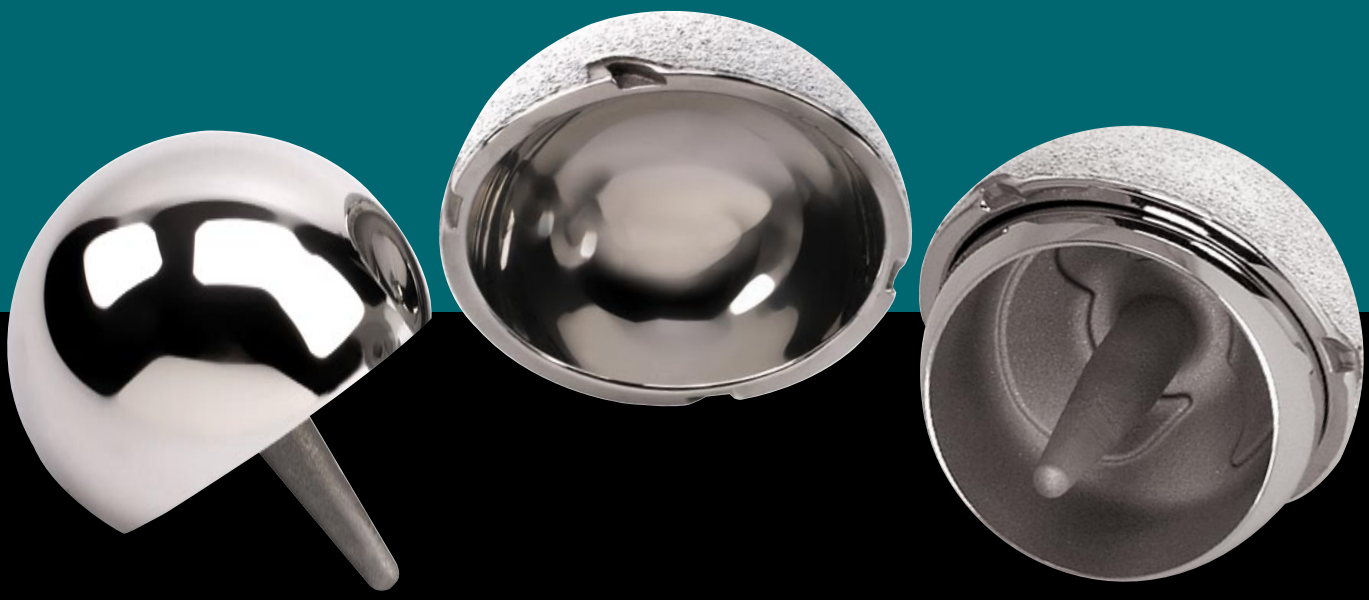
stryker®

MITCH TRH™ System

Resurfacing Operative Technique



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Introduction

Resurfacing of the hip, traditionally involves the replacement of pathological femoral and acetabular tissue with anatomically sized and relatively thin bone conserving implants.

The procedure is indicated for patients, who have good proximal femoral bone quality and reasonably normal anatomy, with degenerative osteoarthritis.

It is particularly suitable when:

- the degenerative pathology has not caused significant bone loss
- there are minimal degenerative anatomical changes and
- there is minimal femoral deformity.

The short to medium term clinical results of resurfacing hip replacements confirms that these implants maximise the preservation of viable host bone, do not limit post operative activities and have exceptional functional outcomes. [1]

As a result of this clinical success, it is considered to be an appropriate solution for management of degenerative disease of the hip in the following patient groups[2]:-

- Those aged 65 years and under
- Those aged 65 years and over who participate in activities predicted to shorten the life of a traditional total hip arthroplasty.

The MITCH TRH™ System is an evolutionary design comprising of traditional resurfacing components, developed by Stryker® Orthopaedics, in conjunction with an experienced development group at Finsbury Orthopaedics Limited.

Members of the Finsbury Orthopaedics team have been directly involved for many years in the development, manufacture and distribution of the most widely used and clinically proven traditional resurfacing systems.

Indications

The MITCH TRH ™ System is indicated for total hip arthroplasty in patients who have chronic pain and limited mobility as a result of degenerative hip disease where:-

- There is good proximal femoral bone quality
- The degenerative pathology has not caused significant femoral bone loss
- There is good acetabular bone quality
- The removal of viable proximal femoral bone is considered unnecessary.

Contraindications

A combination of two or more of the following factors is associated with the increased potential for early failure[3]:-

- Decreased bone mineral density
- Cysts in the femoral head >1cm
- Lateral Head-Neck remodeling
- Poor shape/biomechanics
- Short femoral neck <2cm
- Shallow or small acetabulum
- Poor head/neck ratio

Relative contraindications include:

- Osteoporosis,
- Metabolic disorder, or a condition of marked bone loss which could impair bone formation,
- Vascular insufficiency, muscular atrophy, or neuromuscular disease,
- Uncooperative patient,
- Distant foci of infection (which may cause hematogenous spread to the implant site).
- Incompetent or deficient soft tissue surrounding the joint,
- The possibility of pregnancy when using metal on metal articulation
- Moderate to severe renal insufficiency

Pre-Operative Planning

Using the templates provided, the AP X-rays are assessed to determine the most suitable size of components and the ideal post operative implant position.

1. Sizing

Components which replicate the pre-degenerative anatomy and result in improved biomechanical performance are optimal.

It is however critical to ensure that, when in its final seated position, the internal distal diameter of the resurfacing head is larger than the largest diameter of the anatomical femoral neck.

In addition the corresponding acetabular implant, which accommodates the optimal femoral resurfacing head, should fill the acetabular fossa ensuring adequate immediate, biological and mechanical fixation.

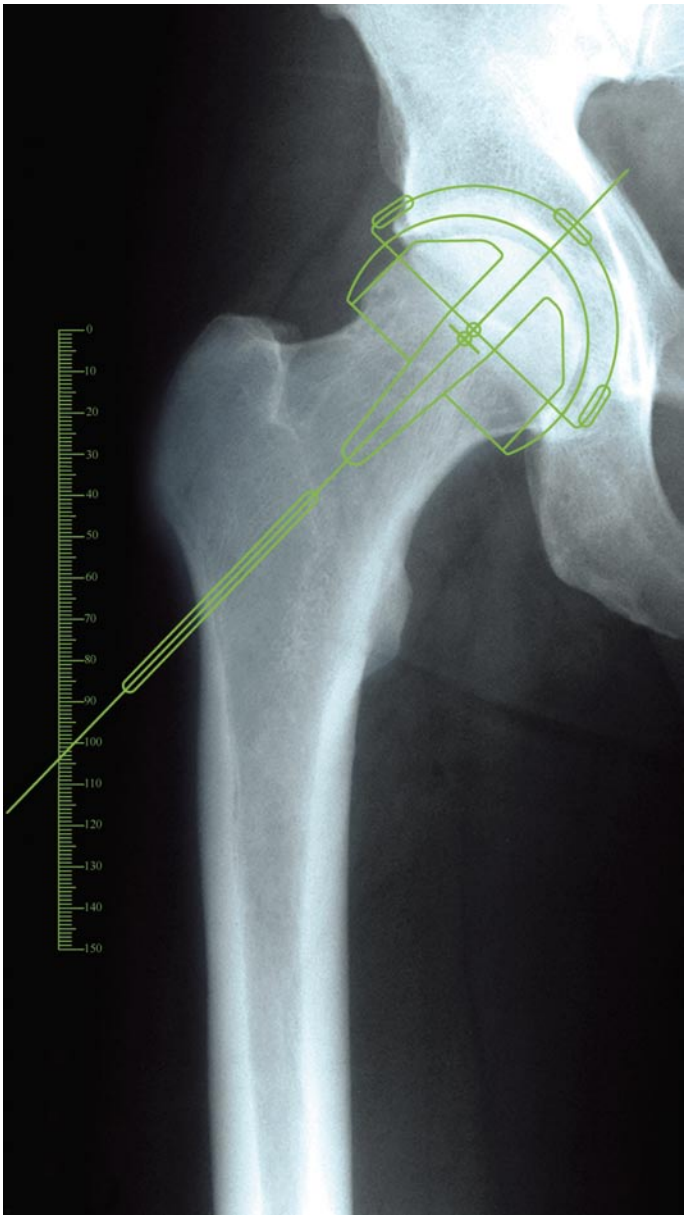
2. Positioning

Position the central axis of the resurfacing stem to align with the neutral axis of the femoral neck (see opposite). Increasing valgus alignment to parallel the medial femoral neck cortex may be appropriate in selected cases. However, varus alignment should be avoided [4].

3. Insertion

As a rough guide the centre line of the stem should emerge in the region of the the middle of the lesser trochanter as it appears on the x-ray.

Measure the distance between the highest point of the greater trochanter and its intersection with the central axis of the resurfacing femoral stem at the lateral cortex of the femur using the rule included on each template. This will give an indication of the insertion point of a guide pin used with the lateral jig.



Surgical Exposure

As a guide, the chosen surgical approach should provide sufficient exposure to ensure visualisation of the exposed femoral neck, with minimal soft tissue trauma during the procedure and allow the precise positioning of the definitive implants using the instrumentation supplied

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Implantation of MITCH TRH ™ System can be achieved through a variety of surgical approaches.
Both the posterior and anterolateral approaches have been used with the traditional lateral referencing instruments.
Alternative approaches which provide adequate access and visualisation may be considered.
This document illustrates the patient lying in a lateral decubitus position on the contra-lateral side.

Intra-Operative Femoral Head Assessment

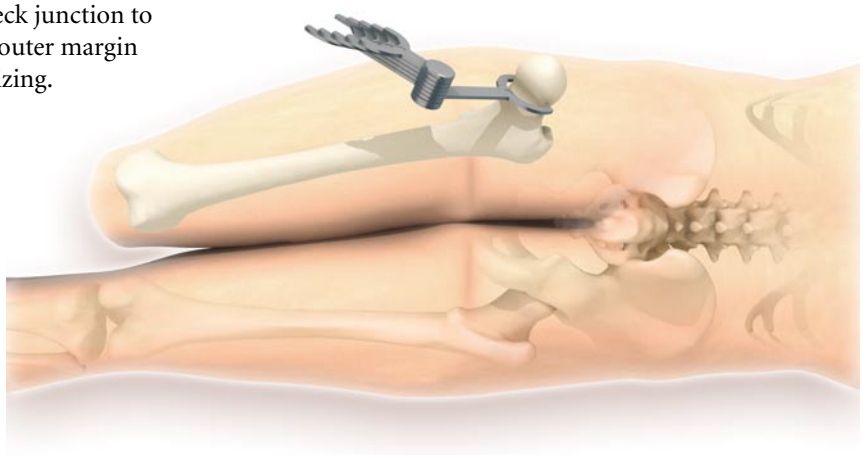
The optimal femoral component will be matched to the pre-degenerative femoral head diameter and have an internal diameter that is larger than the maximum anatomical neck diameter. The use of a size specific Head/Neck Gauge can help confirm the size of implant predicted during pre operative x-ray templating.

1. Remove Osteophytes

To help assessment of optimum head size and position, carefully remove any osteophytes from around the head/neck junction with rongeurs or a curette.

2. Size Femoral Head

Place successive Head/Neck Gauges around the neck at its widest diameter and draw proximally towards the head/neck junction. The Head/Neck Gauge will rest on the head/neck junction to confirm an acceptable inner diameter and the outer margin may be apposed to the head to confirm head sizing.



There are two effective surgical strategies for femoral and acetabular preparation. These should differ only in the sequence with which the steps are undertaken.

Strategy One

After deciding the optimal head diameter, femoral preparation is performed as shown in steps 1-12 of the Femoral Head Preparation section, pages 7 to 12 This facilitates acetabular access as the femoral head bulk has been reduced.
In cases where there is uncertainty over optimal acetabular component size, the femoral head can be prepared one size larger than predicted so that the surgeon has the options to implant a larger acetabular component or refinish the femoral side after acetabular implantation.

Strategy Two

Involves acetabular preparation and implantation with the natural femoral head intact.
This ensures maximal flexibility for acetabular preparation (subject to the femoral head options previously identified) but may necessitate slightly more soft tissue release to ensure adequate acetabular exposure.
This Operative Technique will now continue with Strategy One.

Femoral Head Preparation

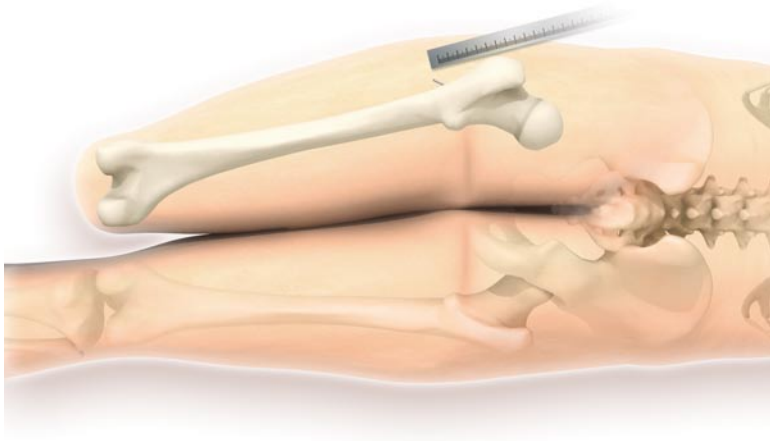
Accurate preparation of the femoral head is critical to ensure optimal positioning of the femoral implant and to avoid femoral neck notching, varus implant placement and the potential for early fracture of the neck of femur.

1. Predicting the Initial Guide Wire Entry Point

A line representing the central axis of the femoral neck in the anterior-posterior plane can be made with a surgical marker or diathermy blade on the external surface of the femoral neck , starting distally and continuing around to the proximal femoral head.
This can be intersected with a similar line drawn to represent the central axis of the femoral neck in the superior-inferior plane. The point at which these lines intersect on the proximal femoral head can be used as a guide to predict the entry point of the Initial Guide Wire.

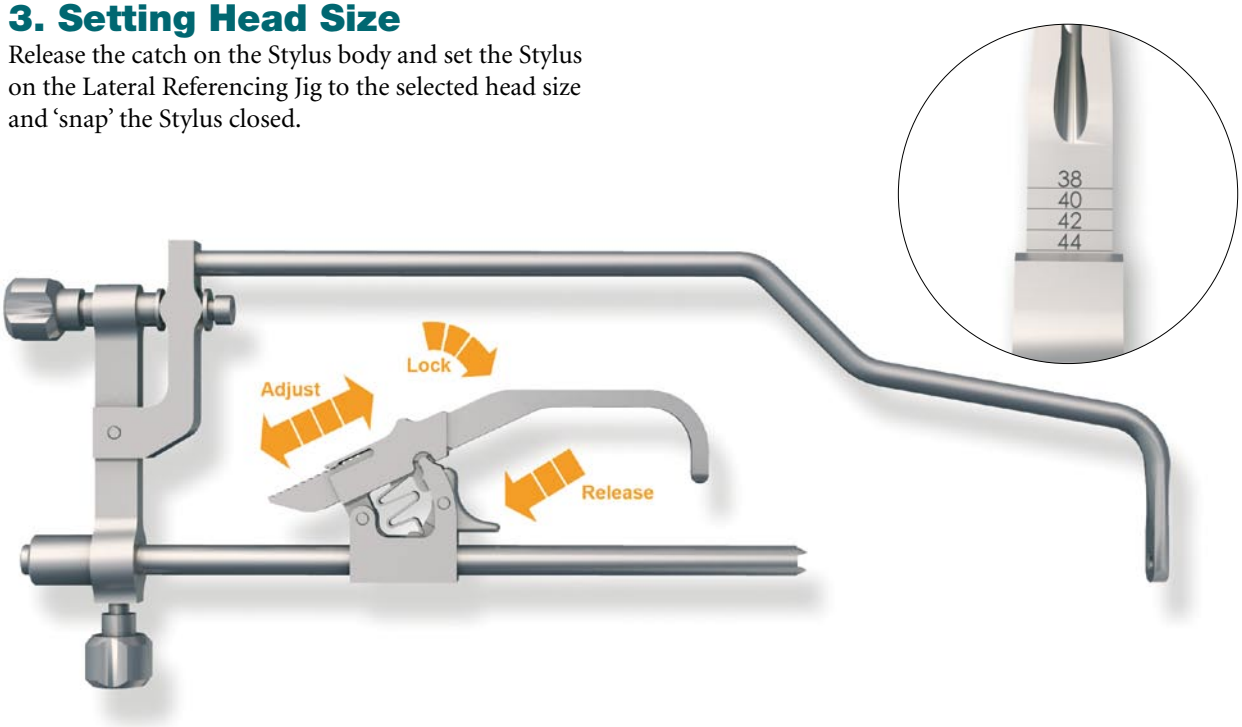
2. Inserting The Lateral Pin

Measure down from the greater trochanter to locate the Lateral Pin in the position pre-determined from the X-ray.
Drill the pin directly into the mid lateral cortex and then angle towards the entry point determined by the intersecting lines previously drawn on the proximal femoral head.
There should be at least 5 mm of the Lateral Pin protruding from the soft tissue.



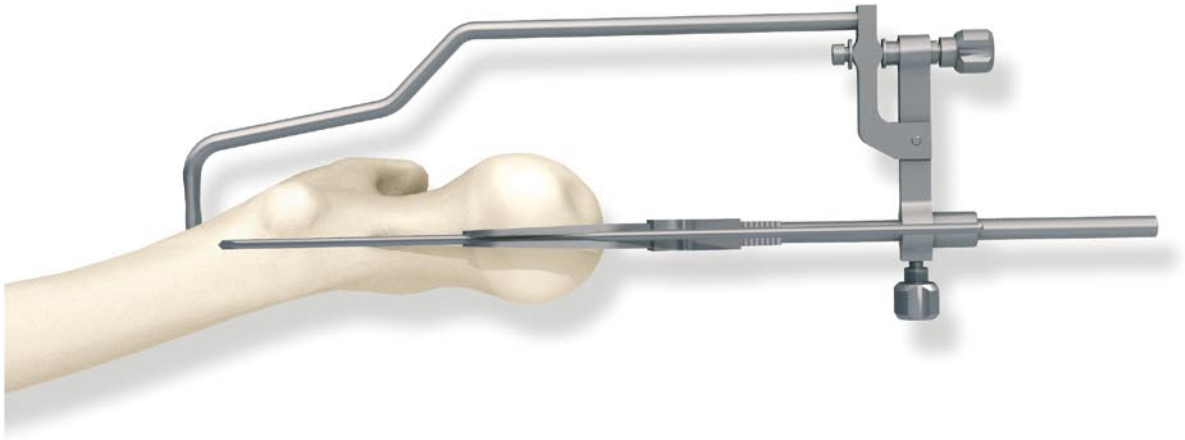
3. Setting Head Size

Release the catch on the Stylus body and set the Stylus on the Lateral Referencing Jig to the selected head size and 'snap' the Stylus closed.



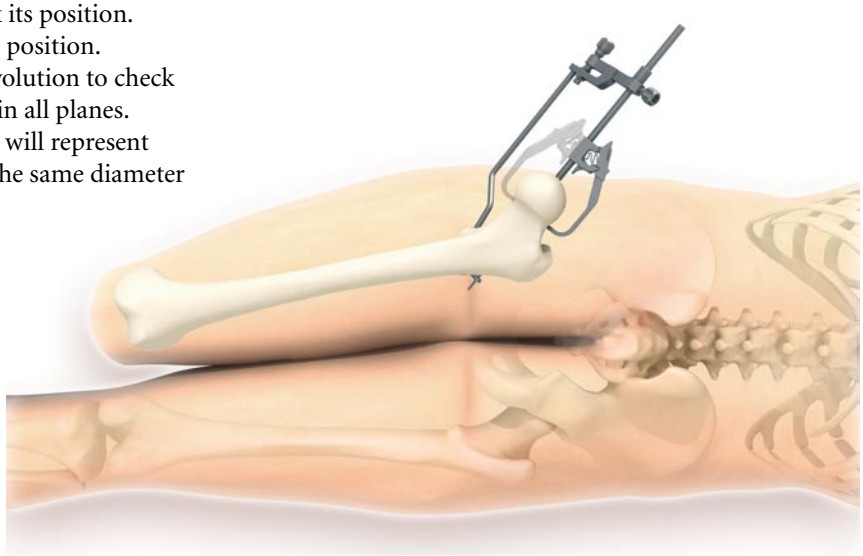
4. Adjust To The Correct Anteversion

Hook the long arm of the Lateral Referencing Jig over the Lateral Pin and reposition the leg to elevate the femoral head out of the surgical field.
Locate the spiked tube on the head approximately in line with the central axis of the femoral neck with the distal tip resting on the proximal head at the intersection of the lines previously drawn on the femoral head.
Position the Stylus as shown below. Ensure the axis of the frame of the instrument is in the true A/P plane of the femur.
Adjust the hinge until the Stylus and Guide Tube follows the anteversion angle of the neck.
A Guide Wire may be used to extend the stylus axis.



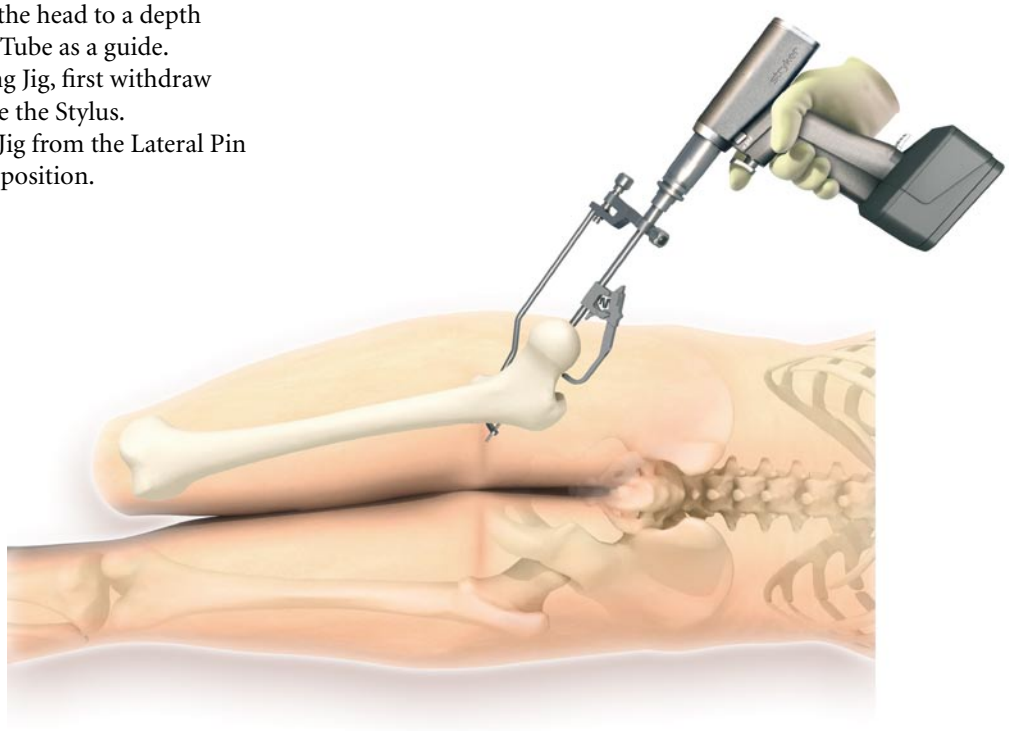
5. Centralise the Lateral Referencing Jig

Align the Pin Guide with the marks previously made on the proximal femoral head.
Rotate the stylus around the head/neck junction to confirm that the Pin Guide on the Lateral Referencing Jig is aligned with the central axis of the femoral neck.
It may appear that the entry point is anterior and superior to the centre point of the anatomical femoral head, this is particularly relevant in cases of pistol grip deformities.
Once a central position is confirmed to the surgeon's satisfaction, the Spiked Tube is tapped into the proximal femoral head to fix its position.
Tighten the screw to secure the Spiked Tube in position.
Rotate the Stylus again through a complete revolution to check that it clears the diameter of the femoral neck in all planes.
The Stylus position on the head/neck junction will represent the exit point of the Cylinder Cutter which is the same diameter as the setting previously set on the Stylus.



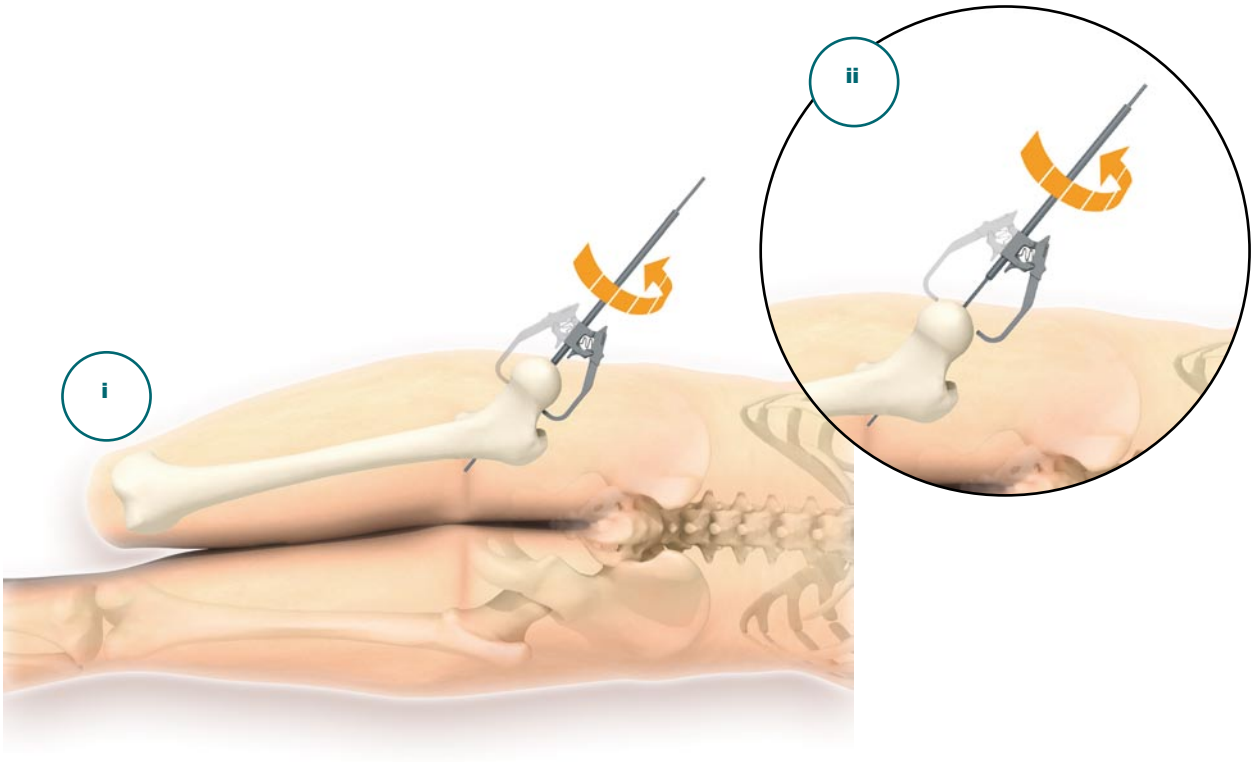
6. Insert Initial Guide Wire

Drill the Initial Guide Wire into the head to a depth of at least 6 cm using the Spiked Tube as a guide.
To remove the Lateral Referencing Jig, first withdraw the Spiked Pin Guide and remove the Stylus.
Unhook the Lateral Referencing Jig from the Lateral Pin leaving the Initial Guide Wire in position.



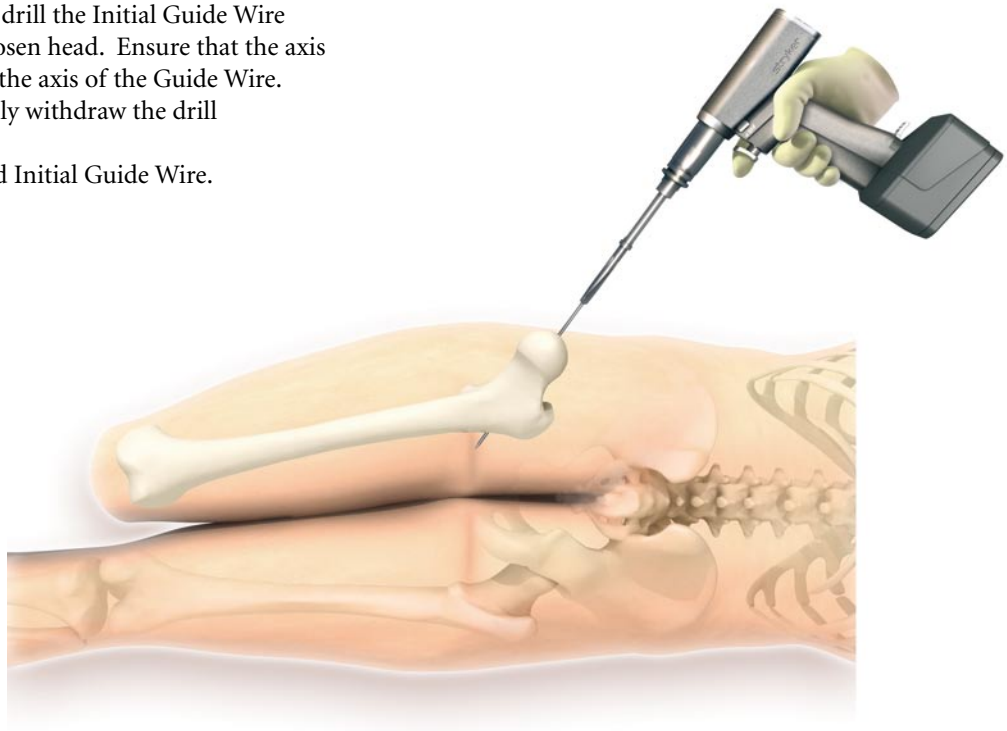
7. Check Guide Wire Position

Replace the Spiked Tube / Stylus assembly over the guide wire and rotate the Stylus through a complete revolution at the head/neck junction to check the position of the Initial Guide Wire (i).
Position and rotate the Stylus on the top side of the head to ensure that enough superior bone is present to support the resurfacing implant (ii).



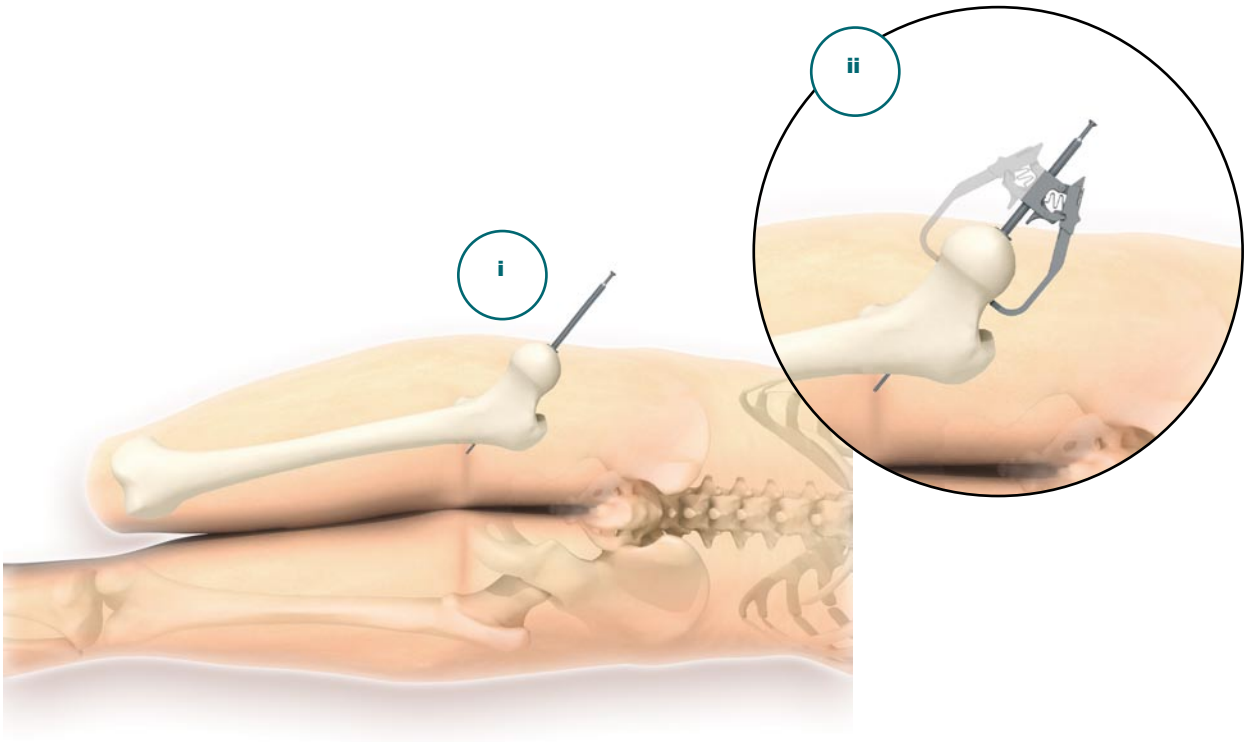
8. Over-Drill Guide Wire

Using the Cannulated Drill, over drill the Initial Guide Wire to the depth indicated for the chosen head. Ensure that the axis of the drill remains aligned with the axis of the Guide Wire. It may be necessary to occasionally withdraw the drill to clear the cutting flutes.
Remove the Cannulated Drill and Initial Guide Wire.



9. Insert Guide Rod

Insert the Guide Rod up to the depth stop (i).
Optionally re-check the position of the Guide Rod by sliding the Stylus (without the Spiked Tube) directly over the Guide Rod.



10. Cylinder Cut

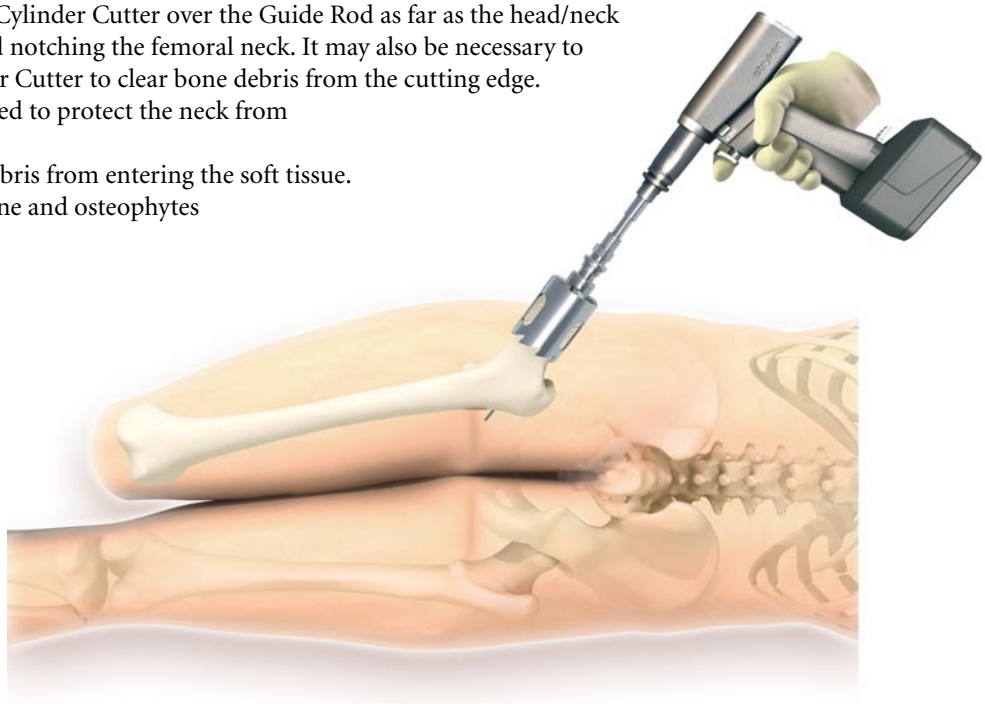
As a safeguard to avoid notching of the superior femoral neck, the surgeon may choose to begin with a cylinder reamer 2 or 4mm larger that the proposed implant and only use the definitive cylinder reamer when correct alignment and size has been confirmed.

It is recommended that the Cylinder Cutter is already spinning before it makes contact with the femoral head. Slowly advance the Cylinder Cutter over the Guide Rod as far as the head/neck junction, taking great care to avoid notching the femoral neck. It may also be necessary to occasionally withdraw the Cylinder Cutter to clear bone debris from the cutting edge.

The Head/Neck Gauges may be used to protect the neck from the advancing Cylinder Cutter.

Use tissue protectors to prevent debris from entering the soft tissue.

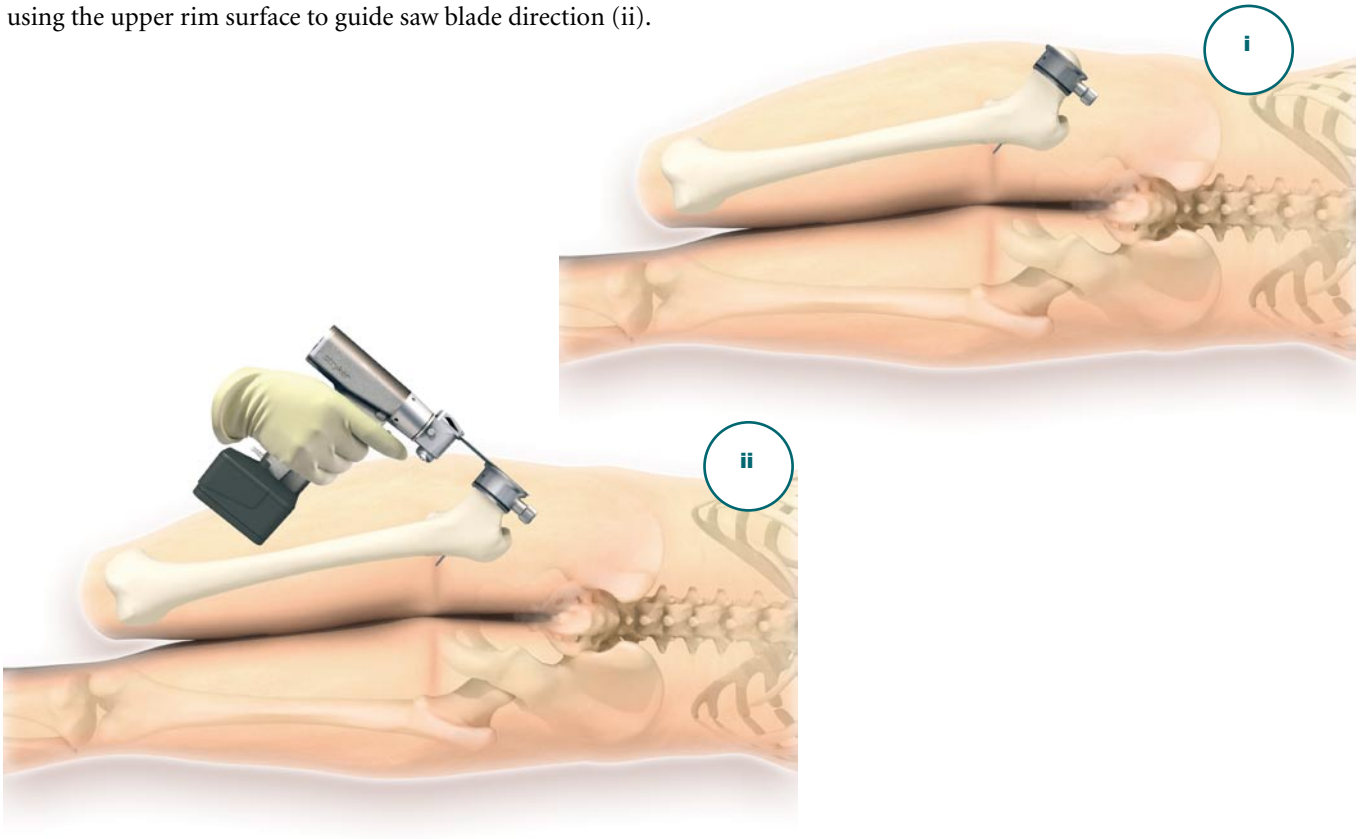
Trim any remaining peripheral bone and osteophytes and remove the Guide Rod.



11. Making The Proximal Cut

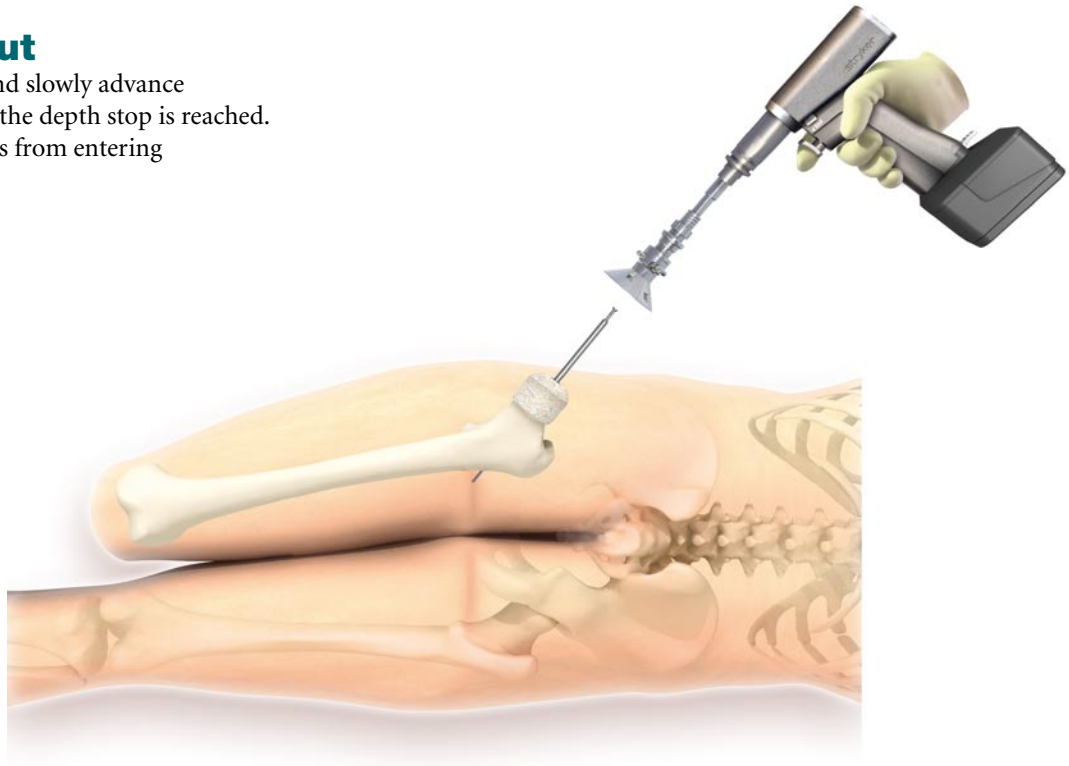
Slide the correct sized Top Cutting Guide over the prepared cylindrical head, and ensure that the lower rim aligns with the medial head/neck junction (i).

The proximal end of the femoral head is now removed using the upper rim surface to guide saw blade direction (ii).



12. Chamfer Cut

Re-insert the Guide Rod and slowly advance the Chamfer Reamer until the depth stop is reached. Use swabs to prevent debris from entering the soft tissue.



Acetabular Preparation

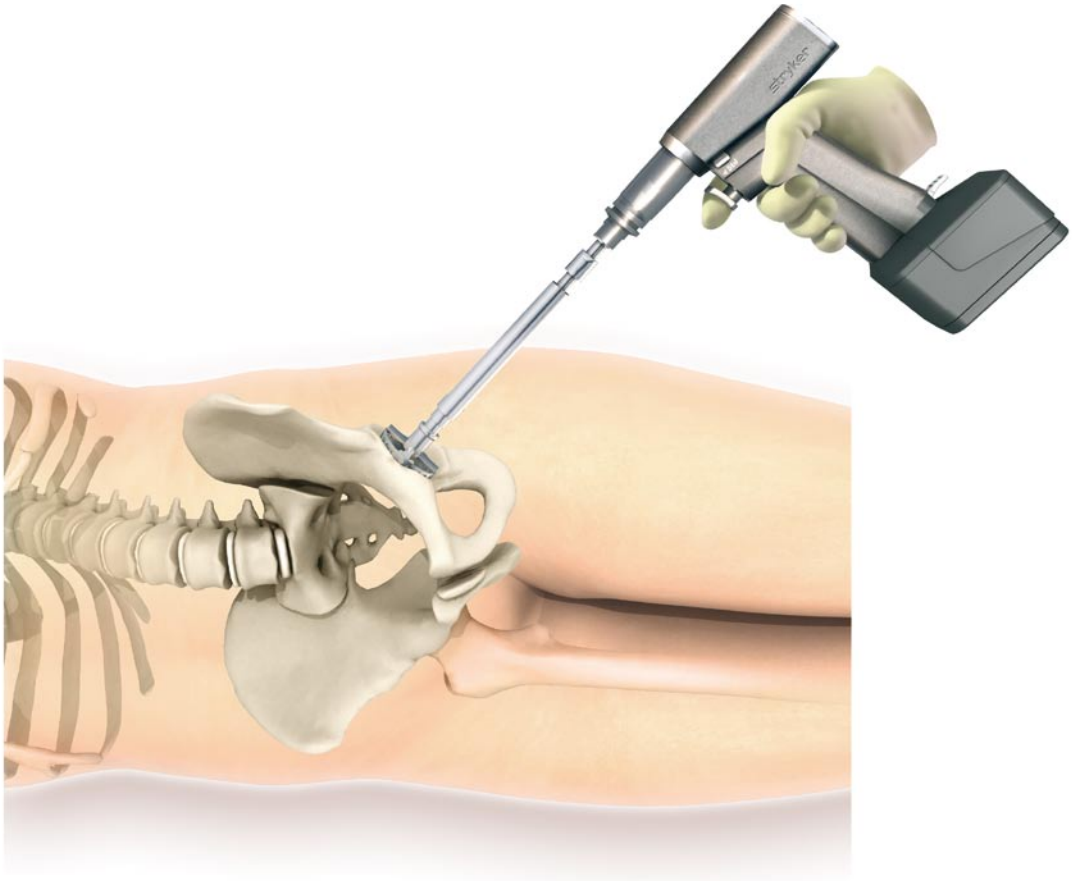
The goal of acetabular preparation is to create a hemispherical cavity, achieve a uniform implant-bone contact, a sufficient interference fit for initial stability and position the acetabular implant at the anatomical centre of rotation.

1. Acetabular Exposure

Excise the labrum and remove osteophytes to visualise the entire acetabular rim.
Clear soft tissue and central osteophytes to reveal the true floor of the acetabulum.
A clear and unrestricted view should be achieved.

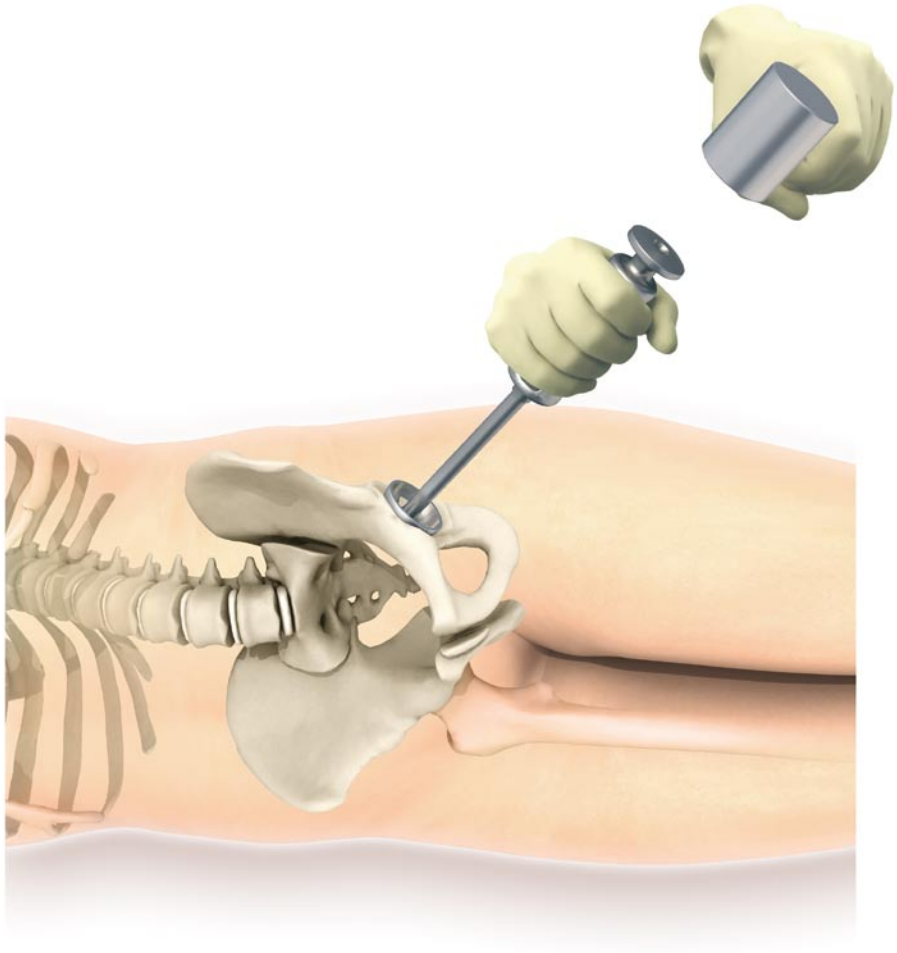
2. Acetabular Reaming

When reaming the surgeon should remember that the outside diameter of the acetabular component will be 6mm larger than the selected femoral component. Sequentially ream the acetabulum until the reamed hemisphere is approximately 1mm smaller than the desired diameter of the definitive implant.
In denser, sclerotic acetabulae, reaming size for size may be appropriate and in larger less dense acetabulae undereaming by 2mm. In all cases the acetabular cup trial should be used to confirm appropriate acetabular socket preparation.
Insufficient depth may be recognised by a tendency for the Cup Trial to 'jump out' when moved and should be rectified by further reaming.



3. Cup Trialing

Correct assessment of reamed size can only be made with the MITCH TRH™ System Cup Trials, which are nominally 1mm smaller than the diameter of the definitive implants.
Screw the chosen Cup Trial Handle fully into the selected Cup Trial, position in the acetabulum and impact.
Check that full bone contact is achieved , that the cup trial resists gentle toggling and trim any marginal osteophytes down so that they are no more than 2mm proud of the trial rim.
Remove the trial.

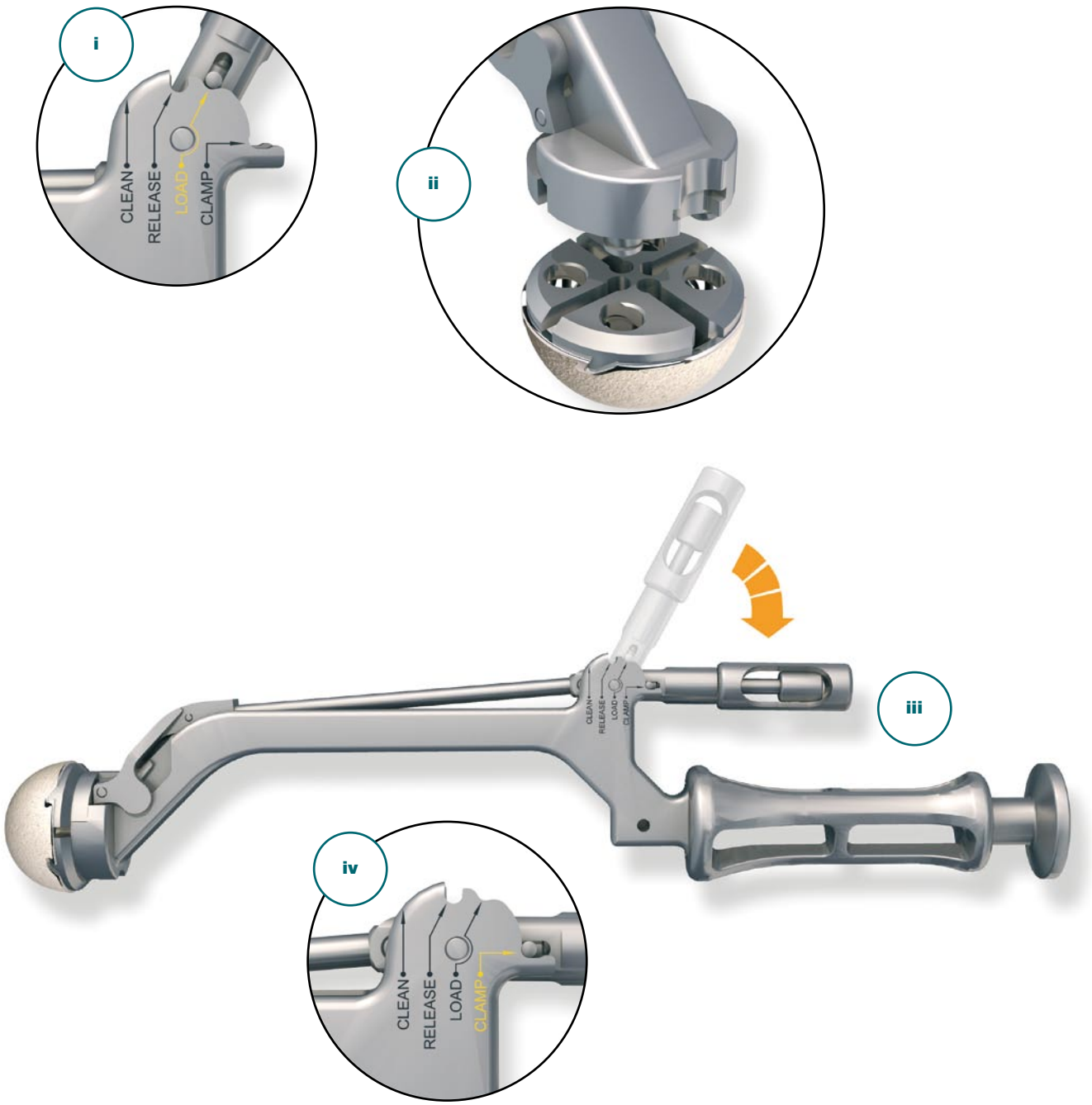


Acetabular Implantation

Surgeons are reminded that all hip protheses, including resurfacings, are vulnerable to rim loading and subsequently dramatically increased wear rates if the acetabular component is positioned too open.
Also for successful osseointegration, initial mechanical stability is essential.

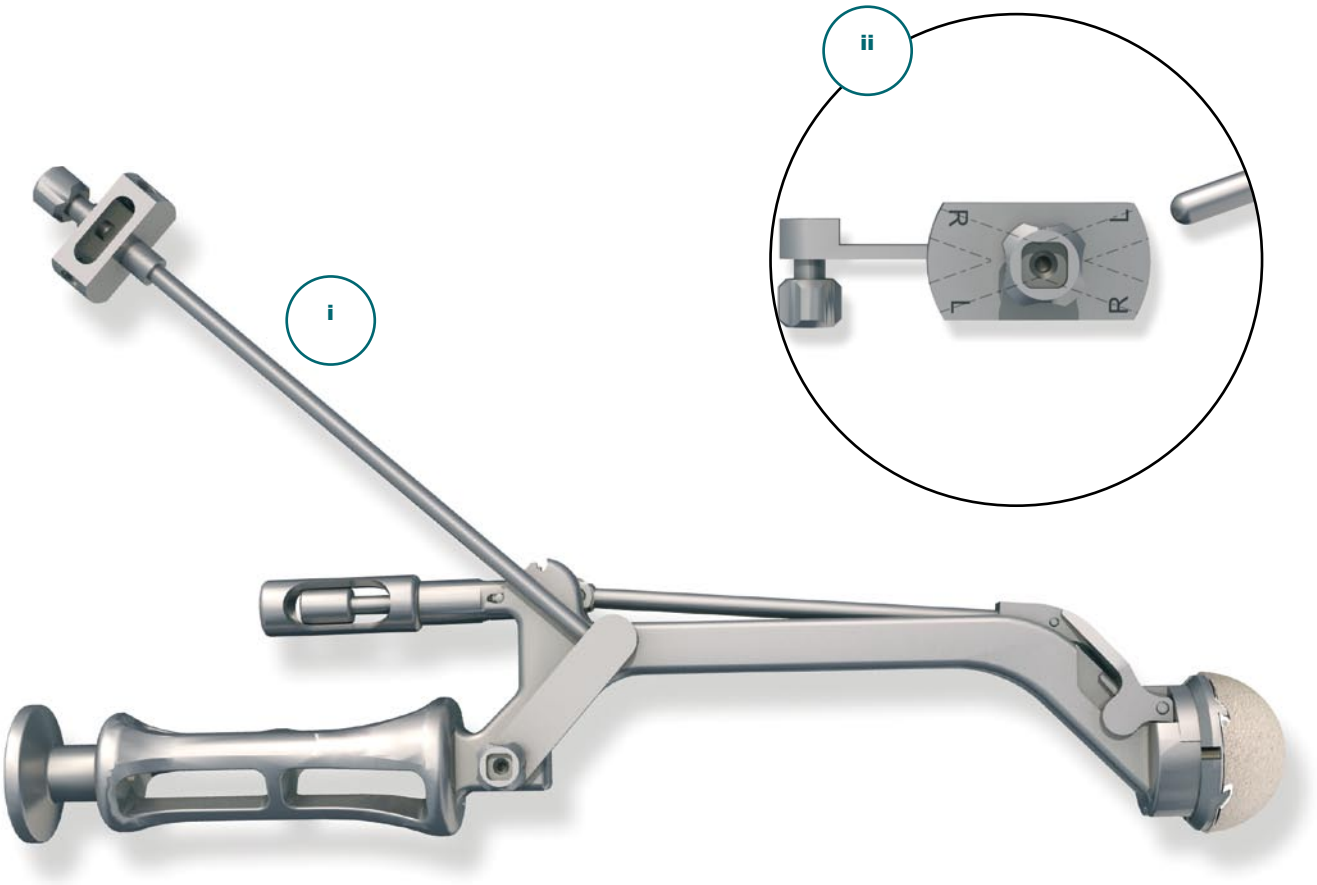
1. Prepare Implant

Set the Cup Introducer lever to "LOAD" position (i). Locate the Cup Introducer into the Cup Impaction Plate ensuring all 4 pins engage fully. A notch on the Introducer should align with 1 of 2 corresponding notches on the Impaction Plate to give the correct instrument / implant alignment (ii). Shift the lever towards the handle until it snaps positively into the 'CLAMP' position (iii + iv).



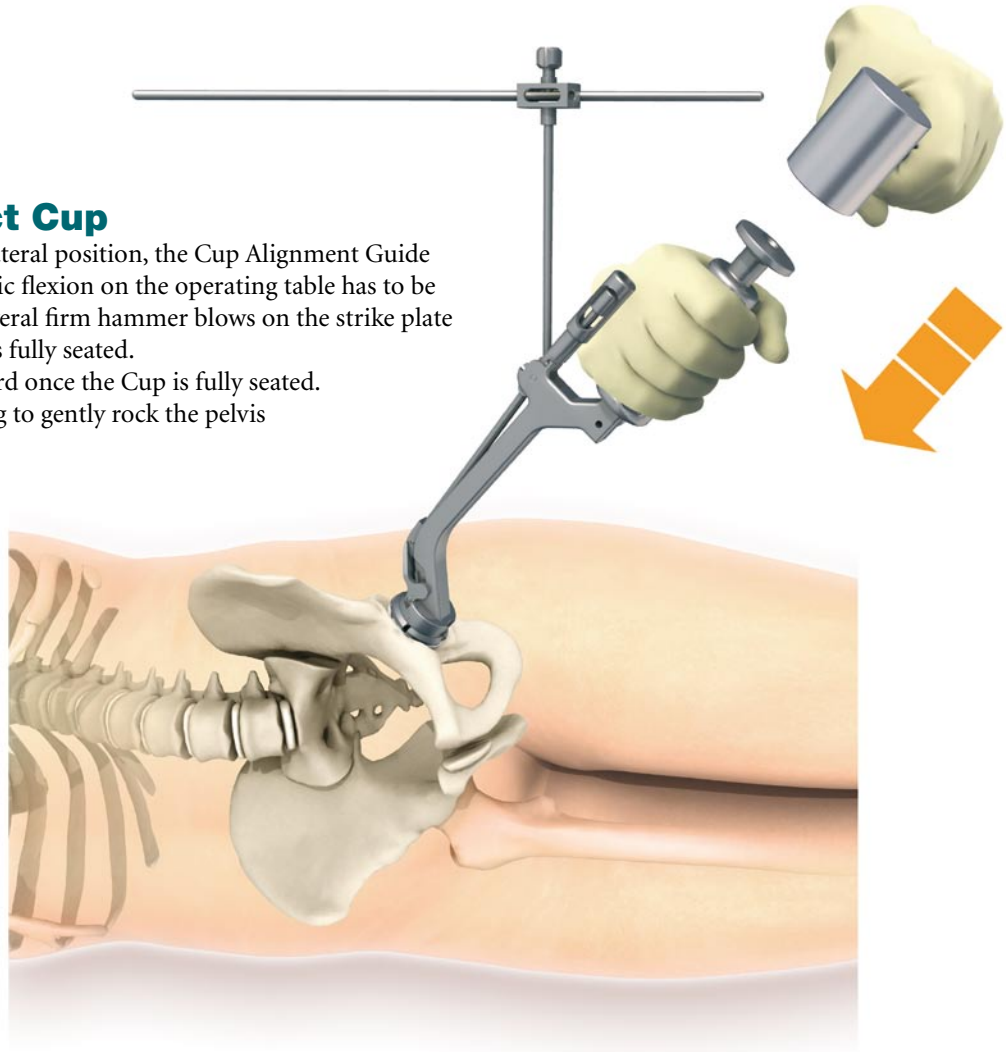
2. Cup Alignment

An optional Cup Alignment Guide can be attached to the Cup Introducer Handle to facilitate cup alignment.
The instrument is set at a guide position of 45 degrees abduction and 20 degrees anteversion (i).
Insert the Cup Alignment Guide in the correct recess for either a left or right hip as indicated by the laser marking on the alignment guide (ii).



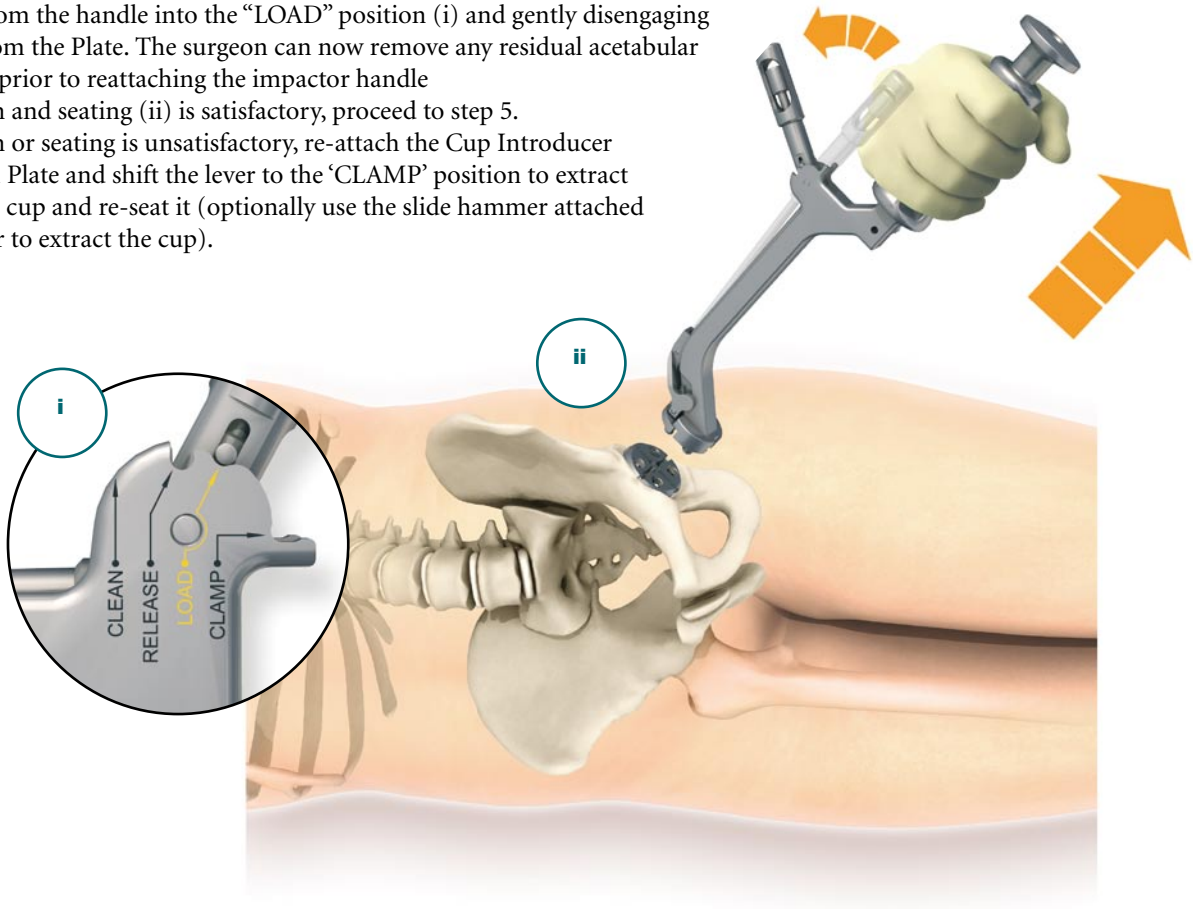
3. Position and Impact Cup

With the pelvis orientated in the true lateral position, the Cup Alignment Guide will indicate an inclination of 45°. Pelvic flexion on the operating table has to be accounted for. Impact the Cup with several firm hammer blows on the strike plate of the Cup Introducer Handle until it is fully seated.
A change in impact note should be heard once the Cup is fully seated.
Test the firmness of the cup fit by trying to gently rock the pelvis with the Cup Introducer. If the cup has been loosened by testing,repeat the impaction process with or without additional reaming and grafting as necessary.



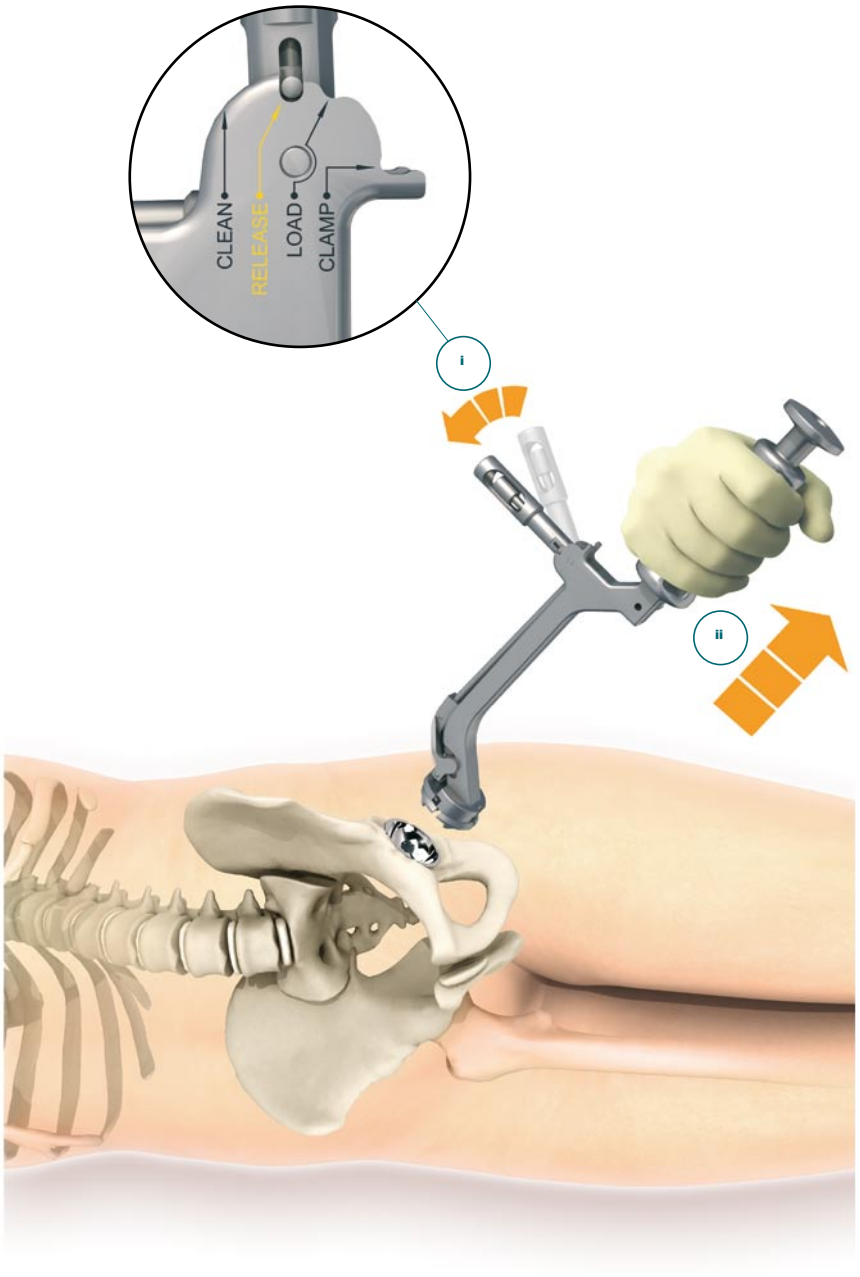
4. Assess Cup Orientation

At this stage the surgeon has the option to remove the cup introducer while leaving the impaction plate attached to the cup. This is achieved by by shifting the lever away from the handle into the "LOAD" position (i) and gently disengaging the Introduer from the Plate. The surgeon can now remove any residual acetabular rim osteophytes prior to reattaching the impactor handle
If the orientation and seating (ii) is satisfactory, proceed to step 5.
If the orientation or seating is unsatisfactory, re-attach the Cup Introducer to the Impaction Plate and shift the lever to the 'CLAMP' position to extract or reposition the cup and re-seat it (optionally use the slide hammer attached to the Introducer to extract the cup).



5. Remove the Impaction Plate

To ensure appropriate initial fixation, the outside diameter of the acetabular implant is at least 1mm greater than the outside diameter of the final reamer.
Depending on the depth of the reamed acetabulum and when the acetabular implant is seated in its final position, there is the potential for the acetabular cup/impactor plate assembly to be partially obscured by overhanging soft or bony tissue.
It is recommended that this tissue, which may interfere with the removal of the impactor plate, is excised to ensure that the entire peripheral margin of the impaction plate can be visualised before removal.
Failure to excise any overhanging tissue may result in either a reduced range of motion, the inability to easily remove the impaction plate or a difficulty to maintain the correct cup orientation.
Ensure the lever on the Introducer is in the 'LOAD' position.
Re-attach the Introducer with a notch corresponding to the notch on the impaction Plate.
Whilst maintaining a downwards pressure on the cup impactor shift the lever to the 'RELEASE' position (i)
and remove the Introducer with the plate attached (ii).



Trial Reduction

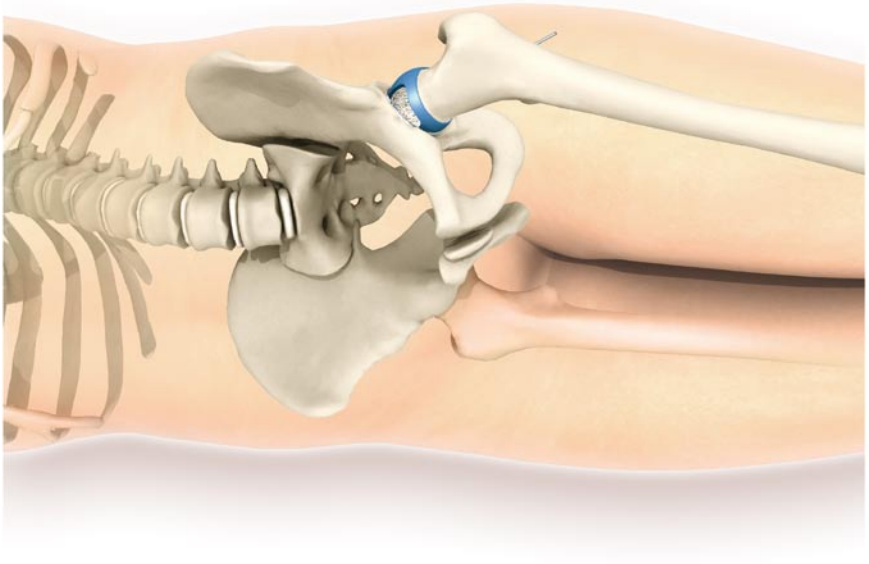
For surgeons following strategy one, it may be necessary to complete the femoral head preparation to the size that matches the acetabular component

1. Confirm Fit

Use the correct sized Head Trial to check
the correct fit and shape.
Mark the head edge position on the medial neck junction with a sterile pen or diathermy.
This will act as a depth mark for the distal rim of the resurfacing Implant and confirm
when it is fully seated.

2. Trial Reduction

With the Head Trial in place and the Impaction Plate removed from the acetabular cup,
a trial reduction may be performed if desired.

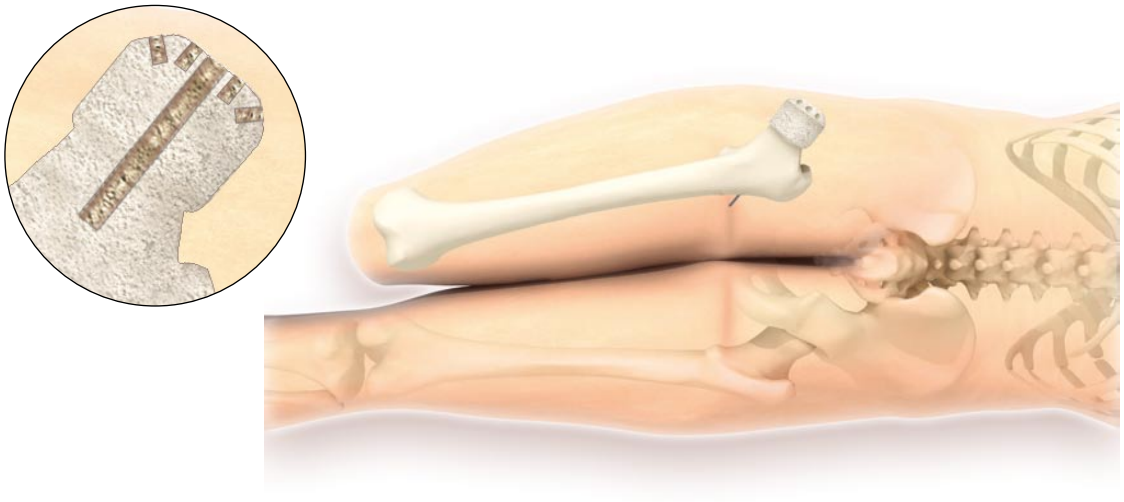


Femoral Head Implantation

Careful femoral head preparation is designed to achieve an increased cement bone interface, ensure adequate interdigitation of the cement and therefore result in mechanical stability of the implant, whilst keeping damage to the prepared femoral head to a nominal level

1. Prepare Head For Cement

Drill several short holes into the prepared proximal head using a drill of diameter according to surgical protocol. Surgical experience suggests that drill holes raging from 3.5 and 6mm diameter are widely used.
This step is particularly important when the prepared head is asymmetrical and there are areas of non cancellous bone present.
Perform curettage of cysts; remove loose bone and lavage the prepared femoral head using a pulsed lavage such as the Stryker® Interpulse™.



2. Insert A Drainage Cannula

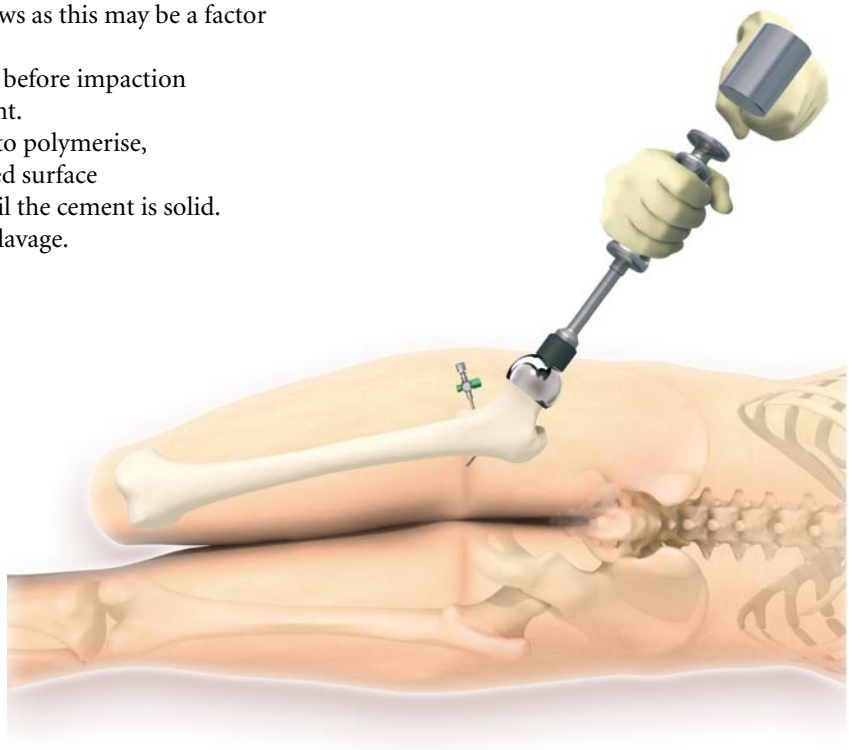
Drill a venting hole in the region of the lesser trochanter to avoid increased intraossus pressure during cementation.
Some surgeons may chose to attach suction using a cannula. However you should be aware that this could draw cement around the stem and may adversely affect implant to bone load transfer.
If used, insert the Drainage Cannula, ensuring that it does not extend into the stem hole.
Connect to a suction pump and apply suction if appropriate.
Wash the prepared bone surfaces with saline lavage and dry thoroughly.

3. Cementing

Fill the femoral implant approximately 2/3 full with antibiotic cement, such as Simplex®, used in its low viscosity state.
A useful tip is to use fine nibblers to make a shallow channel along the cylindrical section of the prepared proximal femur which ends just short of the cylindrical lower margin of the metal head (see right). As the head is advanced over the femoral bone, excess cement can escape through the channel however this will seal as the head rim passes over its lower end, ensuring proper pressurisation.

4. Femoral Head Impaction

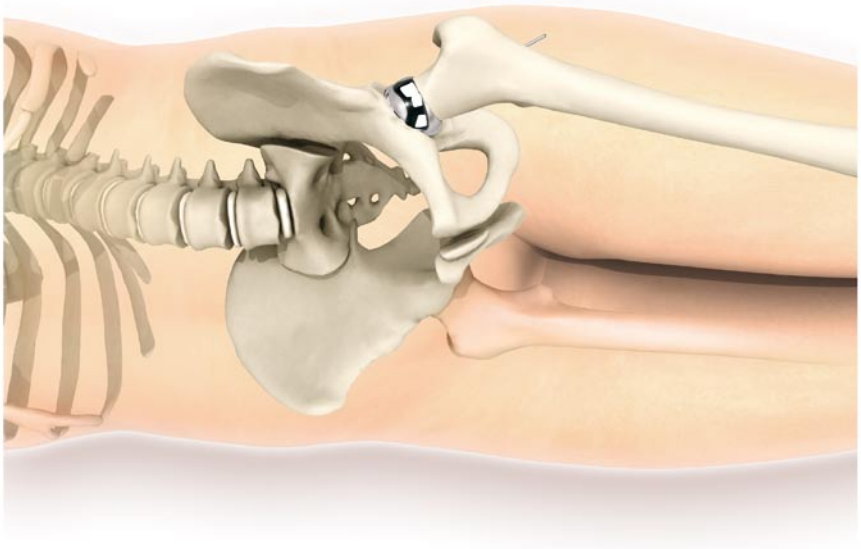
When the cement begins to develop a surface skin/membrane and moves more slowly as the inverted head is tilted, place the implant over the prepared proximal femur and advance until the desired position using the resurfacing head impactor.
It is important that the surgeon is able to advance the head using a series of light taps rather than fewer heavy blows as this may be a factor in the initiation of early femoral neck fracture.
Do not allow the cement to become too viscous before impaction as this may prevent full seating of the component.
Remove excess bone cement once it has begun to polymerise, taking particular care not to damage the polished surface of the Resurfacing Head. Maintain pressure until the cement is solid.
Wash the polished head with pressurised saline lavage.
Avoid wiping the superfinished bearing surface which may result in minor scratches.



Reduction And Closure

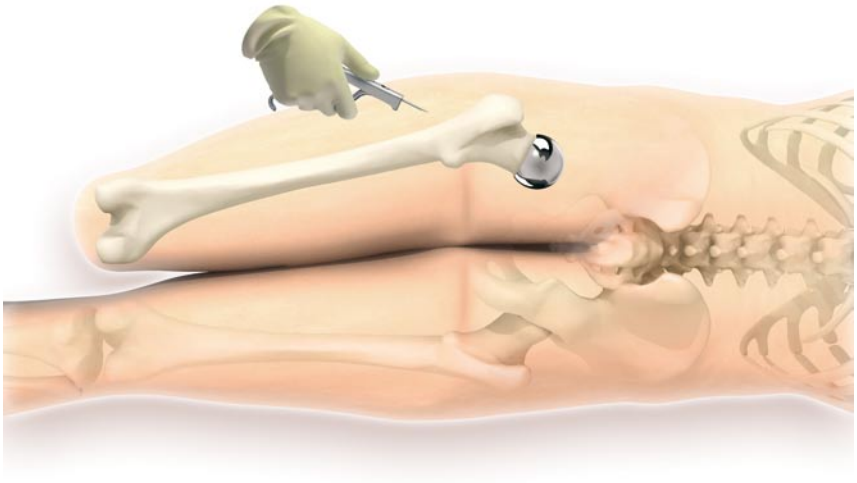
1. Reduction

Flush the entire joint with saline, and wash and inspect the polished surfaces.
Reduce the hip taking great care to reduce the components cleanly without scraping the head on the cup rim.
A retractor can be used to hold the hip capsule away from the acetabulum.
Perform a full check to ensure that there is no entrapment of soft tissues, and that the range of movement and stability is satisfactory.



2. Removal Of Lateral Pin (if used)

Ensure that the Lateral Pin is removed from the femoral cortex before the wound is closed.

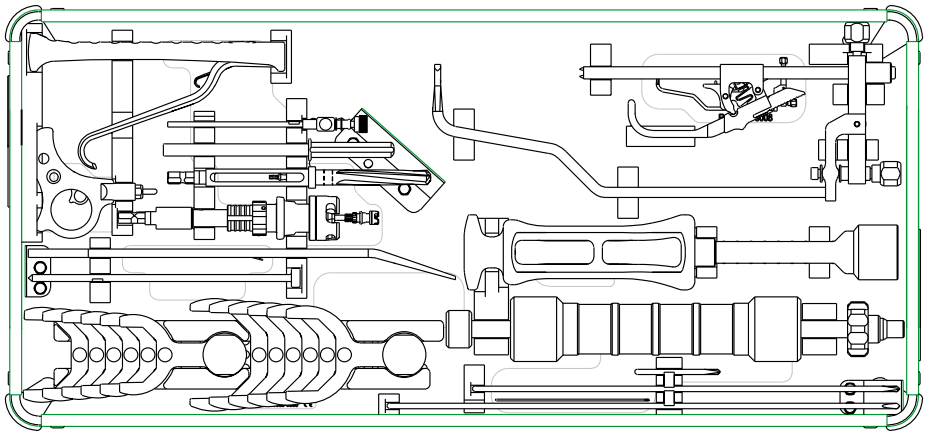


3. Close Wound

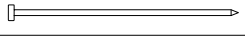
Follow the preferred procedure to re-attach muscular structures and suture the fat layers and skin, inserting a drain if required.

Instrumentation

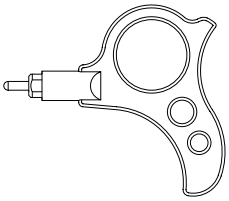
Core Set



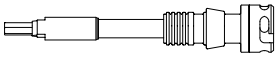
RCI99890001
Capsule Scissors



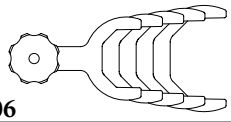
RCI99890002
Judd Nail



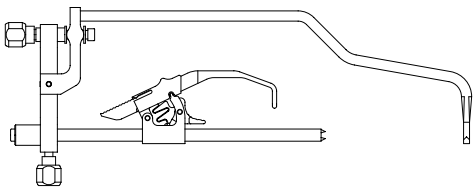
RCI99890003
Knob Tightener



RCI99890004
Head Cutter Drive Handle



RCI99890005 - RCI99890006
Head Neck Gauges



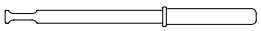
RCI99890008
Lateral Referencing Jig

RCI99890009
Lateral Pin

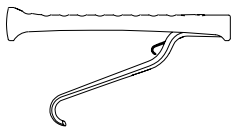
RCI99890010
Initial Guide Wire (Long)

RCI99890011
Initial Guide Wire (Short)

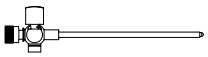
RCI99890012
Cannulated Drill



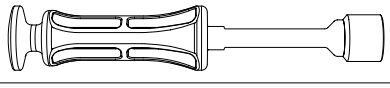
RCI99890013
Guide Rod



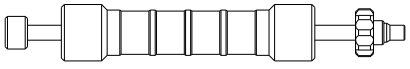
RCI99890014
Pin Extractor



RCI99890015
Drainage Cannula

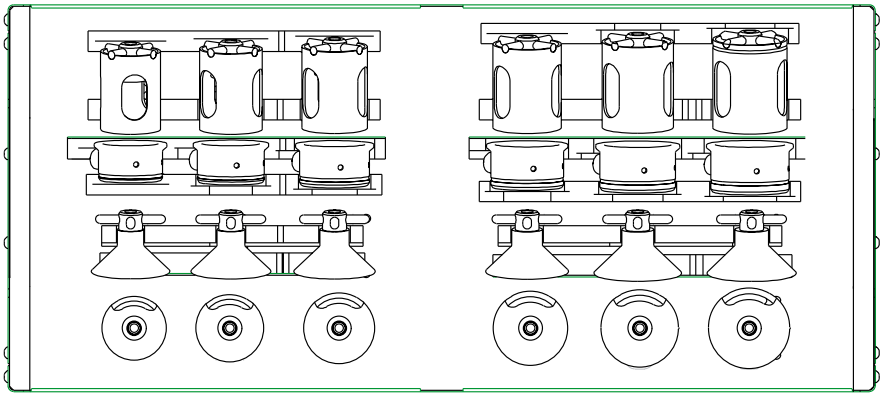


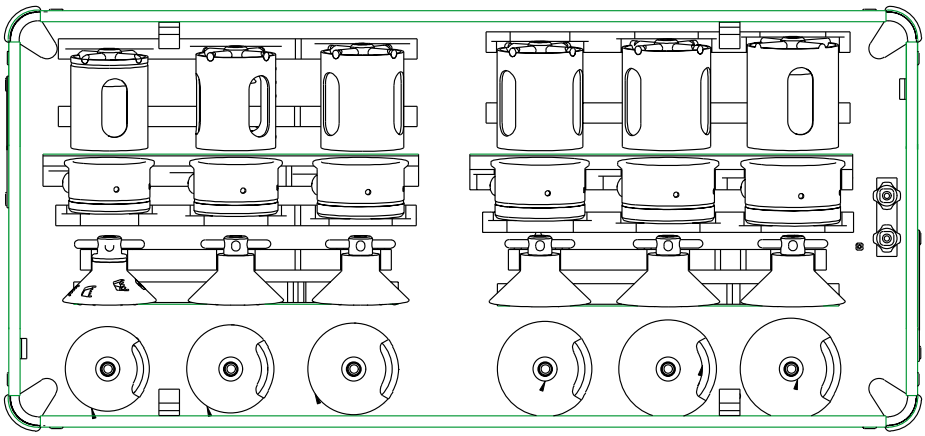
RCI99890016
Head Impactor

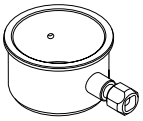


RCI99890069
Acetabular cup Extractor Slap Hammer

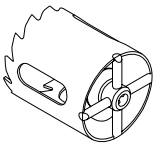
Instrumentation
Femoral Set



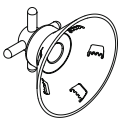




RFI99899238 - RFI99899260
Top Cutting Guide & Screw

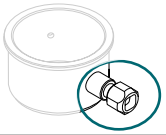


RFI99899338 - RFI99899360
Cylinder Cutter



RFI99899438 - RFI99899460
Chamfer Reamer

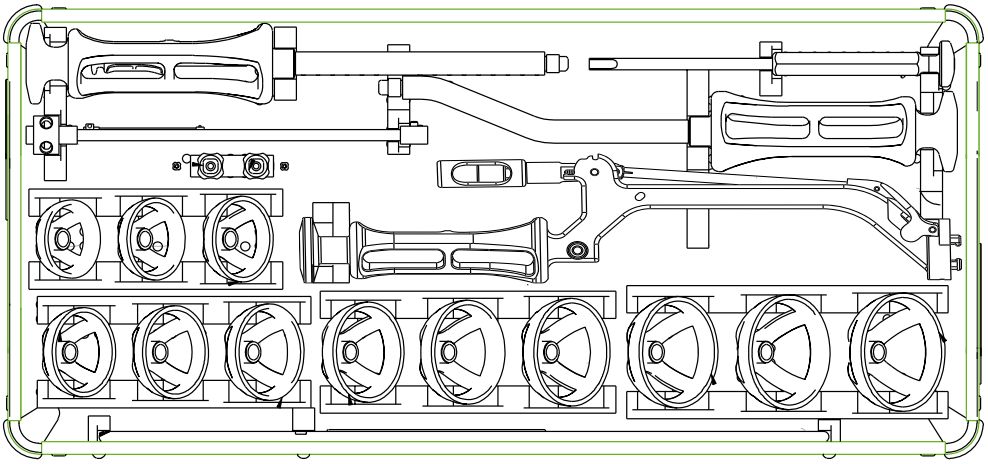
RFI99899538 - 99899560
Head Trial

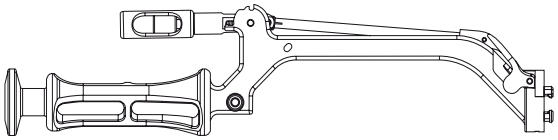


RFI99890045
Screw for Top Cutting Guide

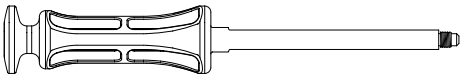
Instrumentation

Acetabular Preparation Set

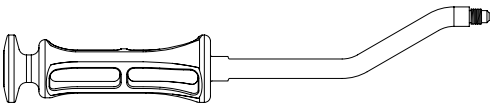




RAI99890040
Acetabular Cup Impactor

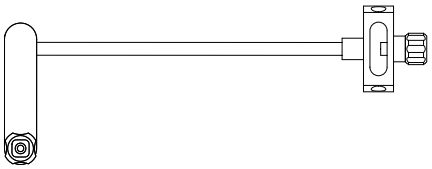


RAI99890029
Straight Cup Trial Handle

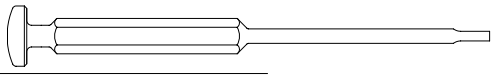


RAI99890030
Curved Cup Trial Handle

RAI99890031
Cup Alignment Rod

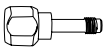


RAI99890032
Cup Alignment Aerial



RAI99890033
Punch

RAI99890034
Screw



RAI99890035
Dog Screw

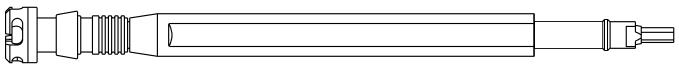
RAI99899044 - RAI99899066
Acetabular Cup Trial

Instrumentation

Acetabular Reamers

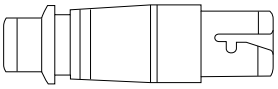
21020438-21020466

Cutting Edge Reamer



21020410

Reamer Handle



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2. National Institute For Clinical Excellence, Guidance on the use of metal on metal hip resurfacing arthroplasty. Technology appraisal guidance – No 44, June 2000.
3. Beaulé et al, Risk factors affecting outcome of metal-on-metal surface arthroplasty of the hip. Clin Orthop Relat Res. 2004 Jan; 418):87-93.
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