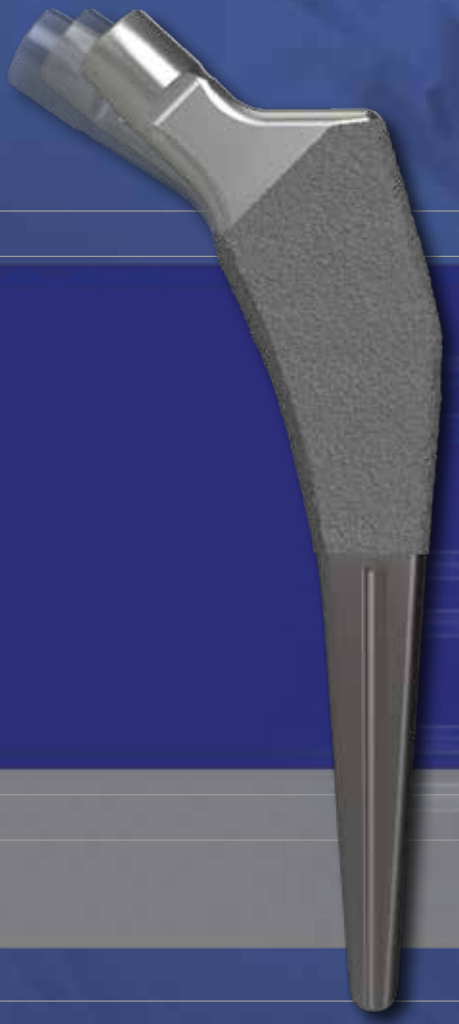
MasterLoc

HIP SYSTEM

UNDERSTANDING TRADITION, MASTERING INNOVATION



Design Rationale

Joint | Spine | Sports Med

Medacta International

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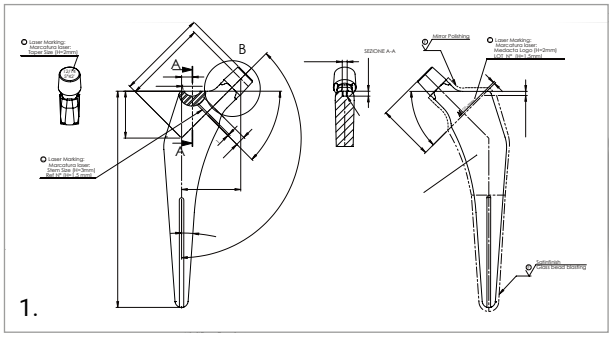
1. CONCEPT

The tapered wedge design has a long clinical history in both cemented and cementless applications[1,2,3,4]. The concept was originally described by Professor Maurice Edmund Müller in the late 1970s[4].

The original concept featured a cemented stem with a mono-planar taper and lateral trochanteric relief, designed for ease of insertion. The concept later evolved into a bi-planar taper to achieve gradual transfer of load through the length of the stem. In the early 1980s, the design was introduced as a cementless application. In subsequent cementless designs, the stem was proximally porous coated to a length just below the lesser trochanter. The addition of the porous coating was designed to allow for fixation of the stem within the metaphysis down to the meta-diaphysis. This minimized fixation of the stem within the diaphysis, enhancing the opportunity for proximal fixation.

During this time, the stem began to be manufactured from a titanium alloy, which today is the material of choice for most cementless stems[5].

As with all stem designs, there has been an evolution with this style of femoral component over the last 40 years.



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2. TECHNICAL DETAILS

- REDUCED FEMORAL NECK GEOMETRY
  The neck geometry has been reduced to allow greater range of motion, resulting in additional motion in flexion and extension.

- HIGHLY POLISHED FEMORAL NECK
  The mirror polished surface treatment minimizes soft tissue damage and liner wear, making the MasterLoc Hip System suitable for double mobility liners.

- MECTAGRIP
  A layer of commercially pure titanium deposited through VPS (Vacuum Plasma Spray), to offer a high friction coefficient for enhanced initial stability[6], and potential long-term fixation[7,8,9,10].

- MATERIAL
  The MasterLoc Hip System is manufactured from an industry standard titanium alloy (Ti6Al7Nb). This material has been shown to be biocompatible while remaining flexible to enhance gradual stress transfer and preserve bone density[12].

3. MASTERLOC HIP SYSTEM

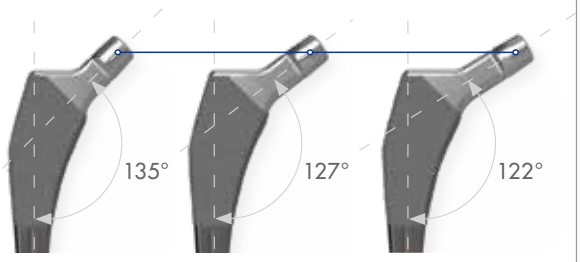
- **PROGRESSIVE TRIPLE OFFSET**
  The MasterLoc Hip System offers a unique progressive triple offset, which allows for an easier and more effective management of the patient's femoral offset, completely independent from the leg length.
  This distinctive offer enables for an optimal restoration of the hip joint biomechanics in nearly all patient populations.
- **MECTAGRIP**
  A coating treatment consisting of a layer of commercially pure titanium deposited through Vacuum Plasma Spray technique (VPS), to offer a high friction coefficient for enhanced initial stability[6], and long-term fixation[7,8,9,10].
- **AMIS**
  The MasterLoc Hip System has been designed to be implanted through MIS techniques, in particular with the AMIS (Anterior Minimally Invasive Surgery) approach.
- **SIMPLE AND REPRODUCIBLE SURGICAL TECHNIQUE**
  The stem was designed to allow a simple and reproducible operative technique, based on a broach-only preparation of the femur.
- **TAPERED WEDGE DESIGN WITH A REDUCED DISTAL GEOMETRY**
  This concept allows the implant to self-seat on the femoral canal providing for enhanced mediolateral stability, maximizing fixation on the proximal femur.

4. PROGRESSIVE TRIPLE OFFSET

During hip replacement surgery it is vital to properly reconstruct the patient's femoral offset. An inadequate femoral offset may compromise adductors strength, the hip's range of motion, increase wear, and may be the cause of pain, which leads to decreased hip function[18].

In order to manage the patient's offset, current tapered wedge designs tend to offer only two options for femoral offset that are independent of leg length management.This can make the restoration of the hip joint biomechanics more challenging. The MasterLoc Hip System was conceived to provide three options of femoral offset, that do not change the leg length:

- Standard (135° CCD angle)
- Lateralized (127° CCD angle), which adds 6 mm of femoral offset to the standard version, maintaining the same leg lentgh
- Lateralized Plus (122° CCD angle), which adds an additional 5 mm for 11 mm in total offset, maintaining the same leg length



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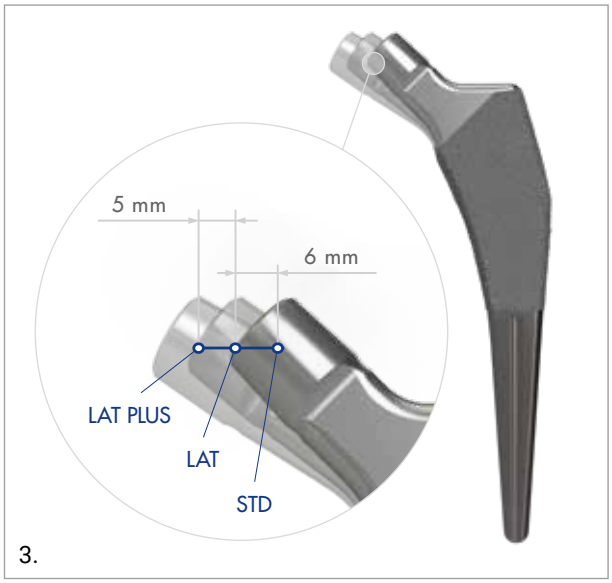


3.

This will allow for an easier and more effective restoration of the hip joint biomechanics in nearly all patients, without compromising the stability of the hip or the leg length (still one of the leading causes for patient dissatisfaction and litigation in hip replacement[20]).
This can also reduces the need for having different types of hip stems for different patient anatomies

In addition, literature tells us that femoral offset should increase progressively with stem size[19], so this feature was included in the design of the MasterLoc Hip System.

5. MECTAGRIP

One of the key features of the MasterLoc Hip System is the use of Medacta's Mectagrip coating.

Mectagrip is Medacta's plasma sprayed titanium coating designed to enhance initial stability due to its high coefficient of friction and potential long-term fixation inherent to titanium plasma sprayed devices[5]. Plasma spray coating is one of the most clinically proven surfaces to achieve sound fixation in cementless total hip arthroplasty. Since its introduction in the 1980s, it has become one of the gold standards in cementless fixation[16].

Mectagrip consists of a layer of commercially pure titanium deposited through a special Vacuum Plasma Spray technique (VPS). The VPS method used to deposit the titanium coating on the implant shows potential advantages:

- Pure titanium composition for biocompatibility;
- High friction coefficient increasing grip at the interface with bone[6];
- Favourable environment for bone [7,8,9,10]:
  - open pores with pore dimensions between 100÷350 µ
  - continuous interconnected pores

4.

6. AMIS

The MasterLoc Hip System has been designed to be implanted through various MIS techniques.

Both instruments and implants have been specifically designed to reduce the risk of damaging soft tissues.

Considering Medacta International has become leader for educating and supporting surgeons in their pursuit of Anterior Minimally Invasive Surgery (AMIS), dedicated instruments for the anterior approach were specifically designed and made available.

5.

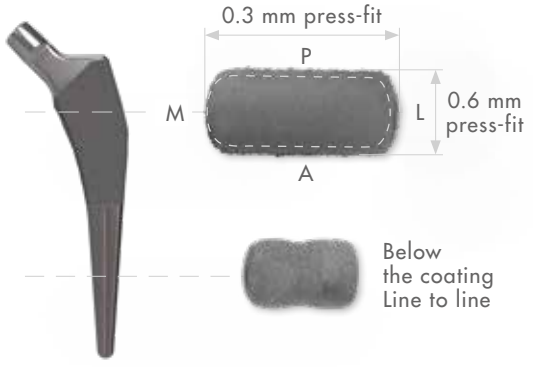
6.

7. SIMPLE AND REPRODUCIBLE BROACH-ONLY TECHNIQUE

One of the most important aspects of total hip arthroplasty is consistency and reproducibility. The MasterLoc Hip System was designed with both of these concepts in mind.

The relationship between implant geometry and broach geometry is paramount. To provide for appropriate fixation and implant stability, broaches and implants were designed to provide 0.3 mm of press-fit on each of both anterior and posterior sides and 0.3 mm on the medio-lateral dimension on the coated portion of the stem. The goal of this design is to allow the implant to sit within 1-2 mm of the position of the final broach. This concept was validated through cadaveric studies and has been further validated through the early clinical use of the implant[13,15].

With only one tray of instruments, the MasterLoc Hip System uses a simple and reproducible broach-only technique.



7.


ONE TRAY IS ENOUGH!
8.

8. TAPERED WEDGE DESIGN WITH A REDUCED DISTAL GEOMETRY

The design concepts of the MasterLoc Hip System adhere to the original design presented by M. E. Müller.

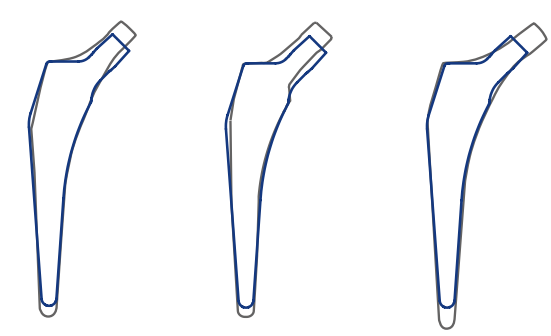
TAPERED WEDGE DESIGN
The stem utilizes a 3-degree taper in the A/P plane, to enhance metaphyseal fixation from the medial aspect of the femur to the lateral aspect of the femoral canal. The transition from the metaphyseal filling region to the smaller diaphyseal region maximizes fixation proximally, reducing the potential of distal fixation.

Wolff's law states that bone density will increase under load[14]. Therefore, the stem was designed to enhance proximal load transfer and maintain a good trophic bone in the metaphyseal region.


Courtesy of Dr. Jose Rodriguez,
Lenox Hill Hospital, New York, USA
9.

REDUCED DISTAL GEOMETRY
Studies reported a non-negligible incidence of thigh pain related to the first generation of tapered wedge design stems. This was attributed to an unexpected distal fixation observed in some patients' anatomies (mainly Dorr type A femurs)[11], and it was addressed by the second generation of tapered wedge design stems by reducing the distal shape[17].

The MasterLoc Hip System features a reduced distal geometry, which will enhance the metaphyseal proximal fill, and also make it suitable for Dorr type A femurs, while at the same time allowing for bone preservation.



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9. ACETABULAR SOLUTIONS

The MasterLoc Hip System may be coupled with all Medacta's state-of-the-art acetabular products.

Mpact SYSTEM

11.

Mpact DM

13.

VERSAFITCUP CC TRIO

12.

VERSAFITCUP DM

14.

10. REDEFINING THR: THE AMIS SYNERGY

The anterior approach, strengthened by years of clinical experience, is the only technique which follows a path both intermuscular and internervous and therefore lowers the risk of damaging periarticular structures such as muscles, tendons, vessels and nerves.

The AMIS approach, developed in 2004 by an international group of expert surgeons with the support of Medacta, was born to optimize and enhance the reproducibility of the anterior approach, minimizing soft tissue damage.

With almost 15 years of clinical experience, Medacta International has become leader for educating and supporting surgeons in their pursuit of Anterior Minimally Invasive Surgery (AMIS). Reference Centres, located throughout the world, provide the necessary AMIS educational experience and Medacta offers continuous support for surgeons, as well as constantly improving and developing the industry's most specialized instrumentation platform.

Using the MasterLoc Hip System lets you enter Medacta

International's world of AMIS.

Discover:

- The definitive MIS approach: AMIS;
- Dedicated AMIS instrumentation;
- The AMIS Mobile Leg Positioner: the original extension table included as part of the instrumentation that makes surgery easier and reproducible;
- The AMIS Education Program based on Medacta's proven educational process.

The AMIS Mobile Leg Positioner will be supplied as part of the instrumentation to help ensure effective and reliable positioning of the leg during surgery. Traction, adduction and hyperextension have never been so easy.

15.

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REDEFINING BETTER
IN ORTHOPAEDICS
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MasterLoc
Design Rationale

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