

UNDERSTAND SOFTWARE- GUIDED JOINT REPLACEMENT SURGERY

for knee



Software-Guided Surgery:
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HELLO

Across the world, approximately 355 million people suffer from arthritis and joint degeneration, including 151 million diagnosed with Osteoarthritis (OA) and 24 million with Rheumatoid Arthritis (RA). In fact, OA is the sixth leading cause of years lost to disability worldwide. ^[1]

Osteoarthritis is the most common reason for people to undergo a knee replacement surgery. Nearly 2.9 million joint replacement procedures are performed globally each year, including more than 1.1 million knee replacements. ^[1]

In the late 1990s, the first ‘computer-assisted’ joint replacement systems were introduced. These “helping hands” have been refined over the last 15 years and include sophisticated software guidance systems, robotics, surgical tools and new implant designs that support surgeons in their daily routine.

Joint replacements surgery can relieve stiffness and pain, help restore normal activity levels and increase quality of life. If you and your doctor decide that joint replacement surgery is the next best step, you may be interested in learning more about surgery using software guidance.



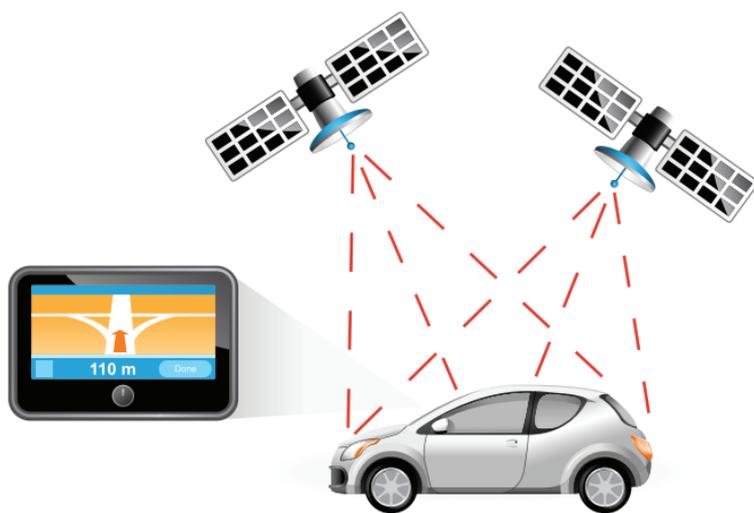
WHEN IS JOINT REPLACEMENT NEEDED?

The most common reason for joint replacement is pain and decreased quality of life from osteoarthritis. Demand for joint replacements is growing rapidly. By the year 2030, the number of total knee replacements is expected to reach about 3.5 million. ^[2]

Joint replacement surgery is often performed when the cartilage in the joint is damaged or starts to erode, eventually causing the bones of the joint to rub together, increasing pain and limiting mobility.

Once the decision to have a joint replacement surgery has been made, the main goal for surgeons and their patients is reducing pain and restoring the natural range of motion of the joints.

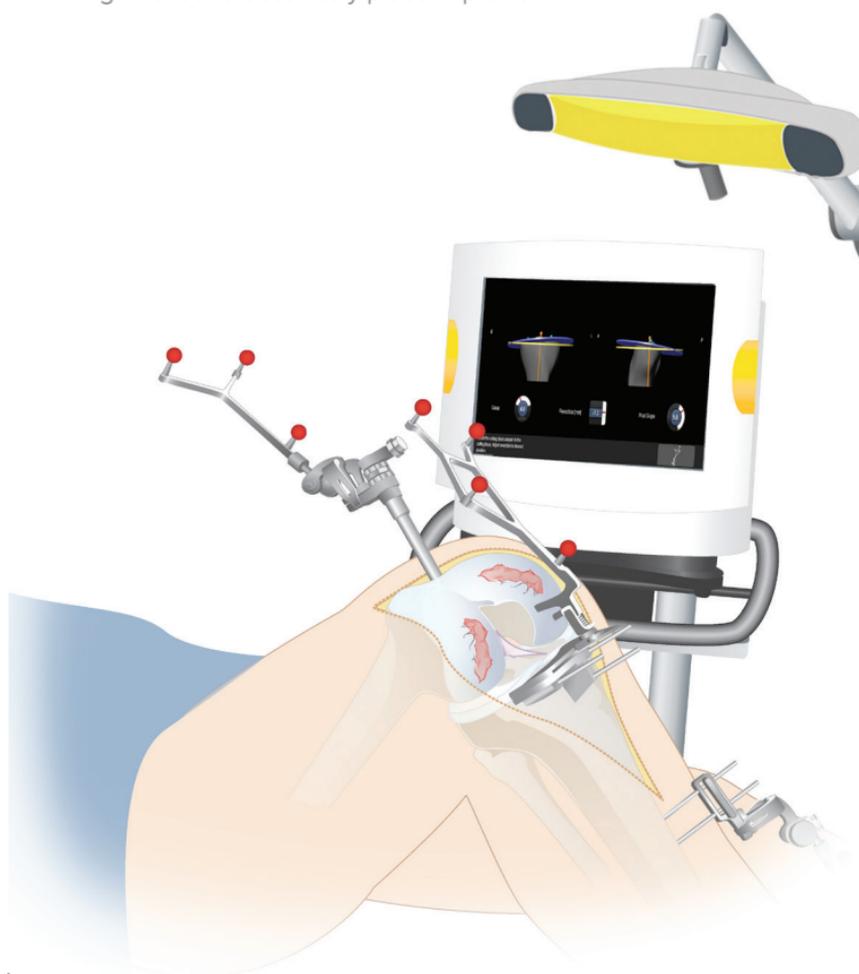




WHAT IS SOFTWARE-GUIDED SURGERY?

Similar to a car or mobile Global Positioning System (GPS), software-guided surgery – also called surgical navigation and computer-assisted surgery – continuously tracks points of your anatomy and displays them on a computer monitor in the operating room before, during and after surgery.

The software-guided surgery system provides your doctor with additional information and measurements and tracks the surgical instruments being used for the procedure. In knee replacement surgery, the surgical navigation software will measure the position of your knee bones and the surgical instruments in relation to each other – helping to calculate leg alignment and accurately place implants.



WHY SOFTWARE-GUIDED SURGERY?

Benefits of software-guided surgery

Software-guided surgery for knee joint replacement offers many benefits to surgeons and their patients:

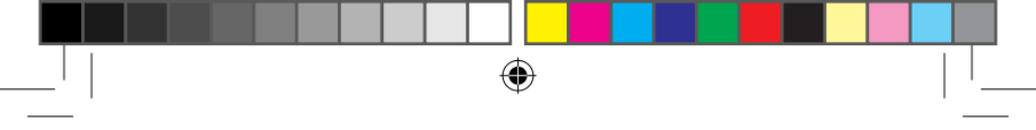
Knee:

- Can lead to decreased blood loss due to minimally invasive approaches ^[3]
- Provides alignment information and helps to improve positioning of the implant components ^[4]
- Can be a valuable tool for the implant positioning for knees with large deformities ^[4,5]
- Enables balancing of the knee with software guidance

A recent study found 91% of the navigated knee replacement surgery patients to be extremely or very satisfied with the outcome versus 70% of the conventional surgery patients. ^[6]

Software-guided surgery does not take the place of the doctor nor is it a robotic surgery. Rather, it helps guide the surgeon through surgery by tracking surgical instruments used in relation to your specific anatomy and provides additional beneficial information during the surgery.





IS SOFTWARE- GUIDED SURGERY NEW?

History of software-guided surgery

Software-guided surgery, also known as surgical navigation and computer-assisted surgery, is an important example of today's technological capabilities being applied to medicine. It has emerged as one of the most reliable medical technologies and it continues to help transform surgeries into safer and less invasive procedures.

Orthopedic surgeons have been using navigation software for more than 15 years now, making it an established and well-known procedure worldwide. Today, surgeons can use navigation on mobile, handheld technology. The Brainlab Dash® software runs on an iPod touch®, utilizing the iPod touch as the monitor.^[7]



WHAT TO EXPECT IN SOFTWARE- GUIDED KNEE SURGERY?

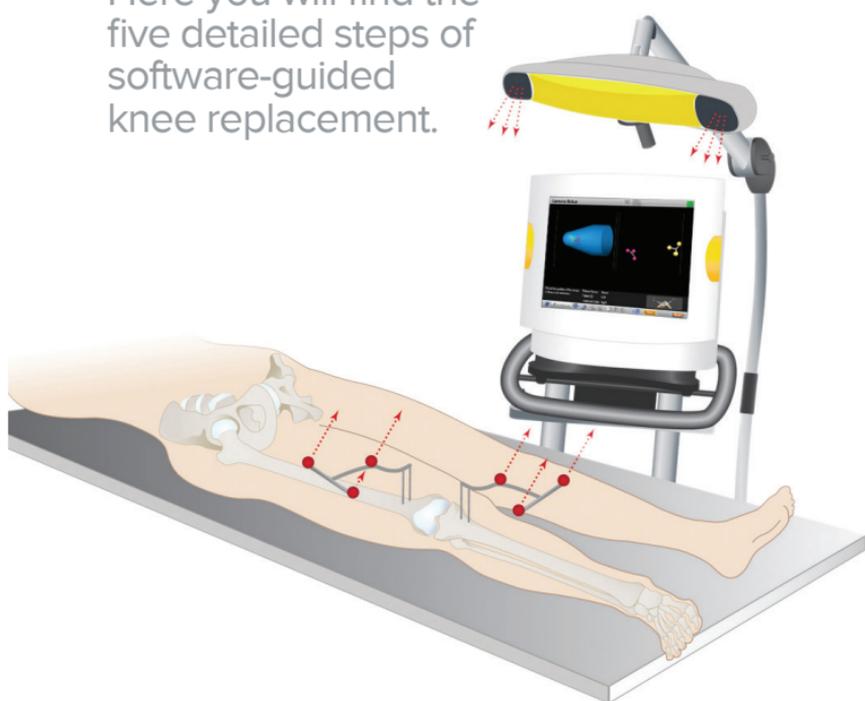
Knee replacement surgery is a common procedure considered successful in relieving pain and restoring knee function.

When you undergo knee replacement surgery, the damaged parts are replaced by artificial components so that you may experience a better quality of life with improved mobility and less pain. Proper implant fit and straight and natural alignment restoration are critical for the stability and functioning of your knee.^[8, 9, 10]

Software-guided surgery helps doctors address the main challenges that may happen during conventional knee replacement surgery, including achieving straight overall leg alignment, stability and mobility of the knee. Surgical navigation may also help prevent misalignment of the implant components which may lead to implant dislocation, increased implant, wear and potentially early need for revision surgery.

SOFTWARE- GUIDED KNEE SURGERY STEPS

Here you will find the five detailed steps of software-guided knee replacement.



1. Anesthesia and incision

The first step in surgical preparation is anesthesia and the covering of the knee area. Once you are under anesthesia, an incision is made over the front of the knee to expose the knee joint so your surgeon has free access to the diseased or damaged bones.

During the next step, reference markers – small reflective spheres that function as landmarks for the infrared camera of the navigation system – are attached to the thighbone and the lower leg.

These markers are attached with temporary pins that are inserted into the bone or the incision. These pins are removed at the end of the procedure.



2. Anatomy correlation

The next step is a registration process. Your surgeon uses a small instrument that has the same type of reference markers attached to it. This tool is used to mark various points on the bones and communicate the anatomical information to the software. With this information, the navigation software can calculate correct values for the alignment and positioning of the artificial knee implant.

Software-guided knee surgery is performed without any additional images. This means that, except for diagnosis and planning, surgeons do not use further X-Rays, MRI or CT images during knee navigation.

3. Pre-surgical simulation

Before surgery proceeds, your surgeon uses the software guidance system to perform stability tests on your knee. This gives valuable information which the surgeon takes into account to create a stable knee with the artificial components.

After a check of the initial leg situation in flexion and extension, the navigation software provides important information for the successive surgical steps before any bone cuts are made.

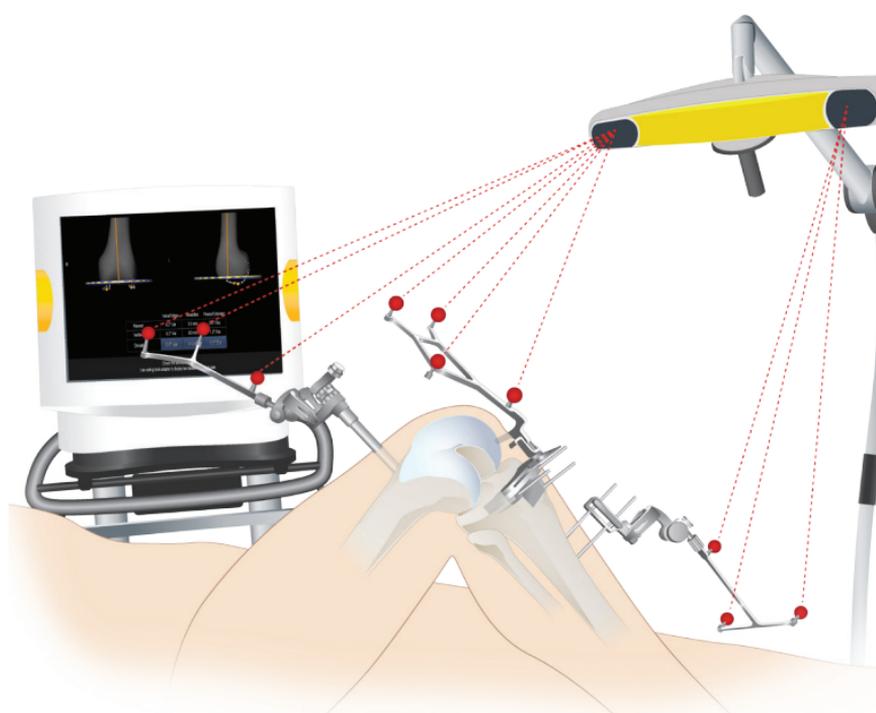
In a later step, with the trial implants inserted, the final leg alignment is stored and analyzed, and then factors like implant components and ligament position can still be adjusted accordingly.

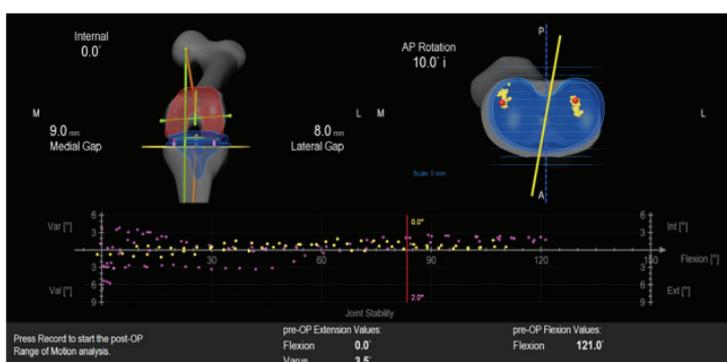
SOFTWARE- GUIDED KNEE SURGERY STEPS (cont.)

4. Bone preparation

The ends of the thigh bone and of the lower leg need to be prepared and cut so that according to the size and design of the implant, the diseased bone is removed and the artificial joint can properly fit into your knee anatomy.

A cutting block is fixed to the bone to control the cutting tool. The guidance of the navigation software supports surgeons to make the necessary bone cuts with predictable and reproducible accuracy. Once the cut is made, the navigation software enables your surgeon to check the accuracy and make alterations if required.





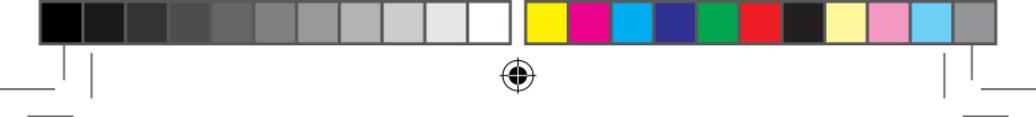
RANGE OF MOTION GRAPH FOR SOFTWARE-GUIDED KNEE SURGERY

5. Final alignment

Before the final implants are placed in the knee joint, your surgeons will use trial implants to see if the chosen size and position fit well before proceeding. The navigation software runs a final leg alignment test and allows your doctor to analyze the stability curve of the artificial knee on the computer screen. This enables your doctor to improve soft tissue balancing during surgery if required.

Once the calculated alignment and balance results on the software screen are achieved, the trial implants are replaced with the final artificial components and the incision can be closed.

The navigation software enables your surgeon to check and re-check all steps during the procedure to help place your final knee components in their ideal positions.



WHERE CAN I GET MORE INFORMATION?

Resources and information

Make an appointment:

Center for Knee Surgery

Address:
Memorial Hospital
1236 Medical Avenue
Chicago, IL 60607

Phone:
1-800-555-7700 or
1-708-555-1343

Website:
memorialhospital.org/smartmove

Find supportive information:

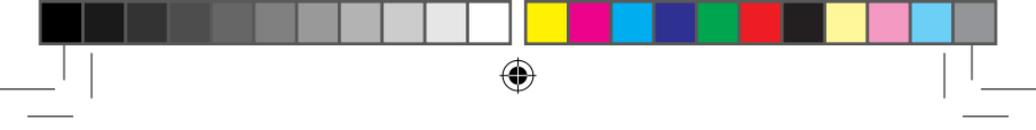
www.orthoinfo.aaos.org
www.arthritis.org

Understand software-guided surgery:

www.brainlab.org

Our goal, at Brainlab.org, is to demystify health conditions, support how they make people feel, and provide useable information on Brainlab technology.

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