem body equals 10 degrees of rotation, which permits the surgeon to position and note the optimal stem version for the final implant.





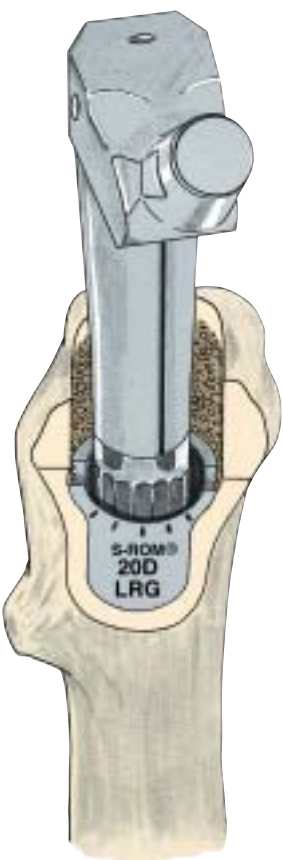
Extraction Trials

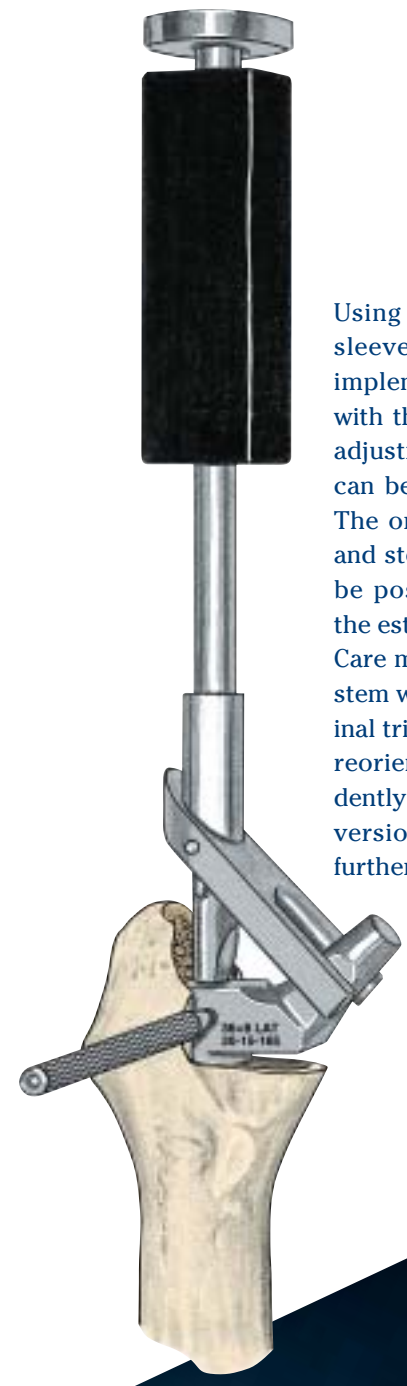
8. Use the instrumentation provided to extract the trial stem and sleeve.



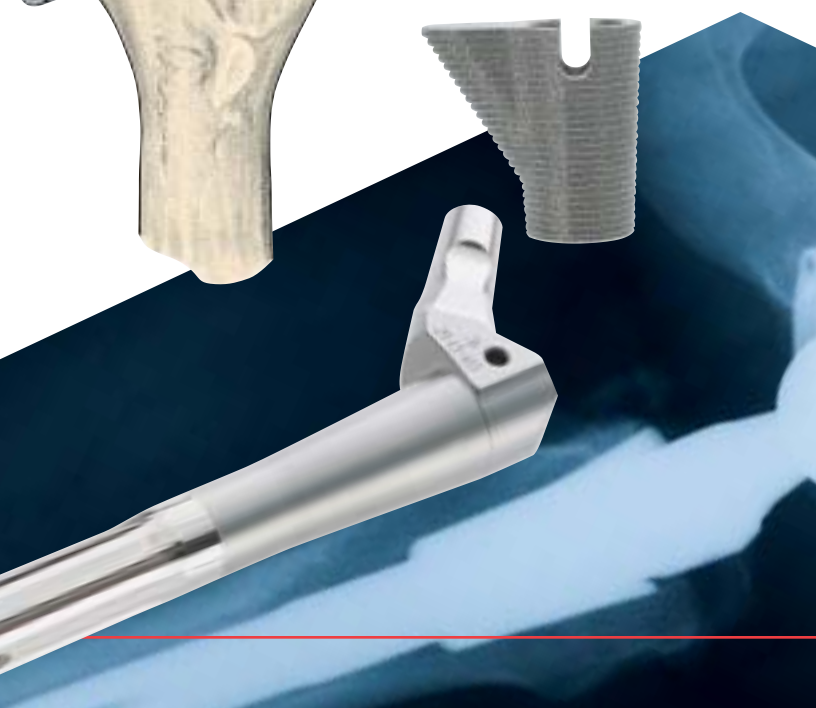
9. Implant

Secure the final implant in the same order as the trial sleeve and body were positioned. Secure the proximal sleeve onto the sleeve inserter handle and gently impact the sleeve into the metaphysis. Load the final stem onto the stem introducer handle and insert the stem into the femoral canal.





Using the orientation lines on the sleeve and stem, the surgeon can implement the criteria established with the trial components. If further adjustments are required, the stem can be repositioned independently. The orientation lines on the sleeve and stem permit the final implant to be positioned in accordance with the established position of the trials. Care must be taken to align the final stem with the orientation of the original trial stem. The system allows for reorientation of the stem independently of the sleeve until the optimal version is established, should any further adjustments be required.



Neck Selections

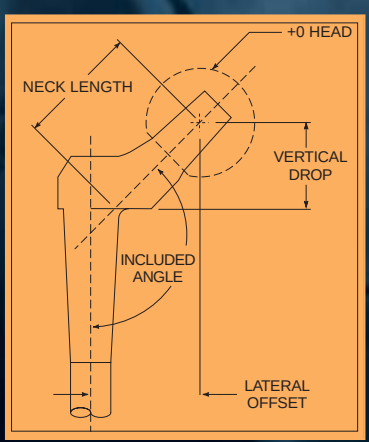
Abductor Tensioning

Lateral Offset

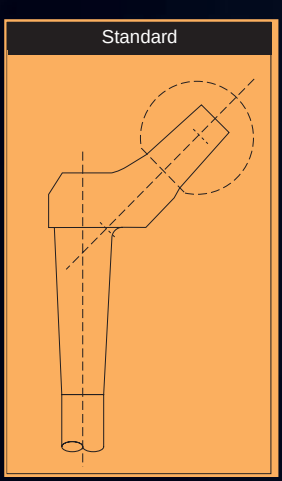
Horizontal distance from the center of the femoral head to the center of the femoral stem.

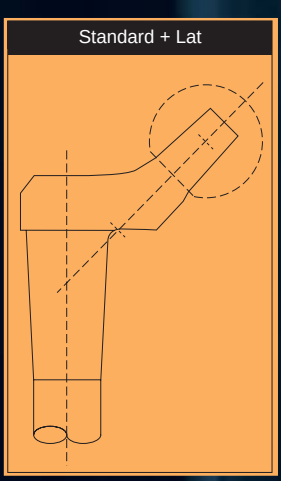
Vertical Drop
Leg Length
Neck Height

Vertical distance from the center of the femoral head to the base of the femoral neck.



Neck Styles

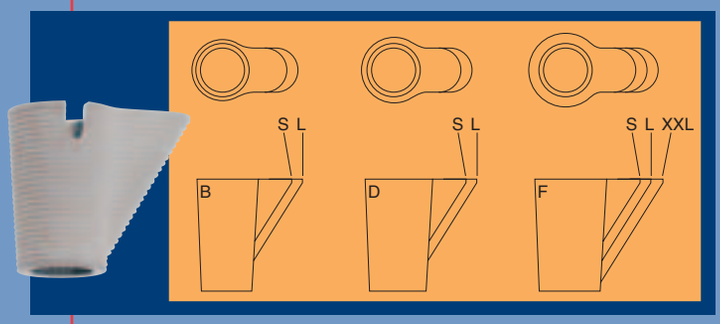




Triangle Miller Sizing

The final element that must be machined is the spout or triangle of the proximal sleeve. The triangle indicates the extension of the triangle from the outside diameter (O.D.) of the cone. Triangle sizing comes in Small, Large, or XX-Large.

Small — extends 9.5 mm from the cone O.D.
Large — extends 13.5 mm from the cone O.D.
XX-Large — extends 17.5 mm from the cone O.D.



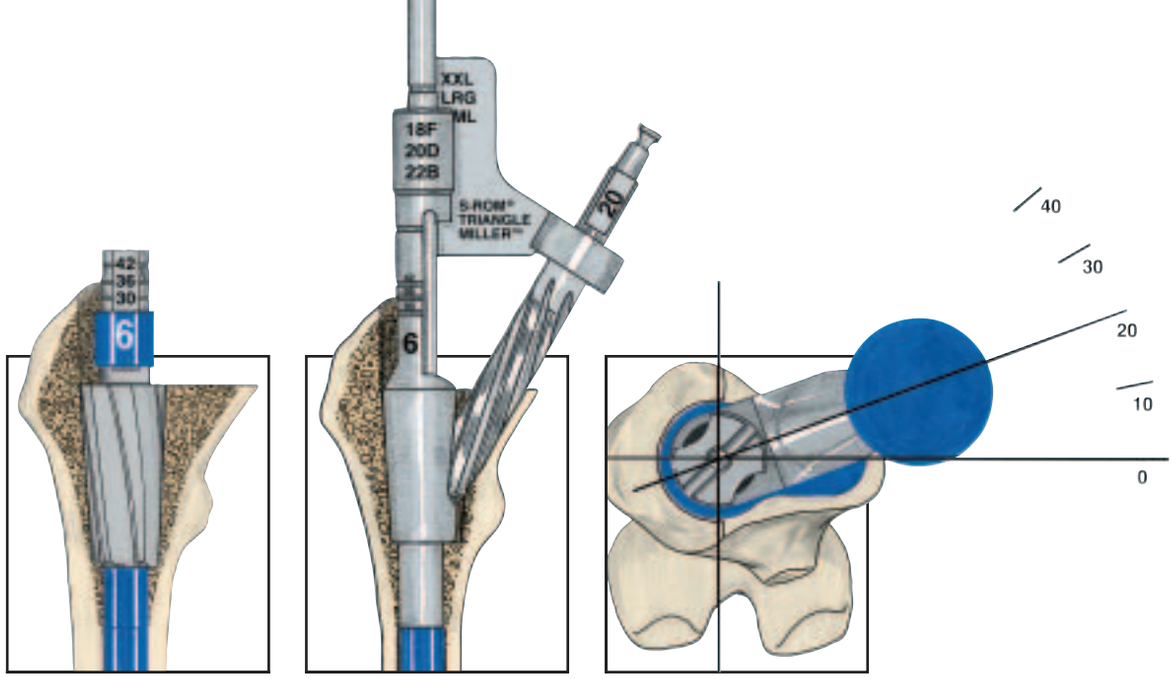
A proximal sleeve trial designated 20 D Large is a sleeve that will fit a 15 x 20 stem with a D outer diameter (add 5 mm) and a large triangle (extends 13.5 mm). Proximal sleeve trials have color coding which matches it to its designated stem.

The extent of the triangle on the ZTT™ sleeve is proportional to the diameter of the stem.

Improper prosthesis selection or alignment, inadequate fixation, use where contraindicated or in patients where medical, physical, mental, or occupational conditions will likely result in extreme stress to the implant may result in premature failure due to loosening, fracture or wear. Infection and loosening have been reported following total joint arthroplasty, as have wear and failure due to fracture or breakage of prosthesis components.

NECK SIZING CHART – ASSUME USE OF + 0 HEAD
(ALL NECKS HAVE AN INCLUDED ANGLE OF 135°)

Neck Style (mm)	Neck Length (mm)	Lateral Offset (mm)	Vertical Drop (mm)
Standard	30	28	21
Standard	36	32	25
Standard	42	37	30
Standard + 4 Lat	30	32	21
Standard + 4 Lat	36	36	25
Standard + 8 Lat	36	40	25



S-ROM

TOTAL HIP SYSTEM

SURGICAL TECHNIQUE

The S-ROM Prosthesis offers expansive metaphyseal and diaphyseal geometries, making it the stem of choice for the high-demand primary patient. With over 15 years of clinical success, the S-ROM Prosthesis has been proven in well over 65,000 cases.

This surgical technique was developed in cooperation with . . .

- James V. Bono, M.D., *Boston, Massachusetts*
- Hugh U. Cameron, M.B.Ch.B.,F.R.C.S.(C)., *Toronto, Ontario*
- Michael J. Christie, M.D., *Nashville, Tennessee*
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