

PINNACLE®
HIP SOLUTIONS

PINNACLE® Hip Solutions

Dual Mobility

Surgical Technique



DePuy Synthes

PART OF THE *Johnson & Johnson* FAMILY OF COMPANIES

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The PINNACLE® Acetabular Hip System primary surgical technique has been developed in consultation with an experienced surgeon design team and provides the surgeon with general guidance when implanting the PINNACLE Acetabular Hip System.

Templating and Pre-Operative Planning

The primary goal of total hip arthroplasty is the anatomic reconstruction of the hip joint, resulting in favorable prosthetic joint load and function. Mechanically, the goals are to create a stable articulation with an optimized range of motion, restore biomechanics for muscular efficiency and equalize limb lengths. Meeting these goals begins with a thorough analysis of the hip with comparison to the contralateral side in anteroposterior (A/P) and lateral projections. The desired magnification for all imaging should be 20 percent, which corresponds to the acetate templates provided for the PINNACLE® Acetabular System (Figure 1). Magnification markers taped to the patient's leg at the level of the trochanter will assist in determining actual magnification.

For the A/P projection, place both extremities in 15 degrees of internal rotation to position the head and neck parallel to the coronal plane. Center the beam on the pubic symphysis and ensure the proximal femoral shaft is included in the radiograph. The radiographs should clearly demonstrate the acetabular configuration and the endosteal and periosteal contours of the femoral head, neck and proximal femur.



Frequently, the affected hip is fixed in external rotation, which leads one to underestimate the amount of offset present. In this situation it may be helpful to template the normal hip. Take a Lowenstein lateral with the patient on his/her side, and the trochanter, ankle and knee on the table. Alternately, take a Johnson's lateral for a detailed examination of the anatomic version and anterior osteophytes. Take into consideration any anatomical anomaly, dysplasia, previous fracture or leg length discrepancy.

PINNACLE Acetabular Templates are oriented at 45 degrees and allow measurement of any Hip that can be accommodated by the PINNACLE Acetabular Cup System primary components (38–72 mm). Using the A/P radiograph, position the template at a targeted 40–45 degrees to the inter-teardrop or interischial line so that the inferomedial aspect of the cup abuts the teardrop and the superior-lateral cup is not excessively uncovered (Figures 2 and 3).

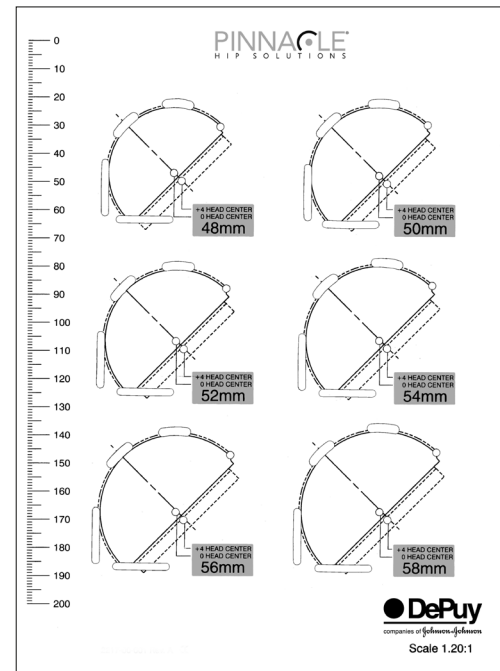


Figure 1.



Figure 2. Acetabulum with good lateral coverage

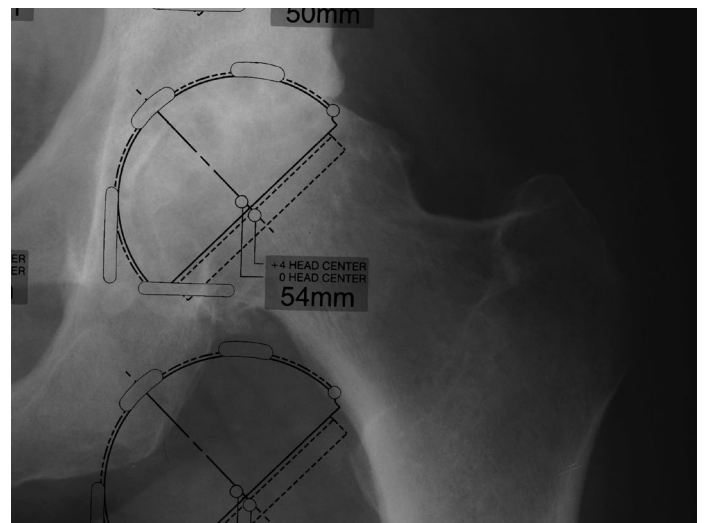


Figure 3. Properly positioned acetabular template

Anterolateral Surgical Approach

Use the approach with which you are most familiar. PINNACLE Hip System Instrumentation was designed to accommodate all surgical approaches.

Skin Incision

For the anterolateral approach, place the patient in the lateral decubitus position and execute a skin incision that extends from distal to proximal, centered over the anterior aspect of the femur, continuing over the greater trochanter tip (Figure 4).

Fascial Incision

The iliotibial band is split under the skin incision, extending proximally into the gluteus maximus or in between the maximus and the tensor fascia lata muscles (Figure 5).

Initial Exposure

Palpate the anterior and posterior borders of the gluteus medius. The gluteus medius is split from the trochanter, parallel to its fibers, releasing the anterior 1/2 to 1/3 of the muscle (Figure 6).

The gluteus medius should not be split more than 4 cm from the tip of the greater trochanter. Care must be taken to ensure the inferior branch of the superior gluteal nerve is not damaged. The gluteus minimus is exposed and released either with or separate from the gluteus medius. Flexion and external rotation of the leg facilitates exposure of the hip capsule, which is incised (capsulotomy) or excised (capsulectomy) depending on surgeon preference.



Figure 4. Skin Incision



Figure 5. Fascial Incision

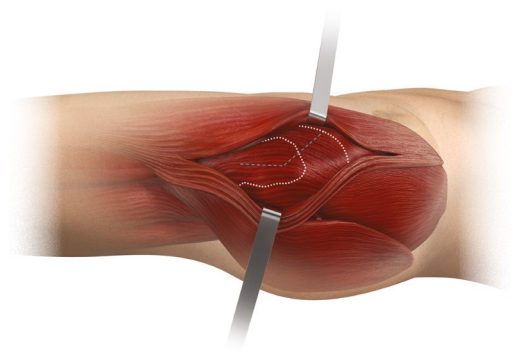


Figure 6. Gluteus Medius Split

Hip Dislocation

Dislocate the hip with gentle adduction, external rotation and flexion. The patient's leg is now across the contralateral leg and the foot is placed in a sterile pouch (not shown, Figure 7). If dislocation is difficult, additional inferior capsule may be released.



Figure 7. Hip Dislocation

Femoral Neck Osteotomy

Expose the femoral neck (Figure 8) and perform a femoral neck osteotomy protocol for the selected femoral prosthesis. Exposure of the acetabulum is accomplished by placing the leg back on the table in slight flexion and external rotation. Use a self-retaining retractor to spread the medius and minimus anteriorly and the hip capsule posteriorly.

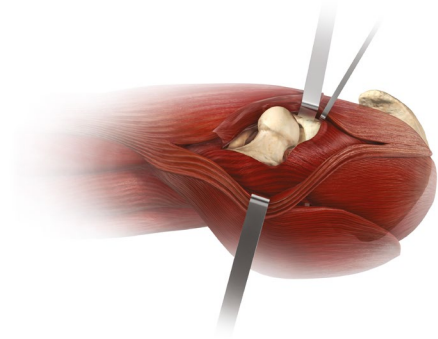


Figure 8. Femoral Neck Exposure

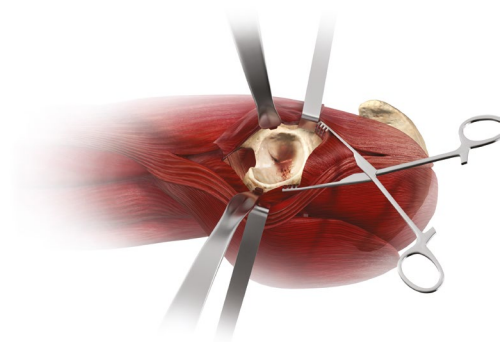


Figure 9. Acetabular Exposure

Posterolateral Surgical Approach

Use the approach with which you are most familiar. PINNACLE Hip System Instrumentation was designed to accommodate all surgical approaches.

Skin Incision

For the posterolateral approach, place the patient in the lateral decubitus position. Ensure that the operating table is parallel to the floor and that the patient is adequately secured to the table to improve accuracy.

Center the skin incision over the greater trochanter, carrying it distally over the femoral shaft for about

15 cm and proximally in a gently curving posterior arc of about 30 degrees for about the same distance (Figure 10)



Figure 10. Skin Incision

Fascial Incision

Incise the iliotibial tract distally following the skin incision (Figure 11). Develop the incision proximally by blunt dissection of the gluteus maximus along the direction of its fibers.

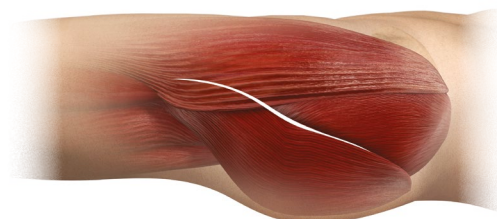


Figure 11. Facial Incision

Initial Exposure

Place the leg in extension and internal rotation. Utilize self-retaining retractors to facilitate the exposure. Gently sweep loose tissue posteriorly, exposing the underlying short external rotators and quadratus femoris (Figure 12). Identify the posterior margin of the gluteus medius muscle proximally and the tendon of the gluteus maximus distally. Use caution to protect the sciatic nerve.

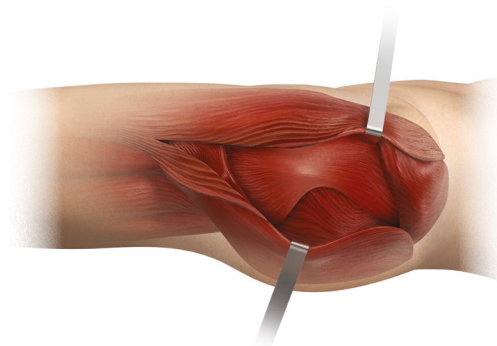


Figure 12. Short External Rotators

Incise the quadratus femoris, leaving a cuff of tissue for later repair (Figure 13). This exposes the terminal branch of the medial circumflex artery, which lies deep to the proximal third of the quadratus femoris. Identify the piriformis tendon, the obturator internus tendon (conjoint with the gemelli tendons) and the tendon of the obturator externus, and free them from their insertions at the greater trochanter. The piriformis and the conjoint tendon may be tagged for subsequent reapproximation.

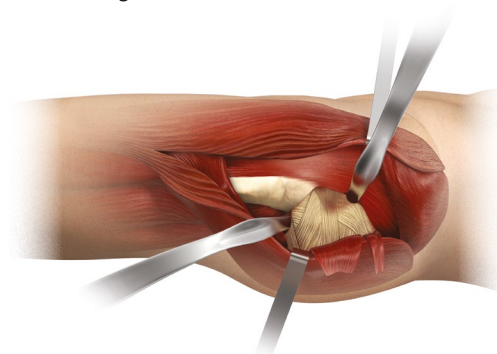


Figure 13. Quadratus Femoris Incision

Posterior Capsulotomy

Retract the short rotator muscles posteromedially together with the gluteus maximus (with consideration to the proximity of the sciatic nerve), thus exposing the posterior capsule (refer to Figure 13). Place cobra retractors anteriorly and inferiorly (Figure 14).

Open the capsule posteriorly starting at the acetabular margin at about 12 o'clock and heading to the base of the neck, around the base of the neck inferiorly and back to the inferior acetabulum, creating a posteriorly based flap for subsequent repair. Excise additional anterosuperior capsule to enhance dislocation of the hip. Alternatively the capsule can be excised (capsulectomy).

Femoral Exposure

Place a superior pin or retractor in the ilium at approximately the 12 o'clock position. The pin placement is approximately 2 cm superior to the acetabular margin. Caution should be taken not to penetrate the medial wall of the ilium. Measure leg length and dislocate the hip through a combination of flexion, adduction and internal rotation. Osteotomize the femoral neck in accordance with the protocol of the femoral component you have selected.

Acetabular Exposure

One key to proper acetabular component positioning is adequate surgical exposure. Following femoral neck resection, pass a curved retractor, which straddles the pubis, or a blunt cobra over the anterior column to displace the femur anteriorly (Figure 15).

Position a second retractor at the acetabular notch, inferior to the transverse acetabular ligament. An additional retractor may be positioned posteriorly to retract the capsule or short external rotators.

Care should be taken to position retractors to avoid injury to the sciatic nerve. Obtain an unobstructed view of the acetabulum. Excise the entire labrum and remove osteophytes to identify the true anterior and posterior acetabular margins. Release or resect the transverse ligament, together with any accompanying osteophytes. A branch of the obturator artery is often encountered. Clear all soft tissue from the fovea to define the true medial wall.

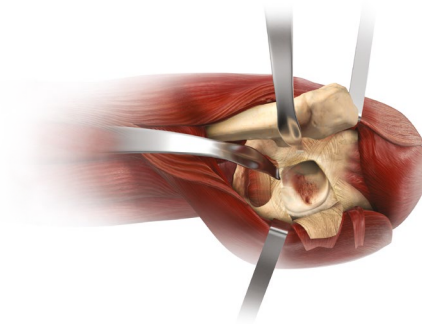


Figure 14. Posterior Capsulotomy

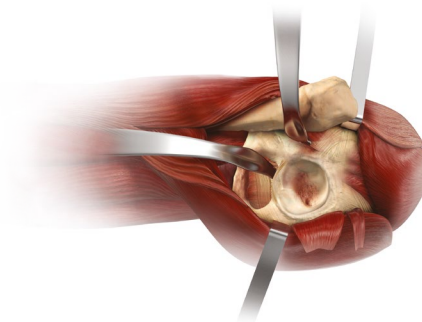


Figure 15. Acetabular Exposure

Acetabular Reaming

The goal of acetabular reaming is to restore the center of the natural acetabulum.

Initially, employ a grater 6–8 mm smaller than the anticipated acetabular component size to deepen the acetabulum to the level determined by pre-operative templating (Figures 16 and 17). Subsequent reaming should proceed in 1–2 mm increments. Center the graters in the acetabulum until the deepened socket becomes a true hemisphere. Use a curette to free all cysts of fibrous tissue. Pack any defects densely with cancellous bone.

It is important to understand that all PINNACLE Acetabular Hip System Instrumentation is marked with true dimensions meaning, for example, a 54 mm grater reams a 54 mm cavity (Figure 18). The graters, shell trials and acetabular implants are all hemispherical and measure 180 degrees around the dome to the level of the coating on the final shell.

Under-reaming of the acetabulum to allow the press-fit of the final shell is dependent on bone quality and the size of the acetabular component. A 1 mm under-ream is usually sufficient in smaller sockets, while a larger socket may require a 1–2 mm under-ream. Likewise, soft bone will more readily accommodate a greater press-fit of the acetabular component than sclerotic bone.

In some patients, line-to-line reaming may be sufficient to achieve stability.

The orientation and depth of acetabular reaming often determines the orientation and depth of the final shell seating. It is important to ream where the final shell is to be positioned. As such, a part of the grater head will be visible on the superolateral rim when reaming (Figure 17).



Figure 16. Acetabular Reaming

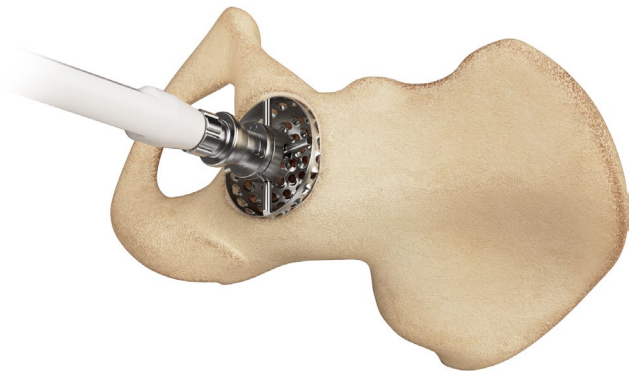
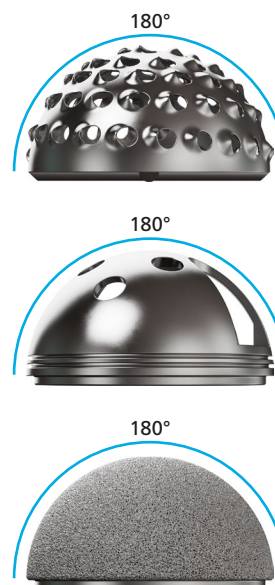


Figure 17. Acetabular Reaming



A 54 mm QUICKSET® Grater reams a 54 mm cavity.

A 54 mm trial is 54 mm in diameter.

A 54 mm PINNACLE Acetabular Shell is 54 mm in diameter as measured over the POROCOAT® Porous Coating

Note: GRIPTION® Coated Shells conform to the same diameter.

Figure 18.

Acetabular Shell Trialing and Positioning

Peer-reviewed publications highlight the importance of acetabular component positioning in relation to short and long-term outcomes during total hip arthroplasty for all types of bearing materials.¹⁻⁸ Cup positioning should be varied to optimize fixation, range of motion and dislocation resistance and minimize the likelihood of subluxation, impingement and edge-loading. This may be assessed during pre-operative planning, acetabular preparation and shell trialing.

Sub-optimal component positioning may lead to edge loading, dislocation, increased wear and polyethylene fracture.¹⁻⁸

Determining the Abduction Angle

The pre-operative A/P radiograph can help determine the targeted abduction angle and be helpful in determining how much of the acetabular component should be left uncovered to provide the proper implant abduction angle (Figures 19 and 20). The targeted shell abduction (as measured on radiographs) should be 40–45 degrees taking into account local soft tissue and anatomic landmarks. The landmarks for acetabular component positioning are the medial wall of the acetabulum (the radiographic tear drop) and the lateral-superior rim of the acetabulum.

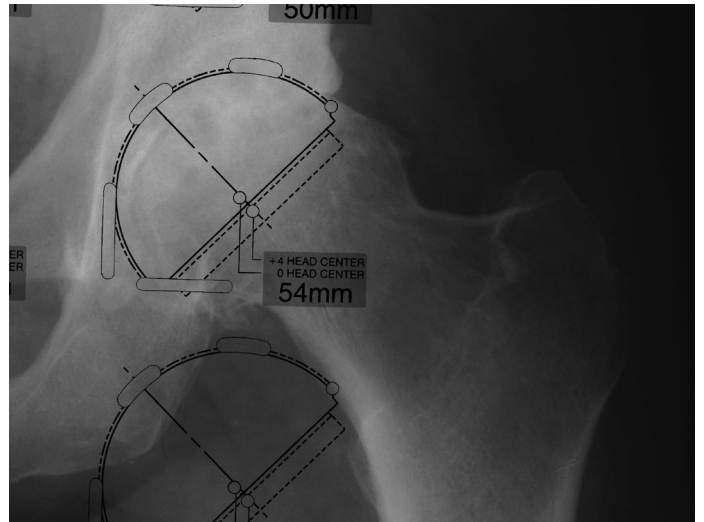


Figure 19. Pre-operative determination of abduction angle.

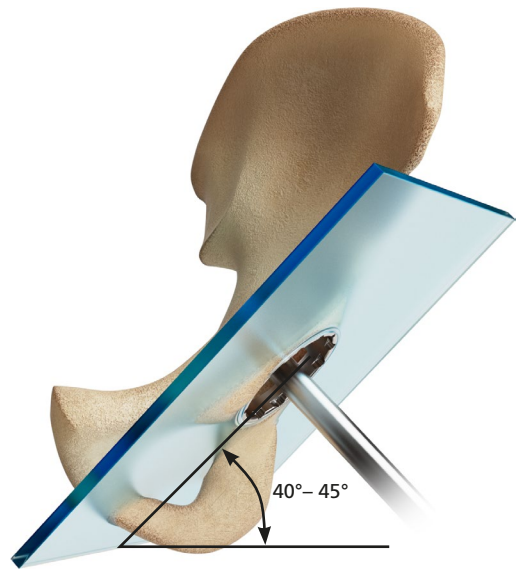


Figure 20. 40°–45° targeted shell abduction (as measured on radiographs).

Acetabular Shell Trialing and Positioning

Determining Proper Anteversion

The use of bony landmarks or the transverse acetabular ligament aids in determining anteversion.⁹ Other methods are subject to error through a change in patient position during the procedure. Defining the bony landmarks of the ischium and pubis during exposure greatly facilitates acetabular component positioning.

The plane created by the pubis and the ischium can serve as a guide for acetabular shell orientation. The shell should be slightly more anteverted than the pubis/ischial plane. This relationship should remain constant regardless of the depth of reaming, and the preoperative A/P X-ray can be helpful in determining how much of the acetabular component should be left uncovered to provide the proper implant abduction angle (Figure 21). The targeted shell anteversion (as measured on radiographs) should be 15–20 degrees taking into account local soft tissue and anatomic landmarks (Figure 21).

Shell trials in 1 mm incremental sizes are available to assess shell fit and orientation. Contingent on the quality of the prepared bone, select the acetabular trial equal to or 1 mm larger in diameter than the final grater size. The “true dimension” of the shell trial is as marked on each trial (i.e. a shell trial marked “54 mm” measures 54 mm in diameter at the rim). Peripheral rim ridges on the shell trial enhance the stability during trial reduction. Liner trials that are marked with an even size fit both even-sized and smaller odd-sized shell trials. For example, a 54 mm dual mobility liner trial fits both the 54 mm and the 53 mm shell trials (refer to Table 2 on page 12). Using shell and liner trials in conjunction with the femoral component trials aid in ensuring optimum position of the components.

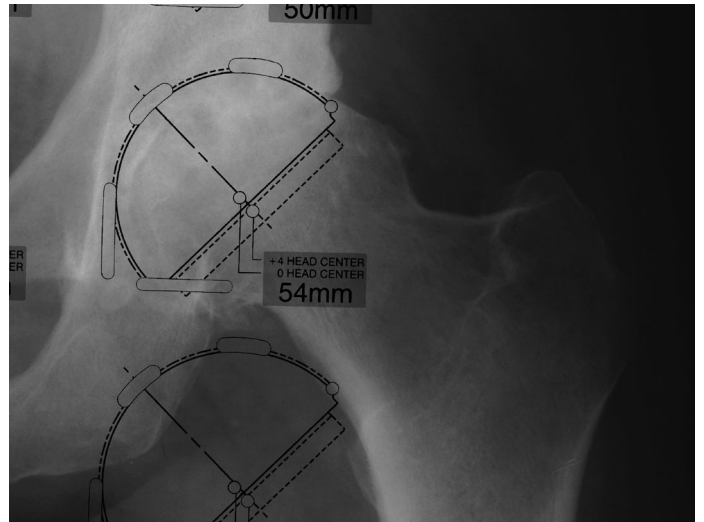


Figure 21. Pre-operative assessment of coverage of the acetabulum.

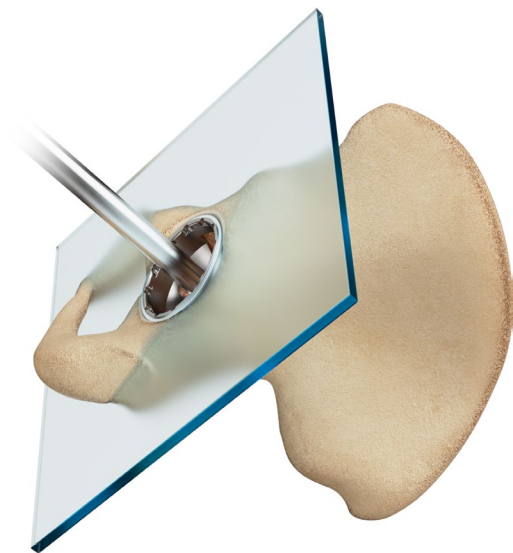


Figure 22. 15°–20° targeted shell anteversion (as measured on radiographs).

Determining Proper Anterversion

An alignment guide is provided to assist with shell positioning. However, shell orientation in the patient depends on patient position. The alignment guide does not allow for variation in patient position with respect to the operating table. It should be noted that patient orientation can vary throughout the procedure.

The PINNACLE Hip Alignment Guide System may be used to indicate an acceptable level of acetabular shell inclination and version. Once assembled, the inserter handle should be raised until the vertical bar is perpendicular to the plane of the operating table with the patient in the lateral decubitus position and the version guide parallel to the floor (Figure 23).

The inserter handle should then be rotated until the extended arm of the version guide is in line with the patient's longitudinal axis (Figure 24).

The extended arm of the version guide follows the long axis of the patient's body, corresponding to the affected hip, to achieve appropriate anteversion.

Confirm complete shell trial seating by sighting through the holes and cutouts in the acetabular shell trial. The screw hole pattern in the trial shell replicates the PINNACLE Sector Shell Implant screw hole pattern to assist with screw targeting.

Do not use the shell trial to prepare screw holes. Prepare screw holes only through the final implant.

The version guide is marked with 30 degree striations, which provides an indication of operative anteversion. Operative anteversion differs from radiographic anteversion due to the projection of angles on a radiograph. Therefore, the 30 degree striation equates to a radiographic anteversion of 20 degrees, as measured on postoperative radiographs.

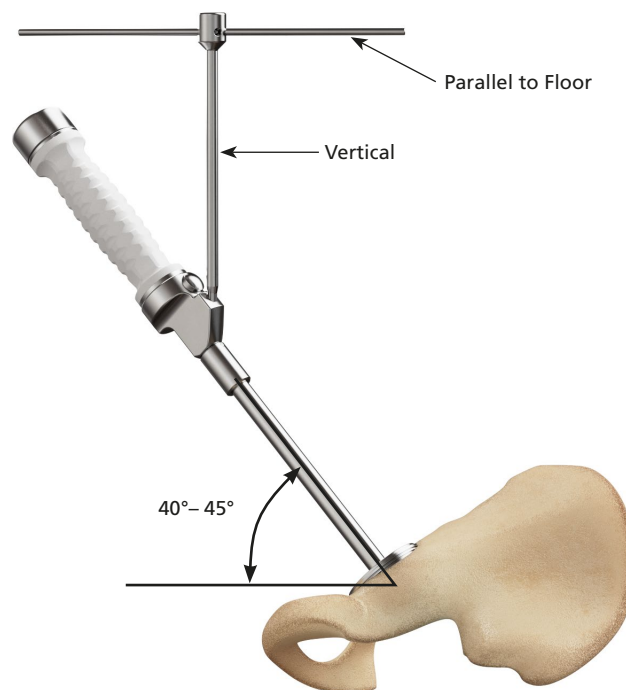


Figure 23. Hold the version guide parallel to the floor and select the abduction angle

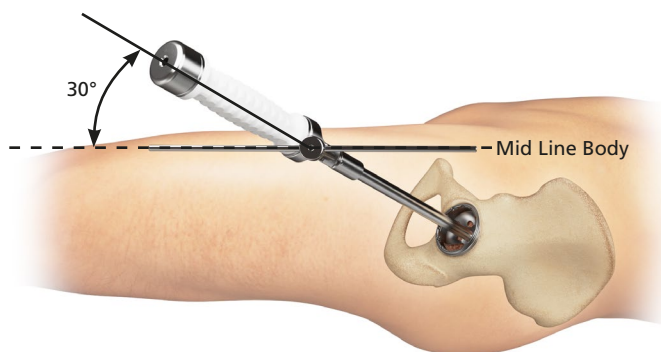


Figure 24. Position the extended arm of the version guide on the long body axis to determine anteversion.

PINNACLE Dual Mobility Trialing

Following the positioning and seating of the acetabular shell trial, choose the correct PINNACLE Dual Mobility Liner Trial (Figure 25) according to Table 2. Secure the liner trial to the shell trial through the apical hole screw using the standard hex head screwdriver (Figure 26).

PINNACLE Acetabular Shell Trial Size	PINNACLE Dual Mobility Liner Trial
47,48	48/41
49,50	50/43
51,52	52/45
53,54	54/47
55,56	56/49
57,58	58/49
59,60	60/51
61,62	62/53
63,64	64/53
65,66	66/55

Table 2: PINNACLE Shell and Dual Mobility Liner Trial compatibility.



Figure 25. PINNACLE Dual Mobility Liner Trial



Figure 26. Secure PINNACLE Dual Mobility Liner Trial to PINNACLE Shell Trial

Mobile Bearing Trial Assembly

Choose the correct PINNACLE Mobile Bearing and ARTICUL/EZE® Head Trials according to Table 3.

Place the correct ARTICUL/EZE Head Trial onto the PINNACLE Dual Mobility Head Trial Insertion Tool (Figure 27) by applying a force to the trial directly in line with the tool until the ARTICUL/EZE Trial is seated and securely in place.

Insert the assembled PINNACLE Dual Mobility Head Trial Insertion Tool into the PINNACLE Dual Mobility Head Trial by holding the Mobile Bearing Head Trial in one hand and placing the ARTICUL/EZE Trial in the opening of the Mobile Bearing Head Trial. Apply pressure at an angle to minimize the force necessary to assemble (Figure 28).

More force is required when attempting to insert the head trial into the Mobile Bearing Head Trial using a direct in-line technique.

Remove the PINNACLE Dual Mobility Head Trial Insertion Tool, ensuring the ARTICUL/EZE Trial remains captured within the mobile bearing head trial by pulling the mobile bearing trial construct and the head trial insertion tool in opposite directions (Figure 29). Verify that the ARTICUL/EZE Trial can move freely within the Mobile Bearing Head Trial.

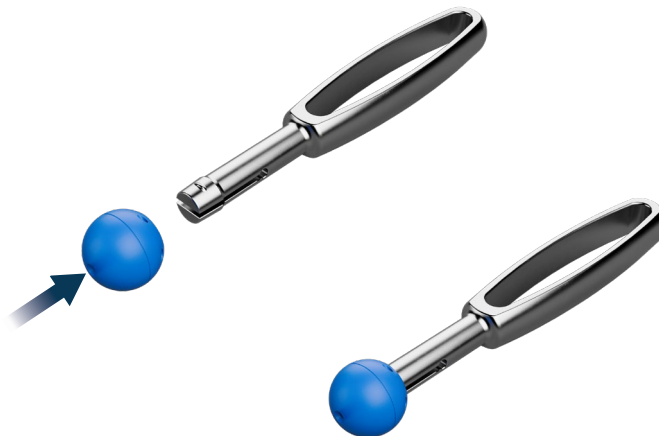


Figure 27. Place ARTICUL/EZE Head Trial onto the PINNACLE Dual Mobility Head Trial Insertion Tool.

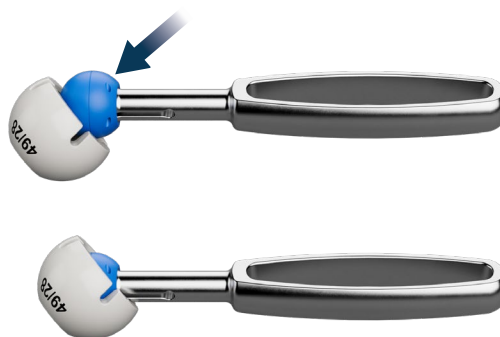


Figure 28. Insert into PINNACLE Mobile Bearing Head Trial.

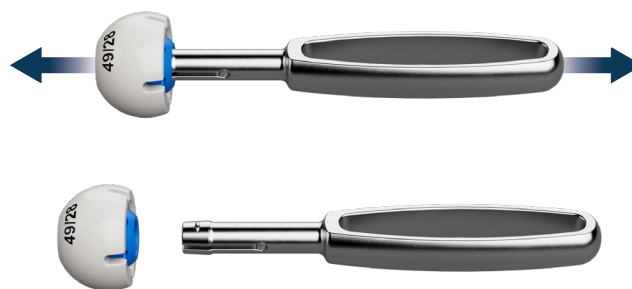


Figure 29. Remove trial construct from PINNACLE Dual Mobility Insertion Tool.

PINNACLE Dual Mobility Liner Trial	PINNACLE Mobile Bearing Head Trial	ARTICUL/EZE Head Trial (mm)
48/41	41/22.225	22.225
50/43	43/22.225	22.225
52/45	45/22.225	22.225
54/47	47/28	28
56/49	49/28	28
58/49	49/28	28
60/51	51/28	28
62/53	53/28	28
64/53	53/28	28
66/55	55/28	28

Table 3: PINNACLE Head Trial compatibility

Mobile Bearing Trial Assembly

Place the mobile bearing assembly onto the neck trial of the femoral component by hand, remove any debris from the outer surface of the mobile bearing head trial and the inner surface of the liner trial, and reduce the construct into the acetabular shell/liner trial.

With the head and liner trials in situ, manipulate the hip and assess what adjustments, if any, are required to ensure stability through a full range of motion (Figure 30).

To check a different inner bearing head offset or to remove the components for disassembly.

Dislocate the hip and remove the mobile bearing assembly from the trial neck segment.

Place the mobile bearing trial assembly onto the shaft of the Dual Mobility Head Trial Insertion Tool.

Lever out the ARTICUL/EZE Head Trial from the mobile bearing trial at an angle similar to what you used to assemble it (Figure 31).

Replace with the desired offset trial head and repeat the steps above for mobile bearing assembly and trial reduction.

Remove the mobile bearing assembly and repeat the steps above to disassemble it with the Dual Mobility Head Trial Insertion tool.

Disassemble the Dual Mobility Head Trial Insertion Tool from the ARTICUL/EZE Head Trial.

Remove PINNACLE Dual Mobility Liner Trial from the shell trial using the hex head screwdriver.



Figure 30.

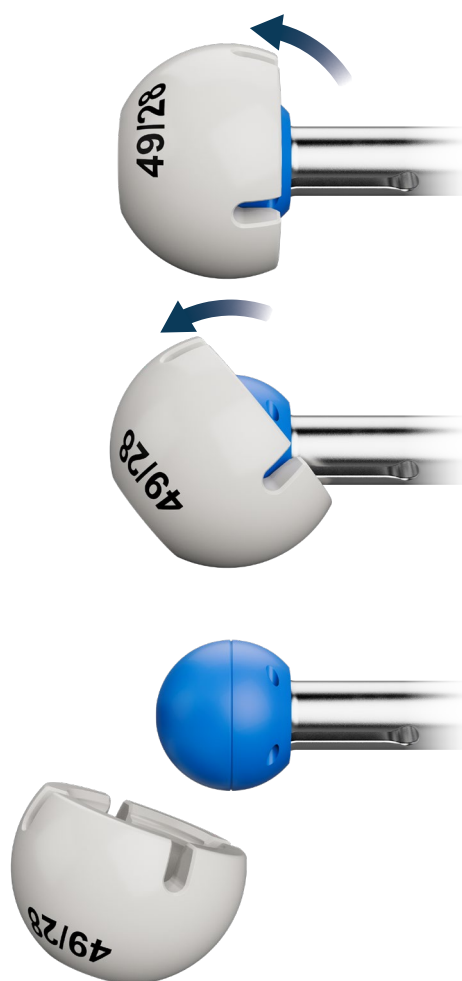


Figure 31.

Mobile Bearing Trial Assembly/Disassembly

Alternative Head Trial Disassembly

Place the assembled head trial onto the black support cone of the head press through the circular opening on the outer head trial (Figure 32).

Please ensure the taper opening on the ARTICUL/EZE Head Trial is facing the tip of the head press.

Align the tabs of the head trial removal tool with the slots on the outer head trial (Figure 33).

Move the polyethylene tip of the head press so it is resting on the head trial removal tool (Figure 34). Compress the handles of the head press until the inner head trial disengages from the outer head trial. An audible click should be heard when the trials become disengaged.

Alternative Head Trial Assembly

The head trials can also be assembled using the head press as described on Page 23 by substituting the ARTICUL/EZE Head Trial for the inner bearing and the mobile bearing trial for the polyethylene component.

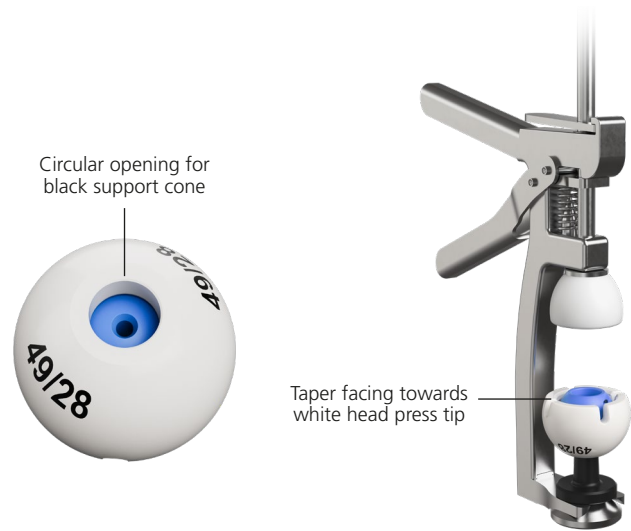


Figure 32.



Figure 33.

Figure 34.

Implanting the Acetabular Shell

Shell Insertion

Each PINNACLE Acetabular Shell style is implanted using the same basic surgical technique; however, some shell styles have technique-specific tips that help facilitate implantation. This technique demonstrates the insertion of a PINNACLE Hip 100 Series (no-hole) Shell. Before implanting the final prosthesis, take the hip through a full range of motion and stability assessment with all trial components in position.

Securely thread the final acetabular shell prosthesis onto the impactor (Figure 35). Use the PINNACLE Hip external alignment guide to assist in component orientation (refer to Figures 23 and 24).

Since the natural acetabulum is inclined at an average angle of 50–55 degrees, a replacement acetabular component implanted at the correct position will have some shell coating visible above the rim of the acetabulum. To achieve the targeted shell position of 40–45 degrees of inclination and 15–20 degrees of anteversion, it is recommended that 4–6 mm of coating should be left exposed. It should be noted, however, that the amount of coating to be left visible is dependent on the angle of the patient's acetabulum and the size of the component used. The three anatomical regions indicated in Figure 36 assist with cup position.

After confirming alignment, impact the prosthesis into position. Given the nature of a hemispherical acetabular component, rim contact will occur before dome seating occurs. This may require additional impaction to ensure seating. Confirm seating by sighting through the apical hole or, if present, screw holes. An apical hole eliminator may be inserted with a standard hex head screwdriver following shell impaction. Following final component seating, if adjustments to the shell orientation are necessary, thread the impactor handle back into the apical hole to adjust the shell position. Avoid adjusting the shell position by impacting the Variable Interface Prosthesis (VIP) taper region and/or shell face with a punch or similar instrument, as this may cause damage to the VIP taper inside the PINNACLE Hip Shell.

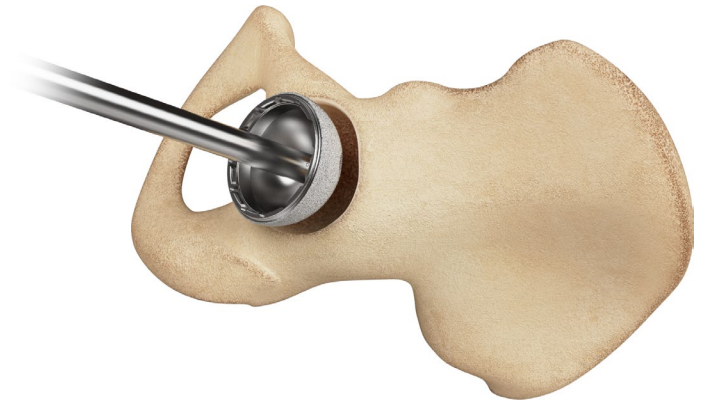


Figure 35.

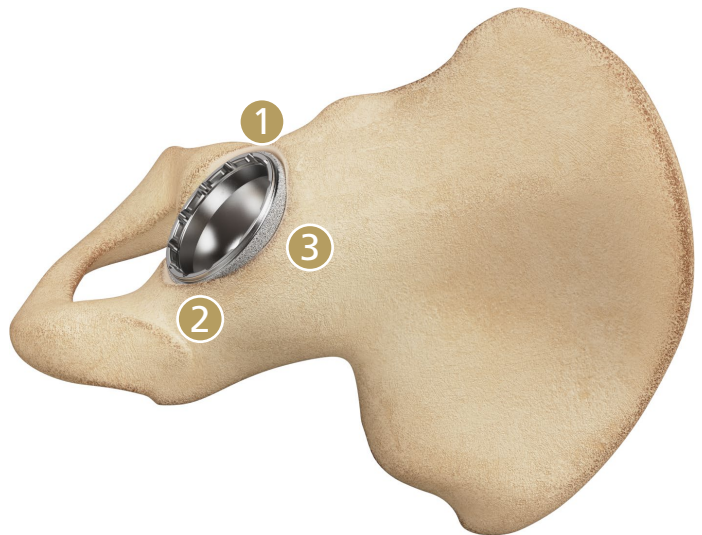


Figure 36.

- 1 Anterior notch**
Check for psoas tendon impingement with large diameter heads.
- 2 Posterior**
Check toe-off impingement.
- 3 Supero-lateral rim**
Shell coating / reamer visible

Implanting the Acetabular Shell with Screw Fixation

Screw Insertion

The PINNACLE System includes the Sector and Multi-hole shell options that are designed for insertion with screws. The Sector shell is referenced on the following pages to demonstrate the surgical technique for implantation of the shell with screw fixation.

QUICKSET® Acetabular Screw Instruments are recommended for screw insertion. The Sector shell has two medial hole alternatives, which are placed to enable screw placement up the posterior column in either the right or left hip. The single lateral screw provides additional access to the ilium.

Select holes where the prosthesis is to be anchored with cancellous screws so that the screws lie within a safe quadrant. The safe quadrant is defined by two lines from the anterior-inferior iliac spine through the center of the acetabulum and posterior by a line from the sciatic notch to the center of the acetabulum (Figure 37).

The 3.8 mm drill bit is controlled by the drill guide as it passes through selected holes into the acetabulum (Figure 38). The screw angle may vary by as much as a total of 34 degrees (Figure 39). The effective lengths of the 7 drill bits available are 25, 30, 35, 40, 45, 55, and 70 mm. By seating the drill bit completely into the guide, holes corresponding to the effective length of the drill bit will be created.

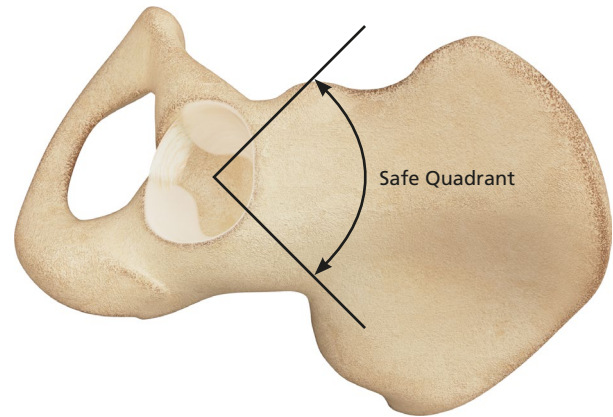


Figure 37.

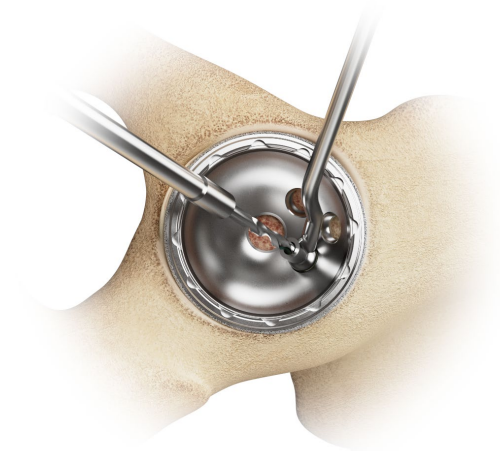


Figure 38. Drill Guide



Figure 39. Screw Angulation

Implanting the Acetabular Shell with Screw Fixation

Verify hole depth using the QUICKSET Depth Instruments Gauge. Alternating colors on the depth gauge represent 10 mm increments (Figure 40).

Insert 6.5 mm PINNACLE Hip Cancellous Bone Screws using a hex head screwdriver (Figures 41 and 42).

The 6.5 mm self-tapping screws have four-point cutting flutes with a blunt tip to reduce the risk of neurovascular injury (Figure 43).



Figure 40. Depth Gauge

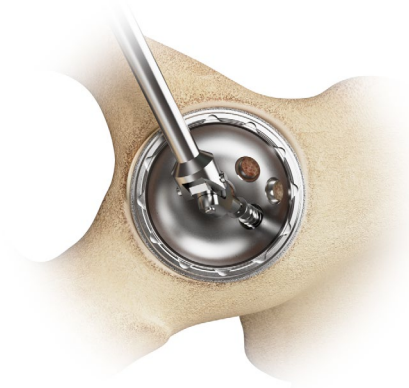


Figure 41. Screw Insertion

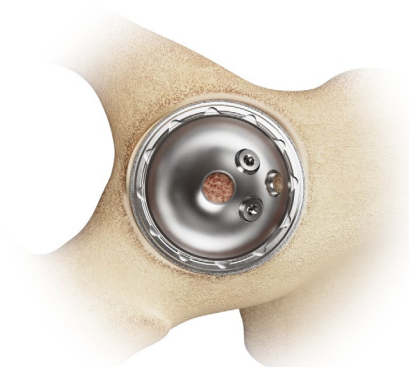


Figure 42. Screw Insertion

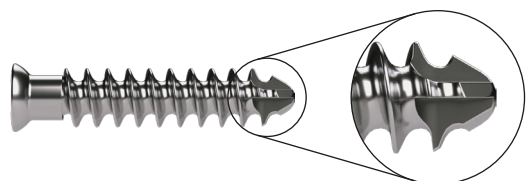


Figure 43. Screw Tip

PINNACLE Dual Mobility Liner Insertion

Ensure the inside of the shell is clean, dry and free of any debris or soft tissue which could prevent the liner from fully seating.

Gently place the dual mobility liner into the shell. The liner has a rounded back design and will allow you to manipulate the liner so the liner face is parallel to the face of the shell. Initial alignment can be achieved by pressing down on the liner rim face with two fingers 180° apart (Figure 44). Assemble the PINNACLE Liner Impactor Tip onto the PINNACLE Impactor, place inside the liner and impact the liner into the shell (Figure 45).

- a. Care should be taken to ensure there is no soft tissue impingement hindering the insertion of the liner into the shell.
- b. Impaction should continue until the liner taper engages and locks into the shell taper.
- c. A noticeable gap (Figure 46) will remain after the dual mobility liner is fully seated.
- d. This gap is by design and should be consistent around the circumference of the shell/liner construct.

The rounded edge on the backside allows for self-centering and proper alignment prior to impaction. The three cut-outs along the liner rim allow for visual inspection of the liner canting. The face of the liner rim should be parallel to the shell as viewed through the cut-outs (Figure 47). The face of the rim and shell should be concentric.



Figure 44.

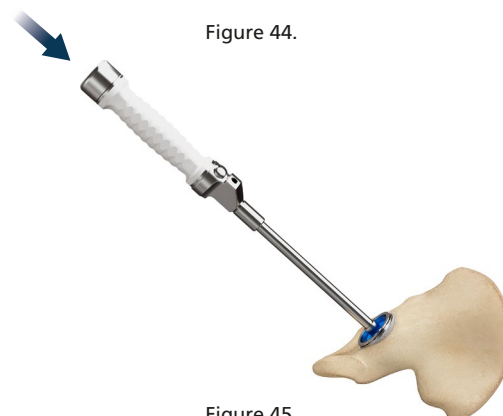


Figure 45.

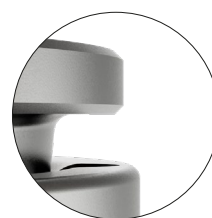


Figure 46.

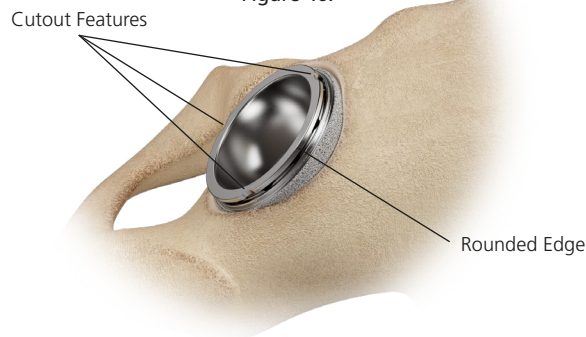


Figure 47.

PINNACLE Dual Mobility Liner Insertion

As a secondary seating confirmation method, place the end of the QUICKSET Depth Gauge in the gap between the liner rim and shell face (Figure 48). Run the end of the depth gauge around the circumference of the rim stopping to check the distance between each component. If bone or tissue hinder access of the gauge, insert the end of the depth gauge through one of the cut-outs to access the gap. (Figure 49). The gap should have a consistent feel throughout the circumference. If the liner is off axis, the gap in one area will be larger than on the opposite end. If you encounter this instance, re-insert the liner impactor and continue impaction of the liner until proper alignment is attained.

The liner is secured into place via a taper lock with the shell. The hook of the depth gauge can be used to verify the liner is locked into the shell by levering on the dual mobility liner rim (Figure 50) in multiple locations to ensure the liner and shell taper are locked. An osteotome or the PINNACLE Dual Mobility Threaded Extractor can also be used in the same manner.

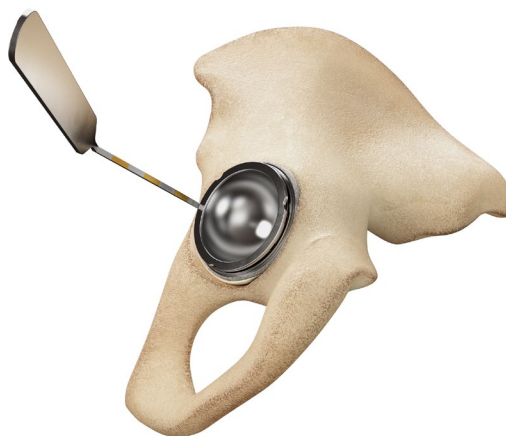


Figure 48.



Figure 49.



Figure 50.

PINNACLE Dual Mobility Liner Removal

Assemble the PINNACLE Dual Mobility Threaded Liner Extractor to the PINNACLE Modular Inserter Shaft. Align the tip of the extractor between the edge of the shell and the rim of the dual mobility liner. The inserter should be placed roughly 45 degrees to the cup face. Using a mallet apply a small amount of force onto the inserter handle. Apply enough force to disengage the taper lock of the liner to the shell. Once the taper is disengaged, the liner can be removed by hand.

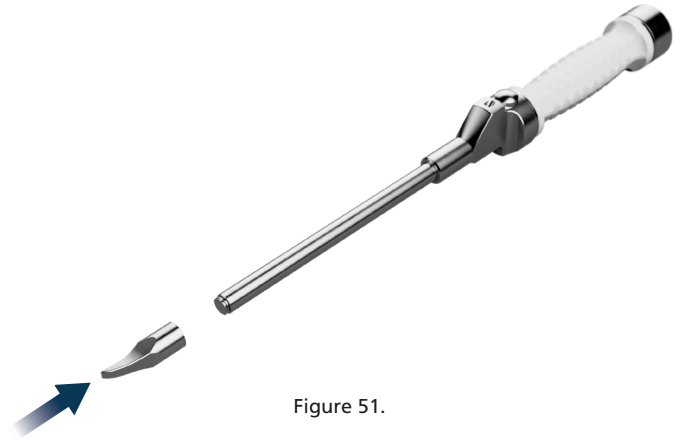


Figure 51.

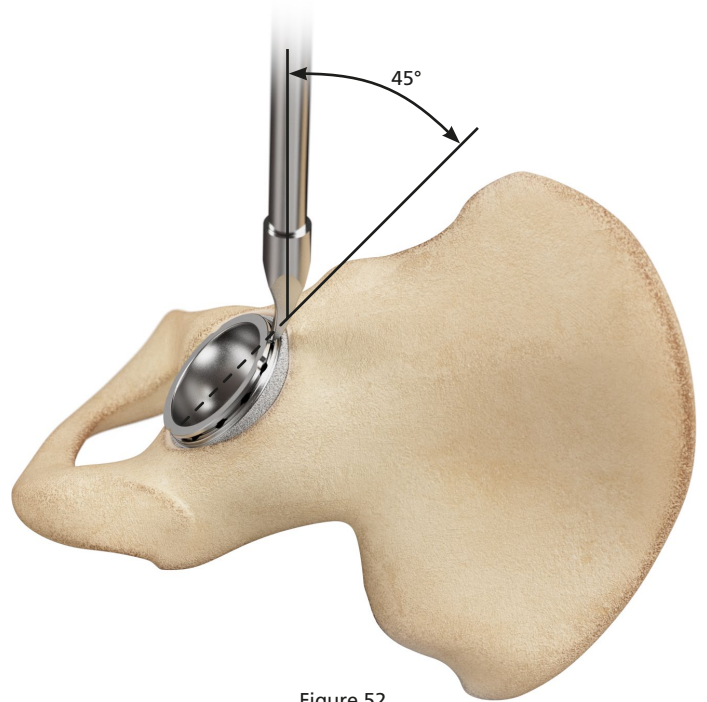


Figure 52.

BI-MENTUM™ Liner Assembly to Head

Two options are possible:

- A Assembly on table
- B Assembly in situ.

Note: A DePuy Synthes 12/14 ARTICUL/EZE ~Modular Head must be used.

Important: In both cases remove any liquid from the surface of the head and inside the liner prior to assembly, as this may render the snap fit over the head impossible.

Table Assembly

Screw the support cone and the clamping ring together, ensuring that they are centered on the fork (Figure 53).

Hold the head-liner press vertically on the table.

Place the head on the support cone and position the liner on the head.

Squeeze the handles to reduce the liner onto the head while maintaining the liner in the axis of the support cone of the press during the descent of the piston (Figure 54).

During assembly of the liner onto the head, the user will feel resistance increase twice and hear two successive noises as the head passes the retentive bore and then air escapes from the bearing. Correct assembly is confirmed when the liner rotates freely around the head.

Femoral Head Impaction

Clean and dry the stem taper carefully to remove any particulate debris.

Place the femoral head onto the taper and lightly tap the head-liner assembly using the head-liner inserter (Figure 55).

Ensure bearing surfaces are clean and avoid any damage to the bearing surface during reduction.



Figure 53. Assembling the support cone and clamping ring.



Figure 54. Maintain alignment of the liner to the axis of the support cone.

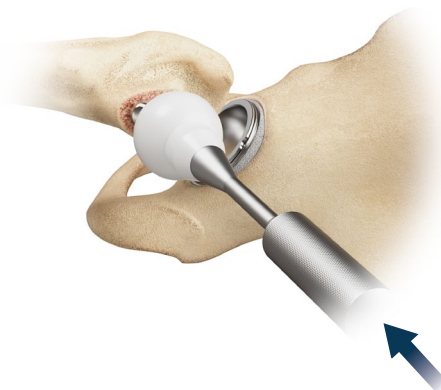


Figure 55. Femoral head impaction.

Assembly in situ

Position the press fork around the stem neck and under the implant head (Figure 56).

Align the liner to the neck axis during assembly, ensuring that the alignment is maintained until complete assembly is achieved.

Position the liner on the head.

Squeeze the handles to reduce the liner onto the head while maintaining the liner in the axis of the support cone of the press during the descent of the piston (Figure 56).

During assembly of the liner onto the head, the user will feel resistance increase twice and hear two successive noises as the head passes the retentive bore and then air escapes from the bearing. Correct assembly is confirmed when the liner rotates freely around the head.

Removing the Liner Assembly Press

Once the liner is assembled to the head, unlock the press by pressing the release tab.

Before reduction ensure that there is free movement between head and liner. Residual air may prevent this from happening, in which case re-compress to release any trapped air. Prior to reduction, please ensure to remove any debris from the outer bearing surface of the polyethylene bearing and inner bearing surface of the dual mobility liner.

Reduce the head and stem into the PINNACLE Dual Mobility Liner (Figure 57).

TIP: it is easier if you rotate the poly component towards the acetabular liner/shell prior to reduction to help ensure the larger poly head does not impinge on soft tissue during reduction (Figure 58).

Perform a complete functional assessment to ensure the implant construct is functioning properly.

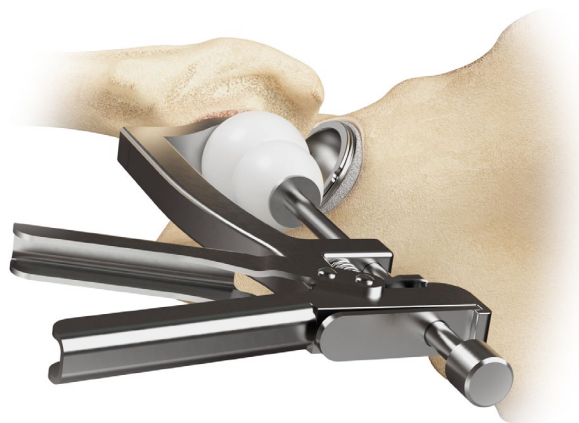


Figure 56. In situ assembly

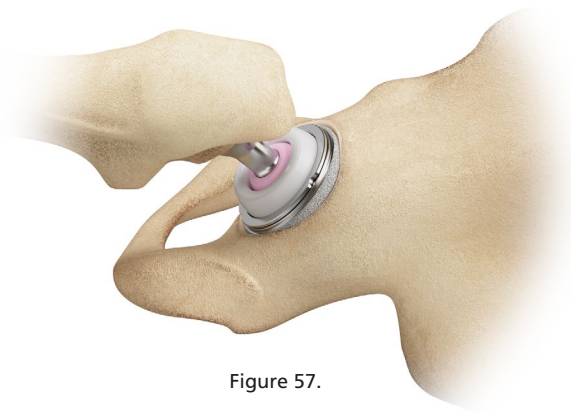


Figure 57.

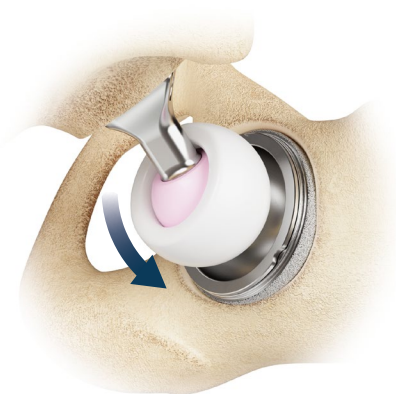


Figure 58.

PINNACLE Dual Mobility Compatibility



PINNACLE® 100, 300, Sector and Multihole Shell Outside Diameter (mm)	PINNACLE® Standard and Deep Profile Revision Shell Outside Diameter (mm)	PINNACLE® Dual Mobility Liner (mm)	BI-MENTUM™ Mobile Bearing Head Size (mm*)	Inner Diameter Head Size (mm)
48	54	48/41	22.225 × 41	22.225
50	56	50/43	22.225 × 43	22.225
52	58	52/45	22.225 × 45	22.225
54	60	54/47	28 × 47	28
56	62	56/49	28 × 49	28
58	64	58/49	28 × 49	28
60	66	60/51	28 × 51	28
62	68	62/53	28 × 53	28
64	70	64/53	28 × 53	28
66	72	66/55	28 × 55	28

Table 1: PINNACLE Dual Mobility Compatibility

Additional Instructions

- Use caution when handling ceramic components during assembly to avoid damage to components.
- It is important not to disassemble/reassemble the ceramic femoral head from the mating femoral stem. Doing so may damage these mating surfaces and lead to early failure.
- Ensure that the outer diameter of the femoral head matches the inner diameter of the acetabular liner by verifying labeling. Sizing mismatch may result in premature implant failure.
- While rare, ceramic head fracture may occur and requires care in the retrieval of all particles from the operative site. Carefully remove any ceramic particles or shards manually or with a pulse lavage. Remove any tissue which may have been affected by abrasion particles.
- Examine instruments and confirm functionality prior to use. Instruments that have been subjected to overuse or misuse conditions are susceptible to failure or may damage implants and should not be used.

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