



**Zimmer®
Trabecular
Metal™
Humeral Stem**

Surgical Technique



**Trabecular Metal™
Humeral Stem
Surgical Technique****Table of Contents**

Trabecular Metal Humeral Stem Sizing Chart	2
Patient Positioning	4
Incision and Exposure	4
Humeral Preparation	5
Ream Humeral Canal	5
Determining Humeral Resection Angle	6
Resect Humeral Head	6
Assembling the Trabecular Metal Humeral Head Cutting Guide	6
Proximal Humeral Reaming	9
Stem Provisional Insertion	10
Humeral Head Selection	11
Countersinking the Humeral Component	12
Final Humeral Preparation	13
Cemented & Press-fit Techniques Intraoperative Assembly	13
Closure	16
Postoperative Management	16
Humeral Head Removal	16
Intraoperative Stem Removal	16

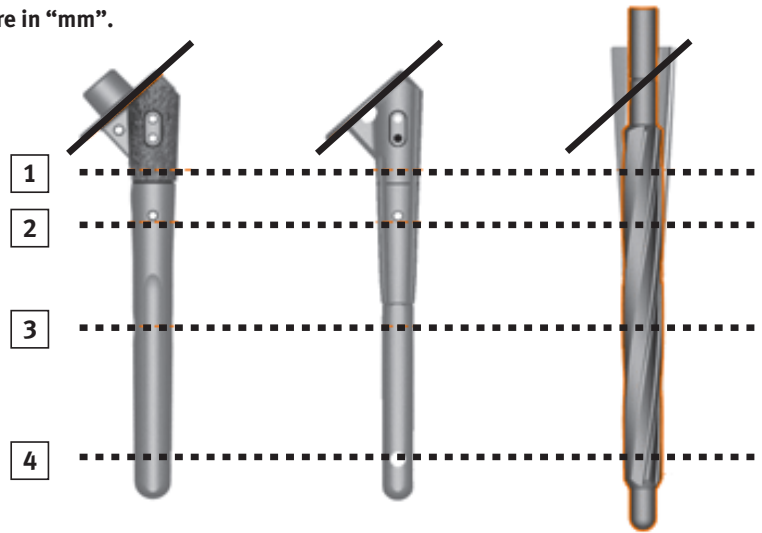
Trabecular Metal Humeral Stem Sizing Chart

The sizing chart below shows the dimensions of the *Trabecular Metal* Humeral Stem, provisionals, and the reamers taken at four points along their bodies. Lines 1 and 2 correspond to locations prepared by the proximal reamer, whereas points 3 and 4 correspond to locations prepared by the distal reamer.

Under the “RELATIONSHIP” section, the dimensions of the A.) Provisional and B.) Stem are compared to those of the reamers. These numbers represent the amount of circumferential press-fit (+) or clearance-fit (-) expected in each zone.

Use this chart to determine the best size stem for press-fit and cemented applications. X-ray templates are also available (97-4309-150-00).

Note: All dimensions are in “mm”.



The dimensions and the numbers listed in the RELATIONSHIP section of the sizing charts results when the appropriate reaming technique is followed.

- Distally reaming until the appropriate 130MM STEM or 170MM STEM marking is even with the center opening of the canal (Fig. 15a).
- Proximally ream to the **proximal-lateral edge** of the canal opening (Fig. 17).

		RELATIONSHIP				
		A			B	
		Stem Diameter	Provisional Diameter	Reamer Diameter	Provisional to Reamer	Stem to Reamer
Size 6	1	9.9	9.4	9.6	-0.2	+0.3
	2	8.9	8.4	8.6	-0.2	+0.3
	3	6.0	5.5	6.8	-1.3	-0.8
	4	5.1	4.5	5.8	-1.3	-0.7
Size 8	1	9.9	9.4	9.6	-0.2	+0.3
	2	8.9	8.4	8.6	-0.2	+0.3
	3	8.0	7.8	8.8	-1.0	-0.8
	4	7.2	7.2	8.0	-0.8	-0.8
Size 9	1	11.9	11.3	11.6	-0.3	+0.3
	2	10.9	10.4	10.6	-0.2	+0.3
	3	9.0	8.8	9.7	-0.9	-0.7
	4	8.3	8.2	9.0	-0.8	-0.7

		Stem Diameter	Provisional Diameter	Reamer Diameter	Provisional to Reamer	Stem to Reamer
Size 10	1	11.9	11.4	11.6	-0.2	+0.3
	2	10.9	10.4	10.6	-0.2	+0.3
	3	10.0	9.8	10.7	-0.9	-0.7
	4	9.2	9.2	10.0	-0.8	-0.8

Size 11	1	13.9	13.4	13.5	-0.1	+0.4
	2	12.9	12.4	12.5	-0.1	+0.4
	3	11.0	10.8	11.7	-0.9	-0.7
	4	10.3	10.2	11.0	-0.8	-0.7

Size 12	1	13.9	13.4	13.5	-0.1	+0.4
	2	12.9	12.4	12.5	-0.1	+0.4
	3	12.0	11.8	12.7	-0.9	-0.7
	4	11.3	11.2	12.0	-0.8	-0.7

Size 13	1	15.9	15.4	15.4	+0.0	+0.5
	2	14.9	15.2	14.5	+0.7	+0.4
	3	13.0	12.8	13.7	-0.9	-0.7
	4	12.2	12.2	13.0	-0.8	-0.8

Size 14	1	15.9	15.4	15.4	+0.0	+0.5
	2	14.9	15.2	14.5	+0.7	+0.4
	3	14.0	13.8	14.7	-0.9	-0.7
	4	13.3	13.2	14.0	-0.8	-0.7

Size 15	1	17.9	17.4	17.4	+0.0	+0.5
	2	16.9	16.4	16.4	+0.0	+0.5
	3	15.0	14.8	15.7	-0.9	-0.7
	4	14.2	14.2	15.0	-0.8	-0.8

Size 16	1	17.9	17.4	17.4	+0.0	+0.5
	2	16.9	16.4	16.4	+0.0	+0.5
	3	16.0	15.8	16.7	-0.9	-0.7
	4	15.2	15.2	16.0	-0.8	-0.8

Size 17	1	19.9	19.4	19.3	+0.1	+0.6
	2	18.9	18.4	18.3	+0.1	+0.6
	3	17.0	16.8	17.7	-0.9	-0.7
	4	16.3	16.2	17.0	-0.8	-0.7

Size 18	1	19.9	19.4	19.3	+0.1	+0.6
	2	18.9	18.4	18.3	+0.1	+0.6
	3	18.0	17.8	18.7	-0.9	-0.7
	4	17.3	17.2	18.0	-0.8	-0.7

Patient Positioning

Patient positioning is especially important in total shoulder surgery (Fig. 1). Place the patient in a semi-beach-chair position. Use a head rest that allows for the superior part of the table to be removed. Place two towels under the spine and the medial border of the scapula to raise the affected side. Raise the head of the table approximately 25-30 degrees to reduce venous pressure. Attach a short arm board to the table, or use another arm support method that will allow the arm to be raised or lowered as necessary throughout the procedure.



Fig. 1

Incision and Exposure

First, mark the coracoid process. Then mark the line of the incision, beginning at the clavicle just lateral to the coracoid process. Extend the line along the deltopectoral groove to the area of the mid-humerus (Fig. 2). Then make the incision following the line. Undermine the skin flaps to improve exposure. Dissect subcutaneous tissue from the deltoid fascia, and expose the deltoid and pectoralis major muscles. Retract the skin by placing Gelpi retractors about one-third of the way down, and one-third of the way up. Develop the deltopectoral interval, retracting the pectoralis major medially and the deltoid laterally. Identify



Fig. 2

and dissect the interval between the pectoralis major muscle and the cephalic vein. Retract the cephalic vein either medially or, preferably, laterally as this will minimize bleeding from the deltoid muscle or cephalic vein. Release the upper 1cm-2cm of the insertion of the pectoralis major tendon, being careful to avoid the long head of the biceps tendon. In very tight shoulders, the pectoralis may need to be completely released. Tag the pectoralis major muscle with a suture so it can be easily identified for later reattachment. Reposition the distal medial retractor under the pectoralis major muscle.

Release any adhesions between the deltoid and strap muscles (coracobrachialis and short head of biceps) and develop a plane between the strap muscles and the humerus. Reposition the proximal medial retractor under the strap muscles (Fig. 3).

Sweep the bursa off the humeral head and the greater tuberosity. Then expose the superior portion of the subacromial

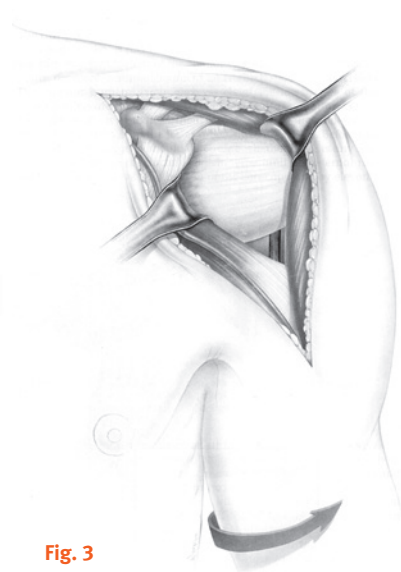


Fig. 3

space by resecting the leading edge of the coracoacromial ligament. Identify the superior and inferior margins of the subscapularis tendon. Divide the tendon just medial to the bicipital groove and remove it from the lesser tuberosity. Being careful inferiorly to avoid the axillary nerve, retract the subscapularis medially, exposing the articular surface of the humeral head.

It is very important to maintain as much length of the subscapularis muscle as possible. Remove the capsule and subscapularis tendon as a unit laterally from the humerus. Do this as close as possible to the humeral neck to avoid injury to the axillary nerve. External rotation of the humerus is helpful. In cases where there is a large inferior osteophyte on the humeral head, it is especially important to dissect the capsule off the neck of the humerus laterally as the axillary nerve is on the medial and inferior aspect of the osteophyte. Medially, at the glenoid rim, the capsule and labrum can be separated from the subscapularis tendon. This will facilitate lateral mobilization.

Humeral Preparation

The goal in replacing the humeral head is to place a prosthetic articular surface precisely on the proximal humerus as it would have been before the destructive arthritic process began. The relationship among bony anatomy, rotator cuff insertions, and soft tissue tension must all be considered.

Technique Tip: To facilitate access to the humeral canal, the shoulder should be off the table. To accomplish this, push the elbow back and externally rotate the arm.

Note: *Bigliani/Flatow*® Humeral General, *Trabecular Metal* Humeral and *Trabecular Metal* Shoulder Reamer instrument trays are needed for this procedure.

Note: The *Trabecular Metal* Humeral Stem was designed for primary, revision, and fracture applications. To meet the wide range of possible needs in these applications, the stem has a 4° taper proximally to the mid-shaft and a 1° taper at the distal end of the implant. This maintains the *Bigliani/Flatow* Shoulder philosophy of a low profile, bone-conserving stem. Reaming of the canal provides an average press-fit of 1/2mm proximally and clearance distally.

Ream Humeral Canal

Dislocate the humeral head by externally rotating and extending the humerus. Removal of capsule from the inferior aspect of the humeral neck may be needed to achieve dislocation. Before reaming the canal, it is important to remove all anterior or inferior osteophytes so that the true anatomical neck (junction of the articular cartilage and cortical bone) can be determined.

Using the reamers from the *Trabecular Metal* Shoulder Reamer tray, attach a Short Intramedullary Reamer with a trocar point to the Ratchet T-handle (Fig. 4). There are three positions marked on the collar of the T-handle: FORWARD, LOCKED, and REVERSE. To ream the starter hole, use the FORWARD position (Fig. 5). Short Intramedullary Reamers are available in diameters of 6mm, 7mm, and 8mm, and the appropriate size should be chosen for the patient's humeral canal. Place the trocar tip of the reamer just posterior to the bicipital groove (Fig. 6) and ream a starter hole. A mallet may be used to start the hole in hard bone.

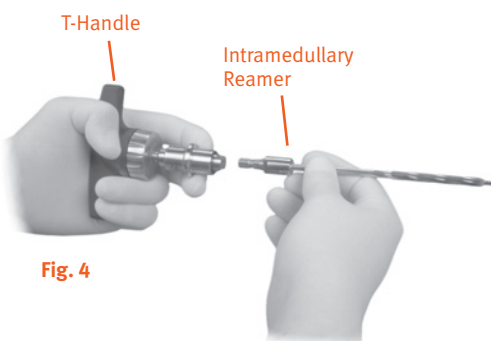


Fig. 4

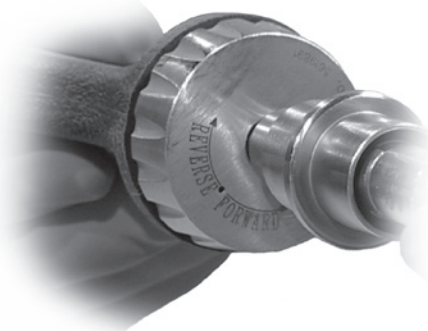


Fig. 5



Fig. 6

Attach the T-handle to the longer, blunt-tipped Intramedullary Tapered Reamer of the same diameter (also from the *Trabecular Metal* Shoulder Reamer tray) and begin manually reaming the humeral canal. Use progressively larger reamers in 1mm increments until resistance is felt from cortical contact in the canal. Continue reaming until the appropriate line (130mm stem or 170mm stem) on the reamer shaft is aligned with the humeral head (Fig. 7). These reamers have blunt tips to help guide them down the canal and prevent obstruction into cortical bone. Remove the T-handle, but leave the last reamer in the canal to interface with the Humeral Head Cutting Guide.



Fig. 7

Determining Humeral Resection Angle

Choose the appropriate angle to make the first cut using pre- or intraoperative techniques. The *Trabecular Metal* Humeral Silhouettes can be used to aid this assessment (Fig. 8). Based upon this evaluation, choose the matching *Trabecular Metal* Humeral Cutting Guide.

Note: If the angle hasn't been determined, use of the 48° Cutting

Guide first would allow you to later change to a 42° cut without violating the rotator cuff insertion site. However, if you use a 42° Cutting Guide, converting to a 48° may violate the rotator cuff insertion site.

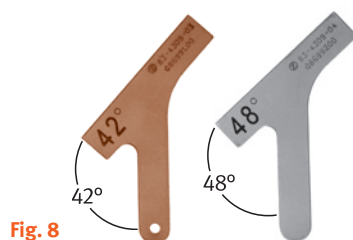


Fig. 8

Note: The *Trabecular Metal* Humeral Cutting Guide 42° preparation instruments are color coded gold throughout the system. This is to distinguish them from the 48° preparation instruments.

Resect Humeral Head

Assemble the *Trabecular Metal* Humeral Cutting Guide for either a right or left configuration. (See “Assembling the *Trabecular Metal* Humeral Head Cutting Guide.”)

Assembling the Trabecular Metal Humeral Head Cutting Guide

Align the groove on the boom stem with the groove on the cutting block. Push the components together until they snap into place (Step A).

With the thumb screw at the end of the boom pointed toward you, observe the various “R” or “L” etchings that indicate a right or left configuration. All the etchings that are facing you now should be the same, either “R” or “L” (Step B).

To change the right/left orientation, remove the thumb screw at the end of the boom (Step C). Then loosen the second thumb screw on the box at the top of the boom stem. Slide the boom stem off the end of the boom. Rotate the sleeve, top to bottom, and reinsert into the opposite side of the box at the top of the boom stem (Step D).

Retighten the thumb screw on the box at the top of the boom stem. Then reinsert and tighten the thumb screw at the end of the boom. Finally, verify that all the appropriate right or left etch marks are visible when the boom thumb screw is facing you (Step E).



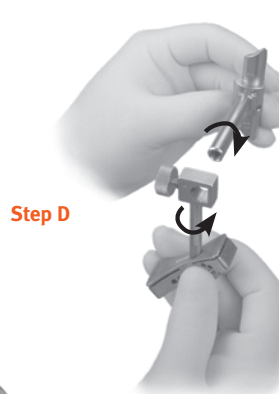
Step A



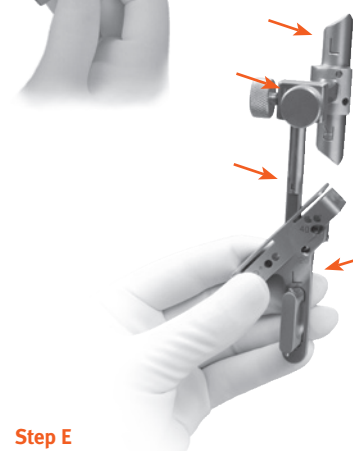
Step B



Step C



Step D



Step E

Slide the boom sleeve over the reamer shaft (Fig. 9). Adjust the depth of cut by moving the sleeve up or down on the reamer shaft. Rotate the sleeve on the reamer shaft until the point is approximately in line with the bicipital groove (Fig. 10). Typically, the tip of the boom sleeve should be touching articular cartilage/bone surface. Then tighten the first thumb screw, which

is located on the end of the boom. Advance the boom stem and cutting block along the boom until the block contacts the bone (Fig. 11). Tighten the second thumb screw, which is located at the junction of the boom and boom stem.

To gauge the retroversion of the cut, insert Threaded Alignment Rods into the holes marked 20 degrees and 40 degrees on the cutting block (Fig. 12a). Then line up the rods with the forearm to assess the retroversion (Fig. 12b).

Retroversion can be adjusted by loosening both thumb screws and rotating the cutting guide about the axis of the Intramedullary Reamer. The forearm should be between the 20 degree and 40 degree rods (Fig. 12c). Then retighten the thumb screws, being sure that the cutting block is again touching the bone (Fig. 12d).

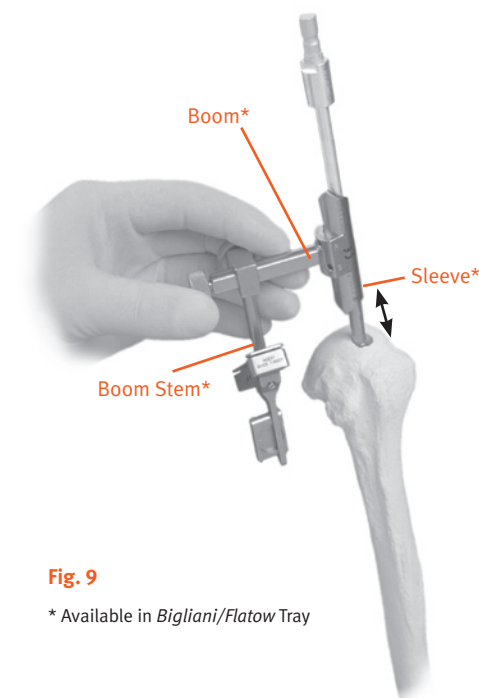


Fig. 9

* Available in *Bigliani/Flatow* Tray

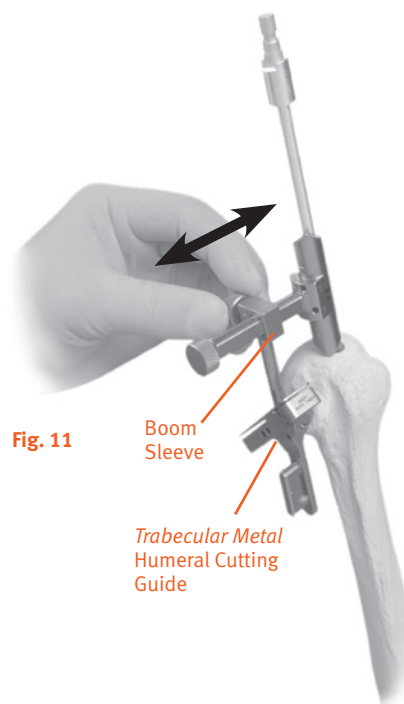


Fig. 11

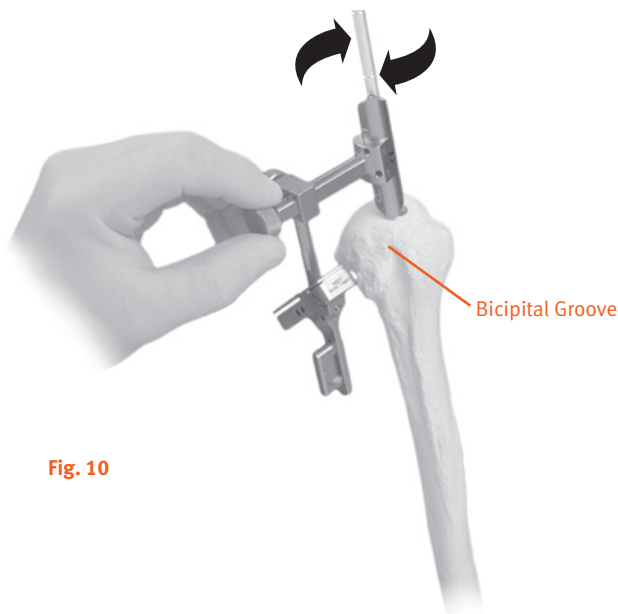


Fig. 10

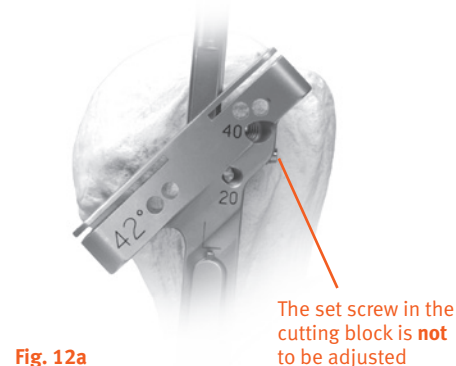


Fig. 12a



Fig. 12b

Note: Threaded Alignment Rods must be used in the cutting block. Non-threaded Alignment Rods from the *Bigliani/Flatow* Humeral General Instrument Set can be used in the boom assembly (Fig. 12b).

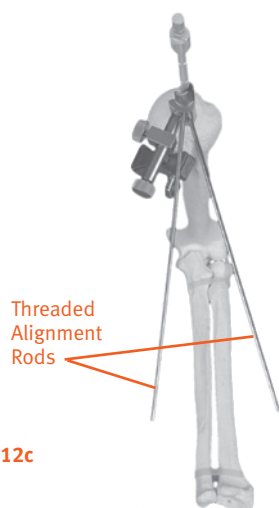


Fig. 12c



Fig. 12d

Insert the Humeral Head Cutting Guide Fingers into the cutting slots to visualize the path of the saw blade through the bone and confirm the angle of inclination chosen (Fig. 13). Confirm that the cut will not violate the rotator cuff insertion but will still remove the articular cartilage on the humeral head. If necessary, loosen the thumb screw at the end of the boom, and move the sleeve up or down to adjust the depth of cut. In some cases, the shoulder capsule may be too tight to accommodate the fingers.

Partially insert a Cutting Guide Pin or 3.2mm Threaded Pin from the *Bigliani/Flatow* Fracture Instrument Kit with Pin Driver through one of the lateral/medial holes in the cutting block. Fully insert a second pin through one of the medial/lateral holes (Fig. 14). If the cortex is very hard, predrill these holes using a drill with a diameter between 2.0mm and 2.7mm.

Loosen both thumb screws on the guide and remove the boom, leaving the cutting block in place. Set the T-handle to the **REVERSE** position. Attach the T-handle to the reamer and remove the reamer from the humeral canal.

The Threaded Alignment Rods may be removed prior to making the cut. It is important to make the cut along the articular surface as this will help ensure the correct retroversion on the majority of cases. Care must be taken to avoid cutting into the rotator cuff posteriorly. Use an oscillating saw to resect the humeral head (Fig. 15). Then remove the cutting block.

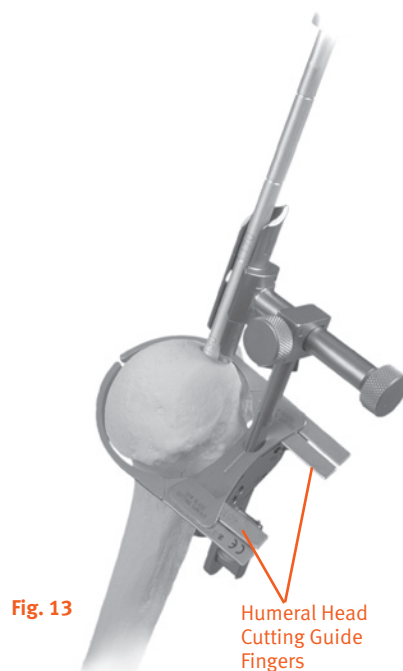


Fig. 13

Humeral Head
Cutting Guide
Fingers

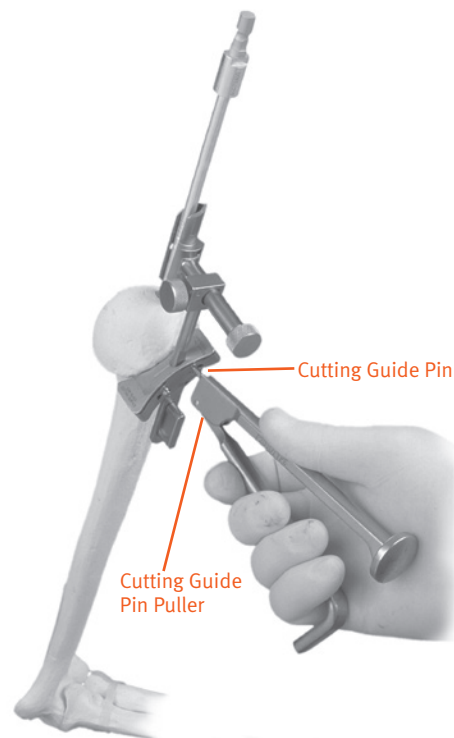


Fig. 14

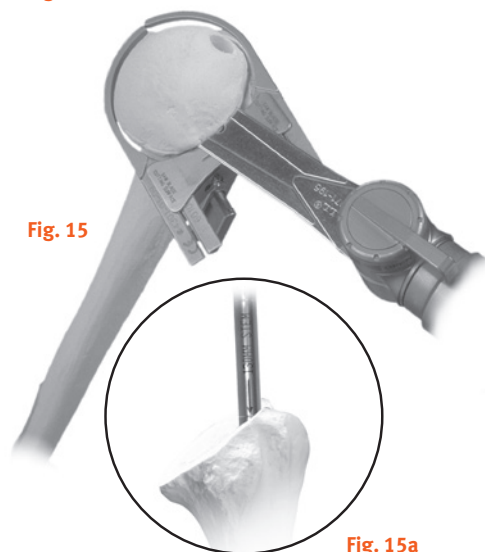
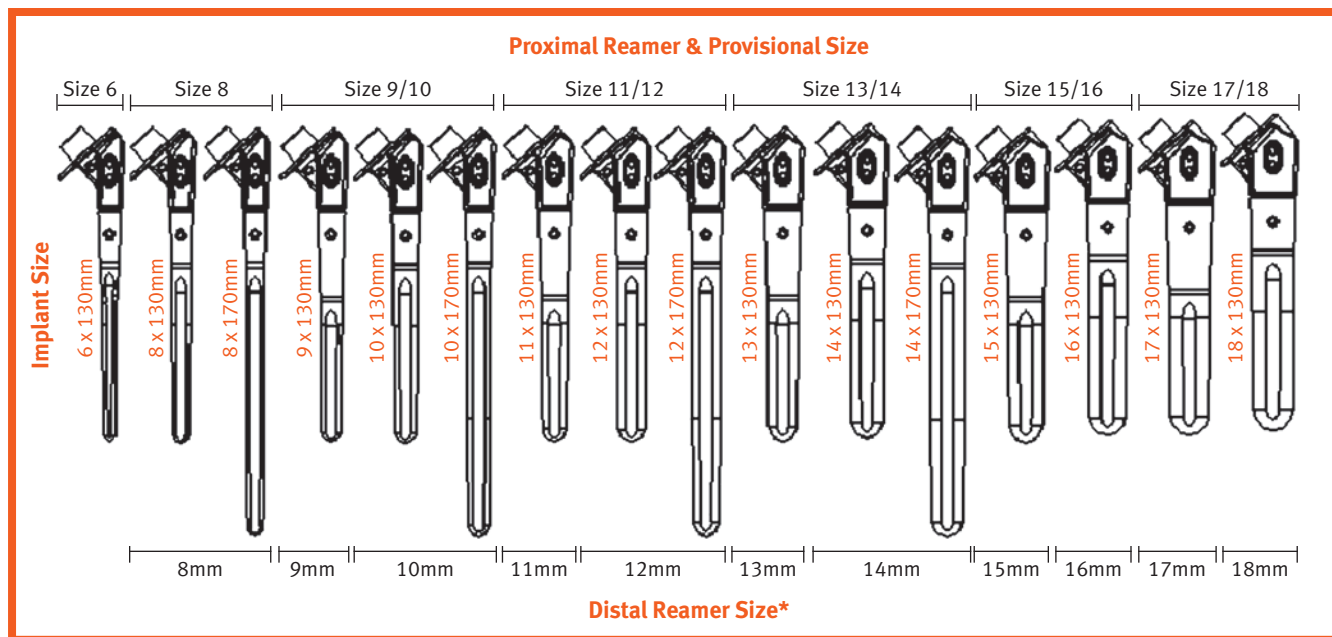


Fig. 15a

In order to account for the tapered geometry of the implant and any variations in head size, reinsert the final distal reamer after the humeral head is resected. Re-ream until the appropriate 130MM STEM or 170MM STEM marking is even with the center of the opening of the canal resulting in the "RELATIONSHIP" detailed in the Sizing Charts on page 2.

WARNING: Not re-reaming the canal may result in a press-fit in the mid to distal region of the provisional and/or implant and distal impingement of the counterbore.

Proximal Humeral Reaming



***Note:** If cementing distally, a larger distal reamer may be used to create a cement mantle, but the proximal reamer size should match the implant size to create a press fit of the *Trabecular Metal* section.

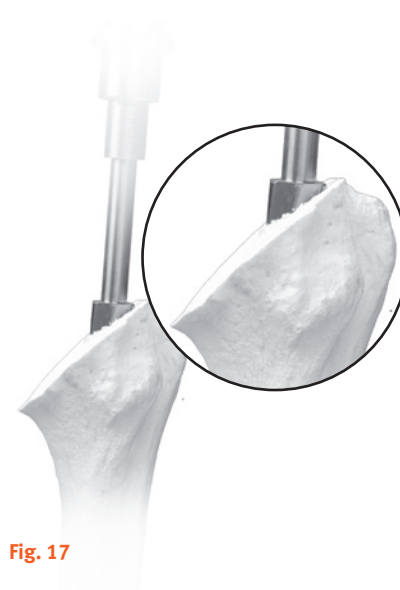
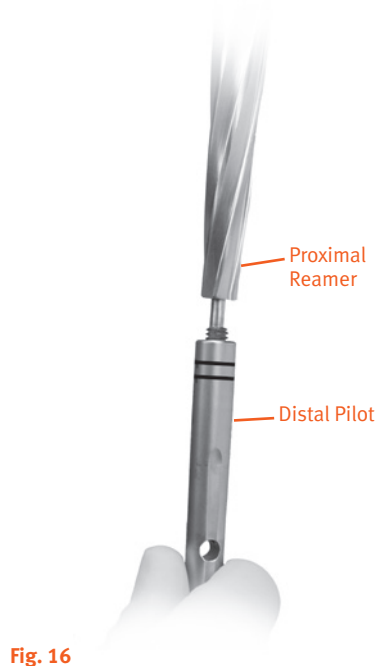
Select the appropriate tapered *Trabecular Metal* Proximal Humeral Reamer (see chart above). The tapered Proximal Reamers are matched to the implant size.

Note: Consecutive odd and even distal stem diameters use the same tapered Proximal Reamer (e.g. the 9mm and 10mm stems use the 9/10mm tapered Proximal Reamer). The 6mm and 8mm stems use the 6mm and 8mm Proximal Reamers, respectively.

Attach the Distal Pilot matching the reamed humeral canal to the tapered Proximal Reamer (Fig. 16). The Distal Pilot should spin freely.

Note: 6mm Reamer does not use a Distal Pilot.

Attach the T-handle and manually ream the proximal humerus until the Reamer is flush with the **proximal-lateral edge** of the canal opening (Fig. 17).



Stem Provisional Insertion

Attach the appropriate Distal Pilot to the *Trabecular Metal* Humeral Stem Provisional (Fig. 18). Choose the Proximal Provisional that matches the Proximal Reamer that was used and the Distal Pilot that matches the Distal Reamer used. Consecutive odd and even distal stem diameters use the same Proximal *Trabecular Metal* Humeral Stem Provisional (e.g. the 9mm and 10mm stems use the 9/10mm Proximal *Trabecular Metal* Humeral Stem Provisional).

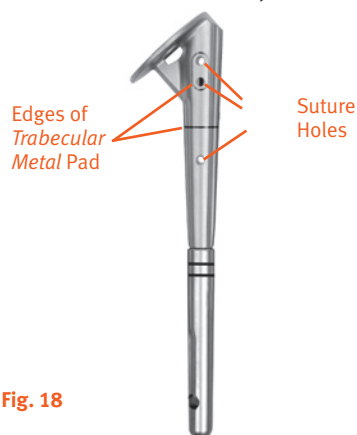


Fig. 18

Note: The 6mm stem uses the “monoblock” 6mm provisional.

Attach the Proximal *Trabecular Metal* Humeral Stem Provisional to the Humeral Stem Inserter/Extractor by the following steps:

- 1 Open the Humeral Stem Inserter/Extractor Handle completely.
- 2 Retract the Clamp Arm approximately half way.
- 3 Insert the Distal Tip into the Inserter/Extractor hole on the *Trabecular Metal* Humeral Stem Provisional Assembly.
- 4 Advance the Clamp Arm into the hole located in the center of the collar until it is completely seated in the provisional.
- 5 Close the Inserter Handle.

There are 20-degree and 40-degree holes on the Inserter/Extractor to allow for verification of the stem retroversion using the Threaded Alignment Rods (Fig. 19).

Technique Tip: To facilitate access to the humeral canal, the shoulder should be off the table. To accomplish this, push the elbow back and externally rotate the arm.

The Alignment Rods may be removed prior to impacting the Humeral Stem Provisional. Insert and impact the Humeral Stem Provisional into the humeral canal until the collar is flush with the cut surface (Fig. 20). The fin on the Proximal Humeral Stem Provisional is self-cutting to prepare a path for the fin on the stem implant. This should place the humeral component in the correct degree of retroversion for that patient. Remove the Inserter/Extractor by opening the handle completely.

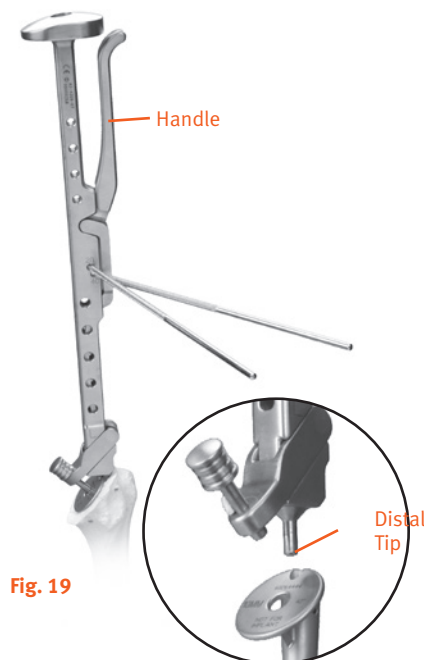


Fig. 19

Use a curette to remove any bone from the center hole of the Humeral Stem Provisional. This will allow for later placement of the Humeral Head Provisional (Fig. 21). Leave the Humeral Stem Provisional in place to help minimize bleeding and protect soft tissue during the glenoid preparation.

Note: If a total shoulder is being performed, glenoid preparation would occur at this point. Refer to the *Bigliani/Flatow Total Shoulder Arthroplasty Surgical Technique* for additional information.



Fig. 20

Fig. 21

Humeral Head Selection

Choose the Humeral Head Provisional from the *Bigliani/Flatow* Humeral General Instrument Tray that best covers the prepared surface of the proximal humerus and fills the rotator cuff circumferentially. Standard and offset heads are available. Insert a metallic Capture Pin into the Humeral Head Provisional (Fig. 22). The resected humeral head can be used as an initial reference for choosing the humeral head size (Figs. 23a & 23b).

Note: If the humeral head height is matched to the resected head, use of the stem collar counterbore will maintain the appropriate height. If the counterbore tool is not used, the effective head height will be increased by approximately 2-3mm.

Place the Humeral Head Provisional on the Humeral Stem Provisional to the point where the head is at the level of the rotator cuff insertion. The humeral head must at least reach or slightly overhang the calcar medially (Fig. 24). If using an offset head, rotate the head into the proper anatomical position and mark the position on the bone at the etched line labeled “MAX”.

Reduce the joint and check the fit on both the superficial and deep surfaces. Applied pressure to the appropriate humeral head will sublux the head about 50 percent of its diameter posteriorly and inferiorly, falling back into place when the pressure is released. A head that does not fill the capsule will dislocate over the glenoid rim, and one that overstuffs the joint will not allow this “50-50” laxity assessment. Pull the subscapularis muscle over the joint. If the fit is too tight, release the tendon as necessary. Often, releasing the subscapularis from the anterior labrum and capsule will provide sufficient mobilization to the neck of the humerus. Remove the provisional components and perform any necessary soft tissue releases.

If the humeral component is placed too low, the greater tuberosity will be relatively prominent and may impinge under the acromion. This condition can limit the range of motion. In addition, the resulting vector forces will drive the humeral head down against the inferior margin of the glenoid and can contribute to rocking and possible loosening. Therefore, it is important to always check that the superior aspect of the humeral head is above the superior aspect of the greater tuberosity.

If the humeral component is placed too high, the supraspinatus muscle will be under too much tension around the prominent lateral margin of the humeral head. In addition, the uncovered calcar can abut under the inferior margin of the glenoid component and may lead to glenoid rocking and possible loosening.

It is important to keep in mind the very precise relationship of the glenoid articular surface to the tuberosities and rotator cuff insertions so that contracture of the rotator cuff muscles and capsule do not eccentrically load the glenoid. The relationship of this entire complex to the acromion is also critical. The subacromial space should just accommodate the functional rotator cuff and tuberosities.

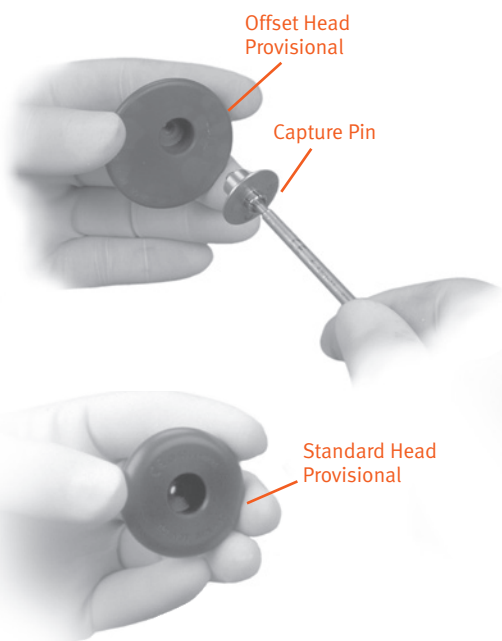


Fig. 22

Fig. 23a

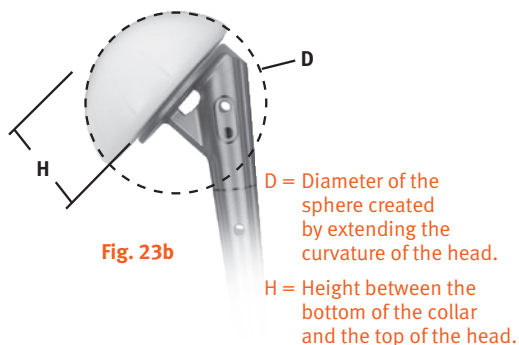


Fig. 23b



Fig. 24

Countersinking the Humeral Component

If countersinking of the humeral component is desired, assemble the appropriate Stem Collar Counterbore (42° or 48°) using the appropriate size Distal Pilot to match the stem diameter chosen (Fig. 25a). Using the pin wrench, attach the Straight Driver to the counterbore (Fig. 25b) and make sure the tabs on the Straight Driver and the slots on the counterbore line up. Insert the distal pilot of the counterbore assembly into the humeral canal (Fig. 25c). (Do not use the Angled Driver.) Using the Ratcheting T-handle, counterbore the resected surface of the proximal humerus. The counterbore depth of cut is limited, and the Stem Collar Counterbore will bottom out (Fig. 25d). **When removing the counterbore, do not pull up in line with the shaft of the driver. Instead, pull up in line with the axis of the humeral shaft.**

Stem Collar Counterbore

Distal Pilot

Fig. 25a

Fig. 25b

Fig. 25c

Straight Driver

Insert Pin Wrench

Fig. 25d

Attach the Humeral Stem Provisional/ Distal Pilot to the Humeral Inserter/ Extractor and reinsert the provisional to ensure that the collar is completely countersunk (Fig. 26).

Provisional Stem

Fig. 26

Final Humeral Preparation

Attach the Inserter/Extractor to the Humeral Stem Provisional. Apply the Slaphammer Weight to the Inserter/Extractor, and repeatedly impact until the Humeral Stem Provisional is removed from the canal (Fig. 27).

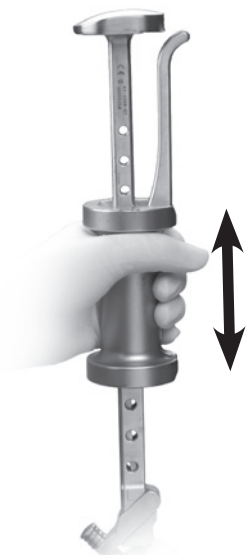


Fig. 27

Before inserting the final humeral component, drill four or five suture holes through the anterior neck of the proximal humerus. The drill holes should start superior, just anterior to the bicipital groove and proceed inferiorly to the inferior aspect of the neck just in front of the midline. Place heavy number 2 braided nylon sutures with swedged-on needles prior to cementing and/or inserting the implant. Each needle should progress from the outside cortex to the inside so that the same needle is used to place the sutures through the subscapularis tendon. By placing the subscapularis tendon more medially against the neck of the humerus, the tendon is effectively lengthened because it does not have to be placed lateral to the lesser tuberosity.

Cemented & Press-fit Techniques Intraoperative Assembly

Cemented Technique

If using a Cement Restrictor Plug, insert a plug one centimeter distal to the tip of the Humeral Stem. The final selection of stem size is a matter of surgeon judgment based on the preferred cementing technique.

Thoroughly clean and dry the canal. Inject cement into the humeral canal. Use a finger to thoroughly pack the cement. Attach the humeral component to the Inserter/Extractor and insert the stem into the canal.

Press-fit Technique

The Humeral Stem can be press-fit by sizing to the reamed diameter. Refer to Sizing Chart on page 2 for press-fit/clearance conditions. Attach the humeral component to the Humeral Stem Inserter/Extractor and insert the stem into the canal (Fig. 28).

Stem Insertion Steps for Cemented & Press-fit Techniques

- ① Open the Humeral Stem Inserter/Extractor handle completely.
- ② Retract the Clamp Arm approximately half way.
- ③ Insert the Distal Tip of the Humeral Stem Inserter/Extractor into the proximal hole on the implant.
- ④ Advance the Clamp Arm into the divot in the center of the taper until it is completely seated within the divot.
- ⑤ Close the Inserter Handle.

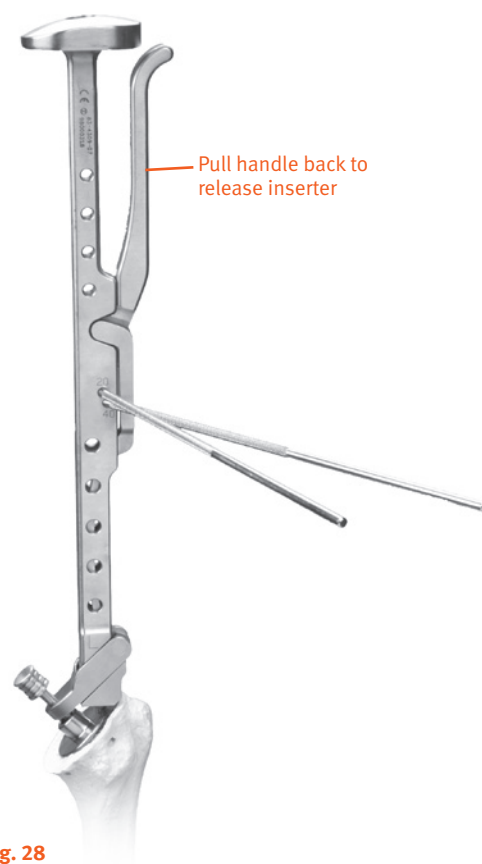


Fig. 28

Insert the two Alignment Rods into the 20-degree and 40-degree holes of the Inserter/Extractor and check retroversion (Fig. 29). When properly aligned, fully insert the stem into the canal. The Threaded Alignment Rods may be removed. Impact the component with a few light taps of the mallet. When the counterbore has been used, be sure that the collar of the component is seated flush with the cut surface of the humerus (Fig. 30).



Fig. 29

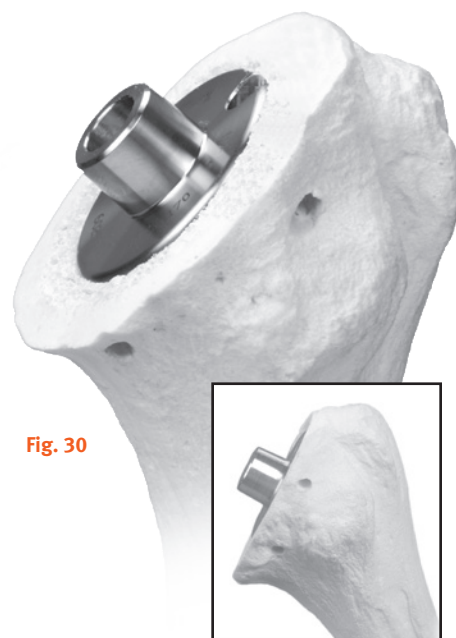


Fig. 30

Humeral component seated flush with the cut surface of the humerus.

Note for Cemented Technique: The humeral head should be assembled to the implanted stem only after the cement has been allowed to fully cure.

Remove the Capture Pin and place the Humeral Head Provisional on the humeral stem taper. Perform a trial reduction to check subscapularis tension. The subscapularis, when reinserted, should allow for 30 to 45 degrees of external rotation. However, sometimes with a chronically contracted rotator cuff, this is not possible. If the closure is too tight, a lower profile head may be used. Once the final head size has been selected, remove the Humeral Head Provisional.

Thoroughly clean the humeral stem taper. If using an offset humeral head, attach the offset humeral head component to the Offset Humeral Head Inserter so the single prong is positioned at the “MAX” or previously marked indication (Fig. 31). Make sure single-use Protective Sleeves (00-4303-075-01) are properly in place on the prongs of the Offset Humeral Head Inserter. Insert the final humeral head component so the single prong is at the mark made earlier (Fig. 32). If using a standard head. Assemble the taper by hand. Apply the Humeral Head Pusher to the head and impact it with a mallet (Fig. 33). Make sure that the head is firmly attached. Then reduce the joint and assess stability.

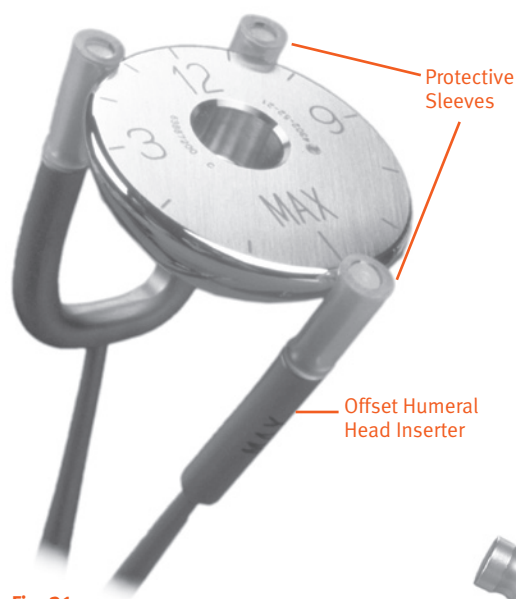


Fig. 31

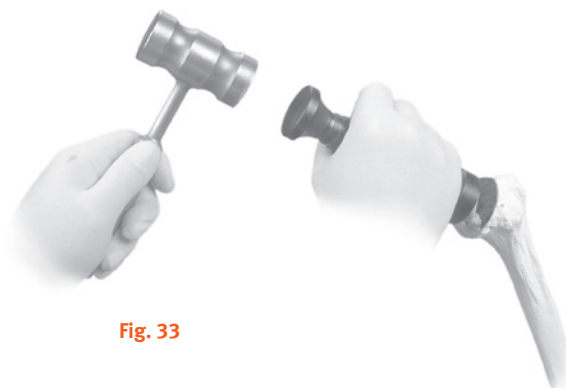


Fig. 33



Fig. 32

Closure

After the definitive humeral head and stem prosthesis has been securely implanted, irrigate the wound and retrieve the previously prepared sutures from the anterior neck of the proximal humerus (page 13). Suture the subscapularis tendon inferiorly and repair it progressively to the superior sutures with the arm placed comfortably in 20 degrees to 30 degrees of external rotation. Insert a *Hemovac*® Wound Drainage Device, being careful to avoid the axillary nerve. Close the deltoid and the subcutaneous layers. Then close the skin.

Postoperative Management

On the first postoperative day, the patient typically begins passive, assisted range of motion. This should include pendulum exercises, assisted forward elevation exercises in the standing and supine positions, and external rotation exercises with a stick in the supine position with the arm slightly abducted. The patient is typically discharged at two to four days postoperative, but should continue exercises as an outpatient with goals of 140-degrees forward elevation and 40-degrees external rotation within two to three weeks. Further range of motion is progressively achieved with stretching exercises. Active exercises are typically started after one to two weeks depending on the pathology. Active internal rotation should be avoided, however, as the subscapularis muscle has been repaired. After six weeks, more resistant strengthening exercises should be started. These exercises should emphasize stretching and balancing the range of motion. Strengthening is a secondary concern that need not be achieved until several months postoperatively.

Humeral Head Removal

Should a humeral head ever have to be removed, slide the Head Distractor between the collar of the humeral stem and the undersurface of the humeral head (Fig. 34). Firmly tap the end of the instrument to loosen the head. This instrument can be used to remove either provisional heads or implants.



Fig. 34

Intraoperative Stem Removal

Should the *Trabecular Metal* Humeral Stem ever need to be removed during initial implantation surgery, a Slaphammer can be used. Apply the Slaphammer Weight to the Inserter/Extractor, and repeatedly impact until the Humeral Stem is removed from the canal (Fig. 35).

Standard Slaphammers may be attached by threading into the proximal end of the humeral Inserter/Extractor.

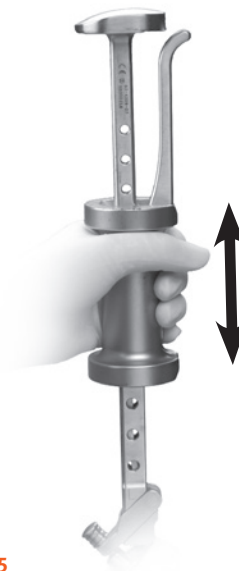


Fig. 35

This documentation is intended exclusively for physicians and is not intended for laypersons. Information on the products and procedures contained in this document is of a general nature and does not represent and does not constitute medical advice or recommendations. Because this information does not purport to constitute any diagnostic or therapeutic statement with regard to any individual medical case, each patient must be examined and advised individually, and this document does not replace the need for such examination and/or advice in whole or in part. Please refer to the package inserts for important product information, including, but not limited to, contraindications, warnings, precautions, and adverse effects.

Contact your Zimmer representative or visit us at www.zimmer.com

The CE mark is valid only if it is also printed on the product label.



97-4309-102-00 Rev. 1 1009-E07 5ML Printed in USA ©2010 Zimmer, Inc.