



**GLOBAL | AP™**  
ADJUSTABLE PROSTHESIS

# GLOBAL AP® Shoulder Arthroplasty System

Surgical Technique



**DePuy Synthes**

PART OF THE *Johnson & Johnson* FAMILY OF COMPANIES

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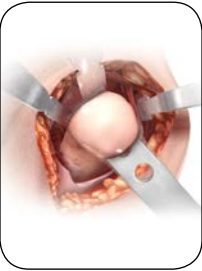
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# Key Surgical Steps

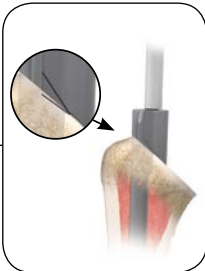
## AP STEPS



1. Resect Humeral Head



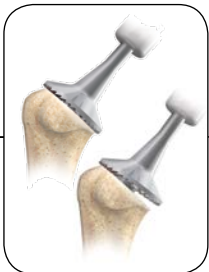
2. Ream Humeral Canal



3. Box Osteotome



4. Broach



5. Evaluate Osteotomy

## CTA STEPS



1. Attach Cutting Guide

## REVISION STEPS

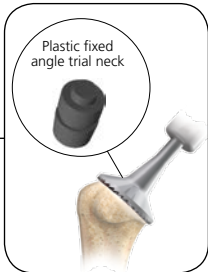


1. Remove Humeral Head

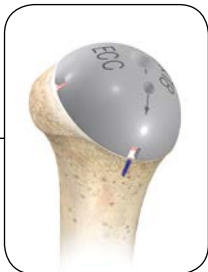


2. Remove Humeral Head Taper

### FIXED STEPS



3. Fixed Neck Trial



4. Trial Head

### VARIABLE STEPS



3. Variable Neck Trial



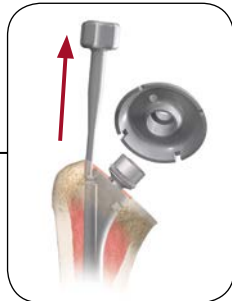
4. Remove Adjustable Neck/  
Revision Trial Insert



6a. Fixed Neck Trial



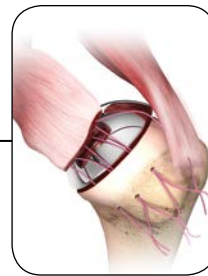
6b. Variable Neck Trial



7. Remove Trial Stem



8. Assemble Final Component



9. Implant Final Component



2. Resect Greater Tuberosity



3. Trial Head



4. Assemble Final Component



5. Implant Final Component



5. Impact Angle Taper



5. Revision Transfer Block



6. Assemble Linking Components



7. Impact Linking Components

6. Final Head Insertion

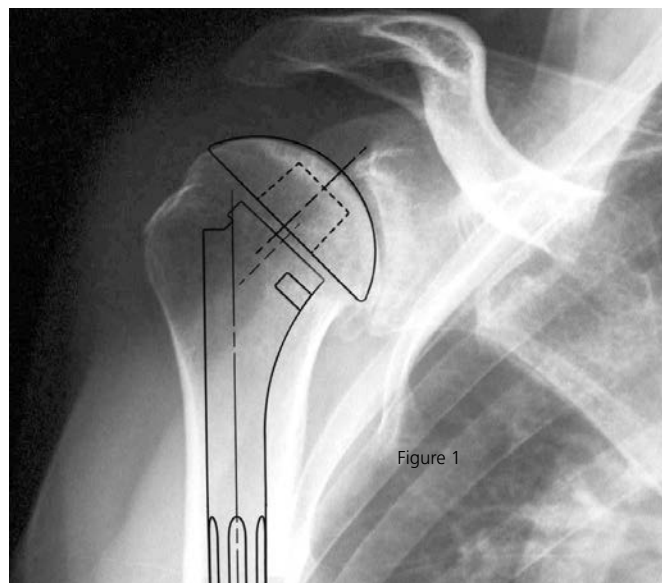


8. Final Head Insertion

# Preoperative Templating and Patient Positioning

## Preoperative Templating

Preoperative evaluation of the humerus using the GLOBAL AP Shoulder Template System helps determine the size of the prosthesis and level of the head resection. The goal is to remove the humeral head at the anatomic neck using the patient's own neckshaft angle and humeral version (Figure 1).



## Patient Positioning

Place the patient on the operating table in a semi-Fowler position with the head inclined at approximately 30 degrees, the legs at around 20 degrees and the knees in approximately 20 degrees of flexion (Figure 2).

Ensure that the involved shoulder extends laterally over the top corner of the table so that the arm can be brought into extension and abduction (this is essential for good exposure of the humeral head) (Figure 3). Use an intraoperative arm or positioner and post attached to the table to help keep the patient on the table and avoid traction on the body. Secure the patient's head with tape and drape the shoulder to isolate the anesthesia equipment from the sterile field.



Figure 2



Figure 3

# Exposure

## Initial Incision

The initial incision line runs from the mid-clavicle, over the top of the coracoid and extends in a straight line down the anterior aspect of the arm (Figure 4).

It should follow the path of the cephalic vein along the interval between the deltoid and the pectoralis major. The length of the initial incision along this line can be varied, depending on the exposure needed to provide adequate access and visualization of the joint, and is determined by patient body habitus.

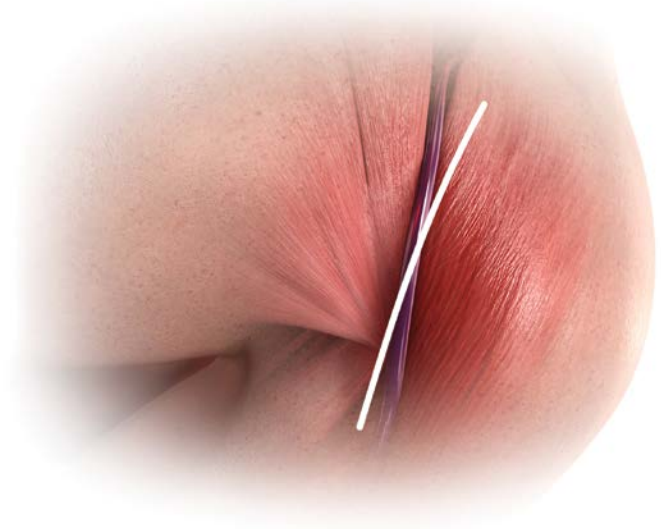


Figure 4

- ! Please refer to the GLOBAL ENABLE® Glenoid Exposure System surgical technique (DSUS/JRC/0116/1308) for detailed information regarding exposure.



**A P C**  
*Glenoid Exposure Simplified*



# Humeral Head Preparation and Resection

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## Assessing the Head Size

Place a curved Crego or reverse Hohmann retractor along the anatomic neck superiorly to protect and retract the posterior-superior rotator cuff (Figure 5).

**Note:** Using a rongeur or other instrument, remove any unwanted osteophytes to return proximal humerus to near native anatomy.

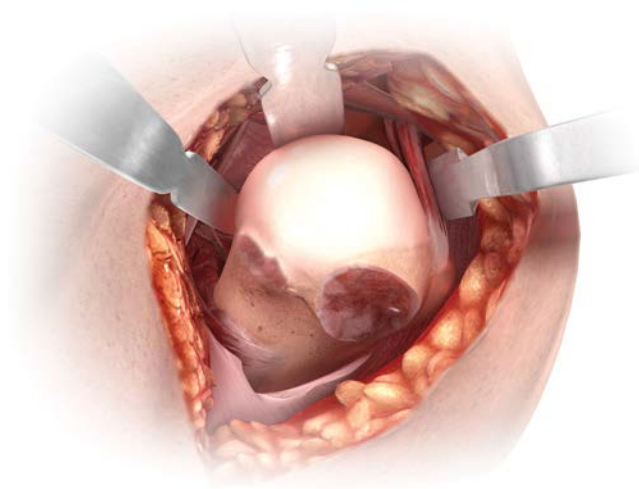


Figure 5

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## Free-Hand Resection Technique

Use an oscillating power saw to remove the humeral head at the anatomic neck. The saw should enter the anterior surface of the humerus along the line of the anatomic neck and exit 2-3mm proximal to the posterior cuff attachment. In this way, the native neckshaft angle and humeral retroversion can be approximated. Once complete, the resection should be at the level of the articular surface of the supraspinatus insertion site (Figure 6).

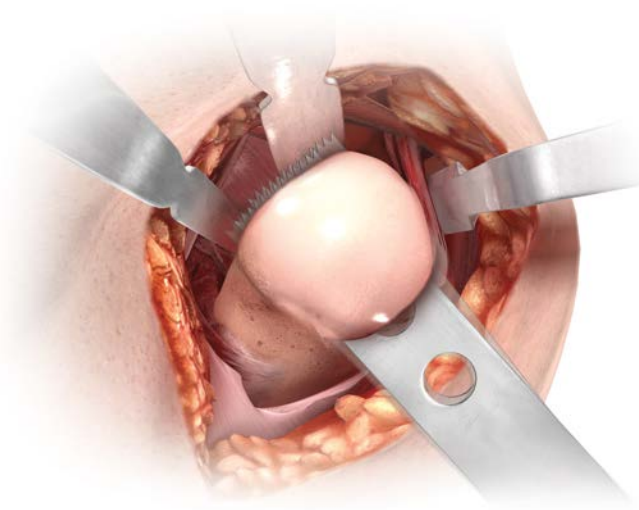


Figure 6



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### Alternative Head Resection with a Cutting Guide

Verify the humeral head diameter and thickness with the flat head gauge (Figure 7).

Once the head size and thickness has been determined, assemble the humeral head sizer with the appropriate diameter to the sizer/drill guide handle. Use the head sizer to find the center of the head and the plane of the anatomic neck in both neck shaft angle and version (Figure 8).

**Note:** There is only one plane that is exactly in alignment with the anatomic neck. It is therefore critical that the periphery of the hooded template be parallel to the anatomic neck and then the pin is drilled into the center of the head.



Figure 7



Figure 8

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### Identifying the Center of the Humeral Head

Mark the superior-inferior and anterior-posterior axes of the humeral head using electrocautery or a marking pen through the round windows in the sizer (Figure 9). Remove the sizer and complete the axes.

Visually assess the intersection to confirm positioning is appropriate and in the center of the head. If not, repeat the previous steps.



Figure 9

# Humeral Head Preparation and Resection

Replace and center the humeral sizer over the humeral head. Drill the threaded pin through the center of the cannulated sizer and into the humeral head (Figure 10).

The tip of the threaded guide pin should penetrate the lateral cortex of the humerus to prevent the pin from migrating in cancellous bone. Remove the humeral sizer leaving the guide pin in place.

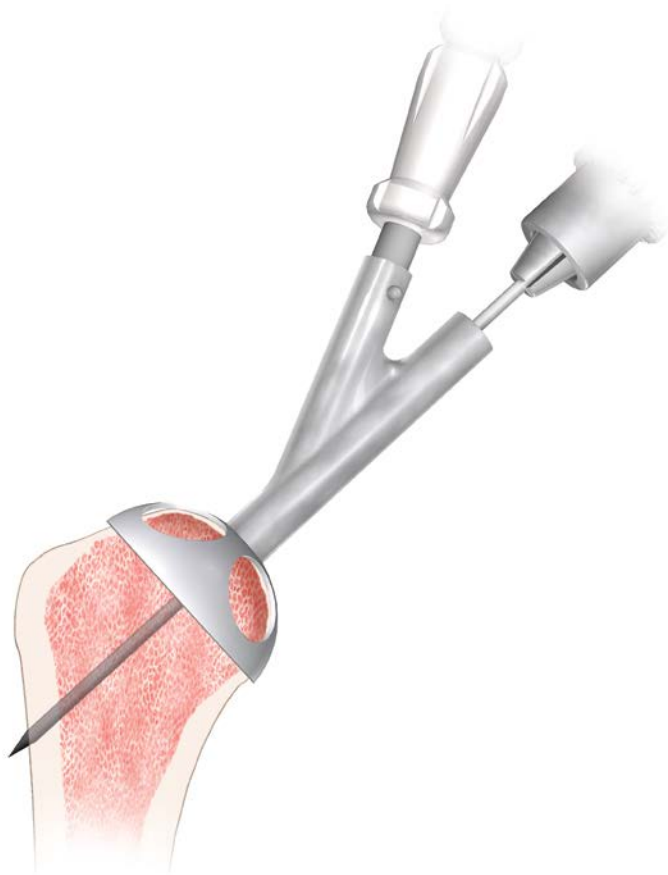


Figure 10

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## Humeral Head Resection

Pass the resection guide down the guide pin to the level of the anatomic neck. If the guide pin placement procedure was performed correctly then the saw capture slot must be in alignment with the anatomic neck. So the only adjustment to be made is the height of the cut.

Engage the T-handle with the locking screw and secure the resection guide in position on the guide pin (Figure 11). Stabilize the guide by placing the two short pins through the peripheral holes.

Pass an oscillating saw (1.2mm x 20mm blade) through the guide capture and resect the humeral head, following the rim of the articular surface around the humeral head until approximately 50 - 80 percent of the resection is complete, leaving a wedge of bone. Remove the resection guide and pins and complete the cut (Figure 12).

Use the sizer template to measure the resected head diameter and height to confirm the humeral head selection. The resected humeral head can now be used to provide cancellous bone graft if required later in the procedure.

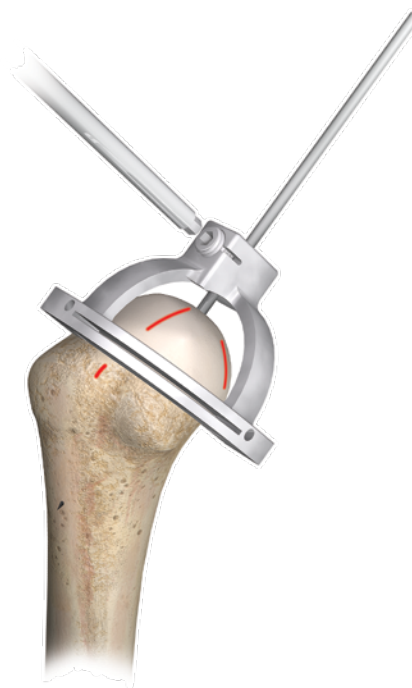


Figure 11

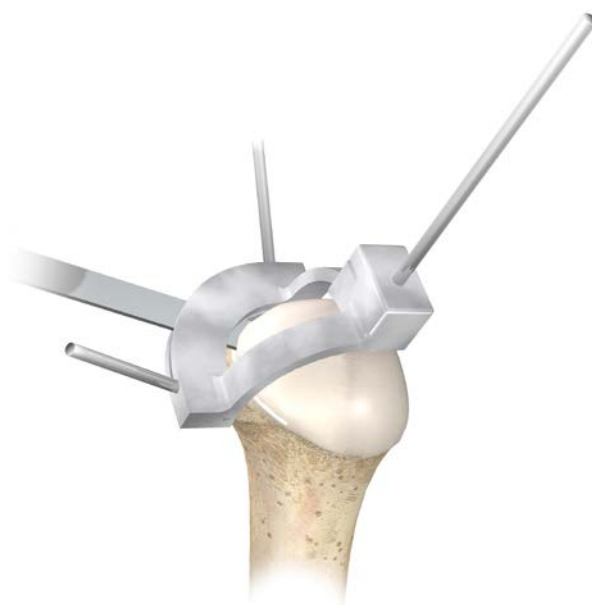


Figure 12

# Humeral Canal Preparation

## Humeral Reaming

Attach the T-handle to the 6mm reamer. Place the tip of the reamer at the most superior point on the resected humerus just behind the long head of the bicipital groove, so that it is aligned with and ready to pass directly down the intramedullary canal (Figure 13). Create a pilot hole and then ream the medullary canal in line with its long axis. For the standard length of prosthesis, stop reaming when the circular mark on the reamer is at the level of the resected bone (Figure 14). When using the long stem prosthesis, pass the entire length of the cutting flutes down the intramedullary canal.

**Note:** Power reaming of the humeral canal should be avoided as it may remove more bone than necessary.

Continue sequential reaming, following the path created through the intramedullary canal, increasing the reamer diameter in 2mm increments until a reamer begins to bite on cortical bone. Note the final reamer diameter. This will determine the stem size of the body sizing osteotome, the final broach and the implant.



Figure 13



Figure 14

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## Proximal Humeral Preparation

The surgeon should assess cancellous bone quality using digital pressure on the center of the cancellous cut surface of the humerus. If with firm digital pressure the humeral cancellous bone can be indented then it is recommended to not use the box osteotome and move directly to the humeral broach. Using the broach without the osteotome will result in the impaction of this poor quality bone and improve the rotational stability of the final implant. If this technique is used and the broach cannot be fully seated with a few attempts at impaction and disimpaction sequences then a small amount of the impacted cancellous bone may need to be removed from the medial area of the metaphysis using a burr or rongeur.

If a box osteotome is necessary, select the box osteotome that matches the diameter of the final reamer. Place the orientation pin through the lower hole of the osteotome. Use the pin to guide rotation. Pass the osteotome down the medullary canal. When the pin sits flat against the resected humeral surface, version is correct (Figure 15).

Carefully remove the pin, without disrupting the rotational position. The side of the osteotome is etched with a **V** indicator laser mark. Using a mallet, tap the osteotome down until the apex of the mark reaches the resected surface. If the resection plane lies within the lateral or open end of the mark, the cut has been made within the osteotomy range of the system (Figure 16). If it does not, the box osteotome must be removed. The osteotomy must be readjusted to bring it into system limits.

Drive the box osteotome down to create space for the proximal body of the implant. After removal of the box osteotome, there may be some residual bone in the humeral canal that requires removal. This can be saved for bone graft at a later time.



Figure 15

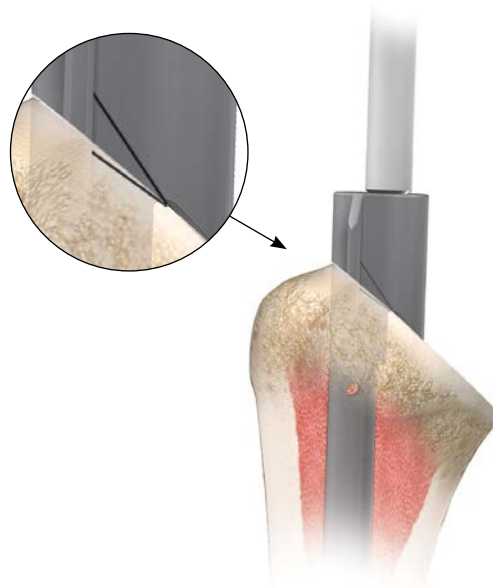


Figure 16

# Broach / Trial Stem Insertion

Select the broach that matches the diameter noted for the final reamer size. Attach the broach to the broach handle, making sure the broach face is flush with the locking surface. Lock the broach to the broach handle (Figure 17).

Carefully drive the broach into the proximal humerus so that the fins on the broach follow the tracks created by the box osteotome. (The broach is approximately 1mm smaller than the corresponding humeral prosthesis, to obtain a proximal press-fit.) Seat the broach until the rocker bar on the broach handle sits on the resected surface both front and back (Figure 18).

**Note:** Be cautious if cancellous bone is soft. Do not drive the broach handle rocker bar into soft bone; the rocker bar should just touch or sit slightly above the osteotomy.

At this point the broach itself is seated approximately 2mm below the resection and is ready to act as the trial stem. Release the locking arm and remove the broach handle.

**Note:** If the broach handle rocker bar does not just touch or sit slightly above the cut osteotomy surface, do not try to aggressively drive it down. Rather, remove the broach and then pass the reamer deeper into the canal (further cutting with the osteotome may be needed). Then seat the broach again and remove any osteophytes.

**Note:** If utilizing the impaction bone grafting technique, it is important that it is done at the time the trial/broach is inserted into the humerus.



Figure 17



Figure 18

# Osteotomy Evaluation

## Attaching The Calcar Alignment Guide

Attach the calcar alignment guide to the T-handle and lock the guide into the recess on the humeral broach (Figure 19). Sufficiently tighten the calcar alignment guide, being cautious not to overtighten. Remove the T-handle.



Figure 19

## Confirming the Neck Resection

Select the appropriate size calcar reamer (see table below) and mount the reamer over the calcar alignment guide. The cutting surface of the calcar reamer, when fixed onto the trial, will be parallel to an osteotomy cut at the standard neckshaft angle of 135 degrees. Assess its relationship to the resected plane.

If the angle of the cutting surface differs from the angle of the head resection by only a few degrees then the calcar reamer can be used to finalize the plane, providing an optimum resection for the fixed head configuration (Figure 20). Remove the calcar alignment guide when completed.

**Note:** Be sure to ream until the calcar reamer bottoms out on the alignment guide. **DO NOT USE POWER.** This verifies both a 135 degree osteotomy angle and that the broach is countersunk by 2mm.

If the resection angle is not approximately parallel to the calcar reamer face, a variable angle neck is required (Figure 21). Refer to page 29 for the procedure.



Figure 20



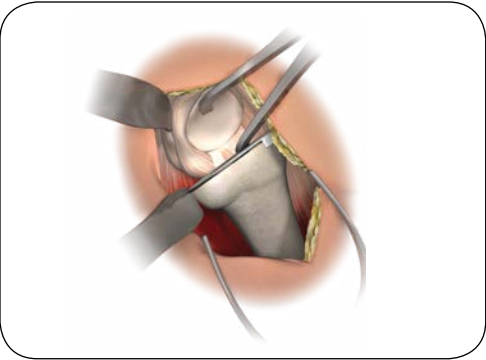
Figure 21

Humeral Head Size	Calcar Reamer
40, 44	Small
48, 52, 56	Large

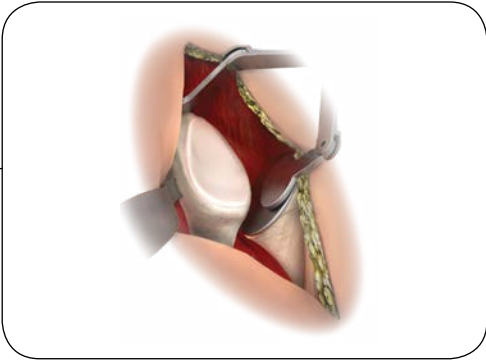


# GLOBAL™ APG System Key Surgical Steps

## GLENOID EXPOSURE



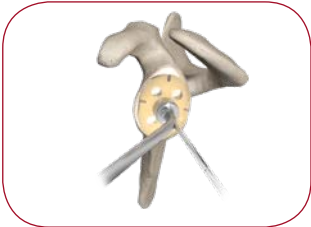
1. Release Posterior Capsule



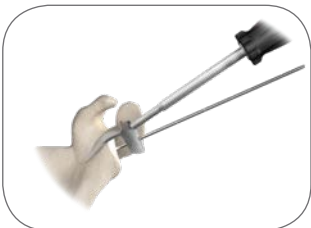
2. Expose Glenoid

## GLENOID PREPARATION AND IMPLANTATION

Sizer Pin Guides (No Version)



Fixed Pin Guide (Version or No Version)

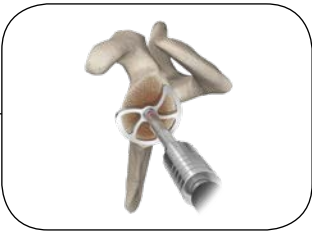


Sizer Pin Guides (Version)

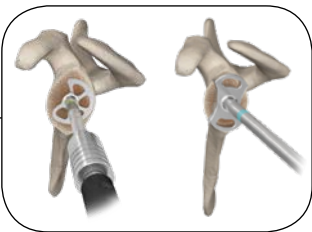


1. Pin Placement, Sizing and Retroversion Correction

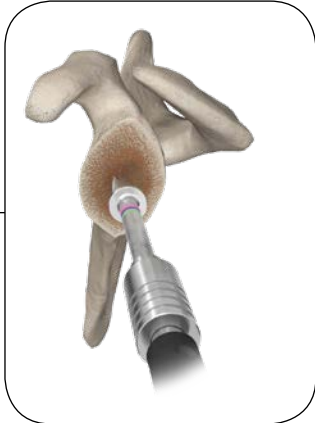
Normal Exposure



Challenging Exposure



2. Reaming



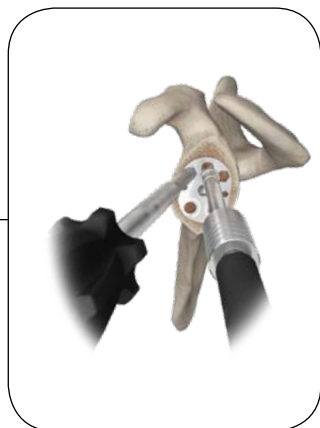
3. Drilling Central Peg Hole



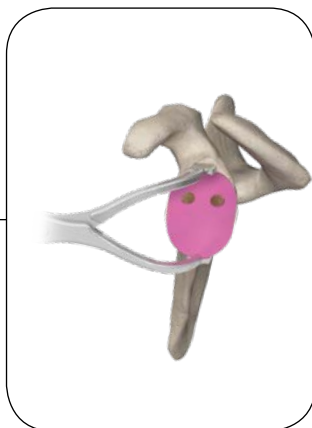
**GLOBAL™ | APG**  
ANCHOR PEG GLENOID



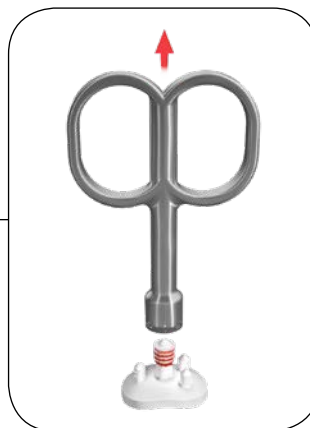
*Ease of Use*



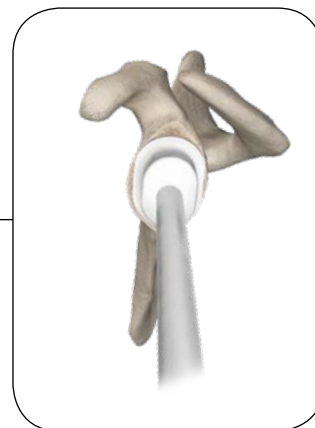
4. Drilling Peripheral Peg Holes



5. Trialing



6. Applying Bone Paste



7. Seating the Implant

# Fixed Neck Trial

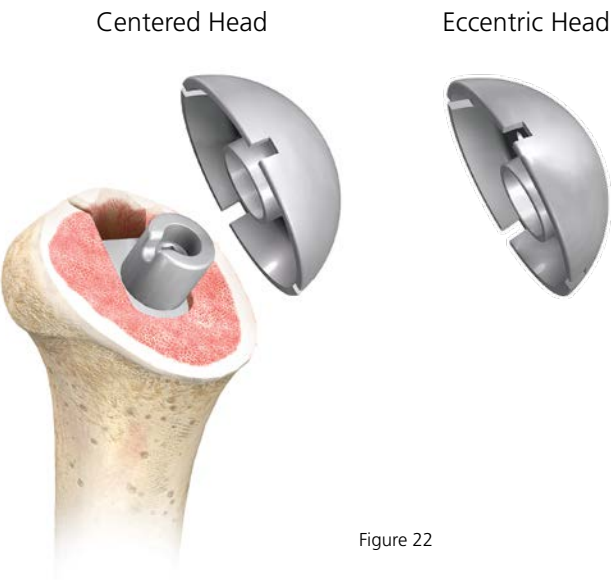
## Assembling a Centered Head to the Fixed Angle Taper

Reattach the calcar alignment guide to the seated broach. Select the head trial that matches the diameter and height of the measured humeral head (see table below). Engage the key in the head trial sleeve into the slot in the calcar alignment guide (Figure 22).

Head Size (mm)	Head Heights (mm)
40	15, 18
44	15, 18, 21
48	15, 18, 21
52	15, 18, 21
56	18, 21

Check that the head trial achieves appropriate coverage of cortical bone, with 5-8mm of height above the greater tuberosity. Proper head thickness can be determined during trial reduction.

If necessary increase or decrease the selected head size and type and reassess in place.



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### **Assembling an Eccentric Head to the Fixed Angle Taper**

If an eccentric head is needed, insert the calcar alignment guide into the seated broach. Start, but do not tighten the calcar alignment guide screw using the T-handle (Figure 23). Attach the eccentric head to the fixed angle taper, and rotate it until optimal coverage is achieved.

Once the head trial position is set, feed the T-handle driver through the trial head handle, and lock the calcar alignment guide in place.



Figure 23

# Variable Neck Trial

Open the sterile, single-use ball cylinder trial. Check that the peg screw is appropriately positioned and that the expandable sphere is not expanded. If necessary, adjust by using the T-handle to turn the screw counterclockwise (Figure 24).

**Note:** For the variable neck trial, loosen the screw so that approximately one thread can be seen through the cut out inside of the trial (Figure 24a).

Select the head trial that corresponds in diameter and height to the measured humeral head. Insert the ball cylinder neck trial into the trial head by aligning the slot on the neck trial with the knob inside the central base of the trial head. Use sufficient pressure to overcome the interference and “lock” the neck trial into the trial head.

Engage the trial head/ball cylinder trial into the seated broach by hand so the assembly can easily be held together when mounting. Proper engagement will be accompanied by a positive “snap.”

**Note:** Verify that the trial head is resting on the osteotomy. If it is not, the head and/or ball cylinder is not properly seated.

Take the trial head handle and insert the two prongs into the head. Use the trial head handle to rotate and angle the assembly to achieve optimal version and coverage of the osteotomy (Figure 25).

**Note:** The GLOBAL UNITE® Shoulder System size 40mm x 12mm and 44mm x 12 mm centered humeral heads should not be utilized with GLOBAL AP Humeral Stems and taper components.



Figure 24



Figure 24a



Figure 25

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Once the head trial position is set, feed the T-handle driver through the trial head handle and lock the assembly in place with a clockwise turn of the peg screw.

**Note:** When tightening the variable neck trial locking screw with the T-handle driver, take care to apply counter pressure to the handle, stabilizing the trial (Figure 26).

Remove the driver and handle. Check the fit of the head against the osteotomy surface visually, and run an index finger around the perimeter of the trial head to feel and verify that no significant gap exists (Figure 27).

**Note:** The position of the trial head can be adjusted by re-engaging the trial head handle and T-handle driver and slightly loosening the locking screw. Once the new head orientation is obtained, retighten the screw.



Figure 26



Figure 27

# Soft Tissue Balancing and Trial Stem Removal

With the broach and selected humeral head in place, use a burr or a rongeur to remove any residual osteophytes extending beyond the periphery of the humeral head.

It is important to balance soft tissue tension with the appropriate trial humeral head in place. It should be possible to fully internally rotate the arm across the chest so that the hand of the involved shoulder easily rests on top of the opposite shoulder, without elevating the involved shoulder off the table (Figure 28).

It should also be possible to externally rotate the arm 30-40 degrees and still reapproximate the subscapularis tendons to the cut surface of the neck of the humerus. The humeral head should posteriorly sublux 50 percent or more but should spontaneously reduce when the posterior force is released (Figure 29).

If the fit of the humeral head is so tight that the functional internal or external rotation or posterior subluxation cannot be obtained, then further soft tissue release posteriorly could be required. When the final combination of sized trial body and head has been determined, slide the head trial off the ball cylinder or calcar alignment guide, without disturbing its “locked” orientation.

Extract the stem from the humeral canal using the extractor tool attached to the broach removal tool and a mallet with moderate impaction force.

(Figure 30 and 31). Make sure the extractor tool is held in vertical alignment with the stem axis. Assistance may be required to hold the extractor tool in place. Clear away any bone or soft tissue captured in the front or back grooves of the stem.



Figure 28



Figure 29



Figure 30

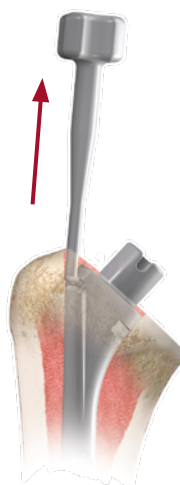


Figure 31



# Power Tower Key Steps - Fixed Neck



1. On a clear surface away from the operating table, mount the trial stem into the impaction tower. Align the back rim and the front groove of the trial stem with the mating features on the impaction block. Secure the broach by firmly tightening the front clamping knob.



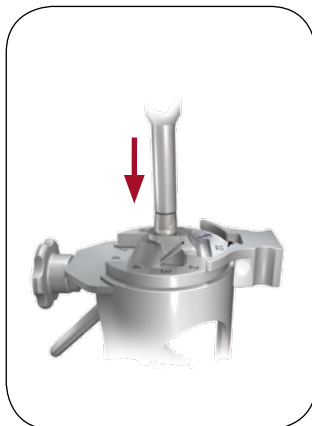
2. Properly reattach the trial head to the calcar alignment guide. The eccentric trial head is marked with an arrow, indicating maximum distance from the center of the head. Use a sterile pen to mark the position of the arrow relative to the surface on the impaction tower. Now remove the trial head.



3. Remove the trial stem from the impaction block and mount, in the same way, the corresponding sized final humeral stem.



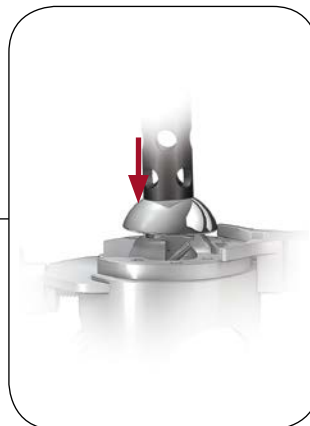
4. Insert the stem correctly into the impaction tower with the indicator marks on the sliding clamp hidden by the mating features on the implant. Insert the fixed angle taper into the slot in the top of the stem, with the end etched "THIS SIDE UP" facing superiorly.



5. Introduce the impaction rod to the top of the fixed angle taper. Ensure the impaction rod is fully seated and flush with the fixed angle taper. Impact the head of the rod sharply, three to four times, to ensure that the fixed angle taper is completely engaged.



6. Place the selected humeral head component on the fixed angle taper. If an eccentric head has been selected, use a sterile pen to mark the arrow position (found on the non-articular surface) on top of the head before placing on the fixed angle taper. Align the mark on the head with the mark made on the impaction tower.

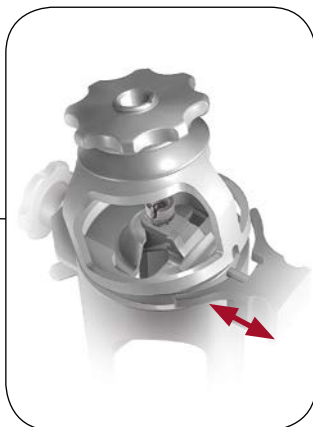


7. Center the black perforated Celcon impactor on the humeral head, making sure that it is colinear with the fixed angle neck taper, and impact the head with three or four controlled impactions with the mallet. The component is now ready for implantation.

# Power Tower Key Steps - Variable Neck



1. Mount the broach/trial ball cylinder assembly into the impaction block, and tighten the front knob to secure in place. Place the head trial on the ball cylinder, if applicable, and note the position of eccentricity relative to the face of the impaction stand.



2. Withdraw the locking mechanism, and mount the orientation device on top of the impaction stand.



3. With the shells of the orientation device loose, carefully engage the taper impactor into the trial ball cylinder.



4. Apply light palm pressure to the fully engaged taper impactor while locking the shells together by tightening the knob. Remove the orientation device from the impaction stand. **DO NOT** loosen the knob-shell assembly.



5. Remove the broach, and insert the humeral stem implant into the impaction stand. Align the stem insert by using the laser line indicator as a guide. Place the ball taper loosely on top of the insert.



6. Reposition the orientation device with its recorded position. Re-insert the taper impactor, and engage the tip of the impactor with the ball taper implant.



7. Strike the taper impactor with the slotted mallet 5-6 times. Make light impactations for the first few times followed by controlled impactations.



8. Remove the orientation device, and place the selected head onto the impacted ball taper. If using an eccentric head, position the indicator on the underside of the head with the appropriate numeral on the face of the impactation stand.



9. With the end of the perforated head impactor over the center of the head, firmly impact the head 3-4 times using the slotted mallet.



10. Remove the final assembly from the impactation tower. Make a visual comparison with the trial assembly to check for orientation of the eccentric head. The construct is now ready for implantation.

# Preparation for Subscapularis Tendon Repair

**A:** If the tendon was taken directly off its insertion into the lesser tuberosity then the tendon is sutured to the humeral neck using suture loops passed through drill holes made within the bicipital groove (Figure 32).

These suture loops will be used after the humeral prosthetic is inserted to pass the permanent sutures that are placed in the end of the subscapularis tendon. These suture loops will be used later to pull the heavy non-absorbable sutures placed in the subscapularis out through the neck of the humerus.

**B:** Another method is to cut the tendon mid substance and then suture tendon to tendon (Figure 33).

**C:** If the subscapularis tendon was removed with a small portion of lesser tuberosity, two permanent sutures are passed through two sets of holes for later tension band suturing of the lesser tuberosity fragment to its native bed (Figure 34).

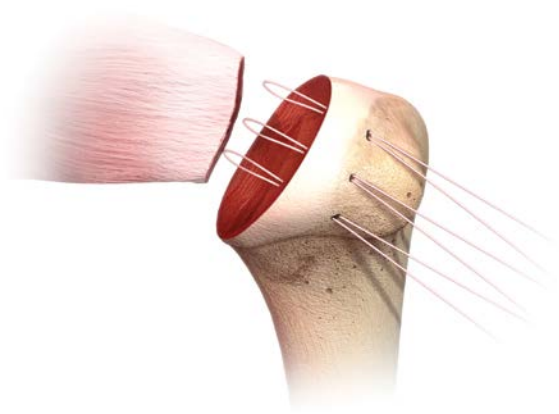


Figure 32

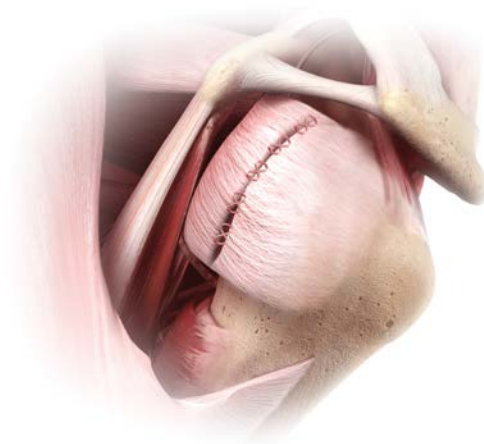


Figure 33

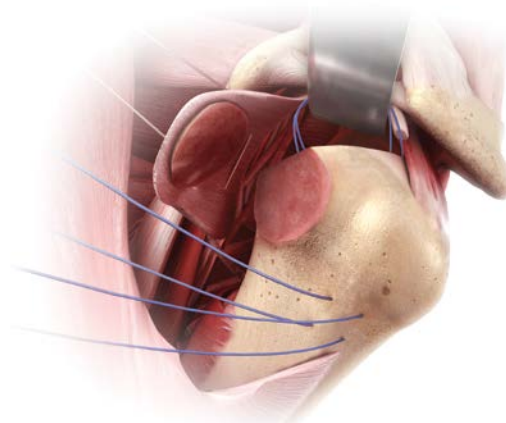


Figure 34

# Insertion of the Final Humeral Head / Stem Assembly

In this circumstance we recommend placing the sutures around the stem of the prosthesis and pulling the slack out of the sutures just before the prosthesis is placed into its final seated position within the humeral canal (Figure 35).

## **Press-Fit, Impaction Bone Grafting or Cement**

Before the final component assembly is inserted, plan the repair of the subscapularis tendon.

The final, standard, prosthesis will obtain 1mm of press-fit across the anterior/posterior dimension and the final POROCOAT® Porous Coating prosthesis will produce 2.5mm of press-fit. Therefore, a firm press-fit without cement can be obtained. If the trial broach was slightly loose after humeral canal preparation, use either autogenous bone graft from the resected head of the humerus or cement for fixation of the final prosthesis. As a general rule following the resection of the head, it is preferred that all of the cancellous bone be removed and saved. If bone graft is used, place the cancellous bone down in the medullary canal, particularly into the inter-tuberosity region, and repeatedly impact it in place using the broach/trial on the driver extractor tool.

**Note: If impaction grafting is performed it should be done at the time of the use of the trial broach and before final recording of the trial ball taper or fixed angle taper. Use of impaction grafting will in many cases change the orientation of the stem in the canal and result in a change in the orientation of the head to the osteotomy surface.**



Figure 35

# Insert Final Humeral Head/Stem Assembly

The decision to use cement or a press-fit technique is up to the individual surgeon. In some instances, such as previous surgical procedures, fractures, osteoporosis or a degenerative cyst in the humerus, it may be necessary to use cement. The cement technique will vary from case to case. Since the stem of the prosthesis fills the reamed out medullary canal, it is rarely necessary to place the cement deep down the canal of the proximal humerus. If the cement is placed distal to the stem of the prosthesis then the use of a cement restrictor is suggested so that the cement does not extend more than 2cm distal to the stem of the prosthesis and cement pressurization is attainable.

**Note:** Long stem humeral components are available for revisions or fractures of the humeral shaft.

If defects exist in the proximal humerus and the fins of the prosthesis are not in contact with the bone, fill that area with cement. Regardless of the method used, place the final humeral head/stem assembly down the intramedullary canal by hand. Use the Celcon impactor to insert the assembly to the final seated position (Figure 36).

**Note:** To assess final positioning of the humeral component the osteotomy surface should be perfectly covered from front to back by the head, and the version should be anatomic for the patient.



Figure 36

---

Remove any further osteophytes with a burr. The humeral head should be about 5mm above the top of the greater tuberosity. If a lesser tuberosity osteotomy was performed there is often a portion of the anterior part of the humeral prosthesis that overhangs the bone. This is where the lesser tuberosity is going to fit. Now perform the final checks for range of motion, correct version and stability.

Using the plastic Darrach retractor as a skid, with gentle traction, internal rotation and finger pressure on the humeral prosthesis, reduce the head into the glenoid fossa. If the subscapularis was taken off of the lesser tuberosity then pass the previously placed #2 or larger non-absorbable suture (DePuy Synthes Mitek Sports Medicine's ORTHOCORD® Suture is recommended) in the subscapularis tendon.

When the subscapularis is removed with a small sliver of lesser tuberosity the non-absorbable sutures previously placed are then passed through the tendon at its intersection into the bone in a figure of eight configuration (Figure 37). Also secure the repair of the subscapularis with sutures placed at the rotator interval. Use of the heavy sutures allows immediate passive movement beginning the day of surgery without fear of detaching the subscapularis tendon. Before wound closure, palpate the axillary nerve a final time to assure that it is in its normal position and is intact.

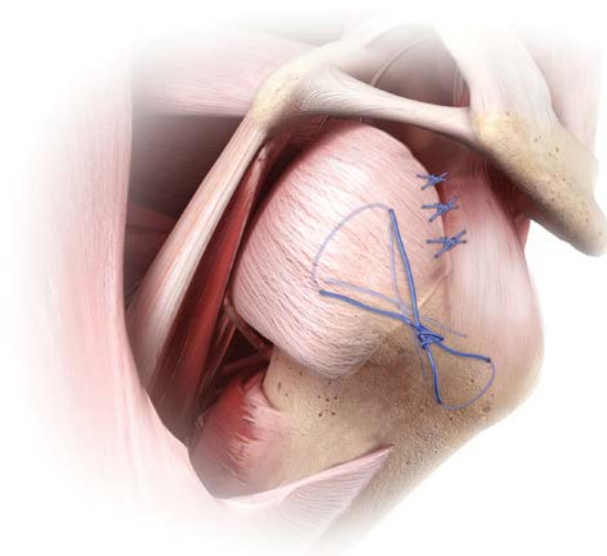


Figure 37



# Final Subscapularis Tendon Repair and Joint Reduction

If the subscapularis was taken off of the lesser tuberosity, place three #2 ORTHOCORD Sutures into the subscapularis tendon in a Mason Allen suture configuration (Figure 38) using the previously placed suture loops (Figure 32). Pull the loops of sutures with the subscapularis sutures out through the bone and use the sutures to secure the tendon back to the bone (Figures 39 and 40). Alternate the limbs of each paired suture through the suture loops so that the permanent sutures are tied over a bone bridge within the bicipital groove.

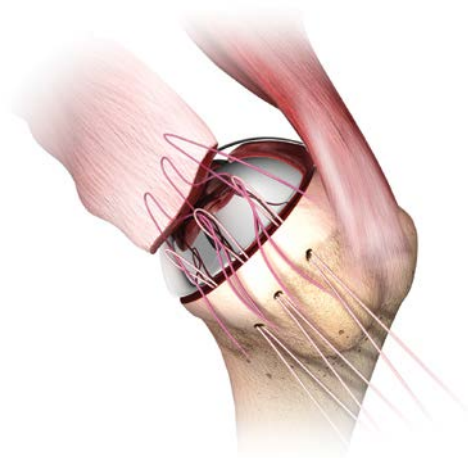


Figure 38

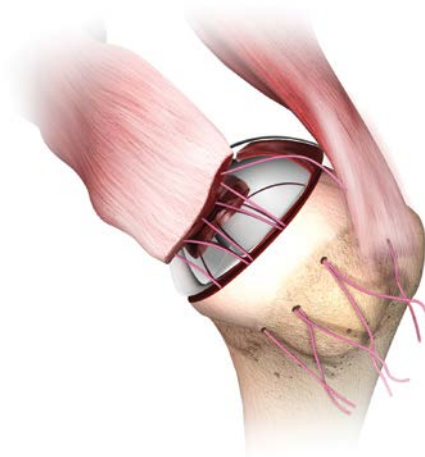


Figure 39



Figure 40

# Wound Closure

Thoroughly irrigate the wound with antibiotic solution. If a regional anesthetic is not used, infiltrate the soft tissue with a local anesthetic that will last six to eight hours.

The wound may be closed according to surgeon preference. Careful attention to wound closure will result in a cosmetically acceptable incision (Figure 41).

After the dressing and shoulder immobilizer are in place, the use of a cold wrap is recommended. This prefrozen wrap can be placed on the shoulder in the operating room and replaced with another unit every three hours. The combination of regional anesthetic or local anesthetic and the immediate cooling seems to decrease the amount of postoperative pain.



Figure 41

# Cuff Tear Arthropathy

The humeral head is resected, and the humeral canal is prepared for a GLOBAL AP Shoulder Humeral Stem. Humeral head sizing is performed using the standard GLOBAL AP Non Eccentric Humeral Head Trials. Once it has been determined that the rotator cuff is not repairable, the remnants of the torn cuff and tissue in the subacromial space are debrided so as not to cause impingement of this tissue between the humeral head and the acromion. An acromioplasty or release of the coracoacromial ligament is not performed as this may compromise the stability of the shoulder.

**Note: The humeral head must be resected using the fixed angle (135 degree) method. The variable neck is not compatible with the GLOBAL AP CTA Head System.**

Reduce the shoulder joint to verify the appropriate head size has been determined. The shoulder joint is then dislocated and the standard non eccentric humeral head trial is removed, leaving the humeral broach in place. The GLOBAL AP CTA Cutting Guide is then attached to the broach (Figure 42). It is important to make sure the guide is centered on the broach and not rotated.

The lateral edge of the cutting guide should line up with the lateral edge of the broach (Figure 43).

An oscillating saw is used to resect the greater tuberosity, taking care to protect any remaining attachments of teres minor or posterior infraspinatus (Figure 44).

A rongeur or small burr can be used to remove any remaining bony prominences above the cutting guide (Figures 45 and 46). It is important to do this as any extra bone may prevent the GLOBAL AP CTA Head from fully seating on the humeral stem.

Remove the Global AP CTA Cutting Guide.



Figure 42



Figure 43



Figure 44



Figure 45



Figure 46

The trial GLOBAL AP CTA Head is placed on the broach and secured with the T-handle. (Figures 47 and 48), and the head is relocated. It is important for the head to sit almost flush against the cut surfaces of the humerus.

The shoulder is reduced, and range of motion and soft tissue balancing is checked.

The trial components are removed, and the subscapularis is prepared for reattachment. Three sutures of a strong non-absorbable suture, such as a #5 or 1mm suture, are passed in a modified Mason Allen fashion through the subscapularis tendon just medial to the lesser tuberosity fragment. The first arm of the stitch should be passed in a superficial-to-deep direction. Most of the suture should then be pulled through, leaving a tail of approximately 15 cm on the superficial surface of the tendon.

If there is degeneration or partial tearing of the upper portion of subscapularis tendon, the sutures can be used to repair or reinforce the tendon. The upper portion of the subscapularis is important in maintaining shoulder function, and every effort should be made to make sure this repair is as strong as possible (Figure 49).

Three holes are then drilled through the humerus just medial to the cut edge of the lesser tuberosity using a 2mm drill bit. Three additional holes are drilled in the bicipital groove just lateral to the lesser tuberosity (Figure 50).



Figure 47



Figure 48

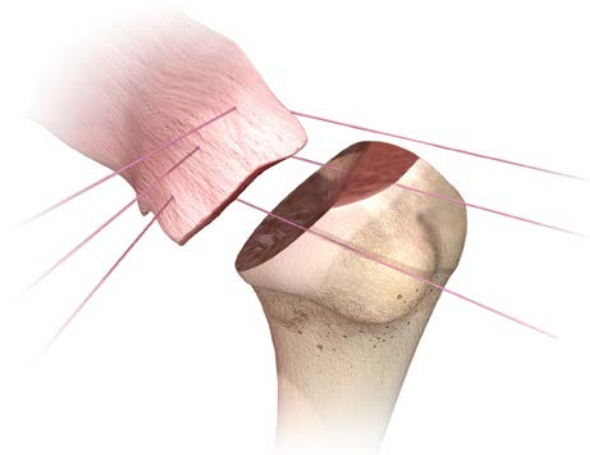


Figure 49



Figure 50

# Cuff Tear Arthropathy

The final components are assembled on the back table. The stem is mounted in the GLOBAL AP Impaction Block, and the head is inserted directly into the stem. It is imperative that the etch line on the underside of the head is in line with the "6" etched on the sliding plate of the impaction stand (Figure 51). The surgeon may find it helpful to locate the etch on the underside of the head and then mark its location on the articulating surface of the head using a sterile pen prior to inserting the head into the stem. Once inserted, the head should be impacted using the GLOBAL AP Humeral Head Impactor and three or four firm taps with the mallet (Figure 52).

The canal and surgical site is irrigated with antibiotic solution. Holding the prosthesis above the proximal end of the humerus, the deep arm of each suture in the subscapularis is passed into the drill hole medial to the lesser tuberosity osteotomy site and into the medullary canal. The sutures are then passed through the holes of the anterior fin of the prosthesis and out the holes in the bicipital groove, taking care not to cross the sutures (Figure 53). Then sutures can be passed behind the prosthesis; however, this risks capturing the suture between the posterior fin of the prosthesis and bone or cutting the sutures once the final component is impacted into the humerus.



Figure 51



Figure 52

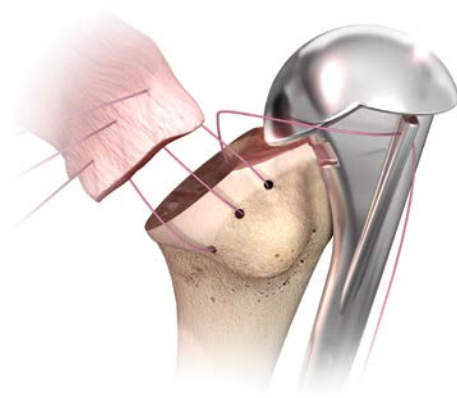
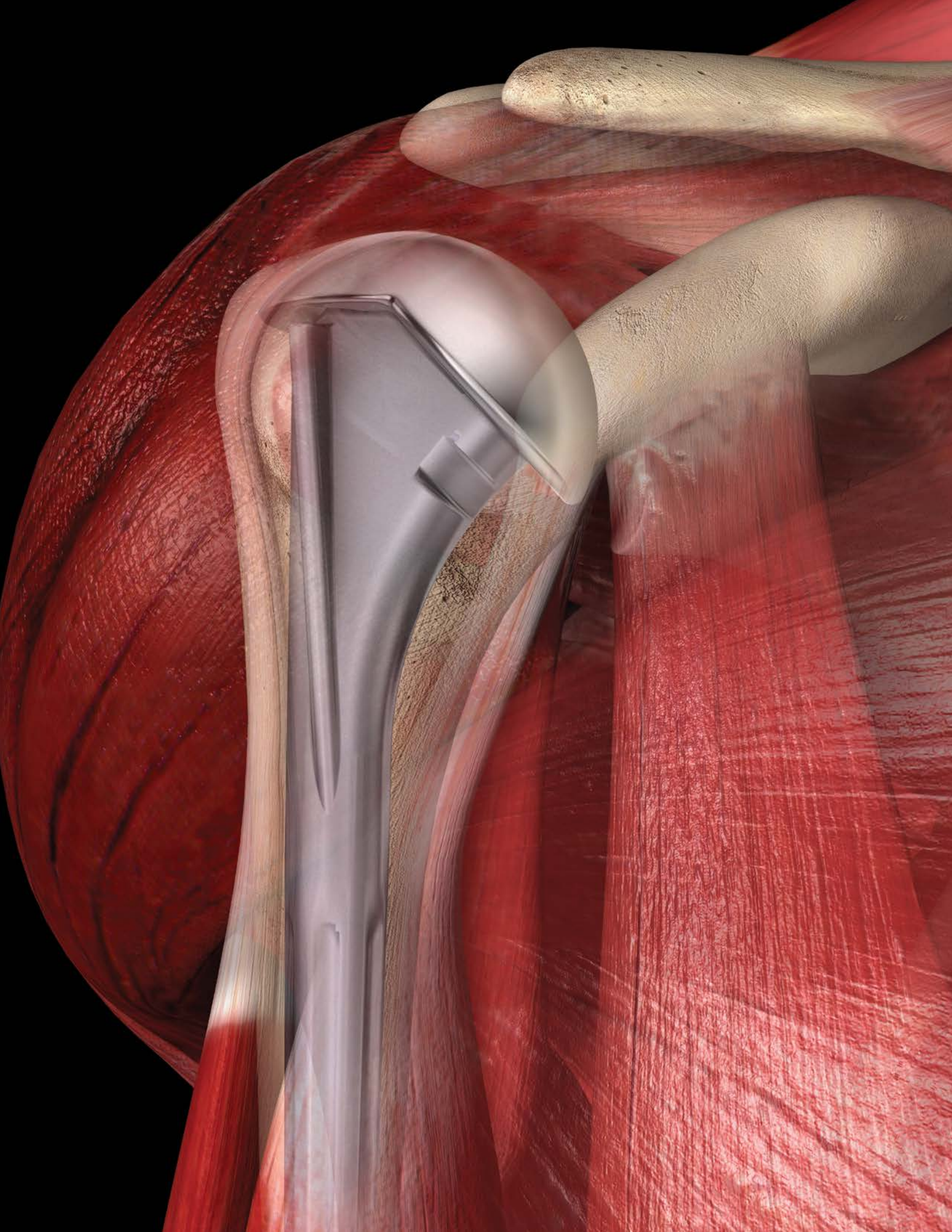


Figure 53





# Revision Procedure

Removal of the humeral head during revision surgery can be achieved without disturbing a well-fixed stem.

## Removing the Humeral Head

The humeral head can be removed using the humeral head removal tool attached to the extractor tool. Place the jaws of the removal tool around the humeral head so that the teeth are inserted into the gap between the humeral head and the osteotomy surface. Tighten the jaws by turning the wheel at the top of the tool. Then use a mallet to remove the head by tapping the extractor tool (Figure 54).

Alternatively, the humeral head can be removed using the humeral head distractor. Place the two prongs of the distractor between the humeral head and the osteotomy surface so that the prongs will advance in each side of the linking component. Lift the head off the neck segment by impacting the end of the distractor (Figure 55).



Figure 54

## Removing the Neck Component

Place the two prongs of the ball taper trial distractor around the taper and impact the end of the tool to lift the taper away from the stem.

The stem is designed so that the stem insert and the ball taper can be removed as a single unit (Figure 56). However, if the stem insert remains in place within the stem, it is easily removed using the extractor tool (Figure 57). Thread the extractor tool into the insert until it contacts the bottom of the stem's taper. Continue advancing the extractor tool until the taper insert is pushed loose. The same method can be used to remove the fixed angle neck component.

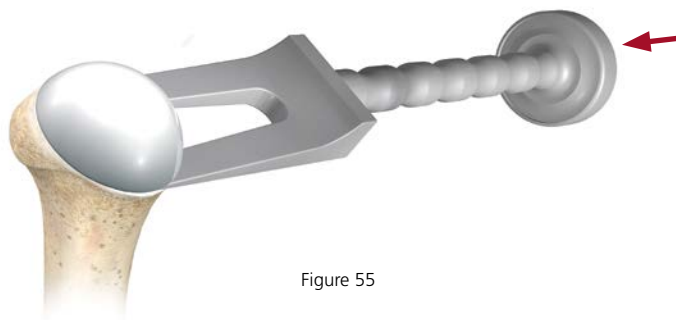


Figure 55

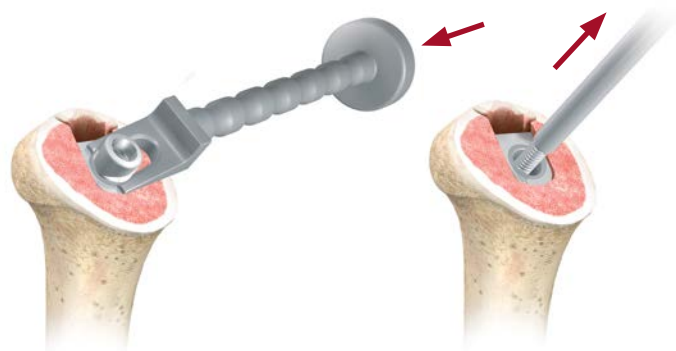


Figure 56

Figure 57



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### Revision Fixed Angle Neck Trial

Place the plastic, fixed angle trial neck into the tapered recess in the implanted stem and lightly tap in place. Place the calcar reamer over the plastic trial to determine how close the neck resection angle is to the 135 degree angle of the fixed neck device (Figure 58).

If the neck angle is correct, place the head trial onto the fixed angle trial neck. Choose either the centered or eccentric head trial, verifying that it achieves appropriate coverage of cortical bone, with 5-8mm of height above the greater tuberosity (Figure 59). If necessary increase or decrease the selected head diameter and height and reassess in place.

If an eccentric head is used, the position of the arrow (indicating maximum distance from the center of the head) needs to be marked on the bone with a sterile pen (Figure 60). Remove the head and fixed angle trial neck.

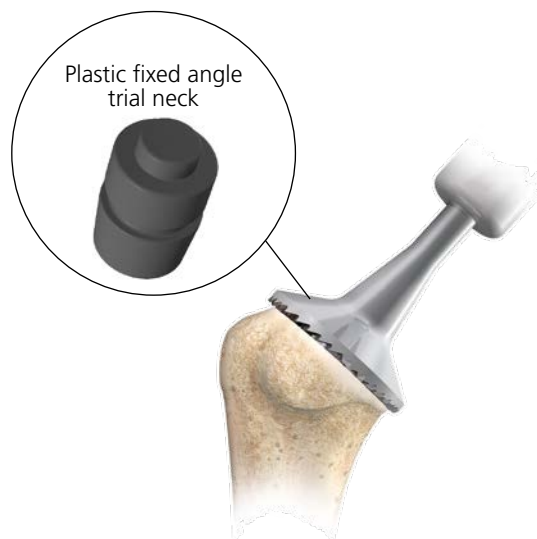


Figure 58



Figure 59



Figure 60

# Revision Procedure

Insert the fixed angle taper into the taper in the top of the stem with the end etched "THIS SIDE UP" facing superiorly. Using the impaction rod, impact sharply three to four times so that the fixed angle taper is completely engaged (Figure 61). Remove the impaction rod.

Place the definitive head onto the fixed angle taper. If an eccentric head has been selected, mark the arrow position (found on the non-articular surface) using a sterile marker on top of the head. Align with the mark previously made on the bone surface (Figure 62). Impact the head using the Celcon humeral head impactor.

**Note:** Verify the head taper engages the neck before the bottom surface of the head hits the osteotomy surface. If the head contacts bone before the taper engages then a small amount of bone must be removed.



Figure 61



Figure 62

### Revision Variable Angle Neck Trial

If the head resection angle is not 135 degrees, select the revision trial insert and lightly tap into position using the impaction rod. Open the sterile ball cylinder trial. Check that the peg screw is appropriately positioned and that the expandable sphere is not expanded. If necessary, adjust by using the T-handle to turn the screw counterclockwise.

Insert the ball cylinder neck trial into the trial head by aligning the slot on the neck trial with the nub inside the central barrel of the trial head. Use sufficient pressure to overcome the interference spring and “lock” the trial neck into the trial head. Insert the trial head/neck assembly into the revision trial insert.

**Note:** Engage the trial head/ball cylinder trial into the seated revision trial insert. Proper engagement will be accompanied by a positive “snap”. Verify that the trial head is resting on the osteotomy. If it is not, the head and/or ball cylinder trial is not properly seated.

Take the trial head handle and insert the two prongs into the head (Figure 63).

Use the trial head handle to rotate and angle the assembly to achieve optimal version and coverage of the osteotomy (Figure 64).

Once the head trial position is set, feed the T-handle driver through the trial head handle and lock the assembly in place with a clockwise turn of the peg screw. When tightening the T-handle driver, take care to apply counter pressure to the handle, stabilizing the implant (Figure 65).



Figure 63



Figure 64

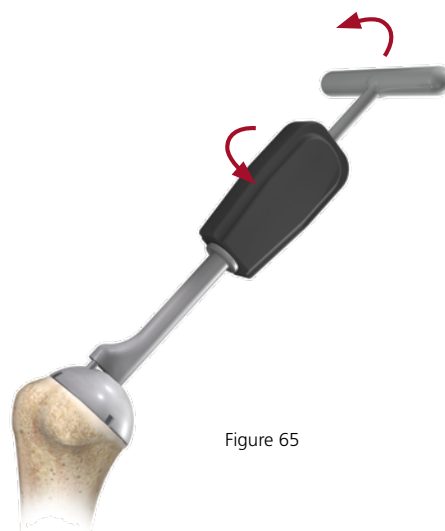


Figure 65

# Revision Procedure

If an eccentric head is used, the position of the arrow (indicating maximum distance from the center of the head) needs to be marked on the bone with a sterile pen. The head can now be removed. The revision trial insert and the ball cylinder trial can now be removed by gently prying up with the ball taper distractor (Figure 66).

**Note:** When removing the adjustable neck trial/revision trial insert assembly be careful to avoid changing the orientation of the recorded angle of the ball trial cylinder.

Once the trial is successfully complete the only change from the primary technique (for transferring neck angle) is the use of the revision transfer block. Place the revision transfer block (gold end up) inside the impaction block and secure it to the block, making sure that the indicator marks on the sliding clamp are hidden by the mating features of the revision transfer block (Figure 67).

**Note:** The revision transfer block has two ends. The gold end is used for recording the angle on the trial; the silver is used to transfer the angle to the definitive assembly.



Figure 66



Figure 67

Firmly tighten the knob on the front of the block, and continue with the procedure outlined on the primary section of this guide, using the revision transfer block in place of a trial (Power Tower Key Steps - Variable Neck 1-4).

Remove the revision transfer block, and place it silver end up back in the impaction block in place of the implant (Figure 68). Repeat steps from the primary section, (Power Tower Key Steps - Variable Neck 5-7).

The definitive linking component assembly is removed from the revision transfer block and placed into the definitive stem so that the etch mark on the stem insert is aligned with the etch mark on the stem. The impaction rod is used to tap the assembly into the stem with 3-4 controlled impactions. Place the head onto the assembly. If an eccentric head has been selected, mark the arrow position (found on the non-articular surface) using a sterile marker on top of the head. Align it with the mark previously made on the bone surface (Figure 70). Use the Celcon humeral head impactor to impact into its final position.

**Note:** Verify the head taper engages before the bottom surface of the head hits the osteotomy surface. If the head contacts bone before the taper engages then a small amount of bone must be removed.



Figure 68

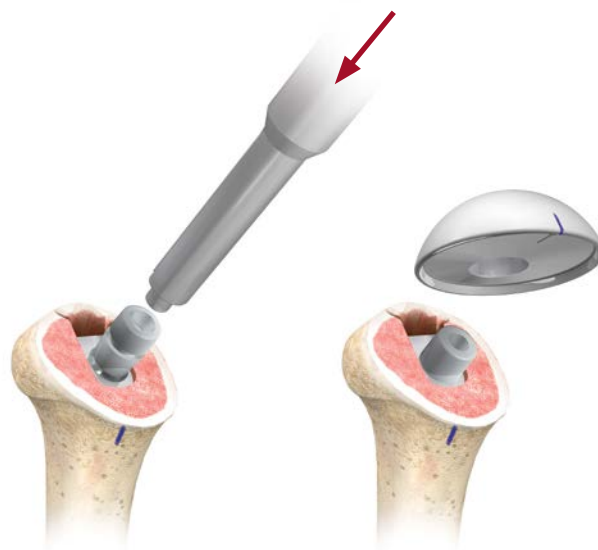


Figure 69

Figure 70

# Implants and Disposables

## Neck Implant Components

1130-00-000	Ball Taper Adjustable Neck Assembly
1130-02-000	Fixed 135 Degree Taper Assembly

## Standard Humeral Stem Components

1130-06-000	Standard Humeral Stem 6mm x 101mm
1130-08-000	Standard Humeral Stem 8mm x 126mm
1130-10-000	Standard Humeral Stem 10mm x 132mm
1130-12-000	Standard Humeral Stem 12mm x 137mm
1130-14-000	Standard Humeral Stem 14mm x 147mm
1130-16-000	Standard Humeral Stem 16mm x 154mm

## POROCOAT® Humeral Stem Components

1130-06-200	POROCOAT Humeral Stem 6mm x 101mm
1130-08-200	POROCOAT Humeral Stem 8mm x 126mm
1130-10-200	POROCOAT Humeral Stem 10mm x 132mm
1130-12-200	POROCOAT Humeral Stem 12mm x 137mm
1130-14-200	POROCOAT Humeral Stem 14mm x 147mm
1130-16-200	POROCOAT Humeral Stem 16mm x 154mm

## Humeral Long Stem Revision Components

1130-08-010	Humeral Stem 8mm x 197mm
1130-10-010	Humeral Stem 10mm x 207mm
1130-12-010	Humeral Stem 12mm x 217mm
1130-14-010	Humeral Stem 14mm x 217mm

## Humeral Head Components

1100-40-500	Humeral Head 40 x 15
1100-40-510	Humeral Head 40 x 18
1100-44-500	Humeral Head 44 x 15
1100-44-510	Humeral Head 44 x 18
1100-44-520	Humeral Head 44 x 21
1100-48-500	Humeral Head 48 x 15
1100-48-510	Humeral Head 48 x 18
1100-48-520	Humeral Head 48 x 21
1100-52-500	Humeral Head 52 x 15
1100-52-510	Humeral Head 52 x 18

## Humeral Head Components

1100-52-520	Humeral Head 52 x 21
1100-56-510	Humeral Head 56 x 18
1100-56-520	Humeral Head 56 x 21
1100-40-600	Humeral Head 40 x 15 Eccentric
1100-40-610	Humeral Head 40 x 18 Eccentric
1100-44-600	Humeral Head 44 x 15 Eccentric
1100-44-610	Humeral Head 44 x 18 Eccentric
1100-44-620	Humeral Head 44 x 21 Eccentric
1100-48-600	Humeral Head 48 x 15 Eccentric
1100-48-610	Humeral Head 48 x 18 Eccentric
1100-48-620	Humeral Head 48 x 21 Eccentric
1100-52-600	Humeral Head 52 x 15 Eccentric
1100-52-610	Humeral Head 52 x 18 Eccentric
1100-52-620	Humeral Head 52 x 21 Eccentric
1100-56-610	Humeral Head 56 x 18 Eccentric
1100-56-620	Humeral Head 56 x 21 Eccentric

## Anchor Peg Glenoid Implants featuring Premieron X-Linked Polyethylene

1136-40-026	Anchor Peg Glenoid 40mm
1136-41-026	Anchor Peg Glenoid 44mm
1136-42-026	Anchor Peg Glenoid 48mm
1136-43-026	Anchor Peg Glenoid 52mm
1136-44-026	Anchor Peg Glenoid 56mm

## Single Use Only Instruments

2130-00-000	Ball Cylinder Trial
2130-02-000	Revision Trial Insert



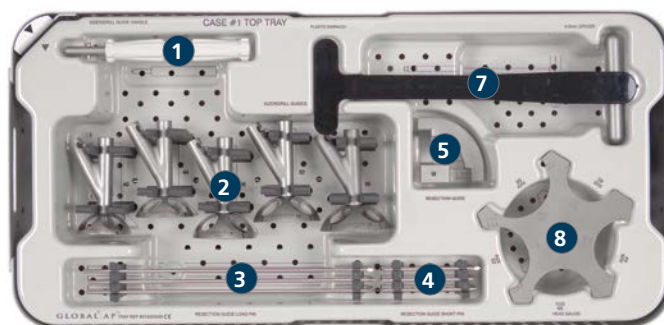
# AP Instruments

## 2130-24-000 Case 1 Complete

### Case 1

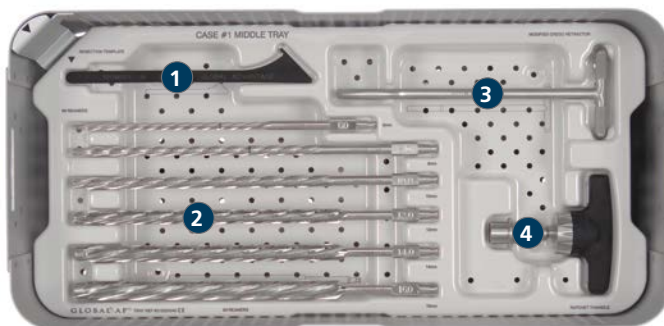
#### Top Tray

- |    |             |                                       |
|----|-------------|---------------------------------------|
| 1. | 2230-80-060 | Humeral Head Sizer/Drill Guide Handle |
| 2. | 2230-80-010 | Humeral Head Sizer/Drill Guide 40mm   |
|    | 2230-80-020 | Humeral Head Sizer/Drill Guide 44mm   |
|    | 2230-80-030 | Humeral Head Sizer/Drill Guide 48mm   |
|    | 2230-80-040 | Humeral Head Sizer/Drill Guide 52mm   |
|    | 2230-80-050 | Humeral Head Sizer/Drill Guide 56mm   |
| 3. | 2235-97-001 | Threaded 6 Inch Guide Pin             |
| 4. | 2490-95-000 | 1/8 Dia. X 3 Short Fixation Pins      |
| 5. | 2130-01-020 | Resection Guide                       |
| 6. | 2130-01-100 | 4.5mm Trial Driver                    |
| 7. | 2236-31-000 | Plastic Darrach                       |
| 8. | 2130-01-019 | Head Gauge                            |



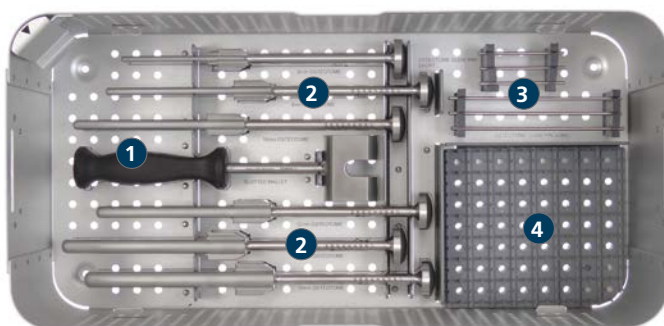
#### Middle Tray

- |    |             |                            |
|----|-------------|----------------------------|
| 1. | 2128-61-071 | Humeral Head Cutting Guide |
| 2. | 2128-01-006 | Humeral Reamer 6mm         |
|    | 2128-01-008 | Humeral Reamer 8mm         |
|    | 2128-01-010 | Humeral Reamer 10mm        |
|    | 2128-01-012 | Humeral Reamer 12mm        |
|    | 2128-01-014 | Humeral Reamer 14mm        |
|    | 2128-01-016 | Humeral Reamer 16mm        |
| 3. | 2236-26-000 | Modified Crego Retractor   |
| 4. | 2128-61-070 | Ratchet T-Handle           |



#### Base

- |    |             |                                   |
|----|-------------|-----------------------------------|
| 1. | 2810-01-003 | Slotted Mallet                    |
| 2. | 2130-01-006 | Osteotome 6mm                     |
|    | 2130-01-008 | Osteotome 8mm                     |
|    | 2130-01-010 | Osteotome 10mm                    |
|    | 2130-01-012 | Osteotome 12mm                    |
|    | 2130-01-014 | Osteotome 14mm                    |
|    | 2130-01-016 | Osteotome 16mm                    |
| 3. | 2130-18-000 | 3.2mm Osteotomy Guide Pin - Short |
|    | 2130-20-000 | 3.2mm Osteotomy Guide Pin - Long  |
| 4. | 2130-01-017 | Large Osteotomy Cover             |
|    | 2130-01-018 | Small Osteotomy Cover             |



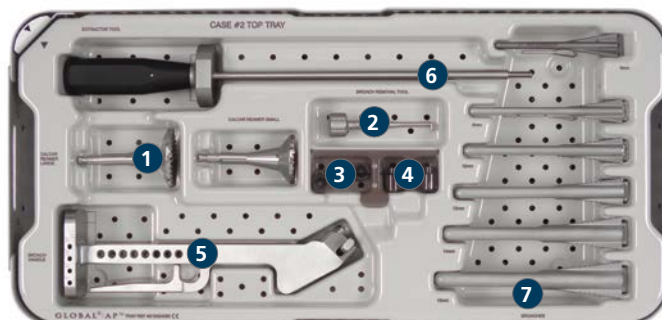
# AP Instruments

## 2130-24-060 Case 2 Complete

### Case 2

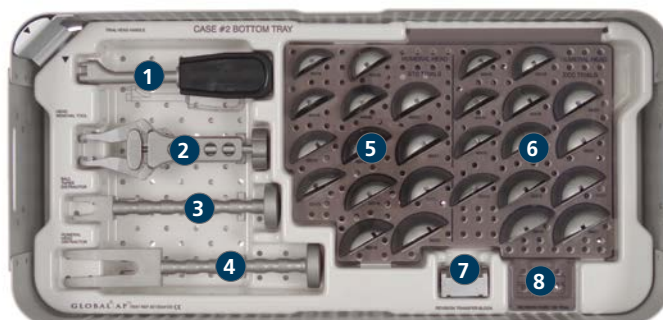
#### Top Tray

1.	2130-01-060	Small Calcar Reamer 40/44mm
	2130-01-065	Large Calcar Reamer 48/52/56mm
3.	2130-01-085	Broach Removal Tool
3.	2130-01-029	Broach Handle Adapter
4.	2130-01-070	Calcar Alignment Guide Assembly
5.	2130-01-030	Broach Handle
6.	2130-01-075	Extraction Handle
7.	2130-06-000	Humeral Stem 6mm Broach/Trial
	2130-08-000	Humeral Stem 8mm Broach/Trial
	2130-10-000	Humeral Stem 10mm Broach/Trial
	2130-12-000	Humeral Stem 12mm Broach/Trial
	2130-14-000	Humeral Stem 14mm Broach/Trial
	2130-16-000	Humeral Stem 16mm Broach/Trial



#### Bottom Tray & Base

1.	2130-01-105	Trial Head Handle
2.	2130-01-080	Head Removal Tool
3.	2130-01-110	Ball Taper Distractor
4.	2130-01-120	Humeral Head Distractor
5.	2130-40-500	Humeral Head 40 x 15 Trial
	2130-40-510	Humeral Head 40 x 18 Trial
	2130-44-500	Humeral Head 44 x 15 Trial
	2130-44-510	Humeral Head 44 x 18 Trial
	2130-44-520	Humeral Head 44 x 21 Trial
	2130-48-500	Humeral Head 48 x 15 Trial
	2130-48-510	Humeral Head 48 x 18 Trial
	2130-48-520	Humeral Head 48 x 21 Trial
	2130-52-500	Humeral Head 52 x 15 Trial
	2130-52-510	Humeral Head 52 x 18 Trial
	2130-52-520	Humeral Head 52 x 21 Trial
	2130-56-510	Humeral Head 56 x 18 Trial
	2130-56-520	Humeral Head 56 x 21 Trial
6.	2130-40-600	Humeral Head 40 x 15 Eccentric Trial
	2130-40-610	Humeral Head 40 x 18 Eccentric Trial
	2130-44-600	Humeral Head 44 x 15 Eccentric Trial
	2130-44-610	Humeral Head 44 x 18 Eccentric Trial
	2130-44-620	Humeral Head 44 x 21 Eccentric Trial
	2130-48-600	Humeral Head 48 x 15 Eccentric Trial
	2130-48-610	Humeral Head 48 x 18 Eccentric Trial
	2130-48-620	Humeral Head 48 x 21 Eccentric Trial
	2130-52-600	Humeral Head 52 x 15 Eccentric Trial
	2130-52-610	Humeral Head 52 x 18 Eccentric Trial
	2130-52-620	Humeral Head 52 x 21 Eccentric Trial
	2130-56-610	Humeral Head 56 x 18 Eccentric Trial
	2130-56-620	Humeral Head 56 x 21 Eccentric Trial
7.	2130-01-000	Revision Transfer Block
8.	2130-00-135	Revision Fixed 135 Degree Neck Trial



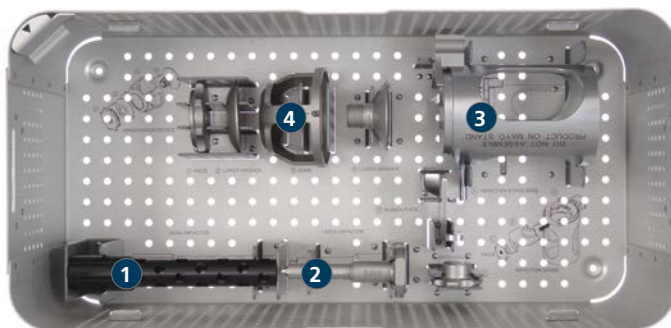


## 2130-24-110 Case 3 Complete

### Case 3

#### Base

- |    |             |                           |
|----|-------------|---------------------------|
| 1. | 2130-04-000 | Head Impactor             |
| 2. | 2130-01-055 | Taper Impactor            |
| 3. | 2130-01-040 | Impaction Stand Assembly  |
| 4. | 2130-01-050 | Orientation Dome Assembly |



### DNIs and Templates

- |             |  |
|-------------|--|
| 2130-99-010 | Humeral Stem DNI Size 8                            |
| 2130-99-020 | Humeral POROCOAT<br>Porous Coating Stem DNI Size 8 |
| 2130-99-030 | Standard Head DNI 48 x 18                          |
| 2130-99-040 | Eccentric Head DNI 48 x 18                         |
| 2130-99-050 | Neck Assembly DNI Components                       |
| 2130-22-000 | X-Ray Templates                                    |

# CTA Implants and Instruments

## Implants

1130-44-515	GLOBAL AP CTA Humeral Head 44 x 18
1130-44-525	GLOBAL AP CTA Humeral Head 44 x 23
1130-48-515	GLOBAL AP CTA Humeral Head 48 x 18
1130-48-525	GLOBAL AP CTA Humeral Head 48 x 23
1130-52-515	GLOBAL AP CTA Humeral Head 52 x 18
1130-52-525	GLOBAL AP CTA Humeral Head 52 x 23
1130-56-515	GLOBAL AP CTA Humeral Head 56 x 18
1130-56-525	GLOBAL AP CTA Humeral Head 56 x 23

## Instruments

2130-44-515	GLOBAL AP CTA Trial Head 44 x 18 Assembly
2130-44-525	GLOBAL AP CTA Trial Head 44 x 23 Assembly
2130-48-515	GLOBAL AP CTA Trial Head 48 x 18 Assembly
2130-48-525	GLOBAL AP CTA Trial Head 48 x 23 Assembly
2130-52-515	GLOBAL AP CTA Trial Head 52 x 18 Assembly
2130-52-525	GLOBAL AP CTA Trial Head 52 x 23 Assembly
2130-56-515	GLOBAL AP CTA Trial Head 56 x 18 Assembly
2130-56-525	GLOBAL AP CTA Trial Head 56 x 23 Assembly
2130-01-130	GLOBAL AP CTA DP Cut Guide Assembly
2130-24-160	GLOBAL AP CTA Instrument Tray Complete
2130-24-170	GLOBAL AP CTA Instrument Tray
2130-24-180	GLOBAL AP CTA Instrument Lid

## DNI and Templates

2130-99-000	GLOBAL AP CTA DNI
2130-23-000	GLOBAL AP CTA Templates



GLOBAL AP CTA Tray Layout



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