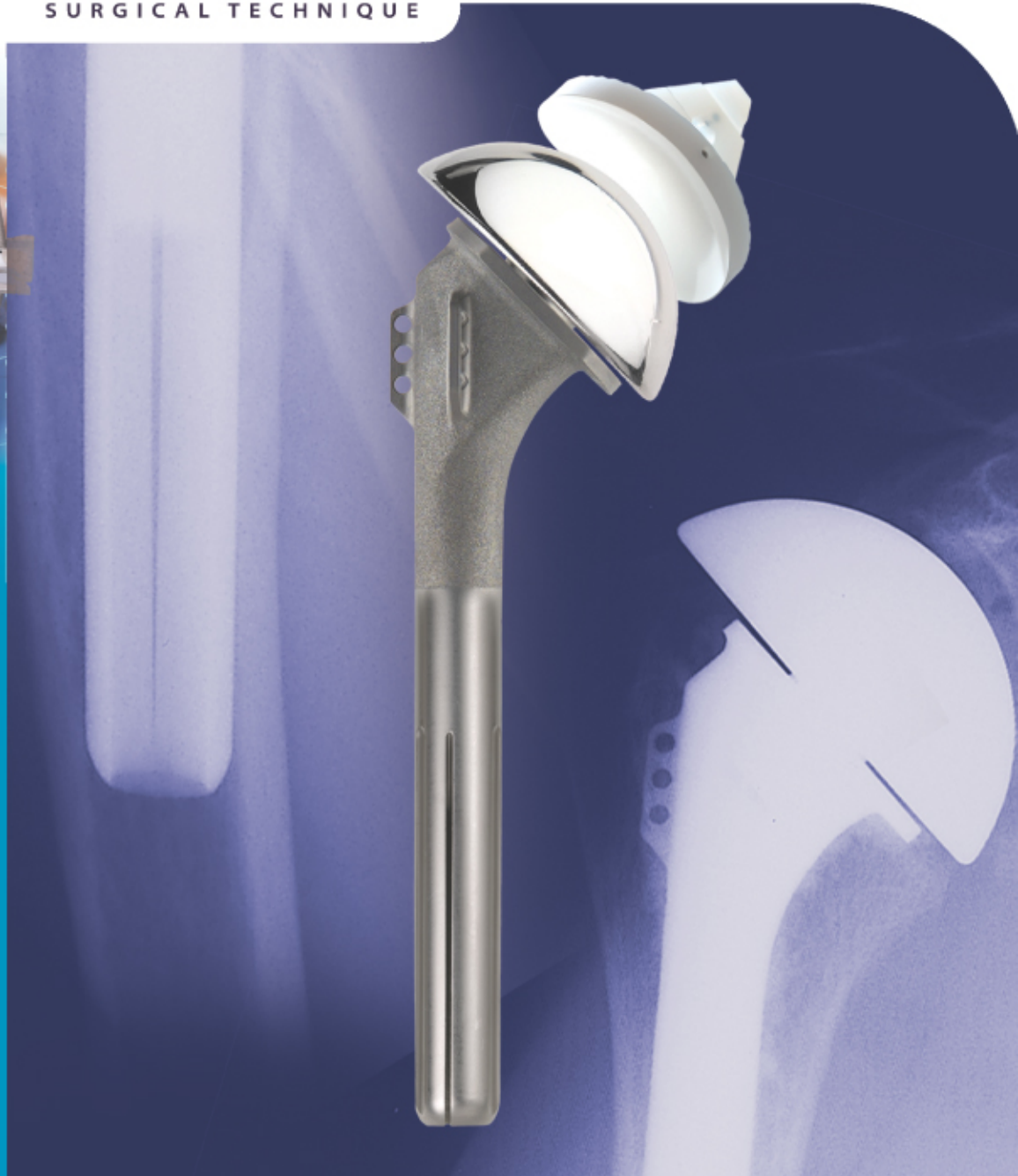


EXTREMITIES solutions

OLYMPIA™

TOTAL SHOULDER SYSTEM

SURGICAL TECHNIQUE




**WRIGHT
MEDICAL
TECHNOLOGY**
A Wright Medical Group Company

OLYMPIA™
shoulder **SYSTEM**

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ordering information 15

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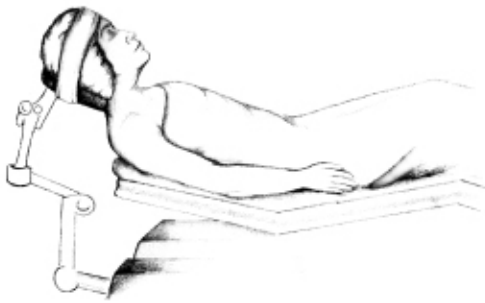
OLYMPIA™
total shoulder **SYSTEM** as described by **Christopher M. Jobe, M.D.**

Proper surgical procedures and techniques are the responsibility of the medical professional. The following guidelines are furnished for informational purposes only. Each surgeon must evaluate the appropriateness of the procedures based on his or her personal medical training and experience. Prior to the use of the system, the surgeon should refer to the product package insert for complete warnings, precautions, indications, contraindications and adverse effects. Package inserts are also available by contacting Wright Medical Technology, Inc.

OLYMPIA™ shoulder SYSTEM SURGICAL TECHNIQUE

1 | PATIENT POSITIONING

The basic position is the 'beach chair' (incline of approximately 35°) with the following essential points: the torso should be secured to prevent rolling off the bed; the head must be secured perhaps with a neuro-surgery rest; the scapula should have something like a rolled towel or bean bag against its vertebral border to hold it still while reaming the glenoid; the arm must be free to be held vertical for humeral preparation.



2 | INCISION

The incision is a curvilinear deltopectoral approach running in the line of skin tension: vertical just lateral to the tip of the coracoid and then swinging lateral inferiorly.



OLYMPIA™
shoulder **SYSTEM**

HUMERAL PREPARATION

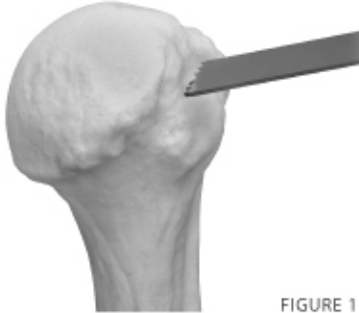


FIGURE 1

After releasing the anterior and inferior portions of the capsule from the humerus, progressively luxate the humeral head forward by an external rotation movement and slight abduction. This maneuver exposes more inferior capsule for release.

This maneuver must be done with particular care, especially in elderly patients and in cases of rheumatoid polyarthritis. Any resistance indicates the necessity for further releasing of the capsule or removal of posterior osteophytes.

Placement of Hohmann-type retractors allows for proper exposure of the humeral head while protecting the periarticular soft tissue.



FIGURE 2A

3 | INITIAL REAMING AND HUMERAL HEAD RESECTION

Resection of the humeral head is one of the critical points of the surgical procedure. The surgeon can choose any one of the following three methods:

FREEHAND HUMERAL RESECTION

Surgeons who prefer to make a freehand resection should determine the articular margin and make a 45° cut | FIGURE 1. A planer will be used later in the technique to adjust or correct the version, height, and/or angle of the initial resection. Proceed to step 4.

HUMERAL RESECTION USING A HAND HELD GUIDE

This method is similar to the freehand humeral resection method. In this method, however, the surgeon may choose to hold the cut block against the humerus while making the cut. Holding the block | FIGURE 2A, 2B will help control the 45° angle of the cut. Proceed to step 4.

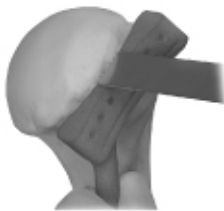


FIGURE 2B

INTRAMEDULLARY ALIGNED HUMERAL RESECTION USING A PINNED GUIDE

Initial Opening

The surgeon must first locate the humeral axis and initiate a small opening at the superior portion of the head close to the greater tuberosity, just behind the canal of the bicipital groove near the anatomical neck | FIGURE 3.



FIGURE 3



FIGURE 4

Initial Reaming

Use the 6mm reamer to enlarge the hole and prepare the medullary canal.

The reamer should be inserted to a depth equal to or greater than the groove in the teeth | **FIGURE 4**.

The goal at this point is not to ream to the cortical wall of the medullary canal. The surgeon should continue sequentially reaming to achieve good central position and orientation for the resection guide.

NOTE | All reaming should be performed by hand.

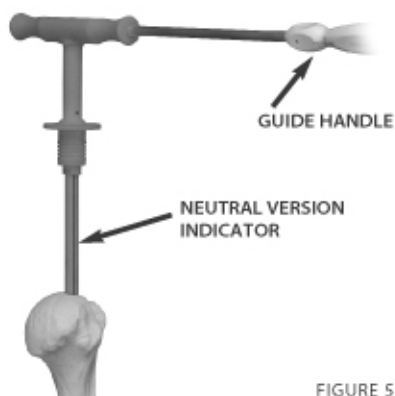


FIGURE 5

Forearm Alignment and Resection Guide Placement

Once cortical contact has been achieved, the guide handle is inserted into the T-handle and the reamers rotated to neutral version by aligning the guide handle with the forearm. The marking on the reamer now represents neutral humeral head version | **FIGURE 5**.

Remove the T-handle from the reamer and place the humeral resection guide on the body of the reamer. The resection guide allows accurate resection of the humeral head by taking into consideration two important criteria required by the surgeon for the correct alignment of the humeral implant in the bone:

- 1 | the height and angle of cut to insure correct seating of the implant on the osteotomy and
- 2 | the degree of retroversion preferred by the surgeon.

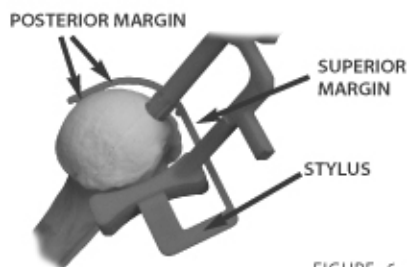


FIGURE 6

Setting the Retroversion

There are several options available to the surgeon for setting the version of the resection. These options are dependent upon the patient's anatomy, amount of disease and the surgical exposure.

Option 1:

If the surgeon is able to visualize the articular margins, the stylus can be used to set the resection guide at the patient's normal version and height | **FIGURE 6**. Use the locking knob | **FIGURE 7** to secure the resection guide on the reamer at the desired retroversion and height.

Option 2:

If another method of determining the retroversion (pre-op X-ray, CT, etc.) has been applied, the resection guide can be rotated about the reamer | **FIGURE 7**. The locking knob is then tightened to secure the resection guide on the reamer at the desired retroversion and height.

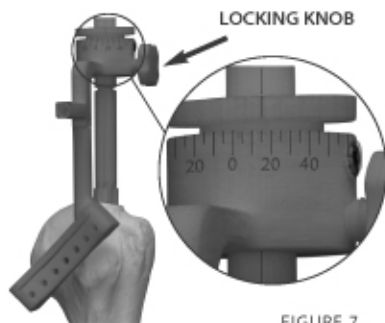


FIGURE 7

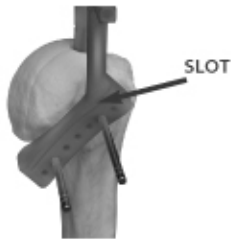


FIGURE 8

Cut Block Pin Insertion

Once the version and depth of the cut has been set, the pins can be inserted through the cut block. At least two pins must be inserted. Hole selection is the surgeon's preference. Pins inserted laterally should only be partially inserted so as not to interfere with the reamer | **FIGURE 8**. Predrilled holes should be 3.0mm.



FIGURE 9

With the pins in place, remove the upper portion of the resection guide along with the reamer. The upper portion of the resection guide should simply pull up and off the cut block. Slide the block along the pins until it contacts bone. Finish impacting both pins making sure to leave enough for the pin puller to grasp | **FIGURE 9**.

NOTE | To prevent the pins from backing out during the resection, bicortical fixation is recommended for the medial pin. The lateral pin insertion can be made bicortical after reamer removal.

Humeral Head Resection

Use an oscillating saw with a 0.050" thick saw blade to resect the humeral head. The cut can be made using the slot | **FIGURE 8** or the bottom face of the cut block | **FIGURE 10**. After the cut is complete, remove the cut block and use the pin puller to remove the pins.



FIGURE 10

4 | FINAL HUMERAL PREPARATION

Continue reaming using a sequential reaming technique until cortical contact is achieved, or the desired size has been reached. As shown, the desired depth is indicated when the groove on the reamer is level with the center of the reamed hole | **FIGURE 11**.

NOTE | Due to the highly variable elliptical shape of the distal humeral canal, it may not always be possible to ream to the full depth indicated on the reamer. In these instances and when the surgeon does not intend to use cement to fix the stem, the final reamer only needs to be placed to the depth indicated on the reamer as "min slot". As long as a sequential reaming technique has been applied, the distal canal will only be 1mm in diameter less than the diameter of the proximally reamed canal allowing the surgeon to implant a tri-slotted stem

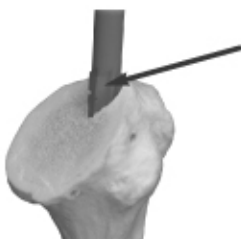


FIGURE 11

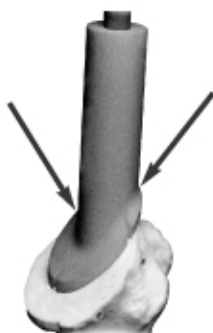


FIGURE 12

OPTIONAL | Before proceeding to the trial insertion, the version marking guide can be placed over the final reamer to mark the locations for the insertion of the stem fins | **FIGURE 12**. An osteotome may be helpful in creating an initial opening for the fins of both the trial and implant stems. This is especially helpful when cementing an undersized stem to help avoid placing the stem at a valgus angle.

NOTE | When reaming for a fractured proximal humerus or when the proximal humerus is otherwise compromised, the distal, cylindrical portion of the broach is 1mm undersized.

5 | TRIAL PROSTHESIS INSERTION

The diameter of the last reamer used indicates the final diameter of the stem of the prosthesis in a non-cemented application. Attach the trial/broach to the stem inserter and insert the trial/broach into the medullary cavity until the bottom face of the stem inserter is resting on the osteotomy | **FIGURE 13**.

NOTE | The version is controlled during insertion by attaching the guide handle to the stem inserter, setting the desired version, and aligning the guide handle with the forearm.

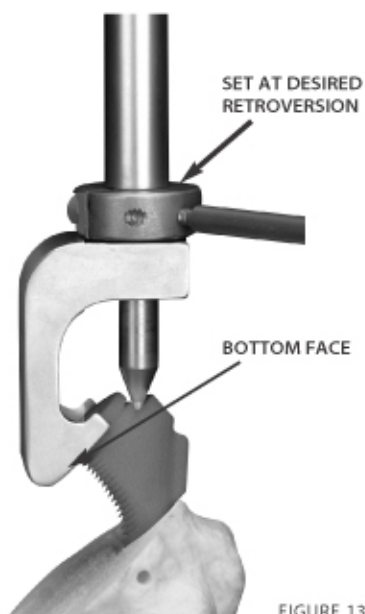


FIGURE 13

Remove the inserter and use the appropriate size countersink planer to create a recess for the stem platform. The calcar planer is then used to correct or adjust the initial osteotomy | **FIGURE 14**. If necessary, the pin from the stem inserter can be used to insert the trial/broach further into the humerus and the planing repeated | **FIGURE 15**.

NOTE | Use of both planers is necessary to insure a minimal head/ osteotomy gap and proper engagement of the head with the stem.

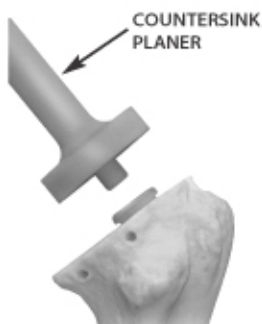


FIGURE 14



FIGURE 15

OLYMPIA™
shoulder SYSTEM HUMERAL HEAD SELECTION AND PLACEMENT

6 | HEAD SIZING AND POSITIONING

Humeral head selection is based on diameter of curvature and head height.

Standard head heights have 157° of articular arc.

Use the head sizing caliper or preoperative examination including patient gender and size to select the appropriate head size | FIGURE 16.

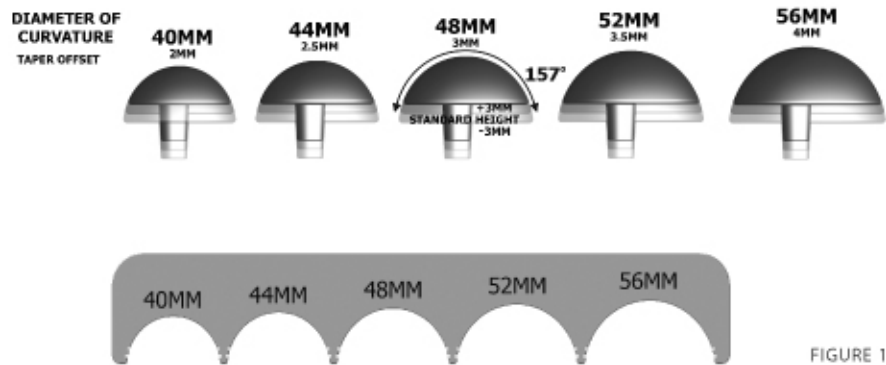


FIGURE 16

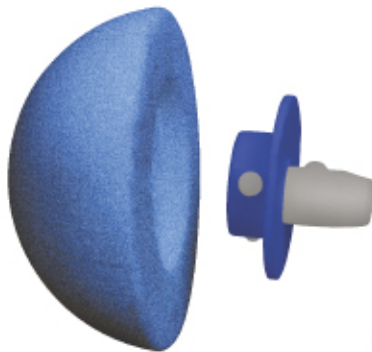


FIGURE 17

The selected head trial and corresponding trial adapter are assembled

| FIGURE 17 and placed on the humeral stem trial. The head trial is then rotated about its offset axis to achieve the best coverage of the osteotomy | FIGURE 18. If the humeral neck is still exposed on the anterior, posterior or medial sides after optimal positioning of the head, that bone can be removed with a rongeur. Using the most lateral marginal of the humeral osteotomy as a reference point, record the dial setting on the head trial.

NOTE | The amount of medial and posterior offset is controlled by both the head height and the rotational position of the head about its offset taper (up to a resultant 2.8mm of additional medial offset for the 56mm heads).

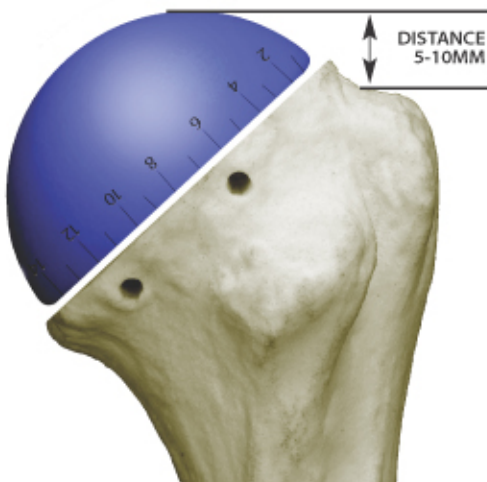


FIGURE 18

OLYMPIA™
shoulder SYSTEM GLENOID PREPARATION



FIGURE 19

7 | EXPOSING THE GLENOID REGION

Adequate exposure is essential for proper socket preparation. Free and retract the subscapularis muscle on the inside using a Hohmann-type retractor placed on the neck of the scapula and with one or two more retractors, expose the superior extremity of the humerus anteriorly. Extensive release of the capsule from the posterior humerus, inferior and posterior glenoid is necessary. Split the anterior and posterior capsule while carefully protecting the axillary nerve. Position the humerus in the abduction-flexion position and apply the rotation necessary to obtain the best access to the socket. The arm is supported on a padded arm board or side table in the position of rotation that offers the best exposure of the glenoid.

In order to protect the resected humerus while preparing and implanting the glenoid, humeral protectors are provided which attach directly to the stem trial/broach | FIGURE 19.

A modified FuLuda retractor is placed behind the glenoid to hold the humerus posteriorly. Excise the anterior part of the glenoid labrum and the residual capsular-synovial fragments to allow palpation or visualization of the base of the coracoid apophysis and of the anterior border of the neck of the scapula. The location of the neck of the scapula must be precisely determined especially at the inferior point so as not to position the implant too low.

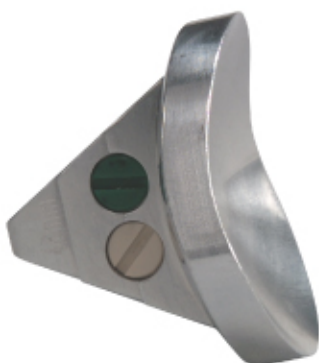


FIGURE 20

8 |

GLENOID SIZING

The glenoids are matched to the heads so that the surgeon can use a glenoid with either the same radius of curvature (conforming articular surfaces with limited translation) or the next size up (nonconforming articular surfaces with increased translational ability). For example, a 44mm head can be matched with either a 44mm or 48mm glenoid. The glenoid trial trials use a color coding system that makes it easy to identify matching components. For example, the 44mm head trial is green and the 44mm and 48mm glenoid trials have green markers | FIGURE 20.

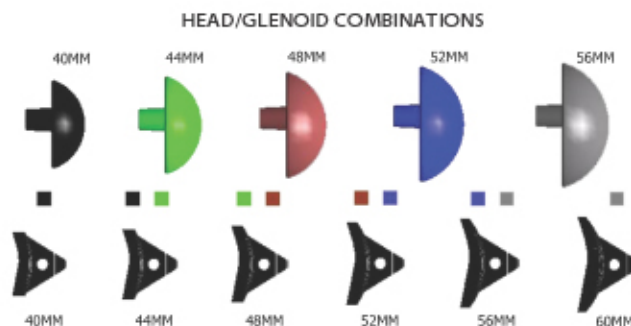




FIGURE 21

The inner dimensions of the glenoid prostheses are such that in a conforming application the humeral head is 28% covered by the glenoid. The pear shape of the glenoid makes it more anatomic and provides an effective way to gain coverage without causing glenoid impingement. The decision to use either a conforming or nonconforming glenoid is left to the surgeon. In instances where translation may not be an issue; i.e. where there are nearly normal mechanics, the surgeon may choose to use a conforming glenoid. Where soft tissue balance is worrisome the surgeon might use the nonconforming glenoid. After removing any remaining cartilage and soft tissue from the glenoid, use the translucent glenoid trials corresponding to the selected trial head size to determine how well they fit the glenoid face | FIGURE 21.

9 | DETERMINING GLENOID ORIENTATION AND DRILLING THE CENTERING HOLE

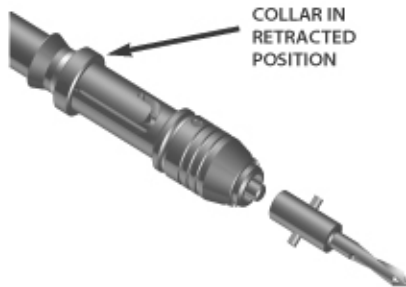


FIGURE 22

Preoperative glenoid orientation may be difficult to determine, especially in those cases where disease will not allow a good transaxillary lateral x-ray. For these cases a CT scan might be useful. (A quick-look CT might be an inexpensive option as well.) The use of prominent bony landmarks for orientation of the drills and reamers is not straight forward. Some orientation may be obtained by finger palpation of the neck of the glenoid (generally offset anteriorly to the blade of the glenoid). Superiorly the prominence of the coracoid base and inferiorly the inferior thickness of the scapula can be palpated. If a finger is placed in the valley between these two prominences of bone, drills and reamers can be oriented toward this finger and a reasonably perpendicular orientation obtained.

The starting point of the center of the glenoid may be hard to find due to osteophytes. These should be noted on the preoperative x-ray and/or CT scan and removed during surgery before choosing a centering hole. With the centering pin in the retracted position, attach the glenoid drill to the glenoid driver | FIGURE 22. Using the glenoid drill guide, create the centering hole in the desired location and orientation | FIGURE 23.

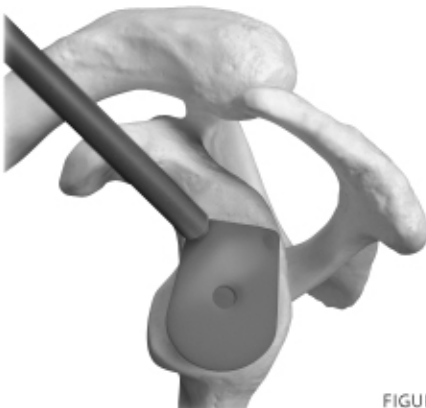
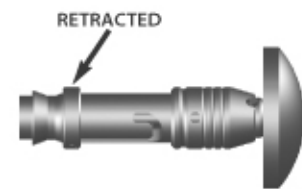


FIGURE 23



10 | GLENOID REAMING

With the appropriate size glenoid reamer attached, retract the centering pin on the glenoid driver allowing easier access to the glenoid cavity | **FIGURE 24**. Once the reamer is on the glenoid face, the centering pin can be locked in the extended position to provide stability while reaming | **FIGURE 25**. The 1cm extension length of the centering pin beyond the reamer will also help control the version of the reamed glenoid.

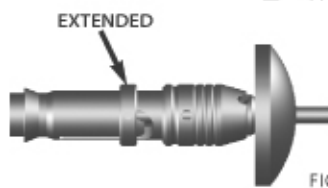


FIGURE 24

FIGURE 25

NOTE | The translucent glenoid trials can be used to help determine the reaming depth as well as how well the reamed glenoid conforms to the back surface of the glenoid implant.

11 | PREPARING THE KEEL SLOT

Osteophytes on the inferior edge of the glenoid may mislead you into placing the glenoid component too low. To avoid this error and verify length, width and depth as well as the direction of the opening for the keel of the glenoid implant, markings are made using the glenoid keel guide to identify the location of the glenoid slot. The superior hole is made first near the top of the glenoid to avoid error of low placement on the glenoid component | **FIGURE 26**.

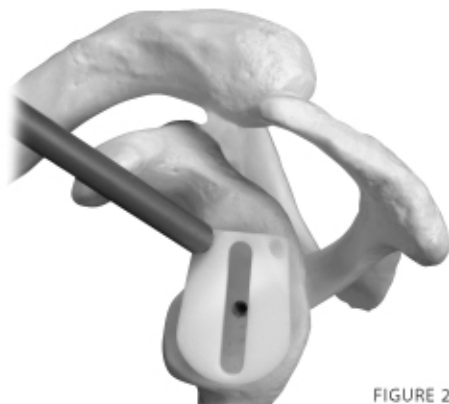


FIGURE 26

The first reference point must be made at the superior pole of the socket, at the level of the base of the coracoid apophysis, just below the superior border of the articular surface. Locate the second reference point underneath using the glenoid keel guide near the inferior pole and in alignment with the external border of the scapula.

Drill subsequent holes between these markings to delineate precisely the length and width of the implantation site. The glenoid keel punch can then be used to form the receptacle for the keel of the glenoid prosthesis | **FIGURE 27**.

12 | TRIAL FIT

Level the articular surface of the socket to fit perfectly with the bony side of the glenoid implant. This point in the procedure is particularly important - the glenoid implant must be absolutely stable and in contact with the bone on every portion of the bony side to avoid rocking. The trial glenoid is thus placed several times until perfect stability is achieved to allow for secure fixation with a minimum of bone cement.



FIGURE 27

13 | TRIAL REDUCTION

Remove the humeral protector from the stem trial/broach and reattach the trial head. Perform a trial reduction to verify the orientation, the translation and the degree of tension on the periarticular muscles, especially the subscapularis. Again, record the dial setting of the trial head as referenced to the lateral margin of the humeral osteotomy.

OLYMPIA™ shoulder SYSTEM IMPLANTATION

14 | GLENOID IMPLANTATION

This step is one of the most critical. Remove the glenoid trial and profusely irrigate the cavity with saline. Coagulate any bleeding and **dry the cavity**. Prepare the cement and apply in several phases. In the first phase apply small quantities of the earlier batch and pressurize to obtain a proper hemostasis. Then remove the majority of this cement except that which has intruded into the interstices of the cancellous bone. In the second phase, the final cement is added filling only the hole for the keel of the prosthesis. Do not fill the entire cavity - the keel will take up most of this cavity and you do not want cement to get between the implant backing and the glenoid subchondral bone. Cement can also be applied to the keel, but must not be applied to the implant backing.

Using the glenoid impactor, insert the implant. The keel will pressurize the cement further into the interstices of the bone. Impact the component until there is complete contact with the glenoid and firmly hold in place. Remove all visible cement from around the head of the prosthesis with a small curette. While the cement sets, irrigate the surgical wound several times with saline | **FIGURE 28**.

When the cement has hardened, test the implant to assure that there is no abnormal mobility where the implant meets the bone.

15 | HUMERAL IMPLANTATION

Non-Cemented Applications

In a non-cemented application, the stem size correlates to the size of the last even-numbered reamer used (6, 8, 10, 12, 14, or 16). Once the definitive head and stem have been selected they can be assembled **in situ** or on the back table. Assembly on the back table insures that the tapers are clear of any debris that might dampen the locking strength of the taper. Assembly **in situ** allows the surgeon to place a trial head on the definitive stem for a trial reduction. It also insures that the definitive head is “dialed” correctly and allows use of the retroversion insertion guide.



FIGURE 28



FIGURE 29



FIGURE 30



FIGURE 31



FIGURE 32

Back Table Assembly

If back table assembly is the preferred method, remove the taper plug and place the head on the stem. Using the lateral fin on the stem as the dial reference, turn the head using a twisting motion to the recorded dial setting obtained from the trial reduction | **FIGURE 29**. Place the components into the back table assembly fixture and apply three quick mallet strikes on the humeral head impactor | **FIGURE 30**.

Hyperextend the humerus, remove the trial stem/broach and clean and irrigate the medullary canal with a saline and antibiotic solution. The assembled humeral prosthesis is then implanted. The humeral head impactor can be used to insert the implant taking care to control the version of the implant as it is inserted. When the implant is inserted correctly, the bottom of the prosthetic head will sit nearly flush against the osteotomy | **FIGURE 31**.

In Situ Assembly

If in situ assembly is the preferred method, hyperextend the humerus, remove the trial stem/broach and clean and irrigate the medullary canal with a saline and antibiotic solution. Attach the desired stem to the inserter and insert the stem into the canal taking care to control the version of the stem. **Do not fully insert the stem.** The stem platform should be left a few millimeters above the osteotomy for the attachment of the head | **FIGURE 32**.



FIGURE 32

Remove the inserter and taper plug. The taper must remain dry and free of any tissue or debris. Using the lateral fin on the stem as the dial reference, place the prosthetic head on the stem and turn the head using a twisting motion to the recorded dial setting obtained from the trial reduction | **FIGURE 32**. Three quick mallet strikes on the humeral head impactor locks the taper connection. As a safety precaution, apply a twisting motion to the head to insure the taper is locked. Use the humeral head impactor to finish inserting the assembled humeral prosthesis into the humeral canal. When the implant is inserted correctly, the bottom of the prosthetic head will sit nearly flush against the osteotomy.

NOTE | By attaching the implant adapter to the head trial, | **FIGURE 33**, the head trial can be used with the definitive stem.

Fully or Proximally Cemented Applications

The use of cement is sometimes necessary depending on the type of pathology and the quality of the cancellous bone. In this case, after drainage, place an aspiration tube in the medullary canal. The technique, **FIGURE 33** or back table, applied here is the same as in a noncemented application, however, only non-slotted stems may be used for fully cemented applications. The slotted-stems may be used in cases where the surgeon is only cementing the proximal portion of the stem.

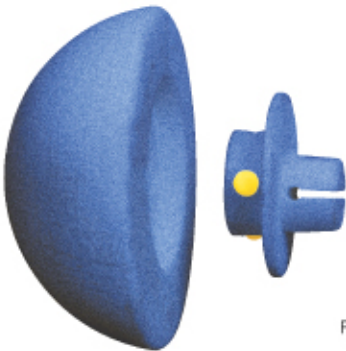


FIGURE 33

Inject the cement with a syringe, remove the drainage tube and place the final stem, using the stem introducer, while carefully controlling height and degree of retroversion. Once seated, remove excess cement.

NOTE | To insure the definitive head does not rest directly on the humerus and locks securely to the stem, it is necessary to place the trial head on the implant stem before attaching the definitive head. A small gap should be present around the entire resection.

NOTE | Since many surgeons cement an undersized stem, it is recommended that in step 4 the version marking guide be used to create starting notches for the fins of the implant. This can be easily accomplished with an osteotome and prevents the implant from being inserted at a varus angle.

NOTE | If removal of the modular head is necessary, utilize the head removal wedge.

OLYMPIA™
shoulder **SYSTEM** **CLOSURE**

CLOSURE

Reattach the subscapularis and close the deltoid and subcutaneous layers.

CONCLUSION

Total shoulder replacement remains a delicate surgical procedure.

Clinical indication, patient motivation, the quality of surgical technique, and the ability to adapt the surgical procedure to the specific pathology encountered, are all essential to producing successful results. Specifically, successful results depend on both the repair and rehabilitation of the rotator cuffs and deltoid, as well as the precise positioning of the prosthetic components.

OLYMPIA™
shoulder SYSTEM

ORDERING INFORMATION

HEADS

OLYMPIA™ Total Shoulder Heads | Standard

870H040	40mm
870H044	44mm
870H048	48mm
870H052	52mm
870H056	56mm

OLYMPIA™ Total Shoulder Heads | +3mm

870H140	40mm +3mm
870H144	44mm +3mm
870H148	48mm +3mm
870H152	52mm +3mm
870H156	56mm +3mm

OLYMPIA™ Total Shoulder Heads | -3mm

870H240	40mm -3mm
870H244	44mm -3mm
870H248	48mm -3mm
870H252	52mm -3mm
870H256	56mm -3mm

GLENOIDS

OLYMPIA™ Total Shoulder Keeled Glenoids

870GK40	40mm
870GK44	44mm
870GK48	48mm
870GK52	52mm
870GK56	56mm
870GK60	60mm

STEMS

OLYMPIA™ Total Shoulder Non-Slotted Stem | 75mm

870S006	6 x 75mm
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OLYMPIA™ Total Shoulder Non-Slotted Stem | 125mm

870S106	6 x 125mm
870S108	8 x 125mm
870S110	10 x 125mm
870S112	12 x 125mm
870S114	14 x 125mm
870S116	16 x 125mm

OLYMPIA™ Total Shoulder Slotted Stem

870SS10	10 x 125mm
870SS12	12 x 125mm
870SS14	14 x 125mm
870SS16	16 x 125mm

OLYMPIA™ Total Shoulder Revision Stem | 175mm

870S206	6 x 175mm
870S208	8 x 175mm
870S210	10 x 175mm
870S212	12 x 175mm

OLYMPIA™ Total Shoulder Revision Stem | 225mm

870S308	8 x 225mm
870S310	10 x 225mm
870S312	12 x 225mm

Patents pending.

NOTES



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Patents pending.

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