

**Comprehensive**<sup>®</sup> Reverse Shoulder System  
Superior Approach

**Surgical Technique**



One Surgeon. One Patient.®

**Over 1 million times per year, Biomet helps one surgeon provide personalized care to one patient.**

The science and art of medical care is to provide the right solution for each individual patient. This requires clinical mastery, a human connection between the surgeon and the patient, and the right tools for each situation.

At Biomet, we strive to view our work through the eyes of one surgeon and one patient. We treat every solution we provide as if it's meant for a family member.

Our approach to innovation creates real solutions that assist each surgeon in the delivery of durable personalized care to each patient, whether that solution requires a minimally invasive surgical technique, advanced biomaterials or a patient-matched implant.

**When one surgeon connects with one patient to provide personalized care, the promise of medicine is fulfilled.**

# Comprehensive<sup>®</sup> Reverse Shoulder System

## Superior Approach

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This brochure is presented to demonstrate the surgical technique and post-operative care protocol utilized by David Adkison, M.D.; Chad Smalley, M.D. Biomet as a manufacturer of this device does not practice medicine and does not recommend this device or technique. Each surgeon is responsible for determining the appropriate device and technique to utilize on each individual patient.

# Comprehensive<sup>®</sup> Reverse Shoulder System

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## Superior Approach

### Indications

Biomet Comprehensive<sup>®</sup> Reverse Shoulder products are indicated for use in patients whose shoulder joint has a grossly deficient rotator cuff with severe arthropathy and/or previously failed shoulder joint replacement with a grossly deficient rotator cuff. The patient must be anatomically and structurally suited to receive the implants and a functional deltoid muscle is necessary. The Comprehensive<sup>®</sup> Reverse Shoulder is indicated for primary, fracture, or revision total shoulder replacement for the relief of pain and significant disability due to gross rotator cuff deficiency. Glenoid components with Hydroxyapatite (HA) coating applied over the porous coating are indicated only for uncemented biological fixation applications. The Glenoid Baseplate components are intended for cementless application with the addition of screw fixation. Interlok<sup>™</sup> finish humeral stems are intended for cemented use and the MacroBond<sup>™</sup> coated humeral stems are intended for press-fit or cemented applications. Humeral components with porous coated surface coating are indicated for either cemented or uncemented biological fixation applications.

### Contraindications

absolute contraindications include infection, sepsis, and osteomyelitis.

Relative contraindications include:

1. Uncooperative patient or patient with neurologic disorders who is incapable or unwilling to follow directions.
2. Osteoporosis.
3. Metabolic disorders which may impair bone formation.
4. Osteomalacia.
5. Distant foci of infections which may spread to the implant site.
6. Rapid joint destruction, marked bone loss or bone resorption apparent on roentgenogram.



Figure 1



Figure 2



Figure 3

## Patient Positioning and Incision

### **Surgical Position**

The arm and shoulder are prepped and draped free (Figure 1). Utilize a modified beach chair position at about 30 to 40 degrees of flexion. For better exposure, use a hip bolster with the table slightly tilted away.

### **Surgical Incision/Exposure**

Utilize a supralateral Coronal plane incision (Figure 2) or a Sagittal plane incision (Figure 3).

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Figure 4



Figure 5a

Figure 5

## Humeral Preparation

Use a sharp dissection down to the deltoid fascia. Split the deltoid from the AC joint to 3 cm lateral to the acromial edge (Figure 4). Place 2 Kolbel retractors at 90 degree angles to each other, one holding the deltoid and the other spreading the skin. Ensure the skin retractor does not engage the muscle laterally.

\*Take great care to avoid dissection greater than 4 cm distal to the lateral border of the acromion to protect the Axillary nerve, which typically travels between 5 and 7 cm distal to the acromion.

Using the 4, 5 or 6 mm intramedullary reamer with the ratcheting T-handle, bore a pilot hole through the humeral head just lateral to the head's articular surface and just posterior to the bicipital groove (Figure 5 & 5a). This pilot hole may also be created with a 4 mm drill or high-speed burr. Insert the humeral intramedullary reamer until the teeth are flush with the top of the humeral head.



Figure 6



Figure 7

## Humeral Preparation (cont'd)

### **Intramedullary Resection Guide Assembly**

Place the superior approach resection guide boom onto the reamer shaft (Figure 6).

Assemble the resection guide arm to the resection guide and align with the crest of the greater tuberosity in the vertical plane (Figure 7).

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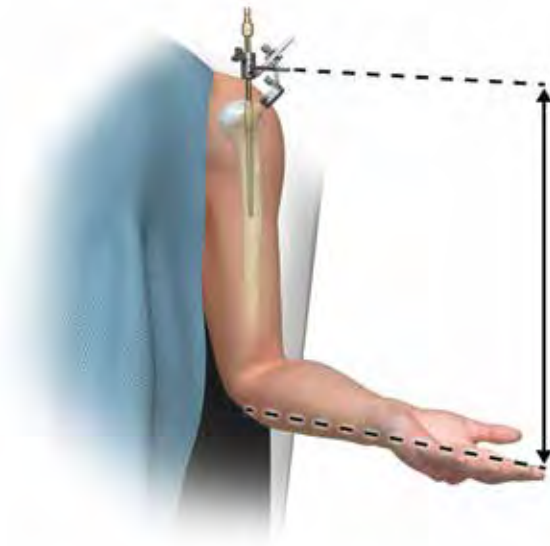


Figure 8



Figure 9

## Humeral Preparation (cont'd)

Screw the version control rod into the desired version hole (most common is 20 to 30 degrees), and align the rod with the forearm flexed at 90 degrees in external rotation (Figure 8).

Slide the resection guide against the humerus and finger tighten the thumbscrew. Place two Steinmann pins through the holes in the resection guide into the bone to secure the guide to the bone (Figure 9).





Figure 10



Figure 11



Figure 12

Note: Prior to making the humeral resection, a curved tissue probe or feeler gauge may be used to confirm the planned humeral cut (Figure 10).

**Note:** In chronic or fixed shoulders, a more aggressive humeral resection may be made at this point to create increased joint space for placement of the prosthesis. If there is uncertainty regarding the resection height, a standard resection should still be performed with the option to resect more bone later in the procedure.

Loosen the thumbscrews on the resection guide block and the reamer shaft (Figure 11). Remove the reamer and guide boom.

Place a small saw blade (approximately 0.5" wide) through the cutting slot in the guide. The saw blade should be in motion when it comes in contact with the bone (Figure 12). Resect the humeral head, and then remove the Steinmann pins and cutting block.

**Note:** Alternatively, surgeons may use the top or bottom of the guide to aid in resection.

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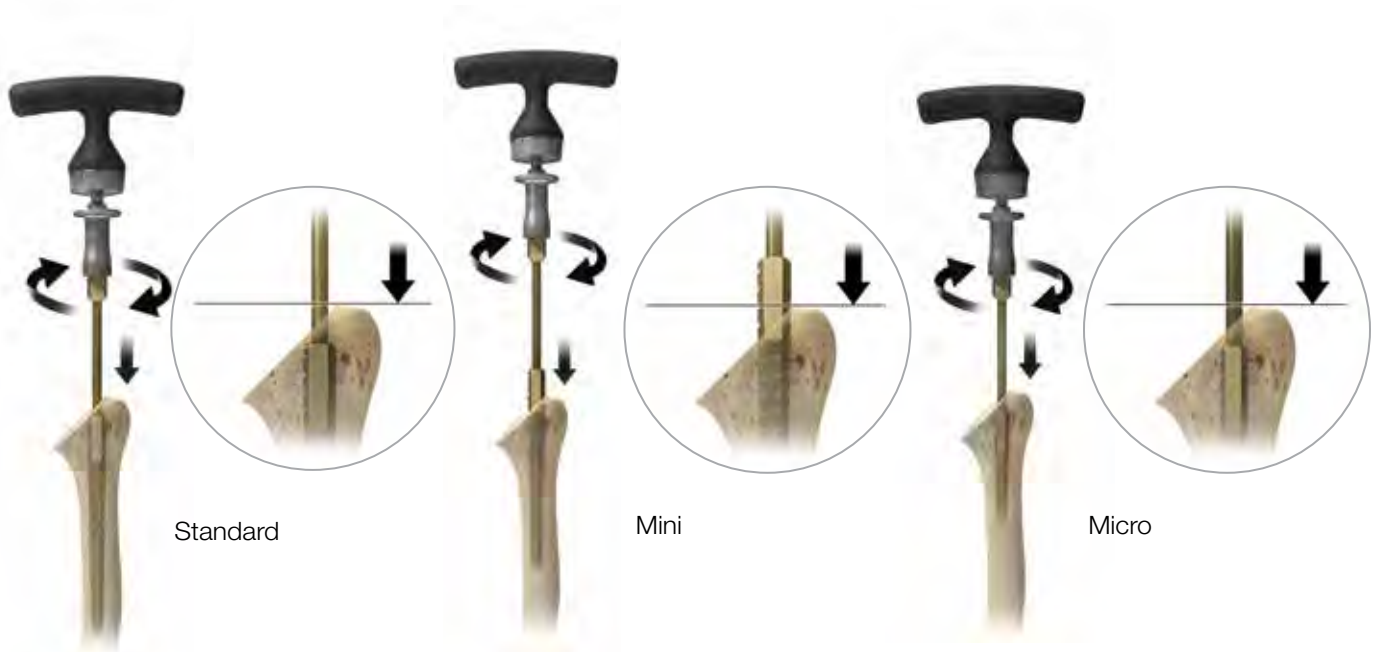


Figure 13

Figure 14

Figure 15

### Humeral Canal Preparation

After the humeral head has been resected, continue to ream in 1 mm increments until cortical contact is achieved. Note the reamer size for future reference.

**Standard Stem** – Using the standard length reamers, insert each reamer until the engraved line just above the cutting teeth is even with the greater tuberosity (Figure 13).

**Mini Stem** – Using the standard length reamers, insert each reamer until the large hashmark between the 3 and 4 on the reamer is even with the greater tuberosity (Figure 14).

**Micro Stem** – Using the Micro specific reamers, insert each reamer until the engraved line just above the cutting teeth is even with the greater tuberosity (Figure 15).



Figure 16

## Humeral Broaching

Using the reversed superior approach broach handle, select a broach that is at least 2 to 3 mm smaller than the last reamer used and attach it to the broach handle. Insert the version rod into the same position used during resection. Flex the forearm to 90 degrees, and externally rotate the arm to be parallel with the version control rod indicating the chosen amount of retroversion.

Sequentially broach/rasp in 1 mm increments until the broach size is equal to the “STD” size of the humeral reamer. For example, if the etching on the last reamer used indicated 10 mm, broach up to 10 mm (see stem sizing chart on page 31). Advance each broach into the humerus in several successive motions. The broach is fully seated when the collar on the broach inserter rests on the resected surface of the humerus (Figure 16). Remove the broach handle, leaving the last broach in place to be used as a trial.

**Note:** If broach feels too tight and will not seat, finish broaching with the next smaller size. There is approximately 1.5 mm of PPS® porous plasma spray proximally on the definitive implants.

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Figure 17

## Glenoid

Attach the threaded glenoid guide handle to the superior approach standard or mini glenoid baseplate sizer. Insert a gold short 3.2 mm Steinmann pin into the glenoid at the desired angle and position (Figure 17). A completely secure Steinmann pin is essential to ensure the subsequent reamer has a stable cannula over which to ream. The Steinmann pin is marked for a 25 mm and 30 mm central screw. After reaming, either read the length or utilize the central drill bit/depth gauge for additional screw lengths. A 10 degree inferior tilt has been built into the glenoid sizer; however you will need to account for any glenoid defects or asymmetric wear when placing the Steinmann pin. When the Steinmann pin is placed correctly within the guide, it will lie flush with the inferior groove. Ideally, the Steinmann pin should be placed into the best possible bone stock, keeping in mind the Versa-Dial<sup>®</sup> glenosphere can be offset up to 4.5 mm in any direction.\*

It may be helpful to section off the glenoid into quadrants for ease of placement of the Steinmann pin, as the best bone is often located centrally.

\* For the 36 mm standard glenosphere, the offset range is 1.5–3.5 mm.

**Note:** If using the Comprehensive<sup>®</sup> Reverse Mini Baseplate and the Mini Baseplate Taper Adapter (packaged together part # 010000589), it is critical to utilize only the Mini Baseplate instrumentation.

**Note:** Obtaining a pre-operative CT scan will help identify bone erosion which may effect glenoid tilt and/or version. It also helps locate best quality bone in which to place the baseplate.



Figure 18

Position the cannulated 3 blade baseplate reamer over the top of the short Steinmann pin (Figure 18). Ream the glenoid to the desired level, ensuring that the medial geometry of the glenoid baseplate is completely reamed. Due to the 10 degree inferior tilt of the steinman pin sizer, an inferior ridge should be evident first. A slight superior bone ridge should then follow, ensuring fully concentric reaming. It is common to see cancellous bone inferiorly, while cortical bone remains superiorly. It is critical that the glenoid is adequately reamed to ensure complete seating of the glenoid baseplate. Depending on the condition of the glenoid, the baseplate can be partially counter-sunk. This is accomplished by sinking the glenoid reamer until the desired inferior bone shelf is evident.



Figure 19

Remove the cannulated glenoid reamer, ensuring that the Steinmann pin remains securely positioned in the glenoid (Figure 19). If the Steinmann pin comes out, the baseplate trial can be used to reposition and place the Steinmann pin into the glenoid.

**Note:** There is not a stop on the glenoid reamer, so continual attention to the reaming depth is important.

**Note:** It is critical to remove excess bone and soft tissue that may prevent complete impaction of the glenosphere/taper assembly into the baseplate.

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Figure 20



Figure 21

### Glenoid Preparation

**Note:** If additional bone or soft tissue are present on the inferior shelf, utilize a rongeur to trim unwanted bone to ensure complete seating of the glenosphere. Using the cannulated trial glenoid baseplate, position the glenoid baseplate provisional over the Steinmann pin and into the prepared glenoid (Figure 20). If the glenoid Baseplate provisional does not fully seat, the baseplate reamer should be used to completely prepare the baseplate geometry.

### Baseplate Impaction

Application of saline or other appropriate lubrication to impactor tip o-ring should aid in distraction of impactor from baseplate after impaction. Place the glenoid Baseplate implant onto the end of the cannulated baseplate impactor (Figure 21). Reference the screw hole indicator hashmarks and grooves on the impactor to align the peripheral hole screw position as desired. All peripheral screw holes on the baseplate are identical, which allows them to be placed in any desired location. Once aligned, impact the Baseplate into the glenoid and remove the baseplate impactor. The back of the baseplate should be fully seated onto the face of the glenoid surface. Visual confirmation can be attained by checking for gaps between the reamed glenoid surface and baseplate at the screw holes. A small nerve hook may aid in confirming complete seating of the baseplate.

Due to the 10 degree inferior to superior orientation for the baseplate preparation, the baseplate may be partially or fully counter-sunk inferiorly.



Figure 22

The glenoid baseplate is now seated, and determination of the appropriate length 6.5 mm central screw can be made (Figure 22).



Figure 23

### **Baseplate Central Screw Selection/Insertion**

6.5 mm central screw length determination may be made in one of the following methods (Figure 23).

1. If Steinmann pin is removed or falls out, insert the central screw drill guide into the glenoid baseplate and drill a 3.2 mm diameter hole to the desired depth. Read corresponding depth marking on the 3.2 mm diameter drill from the back of the drill guide.

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Figure 24



Figure 25

2. Another option for determining screw depth is to utilize the depth gauge. Place the central screw depth gauge into the reverse Morse central taper of the glenoid baseplate and read the corresponding depth marking from the gauge (Figure 24).

Insert the desired length 6.5 mm central screw (Figure 25) and completely tighten with the 3.5 mm hex driver. To verify the 6.5 mm central screw is fully seated in the baseplate, a check with the central screw drill guide should be performed. Simply attach the central screw drill guide/template to the guide handle, and insert the guide into the reverse Morse taper of the baseplate.





Figure 26

If the guide sits flush on the baseplate without rocking or toggling, the central screw is completely and correctly seated (Figure 26).

If the guide does not sit flush, the central screw is not completely tightened. Additional effort should be made to inspect for unwanted soft tissue or debris behind the screw head; then fully seat the central screw. A fully seated central screw provides the best compression and fixation, as well as ensures the male taper of the glenosphere will fully engage.

**Tip:** The most common lengths of the central screw are 25 – 35 mm.

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Figure 27



Figure 28

### Peripheral Screw Selection/Insertion

Position the peripheral drill guide with bushing insert on the baseplate (Figure 27) and drill the superior hole using 2.7 mm drill (Figure 28).

Ensure the drill bushing is flush with the guide when reading the depth markings off of the drill. Remove the drill bushing insert from the guide.

As an alternative, a depth gauge is available. The peripheral screw depth gauge should be inserted directly into the desired baseplate peripheral hole noting the depth marking.

Note: The peripheral depth gauge should not be used in conjunction with a drill guide.



Figure 29



Figure 30

Select and tighten the appropriate length 4.75 mm screw through the channel in the drill guide using the 2.5 mm hex driver, and into the baseplate without completely tightening (Figure 29). Rotate the peripheral drill guide and bushing 180 degrees and repeat for opposing screw. Repeat these steps for the remaining two peripheral screws.

**Warning:** It is important to ensure the screw driver and screw are parallel with each other and fully engaged as you insert the screws using the included Ratchet handle and driver. Do not insert screws under power. Deviation from this technique may lead to stripping of the driver and screw interface. Once the screws are fully seated in the baseplate, do not over-tighten.

**Note:** It is advisable to inspect all screw drivers after each surgery and replace as necessary.

Tighten all peripheral locking screws in an alternating fashion until fully seated to complete baseplate screw insertion (Figure 30).

**Tip:** The most common lengths of superior and inferior screws are 25–35 mm. The most common length of anterior and posterior screws is 15 mm. Typically, locking screws are used in the superior and inferior holes, while nonlocking screws are used in the anterior and posterior holes.

**Note:** When used with locking screws, the baseplates peripheral holes are fixed at a 5 degree diverging angle.

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Figure 31

### Peripheral Screw Selection/Insertion (Optional Method)

As an alternative to using the peripheral drill guide with bushing insert, the peripheral drill guides (fixed angle or variable angle) that thread into each baseplate peripheral hole may be used. The threaded peripheral drill guide is threaded into the baseplate (Figure 31). With the 2.7 mm peripheral drill bit, drill the superior hole and read the desired depth marking at the end of the drill guide. Unscrew the threaded peripheral drill guide from the baseplate, and insert the appropriate peripheral screw. Repeat until all four peripheral screws are inserted, and fully tighten in an alternating fashion.

**Note:** If using the variable-angle threaded peripheral drill guide, the non-locking 4.75 mm peripheral screw must be used. Six degrees of angulation in any direction is possible.

**Note:** If using the fixed-angle threaded peripheral drill guide, either the locking or non-locking 4.75 mm peripheral screws may be used.



Figure 32



Figure 33

## Glenosphere Selection

Select the appropriately sized glenosphere trial and assemble to a trial taper adaptor. Determine the amount and orientation of glenosphere offset, keeping in mind that a fully inferior offset glenosphere provides the best opportunity to minimize or eliminate scapular notching (Figure 32). However, it is possible to orient the glenosphere offset in any direction including anterior/posterior, which may help with instability. Glenosphere provisionals are marked with an arrow to show offset direction. In addition to the amount and direction of offset, medialized or lateralized center of rotation glenosphere (+3 mm, +6 mm) are available depending on preference.

**Tip:** The most common glenospheres used are 36 mm.

After desired positioning of glenosphere trial is achieved, tighten the taper adaptor trial in the head trial with the 5/32 inch Versa-Dial® hex driver (Figure 33).

**Note:** It may be helpful to use the trial glenosphere wrench for optimal positioning and ease of use of the trial glenosphere.

**Note:** Utilizing forceps (part #402640) in conjunction with the slots located on the articulating surface of the glenosphere trial may aid in the removal of the trial.

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Figure 34



Figure 35

### Glenosphere Offset

Remove the glenosphere trial assembly from the glenoid baseplate. Determine the amount of offset needed by referencing the A, B, C, D, and E\* indications on the underside of the trial glenosphere and trial adaptor (Figure 34). This offset indicator will be referenced when preparing the definitive implant.

**Note:** The glenosphere removal fork may be required to remove the trial glenosphere from the glenoid baseplate.

\*The 36 mm standard glenosphere provisional is marked with B, C, D indications as the offset range is 1.5 mm to 3.5 mm for the definitive implant.

### Glenosphere Assembly

Place the glenosphere implant into the impactor base. Ensuring the components are clean and dry, insert the taper adaptor into the glenosphere (Figure 35). Rotate the taper adaptor until the trial offset is replicated. For example, if trialing indicated a fully offset glenosphere (position E), the implant taper adaptor is aligned so that the hashmark is positioned at position E on the definitive glenosphere head. \*For 36 mm Standard Glenosphere, the offset range is 1.5–3.5 mm (B–D).

#### Offset Indicator Offset\*

- A 0.5 mm
- B 1.5 mm
- C 2.5 mm
- D 3.5 mm
- E 4.5 mm



Figure 36

Engage the Morse taper with two firm strikes, using the taper impactor tool and mallet (Figure 36). The taper/glenosphere assembly is now secure.

**Note:** In the event the taper has been engaged in an incorrect position, the Versa-Dial® taper extractor (part number 407298) may be used to remove the taper adaptor from the glenosphere. After removal of the taper adaptor, a new taper adaptor should be used.



Figure 37

### Glenosphere/Taper Adaptor Offset Direction Determination

Place the glenosphere into the orientation block for determination of offset direction. Rotate the glenosphere until the implant reaches the point that is furthest on the orientation block scale. This orientation will represent the direction of the offset (Figure 37).

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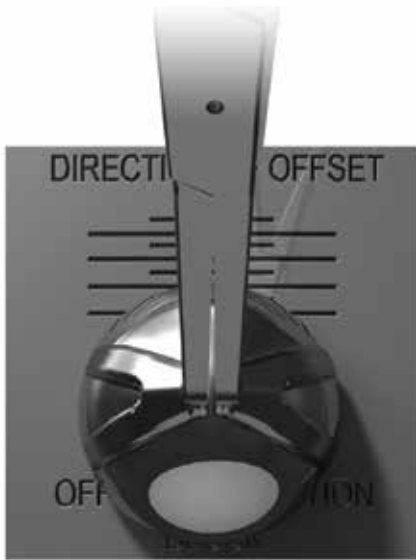


Figure 38



Figure 39

### Glenosphere/Taper Adaptor Offset Direction Determination

Place the glenosphere forceps over the top of the glenosphere and tighten using ratcheting mechanism (Figure 38). Another option for glenosphere insertion is the 2-prong inserter/impactor.

As an alternative to the glenosphere forceps, a surgical marker can be used to note the direction of the offset on the rim of the glenosphere. The glenosphere can then be inserted into the baseplate by hand.

### Glenosphere Orientation/Impaction

Once the reverse Morse taper of the baseplate has been cleaned and dried using the included taper swabs, engage the glenosphere using the forceps, and implant the glenosphere in the same orientation as the trial (Figure 39). It is recommended to hold the glenosphere while it is positioned within the baseplate. With two firm strikes, the concave glenosphere impactor should be used to engage the glenosphere into the baseplate. A screw is not needed to attach the glenosphere to the baseplate. The design of the Morse tapers provide secure fixation.

**Note:** If using the 2-prong glenosphere inserter, you may strike the end of the instrument to engage the glenosphere and taper assembly into the baseplate.





Figure 40



Figure 41

## Humeral Tray and Bearing Preparation

### Glenoid Preparation

Select the appropriately sized one-piece trial humeral tray/bearing. Noting the “SUPERIOR” and “INFERIOR” markings on the humeral tray, place the trial humeral tray/bearing into the Comprehensive® broach/trial backwards (superior side first) (Figure 40).

Then use the rotation tool to spin tray 180 degrees in the broach until the trial tray locks into the channel of the broach (Figure 41).

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Figure 42



Figure 43

## Humeral Tray and Bearing Preparation (Cont.)

Perform a trial reduction to assess range of motion and implant size selection (Figure 42). The included shoe horn may be helpful in reducing the joint. The trial reduction should show very limited distraction (1 mm or less). In cases of extreme instability, +3 mm retentive humeral bearings are available. Retentive bearings capture more of the glenosphere and have polyethylene walls which are 2–3 mm higher than standard +3 mm bearings, but do not add any additional joint space. The rotational tool can be used to aid in trail removal.

**Note:** The trail must be disengaged from the broach before attempting to rotate it to get out of the joint.

**Note:** Trial spacers are included in the set which allow the surgeon to test soft tissue tensioning, but are not used for range of motion (Figure 43).

**Note:** Additional humeral resection and subsequent re-reaming and re-broaching may be required if the joint is extremely difficult to reduce.

**Note:** Glenospheres and humeral bearings have been color coded to ensure only matching curvatures are used together.

**Tip:** The most common thickness of the tray and bearing is standard for each (STD-STD).

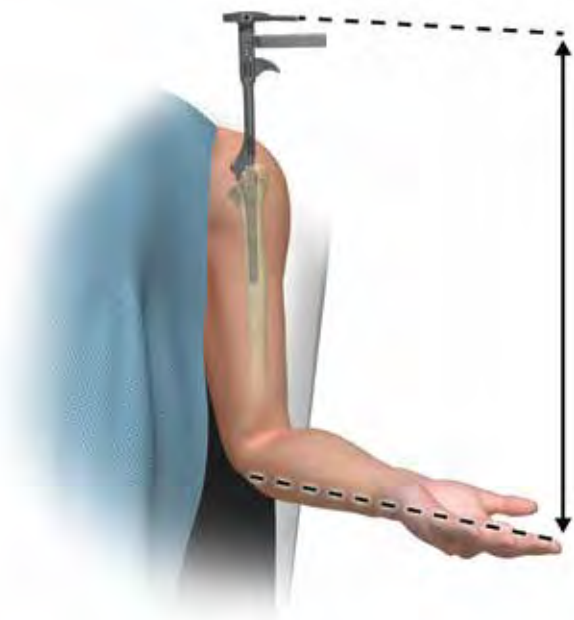


Figure 44



Figure 45

### Standard / Mini Stem Insertion Uncemented\*

Attach the broach handle to the broach/trial, and remove it from the humeral canal. In situations where fluid build-up prevents the broach inserter from engaging the broach, the broach extractor will enable removal of the broach. Select a humeral stem which matches the final broach/trial used. Assemble the humeral stem onto the humeral stem inserter. Place the version control rod into the appropriate version hole and align it with the forearm flexed at 90 degrees in external rotation (Figure 44).

Insert the stem into the humeral canal (Figure 45), impacting if necessary. The implant is fully seated when the collar on the implant inserter rests on the resected surface of the humerus.

### Standard / Mini Stem Insertion—Cemented\*

Attach the broach handle to the broach/trial, and remove it from the humeral canal. Select a humeral stem 2 mm smaller than the final broach/trial used. Assemble the humeral stem onto the humeral stem inserter. Use a pulse lavage/suction unit to thoroughly clean the humeral canal. Dry the canal with absorbent gauze and inject doughy cement in a retrograde manner, completely filling the humeral canal.

Place the version control rod into the appropriate version hole and align it with the forearm flexed at 90 degrees in external rotation (Figure 44). Introduce the implant into the humeral canal (Figure 45), keeping the alignment rod in line with the forearm, until the desired position is attained. Remove excess cement. The implant is fully seated when the collar on the implant inserter rests on the resected surface of the humerus.

\*Humeral components with porous coated surface coatings are indicated for either cemented or uncemented biological fixation applications.

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Figure 46



Figure 46a



Figure 47

### Humeral Tray and Bearing Assembly

Position the definitive humeral bearing in the definitive humeral tray, ensuring that the laser etching on the bearing aligns with the laser etching on the humeral tray. This alignment assures engagement of the RingLoc<sup>®</sup> locking mechanism between the tray and bearing. Snap the humeral bearing into the humeral tray (Figure 46). An audible “click” will be heard when the bearing is properly engaged.

**Tip:** Assembly of humeral tray and bearing may be aided by using index fingers and thumbs to compress and snap into place. It may be easier to engage the inferior part of the humeral bearing and tray first, followed by the superior side.

### Humeral Tray/Bearing Impaction

Using the small mirror to see the taper junction, clean and dry the reverse Morse taper of the stem with the included taper swabs. Insert the humeral tray/bearing into the stem backwards (Figure 46a).

Use the rotation tool to spin tray/bearing 180 degrees until the word “SUPERIOR” etched on the tray is showing (Figure 47).



Figure 48

With two firm strikes of the humeral tray/bearing impactor, impact the assembled definitive humeral tray/bearing into the Comprehensive® stem (Figure 48). The humeral tray is marked "SUPERIOR" to aid in positioning the tray/bearing with respect to the stem.



Figure 49

## Humeral Tray and Bearing (Cont.)

### Humeral Tray/Bearing Impaction

When inserted correctly, the thicker portion of the polyethylene bearing should be inferior (Figure 49). Reduce the joint with the aid of the shoe horn and assess the final range of motion.

The final reduction (Figure 50) should show very limited distraction (1 mm or less). Impingement should not be present in either adduction or abduction. If impingement occurs in abduction, a greater tuberosity osteotomy or tuberopectomy may be necessary.

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Figure 50

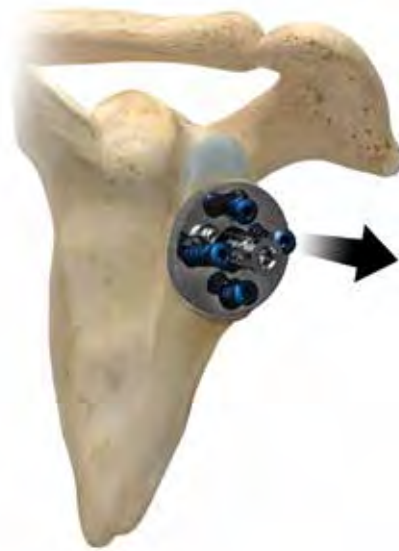


Figure 51

## Subscapularis Repair

There is some evidence that the subscapularis improves the stability of the implant. Therefore, when possible, the subscapularis should be repaired at the completion of the procedure, as long as it does not significantly reduce external rotation. If the tissue at the lesser tuberosity is poor, place sutures through the bone prior to implantation of the stem.

## Salvage Hemi-arthroplasty

In the event a Comprehensive<sup>®</sup> Reverse Shoulder fails, a salvage hemi-arthroplasty may be the only option for a patient. A salvage reverse to hemi-arthroplasty conversion may be accomplished without removing a Comprehensive<sup>®</sup> stem.

## Removal of Glenosphere/ Baseplate

Remove the Versa-Dial<sup>®</sup> glenosphere with the low-profile head removal fork. Once the glenosphere is removed, the peripheral and central screws should be removed with the appropriate size hex driver (Figure 51).

The baseplate should be completely removed by first positioning the two peripheral collets of the baseplate extractor into the opposing holes in the glenoid baseplate and fully tightening (using the 2.5 mm hex driver) and secondary, inserting the threaded shaft into the central portion of the baseplate extractor and turning clockwise with the included extraction bar.



Figure 52



Figure 53

## Removal of the Humeral Tray/ Bearing

This will expand the collet located at the end of the baseplate extractor (Figure 52). Once secure, a slap-hammer can be used to fully remove the baseplate. It may be desirable to use autograft/allograft material on the glenoid at this time, before proceeding to complete the salvage hemi-arthroplasty.

The humeral tray/bearing assembly may be removed with the low-profile removal fork (part number 407389). As the humeral tray sits very near the resected surface of the humerus and the stem collar lies within the counter-bore geometry of the humeral tray, it is preferable to place one of the removal fork arms between the humeral tray and stem collar, which will act as a wedge and disengage the taper from the stem. Once the humeral tray/bearing assembly is removed and the stem taper has been cleaned and dried with the included taper swabs, a large Versa-Dial® or EAS™ humeral head may be inserted and engaged into the Comprehensive® stem (Figure 53).

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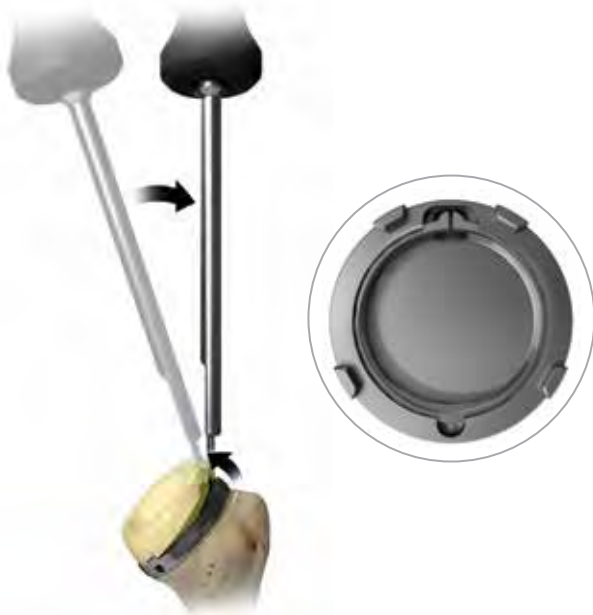


Figure 54a

Figure 54



Figure 55

## Polyethylene Humeral Bearing Removal/Exchange

If a humeral bearing ever needs to be replaced, the RingLoc® locking mechanism of the humeral tray will allow for exchange/revision of bearings without tray removal (Figure 54). To remove a humeral bearing, simply expand the locking ring using the Ringloc® liner removal tool. Position the curved portion of the tip towards the bearing and insert between the open portion of the locking ring. This will expand the ring. Once the ring has been expanded, slide the removal tool down and then underneath the bearing. The humeral bearing is now released. Whenever a bearing is removed, a new locking ring (size 21, #106021) should be placed into the humeral tray before the new bearing is locked in place. A correctly positioned locking ring should open towards the superior portion of the humeral tray as shown in Figure 54a.

## Other Stem Options

The Comprehensive® Micro, Mini, Standard, Fracture and Revision Stems (Figure 55) are compatible with the Comprehensive® Reverse Shoulder. For the complete Comprehensive® Fracture Stem Technique, please see BOI0274.0.

**Note:** If using the micro stem, special-order micro broaches and reamers are required and revision broaches are also available.



## Appendix–Humeral Stem Sizing

MINI STEM		
Last Reamer Used	Broach To Size	Implant Size
20 STD / 19 MI*	20 mm	20 mm
20 STD / 19 MI	19 mm	19 mm
19 STD / 18 MI	18 mm	18 mm
18 STD / 17 MI	17 mm	17 mm
17 STD / 16 MI	16 mm	16 mm
16 STD / 15 MI	15 mm	15 mm
15 STD / 14 MI	14 mm	14 mm
14 STD / 13 MI	13 mm	13 mm
13 STD / 12 MI	12 mm	12 mm
12 STD / 11 MI	11 mm	11 mm
11 STD / 10 MI	10 mm	10 mm
10 STD / 9 MI	9 mm	9 mm
9 STD / 8 MI	8 mm	8 mm
8 STD / 7 MI	7 mm	7 mm
7 STD / 6 MI	6 mm	6 mm
6 STD / 5 MI	5 mm	5 mm
5 STD / 4 MI**	5 mm	5 mm
4 STD**	4 mm	4 mm

STANDARD STEM		
Last Reamer Used	Broach To Size	Implant Size
20 STD / 19 MI	20 mm	20 mm
19 STD / 18 MI	19 mm	19 mm
18 STD / 17 MI	18 mm	18 mm
17 STD / 16 MI	17 mm	17 mm
16 STD / 15 MI	16 mm	16 mm
15 STD / 14 MI	15 mm	15 mm
14 STD / 13 MI	14 mm	14 mm
13 STD / 12 MI	13 mm	13 mm
12 STD / 11 MI	12 mm	12 mm
11 STD / 10 MI	11 mm	11 mm
10 STD / 9 MI	10 mm	10 mm
9 STD / 8 MI	9 mm	9 mm
8 STD / 7 MI	8 mm	8 mm
7 STD / 6 MI	7 mm	7 mm
6 STD / 5 MI	6 mm	6 mm
5 STD / 4 MI**	5 mm	5 mm
4 STD**	4 mm	4 mm

\*Ream to horizontal hashmark in order to implant the 20 mm mini stem, as there is not a larger reamer to facilitate reaming to a point between the 3 and 4 hashmark.

\*\*Since there are no numeric hashmarks on the teeth of these reamers, ream to the horizontal hashmark.





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Biomet, inc.  
P.O. Box 587  
56 E. Bell Drive  
Warsaw, Indiana 46581-0587  
USA