



Hip surgery with a navigation system

The OrthoPilot® navigation system makes possible improved implantation of artificial hip sockets

What is OrthoPilot®?

OrthoPilot® is a computer assisted navigation system which helps the doctor to perform operations on the hip socket with a high degree of accuracy, and thus increased reliability. OrthoPilot® originated from a European Union research project and was developed by the Technical University in Grenoble, France, in cooperation with Aesculap.

A solution for the problems involved in the implantation of artificial hip sockets was found in collaboration with the University Hospital in Frankfurt am Main. In contrast to a surgical robot, OrthoPilot® is a pure navigation system, similar to that in a car. This means that it shows the surgeon where the important anatomical axes are situated. The information given by OrthoPilot® helps the doctor to achieve the best possible position for the implant in accordance with his or her planning. The doctor maintains control over the implantation procedure throughout the operation, and can proceed manually at any time should this become necessary. The navigation of orthopaedic operations is a mature technology. OrthoPilot® has already been used successfully in over 6,000 knee implantations and is standard in many hospitals.



What benefits does OrthoPilot® bring?

One important precondition for a good result in joint replacement is the correct geometric alignment of the implant components. In order to ensure long life for the implant and a large degree of movement in the leg, the artificial hip socket must be implanted in the right anatomical position.

If an artificial hip socket is not correctly aligned, the implant can be subject to increased wear and tear and the range of mobility of the joint can be restricted. The possibility of dislocation is also increased.

The OrthoPilot® navigation system helps the surgeon to achieve correct alignment of the hip socket. In contrast to robotic systems, the OrthoPilot® navigation system does not require the patient to undergo any additional examination. Additional radiation exposure from x-rays or CT scans is completely unnecessary with OrthoPilot®.

The advantages for the patient are obvious. The accuracy of this new method in aligning the implant creates the precondition for long life for the artificial hip joint and good joint function. And this with no extra radiation exposure.



How does OrthoPilot® work?

Various different components work together in OrthoPilot® to make navigation of the instruments possible. We would like to introduce and explain these briefly below:

1. Infrared camera

Infrared light is emitted, reflected off the mobile marker instrument and picked up again by the camera, or alternatively infrared light is given off by the transmitters and picked up by the camera. Infrared light is not dangerous to health and is also used as a form of treatment in other areas.

2. Screen

The screen displays the axes and other data

3. Cart

This contains the computer, keyboard and mouse.

4. Transmitters

Transmitters are attached to the instrumentation and send infrared light to the camera, from which the positional data are calculated.

5. Mobile marker instrument

The mobile marker instrument reflects infrared light emitted by the camera, and from this the positional data are calculated.



OrthoPilot® is a unit comprising a computer with keyboard and mouse, a screen, a camera and transmitters. On this basic unit the software for calculating the navigation is used, and it is possible to use different software applications for different operations.

During the operation the position of the instruments is continuously displayed via the transmitters attached to the instruments and to the pelvis.

From the different positions of the transmitters, the software is able to calculate a three dimensional image. The first step is to measure the pelvis and calculate the anatomical axes. The screen shows the surgeon the position of the instrumentation in relation to the calculated axes.



The surgical procedure with OrthoPilot®

1. An incision approx. 20 cm in length is made in the skin and the muscles are moved aside to expose the hip joint. The neck of the thigh bone is cut through and the diseased, damaged ball of the hip is removed.
2. A transmitter is fixed onto the pelvis.
3. The surgeon uses one fixed and one mobile marker instrument to palpate the pelvis and establish its position. The OrthoPilot® camera records the data which are required for the later stages of the operation.
4. The original midpoint of the hip socket is also measured using the mobile marker instrument.
5. The socket bed is prepared with a cutter to ensure good implantation of the artificial hip socket. OrthoPilot® shows the surgeon on screen the correct cutting depth and position of the socket bed.
6. Once a suitable socket bed has been prepared, the artificial hip socket is implanted. Here OrthoPilot® displays the planned orientation and position of the implant, which can then be inserted in the correct anatomical position.
7. The prosthesis stem is subsequently implanted into the thigh bone and the ball component of the artificial hip joint is fitted onto the top of the stem.



The measurement of the pelvis is displayed on screen



Screen image of the planned orientation for cutting out the socket bed and implanting the artificial socket.