ATLANTIS

Surgical technique
Uncemented modular anatomical revision and reconstruction prosthesis with double curvature, modular neck and distal locking.

Summary of the Atlantis stem concept

The concept of the Symbios Atlantis Reconstruction stem centres around an anatomical double curvature stem fitted with optional distal locking and a modular neck. The double curvature of the stem allows it to adjust itself to the varied natural femoral geometry, thus ensuring maximum contact between the implant and the recipient bone while avoiding spot pressure contacts that are the source of pain.

The numerous possibilities offered by the modular necks and the head lengths allow better reconstruction of the coxo-femoral articulation during revision procedures, thus limiting the risks of dislocation, unequal lengths and gluteal muscle laxness.

1 Indications

The 2D preoperative planning on calibrated face-on images with the corresponding tracings allows the size, length and position of the Atlantis implant to be determined. The profile X-ray in turn allows the position of the implant and its double curvature to be checked. The Atlantis stem is one of the implants available in the 3D HIP-PLAN® software program and can be planned using that program.

Planning of the Atlantis stem using the HIP-PLAN® program.
2 Installation of the access route

The access route described in this brochure is a transfemoral route with an anterior femoral flap, reserved for complex cases. No specific access route is imposed by the Atlantis prosthesis so that the best route is the one which the surgeon habitually uses. Nevertheless, whatever the access route chosen, it is advisable to have planned in a way that anticipates all the difficulties inherent to each case. After evaluating the available bone capital and the areas of bone destruction, it is possible to measure the length of the flap required to extract the existing implant and the cement sleeve. Thanks to the preoperative tracings of the Atlantis stem, the surgeon can determine the length and position of the implant in the femoral shaft as well as the position of the cup in the acetabulum and the choice of modular neck. In the case of a distal femoral flap it is wise to ensure that the stem bridges it by at least 5 cm.

3 Preparation of the femoral canal

It is essential to clean the femoral cavity perfectly to render it free of all cement fragments and granulomas. Perform thorough curettage in the femoral shaft to remove any and all histologically active or inactive membranes and residues of soft tissues and bone, whether inflammatory or not. This preparation is essential for the future osteointegration of the uncemented Atlantis stem. An assessment of the deformation of the double curvature of the femoral canal and of the proximal metaphyseal flare allows perfect choice and positioning of the Atlantis stem. Particular attention is required in the preparation of the distal part of the femoral canal in order to avoid all risk of a false route, especially if the loosened prosthesis has caused varus deformation of the femur. To remove the cement plug, use 2 long drill bits for perforation, together with a retrograde curette. Reaming is then possible. This is done in steps of 0.5 mm, generally reaming 1.5 mm above the planned size. This reaming can be increased in steps of 0.5 mm if the descent of the trial rasp seems difficult when the metaphyseal packing is not optimal. The use of long, thin chisels, reamers and hooks allows meticulous preparation of the femoral canal.
Surgical technique

Since the Atlantis stem has a double curvature, make sure that the trial reamers used correspond properly to the operated side. The reamers must be inserted progressively in order to position the size chosen during preoperative planning. It is essential to achieve good stability of the trial reamer since the definitive implant matches its dimensions exactly. Check the position of the reamer relative to the available bone markers, respecting as far as possible the natural descent position of the reamer in the femur, with the objective of obtaining maximum parallel contact between the implant and the bone since any anteversion may be corrected by the modular neck. The definitive stem size corresponds to the size of the last trial reamer positioned in the femoral shaft.

In theory, the reamer should be sunk to the last teeth that coincide with the definitive implant to the end of the hydroxyapatite coating.

The reduction trials are performed with the trial reamer in place, fitted with the planned trial modular neck and trial head. Any required adjustment of anteversion, length or inclination of the modular neck can then be undertaken.

If mechanical stability of the reamer cannot be obtained, consider distal locking of the definitive implant in order to ensure the perfect primary stability that is essential for secondary fixation (osteointegration phase).
The stem is introduced into the femoral canal and progressively impacted to the visual mark seen on the trial reamer. The modular neck is positioned after implantation of the definitive stem.

To ensure the mechanical integrity of the stem-modular neck assembly, it is important to ensure that the female part of the stem and the modular neck are clean and free of blood. When the definitive modular neck is in place, impact it with the UNIVERSAL neck impacter.

The Atlantis stem is inserted with the ad hoc gripper-impacter, carefully avoiding touching the hydroxyapatite coating. The stem positions itself naturally by fitting to the anatomical geometry of the femoral canal, taking the length of the femoral flap into account.

It should be noted that the Atlantis stem is composed of a series of 5 right stems and 5 left stems. The stems are entirely coated with decreasing layers of hydroxyapatite and porous titanium. The head fits onto the modular neck by means of a 12/14 Morse cone.
**Optional Distal Locking**

Application of the distal locking screw.

**Mounting the Locator**

Application of the distal locking screw. The locator must be mounted before the stem is implanted. This allows simulation and verification of the drill bit trajectory in the locking part of the Atlantis stem.

N.B.: During assembly, the body of the locator must be flat on a horizontal work surface.

**Components of the Femoral Locator**

1. **Locater**
   - 1.1 Body

2. **Barrel**

3. **Drill bit**

4. **Obturator**

5. **Hexagonal screwdriver**

6. **SW5 screwdriver**

7. **W5 Allen key**

8. **Guide measure**

1.2 Locking screw

1.3 Barrel guide

1.4 Locking thumb-wheel
1. Taking account of the implant side (left or right), place the barrel guide (1.3) in the body of the femoral locator (1.1) (the assembly is performed by the instrument nurse outside the surgical field). Use the SW5 screwdriver (6) to hold the barrel guide in place with the locking thumb-wheel (1.4).

2. Screw the locking screw (1.2) into the locator body (1.1).

3. Fix the Atlantis stem onto the locator body (1.1). For a good hold, screw in the screw (1.2) with the SW5 screwdriver (6) or the SW5 Allen key (7).

4. Insert the barrels (2) into the 2 upper holes in the case of $\varnothing$ 12 and $\varnothing$ 14 stems or the 2 lower holes in the case of $\varnothing$ 16 and $\varnothing$ 18 stems (this depends on the size of the stem). It is then important to insert the drill bits (3) into the barrels (2) in order to check that the alignment of the Atlantis stem matches the alignment of the femoral locator holes. The barrel guide (1.3) can be fixed in place with the locking thumb-wheel (1.4).

5. Once checked, withdraw the drill bits (3) and the barrels (2).
1. Impact the stem into the femur by tapping on the anvil.

2. After cutaneous preparation, push the 2 barrels (2) fitted with pointed obturators (4) up to the cortical bone. Tighten the thumb-wheels. 
Mark the cortical bone by gently tapping on the pointed obturators (4) with a mallet.

3. After withdrawing the pointed obturators (4), pierce the bone with the drill bit (3). The depth of drilling can be read directly from the drill bit (3) or by means of the graduated measure (8).
Reading the depth of drilling

Position the barrels against the bone. The length shown on the drill bits (3) before drilling is zero. The value is read directly from the drill bits (3) at the distal end of the barrel (2). After drilling, note the value shown on the drill bit at the distal end of the barrel (2) in order to know its depth (mm). Do the same with the guide measure after advancing to the internal cortical bone.

4.

Lock the stem with the distal locking screw and the hexagonal screwdriver (5).
The required length of the distal locking screw corresponds to the value shown by the guide measure (e.g.: guide measure value = 30 mm, length of distal locking screw = 30 mm). If the value shown by the guide measure falls between 2 sizes, take the greater length for the distal locking screw (e.g.: guide measure value = 33 mm, length of distal locking screw = 35 mm).

5.

Withdraw the barrels (2) before definitive screwing home the distal locking screw.
Comment: the hexagonal screwdriver (5) has a retaining ring to prevent the distal locking screw falling off during the manipulation.

6.

Release the stem by unscrewing the locking screw (1.2) with the SW5 screwdriver (6) or the SW5 Allen key (7).
Note that a product leaflet entitled «Atlantis locking instrumentation» is available with the instruments for the reconstruction stem.
1. Release the barrel guide (1.3).

2. Remove the locking screw (1.2) by hand.
The necessary and sufficient set of ergonomic and high-performance instruments allows anatomical reconstruction surgery as defined during the preoperative planning.