

AMIS™

ANTERIOR MINIMALLY INVASIVE SURGERY
IN HIP REPLACEMENT



Surgical Technique

Hip

Knee

Spine

Navigation

CAUTION

Federal law (USA) restricts this device to sale distribution and use by or on the order of a physician.

INTRODUCTION

This document describes the surgical technique for AMIS (Anterior Minimally Invasive Surgery), used to implant different Medacta products. For more details about products please see the dedicated surgical techniques.

Carefully read the instructions for use and if you have any questions concerning product compatibility please contact your local Medacta representative.

ACKNOWLEDGMENTS

Thanks to

DR. MED. FRÉDÉRIC LAUDE
(Paris, France)

for the collaboration in the development of the surgical technique.

Thanks to

PD DR. MED. CLAUDIO DORA
(Zürich, Switzerland)

for the support during the surgical technique finalization.

TABLE OF CONTENTS

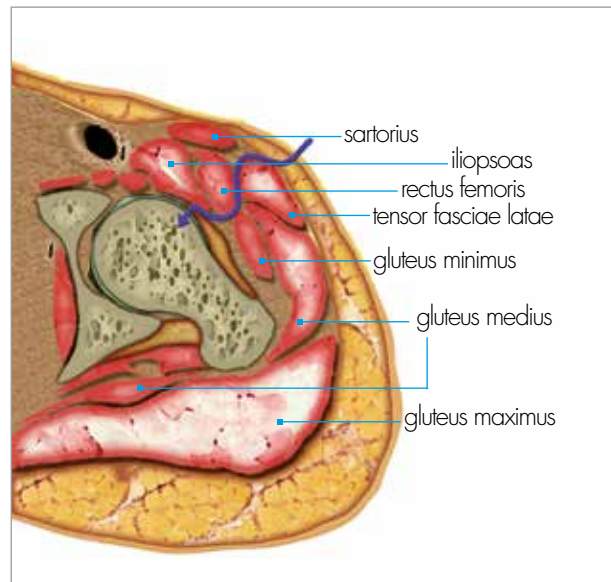
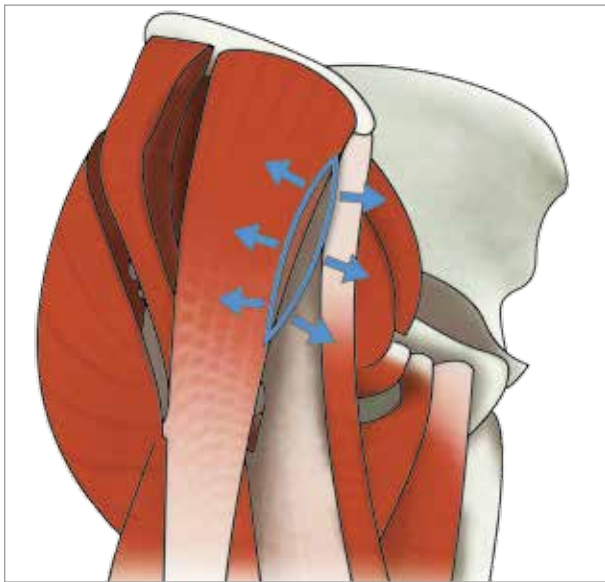
1	INTRODUCTION	4
2	PRE-OPERATIVE PLANNING	4
3	THE AMIS APPROACH	5
3.1	AMIS Mobile Leg Positioner	5
3.2	Patient positioning	6
3.3	Surgical exposure	7
4	FEMORAL NECK OSTEOTOMY	11
5	ACETABULAR STAGE	12
5.1	Reaming	12
6	FEMORAL STAGE	15
6.1	Femoral positioning	15
6.2	Femoral preparation	17
7	REDUCTION	19
8	WOUND CLOSURE	21

1 INTRODUCTION

The anterior approach: a logical approach for minimally invasive surgery.
AMIS: the logical solution from Medacta

The anterior approach for hip replacement is a tissue-sparing technique designed to **follow both an intermuscular and an internervous path**¹.

The AMIS (Anterior Minimally Invasive Surgery) approach is an anterior approach technique developed in 2004 by an international group of expert surgeons with the support of Medacta. The goal is to optimize and enhance the reproducibility of the anterior approach through ongoing educational support and minimize the risk of soft tissue damage.



2 PRE-OPERATIVE PLANNING

Careful pre-operative planning is essential. The surgeon can select the femoral implant size that appropriately restores patient's anatomy. In addition, by using the X-ray templates scaled at 1.15:1 (with an X-ray of the same magnification) it will be possible preoperatively to estimate:

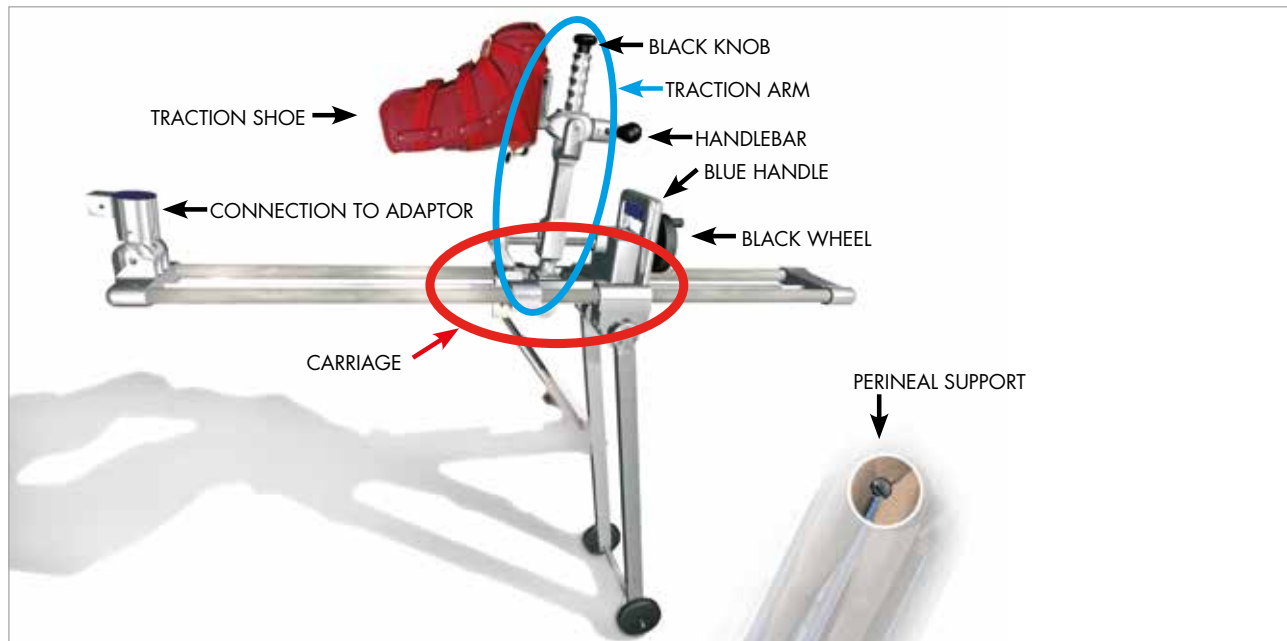
- The implant size;
- Restoration of femoral offset;
- The level of the neck cut;
- The head size;
- The center of rotation of the new hip.

¹ Siguier T, Siguier M, Brumpt B. Mini-incision anterior approach does not increase dislocation rate: a study of 1037 consecutive total hip replacements. Clin Orthop Relat Res 2004; 426: 164-73.

3 THE AMIS APPROACH

3.1 AMIS Mobile Leg Positioner

The AMIS Mobile Leg Positioner should allow the hip to flex, extend, abduct, adduct and rotate. The minimum surgical team may consist of the surgeon, a scrub nurse, and a nonsterile table operator.



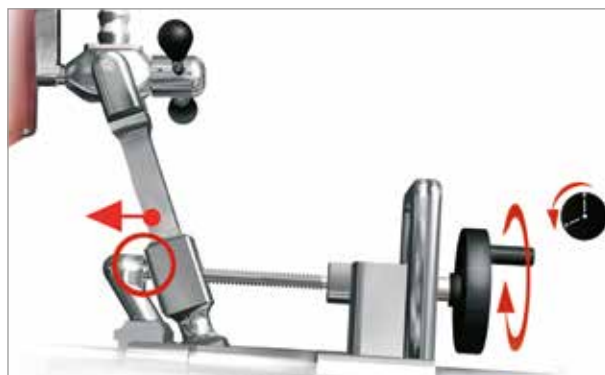
AMIS

Assemble the AMIS Leg Positioner to the orthopaedic table, using the specific adaptor.



TIP

The traction arm should be placed at the beginning of the threaded bar in order to achieve the largest maneuvering length during traction.



AMIS

Remove the traction shoe from the AMIS Leg Positioner. Bolster the foot by a bandage and put it in the traction shoe. Position the carriage in order to match the leg length. Slot the shoe in the traction arm and lock the system with the black plunger.



CAUTION

The perineal support should be well padded in order to avoid injury to genitals and/or pudendal nerve.



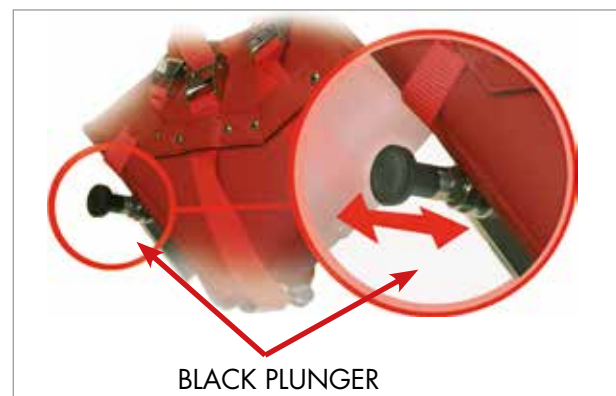
OPTION

The AMIS shoe, reference 01.15.10.0315, is available as an option. This shoe has two different sizes to cover a range of foot sizes.



CAUTION

If using the shoe ref. 01.15.10.0315, do not overtighten the fixation buckle as this will apply excessive pressure to the patient's foot.



BLACK PLUNGER

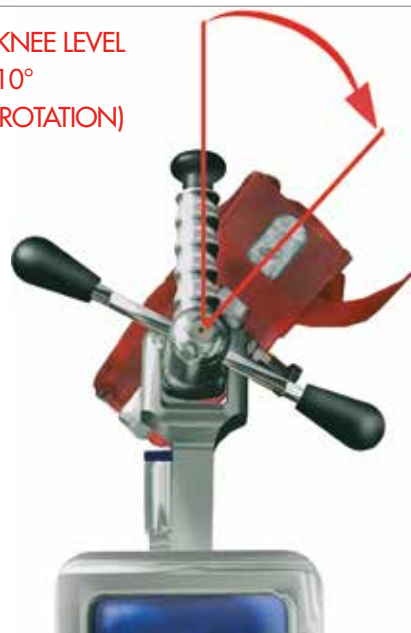
3.2 Patient positioning



AMIS

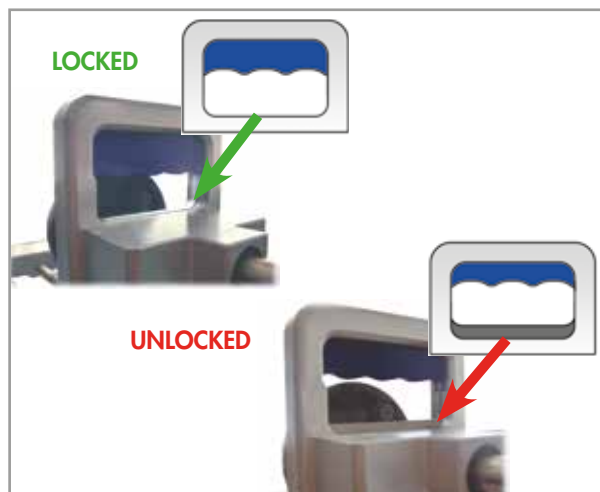
The patient lies supine on the orthopaedic table. Slight traction is applied to the operative limb. Perineal support prevents distal migration of the patient. The patella is at 0° (10° internal rotation of the foot is not rare).

0° AT THE KNEE LEVEL
(FOOT AT 10°
INTERNAL ROTATION)



CAUTION

Make sure that the blue handle is correctly locked.



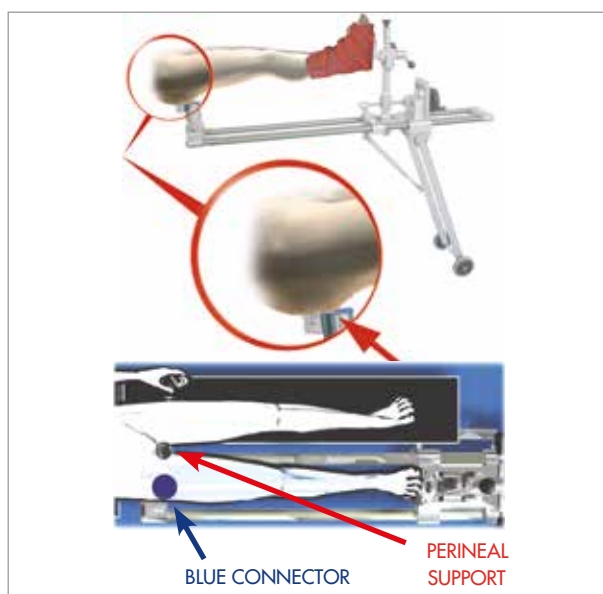
AMIS

The pelvis must be horizontal. The arm on the surgeon's side is fixed on the chest. The operating field is covered by adhesive drapes, transparent if possible (in order to check the patella positioning and the AMIS Leg Positioner handling).



WARNING

Make sure that the blue connector of the AMIS Leg Positioner is under the thigh and at the same level of the perineal support.



3.3 Surgical exposure

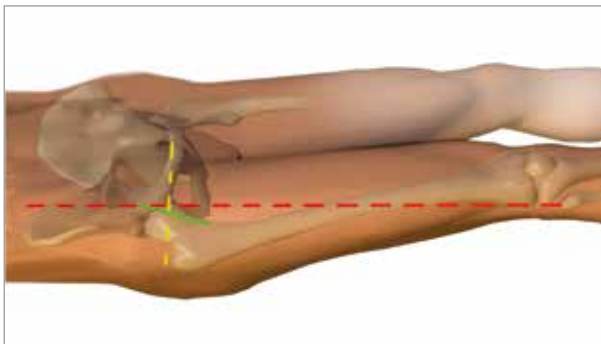
3.3.1 Skin incision

The incision is 6 to 12 centimetres long and runs 1 to 2 fingerbreadths lateral to a line connecting the anterior superior iliac spine to the Gerdy's tubercle. The incision starts 1 centimeter lateral to the iliac spine and normally ends slightly distal to the tip of the greater trochanter.



/ SURGICAL TIP

In thin patients it is easier to palpate the plane of the tensor fascia latae and sartorius and then make the incision lateral to it.



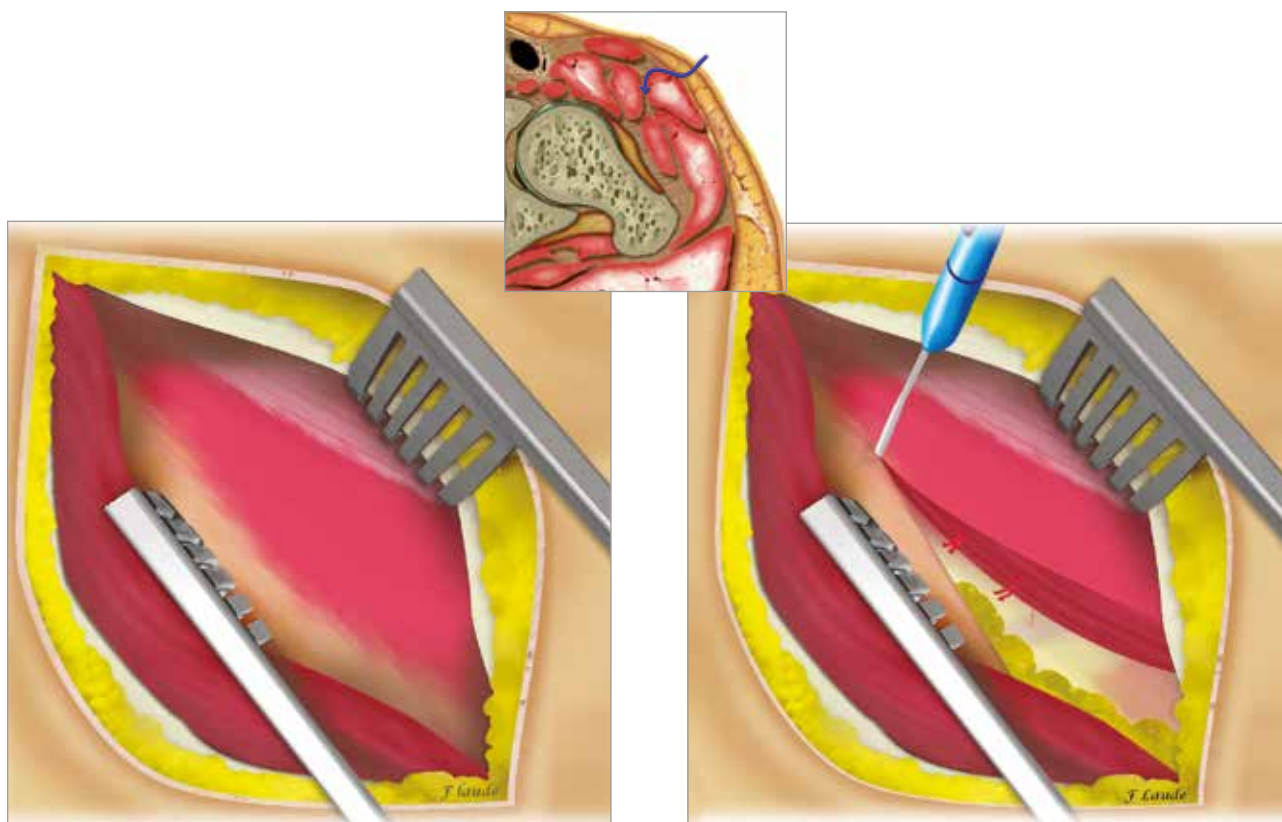
3.3.2 Intermuscular approach

This approach is more lateral than the classic Hueter approach in order to avoid injuring the femoral cutaneous nerve and its branches.

The incision is extended straight to the superficial aponeurosis of the tensor fascia lata. This aponeurosis is incised to expose the muscle fibres of the tensor which run downwards.



NOTICE: If muscle fibres running in the medial direction are seen, then these most probably correspond to the sartorius. In this case, the incision may have been made too medial, and it is necessary to look more laterally for the tensor fibres. To facilitate repair of this sheath, we advise putting two or three tags on the medial border.



Aponeurosis covering the rectus femoris and the incision

Incision of rectus femoris aponeurosis

The medial aponeurosis is lifted with a finger or clamp. The medial side of the muscle is retracted laterally, sparing the aponeurosis of the sartorius in order not to injure the femoral cutaneous nerve. Digital mobilisation is easy, and so the tensor fascia lata can be pushed laterally. It is important that the split in the aponeurosis of this muscle is carried well proximally and distally beneath the skin, so that the retractors will not damage the muscle.

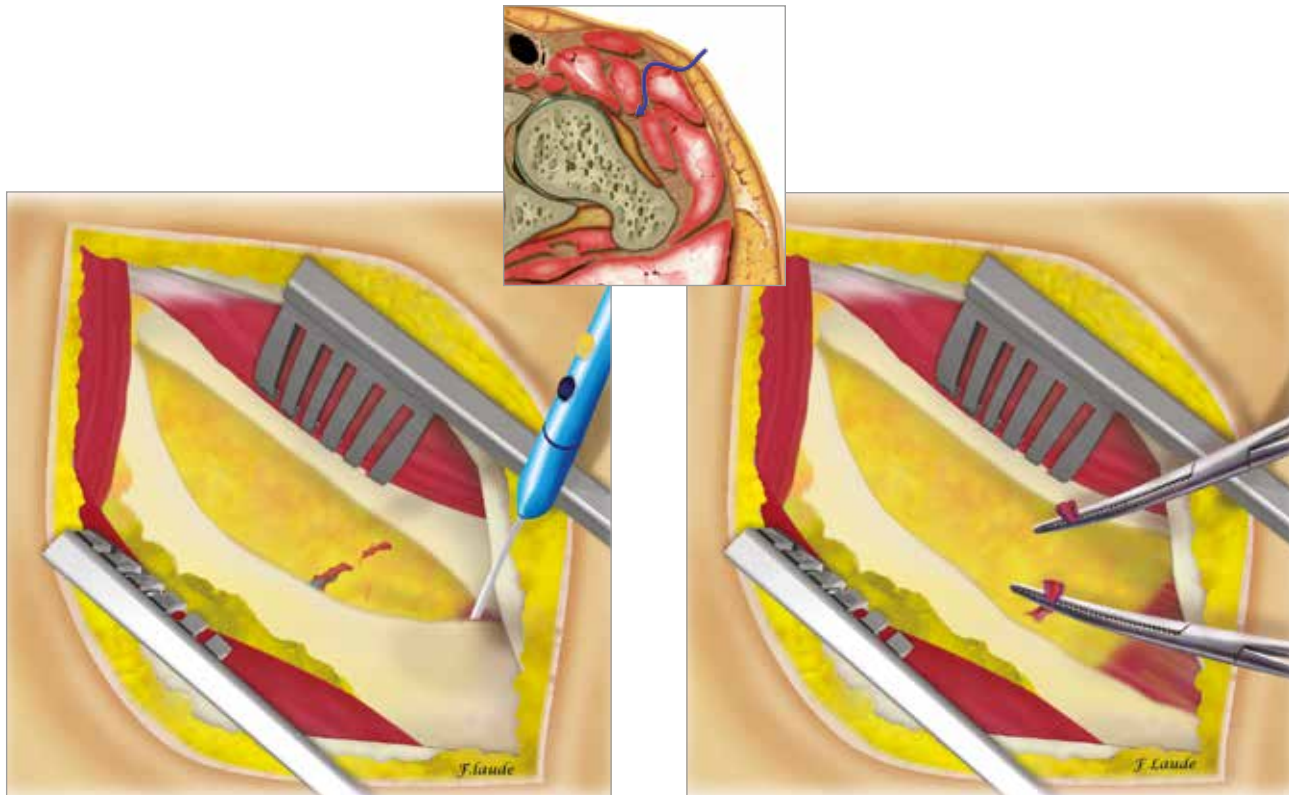
A Beckmann retractor is inserted to hold the tensor and the aponeurosis covering the rectus femoris is visualized.

The aponeurosis covering the rectus femoris is thin and its muscular structure can be clearly seen. The surgeon will easily visualize the red large fleshy mass of the muscle distally and proximally, and tendinous fibres continue to the direct and reflected tendons. The thin aponeurosis covering the red area is incised. Here again, some haemostasis is often required. It is now possible to retract the muscle, medially using the Beckmann retractor.



CAUTION

Care should be taken not to drift proximally at this level. There are vein bundles embedded in fatty tissue that bleed at the slightest contact and haemostasis is often difficult to obtain. In addition, in some cases, there is a secondary branch of the crural nerve innervating the most medial head of the tensor fascia lata that can be injured.



Unnamed pearly aponeurosis incision and circumflex arterio-venous bundle exposure

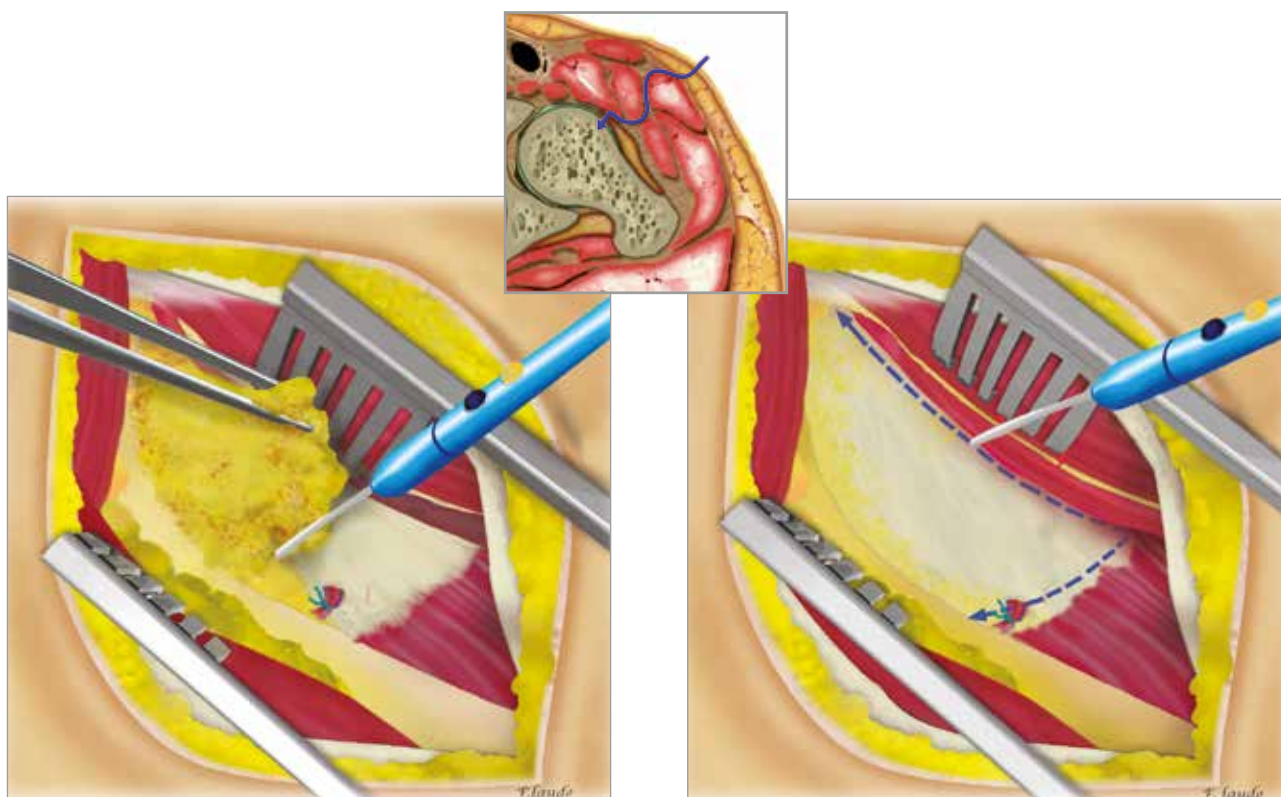
Ligature of the circumflex arterio-venous bundle

With the Beckmann retractor placed between the lateral side of the rectus femoris and the medial side of the tensor fascia lata, an unnamed pearly aponeurosis is seen. This pearly aponeurosis is the only structure standing in the way of the capsule. Below this aponeurosis, and rather in the distal part, the anterior circumflex arterio-venous bundle is seen. Most of the time, at the upper part, this aponeurosis is thin or even absent. The capsule is palpated with a finger. The aponeurosis is thicker at the distal part of the approach, and should be incised with great caution in order to not injure the circumflex vessels.

After the aponeurosis has been opened, the circumflex vessels can be found in a cellulo-fatty layer. They are easily isolated with a Lambotte rasp and cut between two ligatures. These relatively big vessels are directly connected to the femoral artery, and simple coagulation does not seem safe to us. Proximally the reflected tendon of the rectus femoris is isolated from front to rear with the Lambotte rasp.

HOW TO START: At the beginning of your learning curve, or in a very dysplastic acetabulum, it is useful to cut the reflected rectus tendon. In this case, the tendon is placed on a forceps and cut with an electrocautery device.

At the most medial part and under the rectus femoris, is the iliocapsularis, and more distally, the tendon of the psoas. The iliocapsularis is generally covered by a very thin aponeurosis which attaches to the capsule. This is especially true proximally. It does not seem useful to scrape this muscle free from the capsule as was common practice before. Although the capsule is better exposed and a little more easily seen, we observed some post-operative pain, and some difficulty in flexing the hip.

*Fatty tissue removal**Capsule resection*

3.3.3 Articular approach

After resecting the fatty tissue in front of the capsule, the muscles around the capsule are exposed. These should not be touched. Proximally and on laterally, one can see some fibres of the gluteus minimus, and, on the medial side, the iliocapsularis. On the lateral side, the tensor fascia lata retracted by the Beckmann retractor is seen, and more distal, the fibres of the vastus lateralis which follow the inferior insertion of the capsule on the anterior intertrochanteric line are also visible.

The capsule is opened precisely and a flap is detached for supporting the modified Charnley retractor. It is absolutely possible to conserve the capsula flap and to close it at the end.

The joint capsule is incised following the iliocapsularis muscle edge from distally to proximally. At the top, the incision ends at the anterior edge of the acetabulum, but may follow very slightly the edge of the acetabulum outwards. Distally, the incision runs to the infero-medial insertion of the capsule, then laterally following the intertrochanteric line, along the vastus lateralis fibres. Thus, a triangular flap is detached laterally over the fibres of the gluteus minimus in the direction of the tensor fascia lata. It is useful to grip the flap with a suture to dissect it properly. Release the flap laterally until the pertrochanteric tubercle is visualized.

4 FEMORAL NECK OSTEOTOMY

After the capsulotomy, it is possible to place two Hohmann retractors between the neck and capsule. The surgeon can continue to release the capsule up to its insertions to expose the femoral neck around the greater trochanter and in the lower part towards the lesser trochanter. By freeing the capsule this way, the anterior neck will be better visualized. On the superior part of the neck, the retinaculum carrying the vessels to the femoral head is seen. It is advisable to coagulate the vessels before cutting the neck. This will also clear the upper part of the neck.

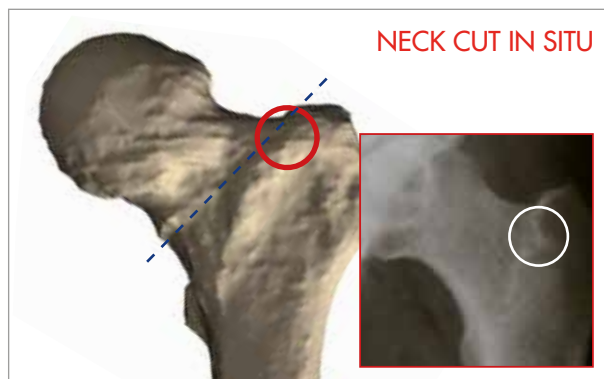


AMIS

Before performing the femoral neck cut, increase traction about 1 cm by turning the black wheel clockwise twice.



The cut is made with the head in situ, using an oscillating saw in order to prevent a femoral fracture which could occur during coxofemoral dislocation. The cutting level is identified with reference to the cervicotrochanteric angle from the preoperative drawing. It starts from the most external part of the neck, at the junction with the greater trochanter, and runs towards the femoral neck. The best anatomic landmark is the pertrochanteric tubercle. You can find it at the upper insertion of the vastus lateralis very close to the reflexion of the femoral neck. If you start the cut just above it, your cut should be ideal.



The cut is made at an angle of 45° to the horizontal plane just over the upper fibre of the vastus lateralis. The saw blade is perpendicular to the floor. Before cutting the neck, the position of lower limb should be checked by palpating the patella. The saw must be fine and long. It is important to be gentle and careful and not to go too far posteriorly, to prevent injury to the posterior circumflex artery.



AMIS

By applying a small amount of traction using the black wheel, the osteotomy opens.

If the osteotomy does not open check the effectiveness of previous surgical steps (for example the capsular release may not be wide enough).



AMIS

Turn the leg to give 45° of external rotation.

- Lift the black knob
- Turn the knob 180° and release to lock
- Apply desired rotation by turning the handlebar



The corkscrew is placed into the head, tilted in the proximal direction.

It is common to have some posterior capsule still attached to the femoral neck and this must be cut before extraction of the head.

The head is then pivoted. If needed the teres ligament is cut. The head is extracted.

In some complicated cases (coxa profunda, numerous osteophytes), it may be necessary to fragment the head.



Head extraction using a "corkscrew".

5 ACETABULAR STAGE

5.1 Reaming



AMIS

The traction is released by turning the black wheel twice counterclockwise. The lower limb has already been externally rotated 45° for extracting the femoral head.



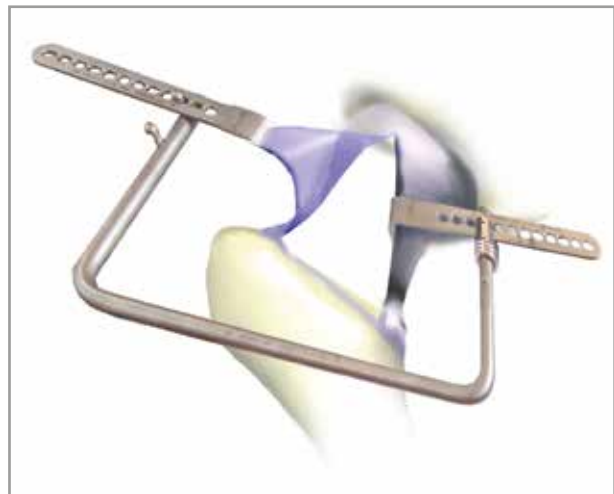
This position relaxes the iliopsoas and allows adequate placement of the AMIS Charnley retractor (Surgeons can use a MIS Frame instead of AMIS Charnley retractor. All the following instructions about the AMIS Charnley retractor are also valid for a MIS Frame).

The Beckmann retractor is removed, and the modified Charnley retractor is inserted in its place.



CAUTION

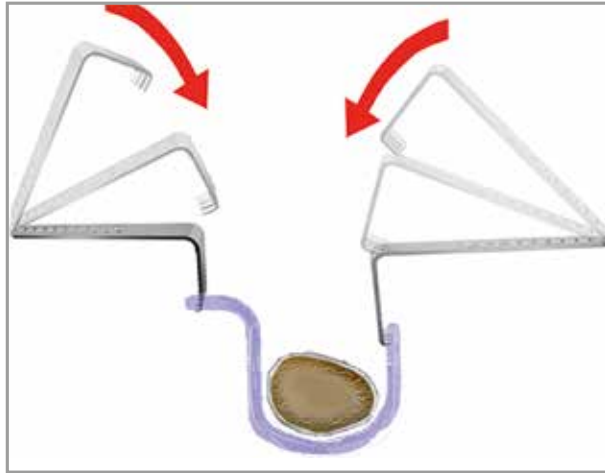
It is very important to place this retractor on the capsular flap. The retractor has aggressive hooks and, if placed on muscle tissue, may damage them. In case of capsulectomy don't use AMIS Charnley retractor. In such cases the use of the MIS Frame or a Beckmann retractor is recommended.



The medial blade is fitted first. This blade is placed beneath the anterior capsule at the junction of the acetabulum and capsule. While firmly holding with one hand the medial blade of the retractor in the anterior capsule, the adjustable lateral blade is placed on the capsular flap which has been turned laterally. The retractor blades are placed into the capsule.

As the capsule is thick in this area the hook will likely obtain a good grip. The surgeon should try to place the lateral blade as lateral as possible on the flap. If the lateral blade is placed too deep inside the capsule, it will cause trouble during the femoral preparation.

The retractor blades are specifically designed for this approach. It is important to check throughout the operation, that the retractor remains in place, hooked into the capsule and only to the capsule. Retracting on the strong structure of the capsule will protect the muscle tissues and facilitate a postoperative recovery.



If the modified Charnley retractor is placed in a good position the surgeon can leave it until the end of the femoral preparation. With this specific retractor, the capsule acts like a retractor itself.

If the AMIS Charnley retractor is well positioned, the acetabular rim is visible or palpable throughout its entire circumference.

OPTION

If the anterior wall of the acetabulum is still difficult to visualize, an AMIS Hohmann retractor can be placed at the anterolateral level of the iliac spine. The whole articular crescent should be seen.

The labrum and round ligament are excised, the acetabular fossa is identified, and the transverse ligament can be cut on its anterior edge to prevent excessive bleeding.

Reaming can be started.

A hemispherical shaped reamer can be easily inserted into the acetabulum.



The offset reamer handle can be used to avoid any conflict with the distal end of the incision, which would damage the skin and a lever effect that would result in excessive reaming of the anterior wall of the acetabulum.



If the incision is small it is possible to place the reamer separately inside the acetabulum by hand and then clip the reamer handle inside the joint. In the same way, the surgeon can remove the two components separately by unclipping first the handle. Then the hemispherical reamer can be removed with strong forceps.

The reaming operation should preserve the subchondral bone and, if some areas appear insufficiently abraded, it is often better to expose some bleeding areas using an aggressive curette rather than over-reaming and run the risk of implanting an acetabular cup on weak cancellous bone. After the acetabulum has been prepared, trial cup is inserted.

! / WARNING

Through this approach, and especially in minimally invasive protocols, care should be taken to avoid implant verticalization or excessive anteversion.

The implant should be placed under the anterior acetabular rim in order to prevent impingement with the psoas.

Assemble the acetabular implant with the cup impactor.



The final acetabular component is impacted and a stability test is performed. The acetabular liner is placed. The retention of the posterior capsule potentially reduces the risk of posterior dislocation^{1,2}.



! / CAUTION

Versafitcup CC Trio in size 40 and in size 42 are not compatible with the Medacta Offset Cup Impactor (ref. 01.15.10.0165). Always use the straight cup impactor (ref.01.26.10.0062) which is part of the Versafitcup CC Trio general instrumentation tray, or the AMIS Cup Impactor M10 HPF with rotation locking mechanism (ref. 01.15.10.0535) available on demand.

6 FEMORAL STAGE

6.1 Femoral positioning

Once the acetabulum has been prepared and the acetabular component is in place, attention should be turned to the femoral side.

The AMIS Leg Positioner should be adjusted:



AMIS

1 - TRACTION: Apply a little traction with the black wheel.



AMIS

2 - EXTERNAL ROTATION: The patella is rotated externally 90°, or even more if possible by turning the handlebar. Place the AMIS Femoral Elevator above the summit of the greater trochanter.



WARNING

The surgeon should accompany the motion AT THE KNEE LEVEL. This will reduce the stresses and facilitate a large external rotation. Foot rotation greater than 180° is not uncommon.



SURGICAL TIP

If it is difficult to obtain 90° of external rotation, it is important to free the pubo femoral ligament near the calcar.

**90° EXTERNAL ROTATION
AT THE KNEE LEVEL
(FOOT ROTATION BETWEEN 100°-180°)**





/ AMIS

3 - TRACTION RELEASE: Once the retractor is placed it is necessary to release all traction in order to prevent overstretching the crural nerve during hyperextension. The AMIS Leg Positioner has a patented mechanism that automatically removes traction during hyperextension. (Pushing the blue handle unlocks both traction and hyperextension functions). In any case it is advisable to release the traction by turning the black wheel counterclockwise before the hyperextension.

As traction is released gradually, it is advisable to put a hook into the intramedullary canal of the femur and to deliver the femur out.



/ SURGICAL TIP

Make sure there is no residual traction by gently moving the knee up and down.



3



/ AMIS

4 - HYPEREXTENSION: The AMIS Leg Positioner can be lowered towards the floor by unlocking the carriage mechanism (push the blue handle unlocking the hyperextension function).



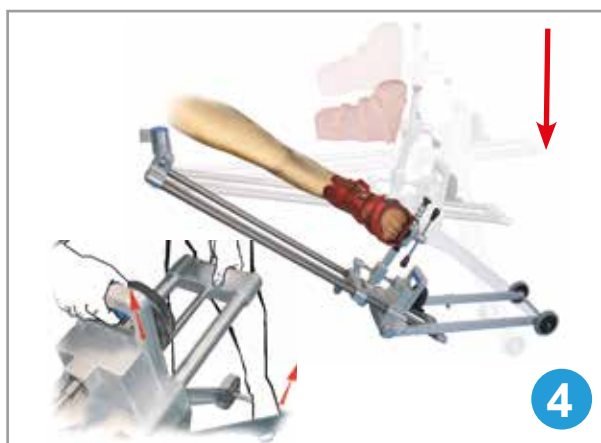
/ SURGICAL TIP

For small patients: during hyperextension, push the leg to protect the psoas from stress. If the operating table is in a high position, it may not be necessary to touch the floor to obtain sufficient hyperextension.



/ SURGICAL TIP

If femoral exposure is not achieved release hyperextension and external rotation and repeat the procedure from STEP 1.



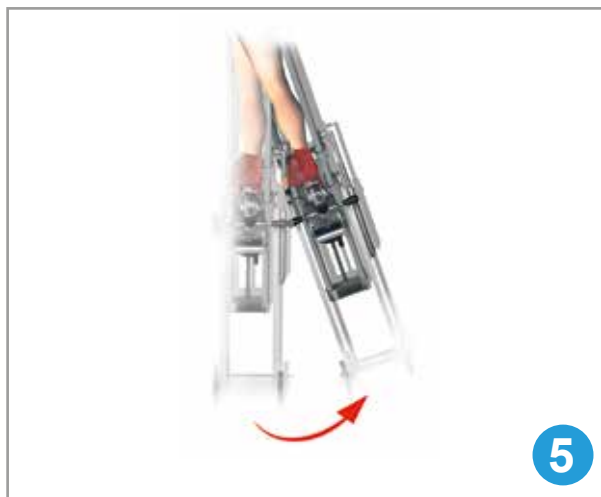
4



/ AMIS

5 - ADDUCTION: Move the AMIS Leg Positioner under the contralateral lower limb.

The femoral neck cutting plane should be horizontal. Another Hohmann retractor may be placed on the posterior medial side of the femoral neck to lateralize the proximal femur.



5

6.2 Femoral preparation

The surgeon stands against the patient's thigh and accentuates the adduction effect with his/her own thigh pushing the limb in further adduction.

In the great majority of cases, femoral preparation can begin by opening the medullary channel using the AMIS Starter Rasp, without the need for touching the capsule or the pelvic-trochanteric muscles.

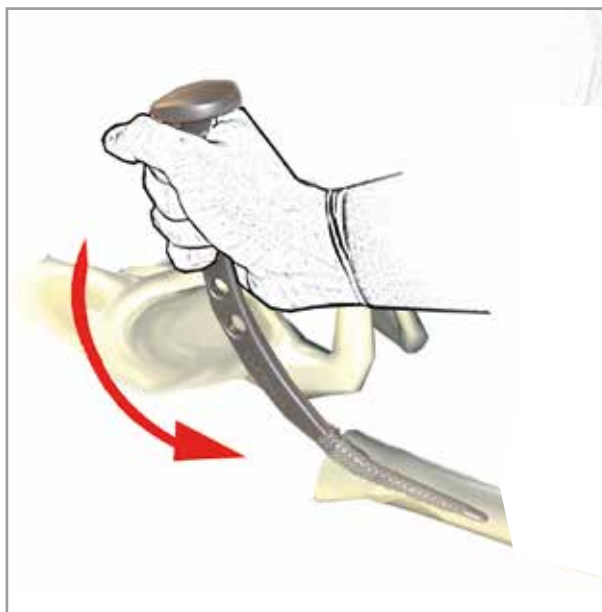
In more difficult cases, it may be necessary to release the posterior capsule; in extreme cases the piriformis and the obturator internus muscles to expose the proximal femur.

If the hip is stiff in external rotation (short neck, longstanding arthritis...) the posterior capsule and piriformis are retracted. It may be important to release them to improve the range of motion.



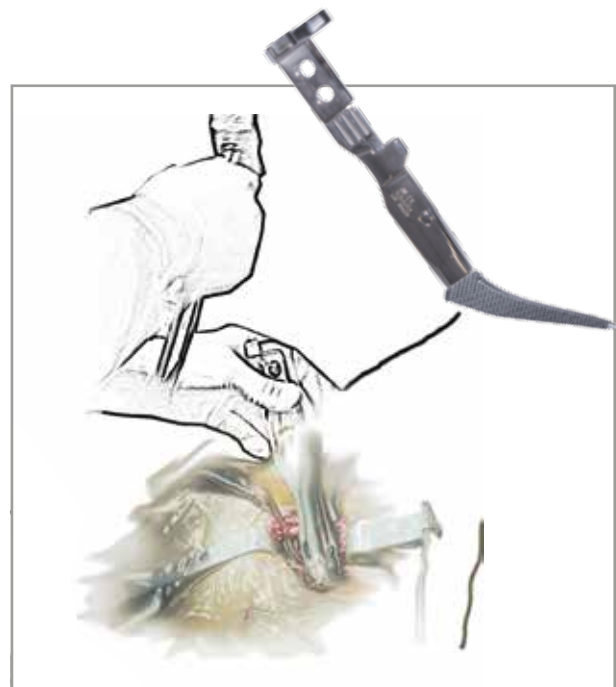
/ WARNING

To avoid creating a false canal, never use a mallet with the AMIS Starter Rasp to find the femoral canal.



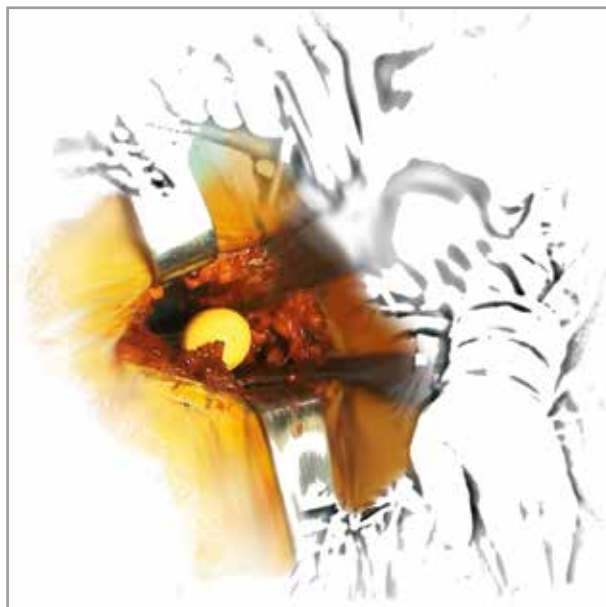
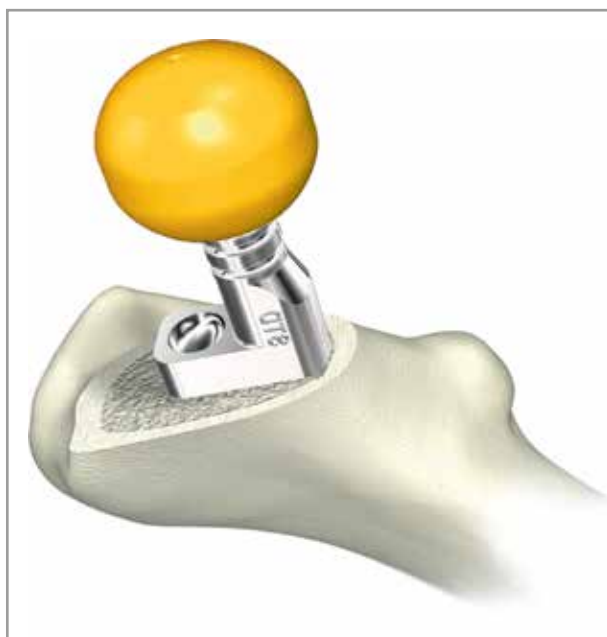
A flexible suction catheter is used to palpate the inner cortex of the femur. The femoral preparation continues with the removal of cortical bone along the medial aspect of the greater trochanter.

It is preferable to remove that bone with the curette or with a gouge, in order to avoid conflicts between the greater trochanter and the shoulder of the prosthesis. Broaches suited to the chosen implant, without trochanter wings, are inserted sequentially into the femur. Here again, we recommend the use of AMIS Broach Handle to avoid injuring with the tensor fascia lata musculature. Each broach should be inserted as deep as possible and flush with the femoral cutting plane.



This preparation is considered complete when the last inserted broach reaches the preoperatively planned level. A basic landmark is usually palpation of the lesser trochanter. The surgeon should not modify the physiological anteversion of the femur in order to decrease posterior dislocation as posterior dislocation is potentially reduced with the anterior approach^{1,2}.

After stability test performed with trial components, the stem is inserted and a femoral head is selected. Its neck length depends on the position of the implant with respect to the preoperative templating. It is also possible to compare the final stem height with the natural femoral head to improve precision.



OPTION

To perform stability and range of motion tests it is possible to disconnect the traction shoe from the AMIS Leg Positioner, but care should be taken to keep the surgical field sterile.

7 REDUCTION

After the definitive prosthesis is in place, the nonsterile assistant should adjust the AMIS Leg Positioner:



AMIS

1 - ADDUCTION RELEASE: Move the AMIS Leg Positioner in order to release the adduction imposed during the femoral preparation.



AMIS

2 - HYPEREXTENSION RELEASE AND TRACTION WITH THE CARRIAGE: Release the hyperextension and exert traction by moving the carriage forward on the leg. At the end make sure that the blue handle is correctly locked.



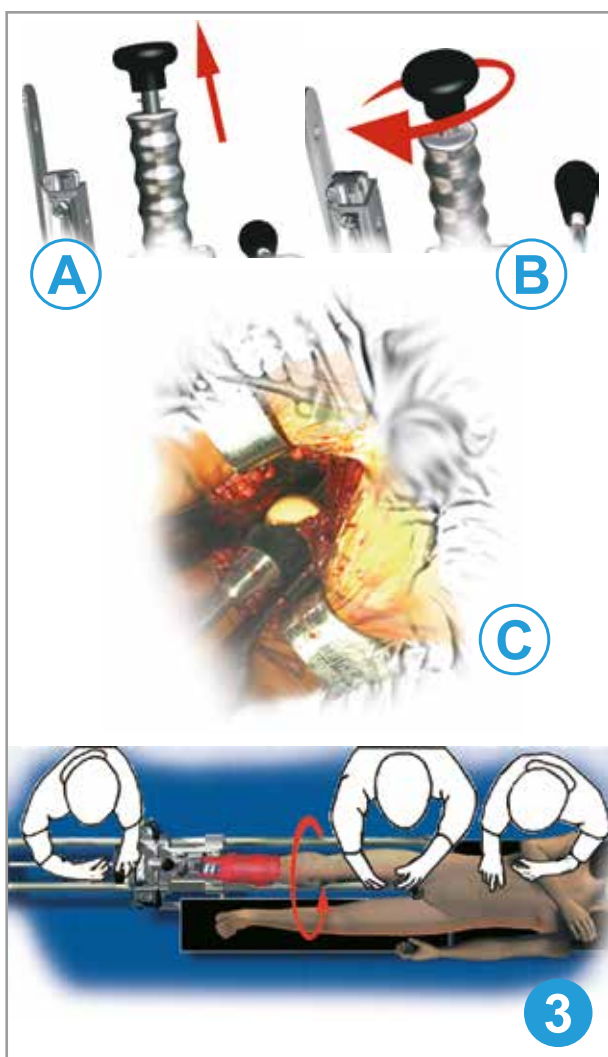


AMIS

3 - EXTERNAL ROTATION RELEASE AND REDUCTION:

Unlock the internal rotation mechanism.

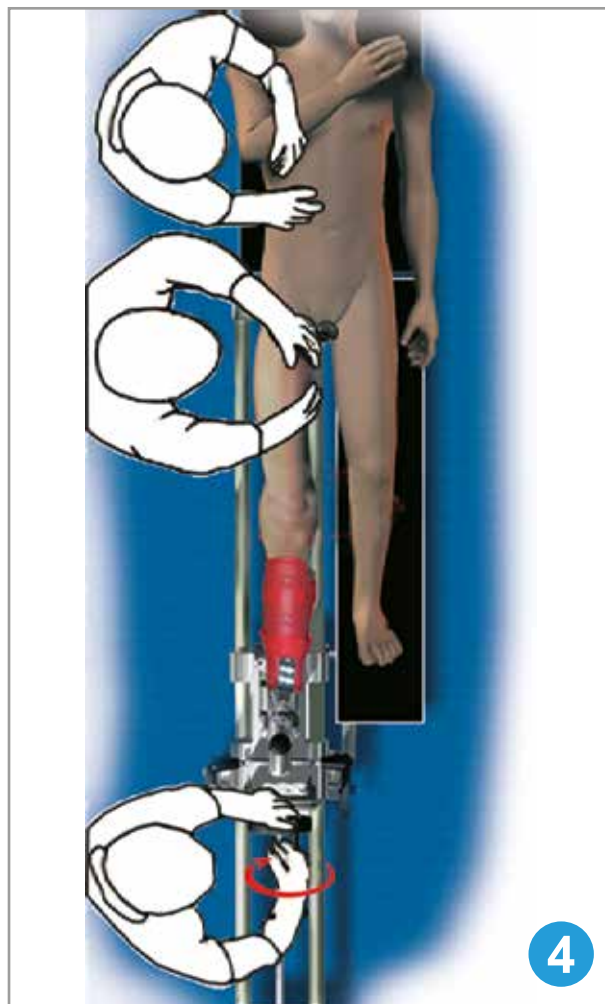
- A. Lift the black knob;
- B. Turn the knob 180° and release to lock;
If necessary, complete the traction by turning the black wheel.
- C. Internally rotate the leg by turning the handlebar and use the Head Impactor to reduce the implant.



AMIS

4 - TRACTION RELEASE: Release the traction by turning the black wheel counterclockwise.

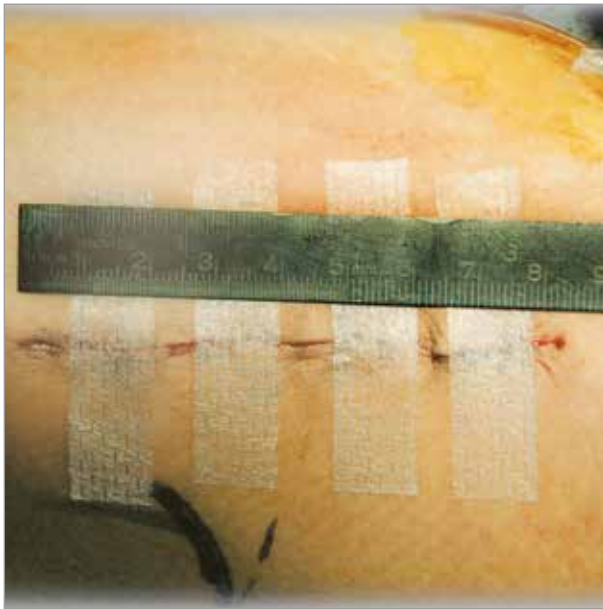
The head is reduced and then the stability of the prosthesis can be tested by external rotation of 90° and gentle traction.



8 WOUND CLOSURE

The AMIS Charnley retractor is removed and the joint capsule can be closed with a few resorbable or non-resorbable sutures.

The superficial aponeurosis of the fascia lata is closed with a running suture, taking care not to catch a branch of the femoral cutaneous nerve.



NOTES

NOTE FOR STERILIZATION

The instruments are not sterile upon delivery. Instruments must be cleaned before use and sterilized in an autoclave respecting the US regulations, directives where applicable, and following the manufactures instructions for use of the autoclave.

For detailed instructions please refer to the document "Recommendations for cleaning decontamination and sterilization of Medacta International reusable orthopaedic devices" available at www.medacta.com.

All trademarks and registered trademarks are the property of their respective owners.



**REDEFINING BETTER
IN ORTHOPAEDICS
AND NEUROSURGERY**

MEDACTA.COM



Medacta International SA
Strada Regina - 6874 Castel San Pietro - Switzerland
Phone +41 91 696 60 60 - Fax +41 91 696 60 66
info@medacta.ch

Find your local dealer at: medacta.com/locations

All trademarks and registered trademarks are the property of their respective owners.

AMIS
Surgical Technique

ref: 99.98.12US
rev. 05

Last update: January 2017