

# Mako Robotic Arm Joint Replacement Surgery

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Taking a leap with **Mako Robotic Arm Assisted Technology** at Leo II Center of Excellence for **Total Joints Replacement**

Total knee Replacement, Partial Knee Replacement and Total Hip replacement is one of the most successful surgical procedure in present day. It is a reliable and a proven method of treatment for pain and crippling deformities that with arthritis. Clinical evidence suggests that patient outcomes and satisfaction in joint replacement surgery is more than 90 percent. A successful **Total joint replacement** surgery typically leads to an improved quality of life by reducing pain and improving patient's mobility.

Arthritis is one of the leading causes of disability and presently in India more than 15 crore people suffer from osteoarthritis and more than 4 crores can benefit from **Total knee or Partial knee replacement**.

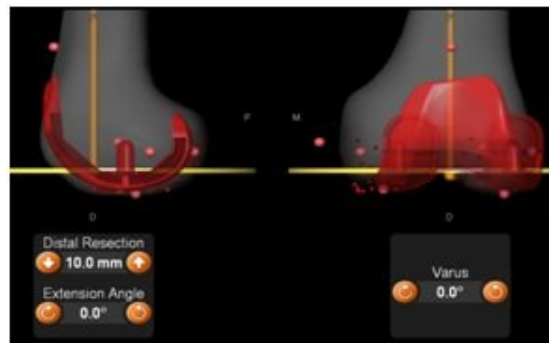
Robotic and computer-assisted technologies are used in the field of orthopedics assisting doctors and giving patients a better life. They drive a transformation in patient outcomes and productivity. Robots have always been used in different ways and procedures for around two decades.

The use of robotic technology in orthopedics increases the alignment and accuracy of implants, which improves the longevity of implant thereby reducing the long-term healthcare cost burden. Further, pre-op planning also helps in reducing

the instrumentation and inventory cost, which significantly impacts the productivity.

In recent times, robotics is being used extensively in surgical space like urological, ocular procedures in a bid to improve delivery of care, reduce risk of complications and improving clinical outcomes. For example, around 90% of all radical prostatectomy for cancer of the prostate in the United States are performed with robotic assistance. Recently, **Robotics in joint replacement surgery** has gained momentum and is the talk of the day.

### **Robotic-arm assisted surgery:**



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It is a novel approach to joint replacement. It leads to higher level of patient-specific implant alignment and positioning. Surgeons can prepare a patient-specific 3D plan using this technology. A surgeon controlled robotic-arm can be used to perform joint replacement surgery helping the surgeon to execute the entire surgery with high degree of accuracy.

Robotic arm is revolutionizing the way joint replacement surgeries are executed by surgeons. Routine radiographs are obtained followed by a Computed Tomography (CT) scan for the patient. This CT scan is segmented and loaded into the system. Once in the system is in place the surgeon can use a virtual 3D model, to personalize each patient's surgical plan pre-operatively, thereby providing complete clarity on implant positioning before entering the operating room.

Surgeons validate that plan and make the required changes during the surgery. During the procedure, the robotic arm enables operating surgeon to execute that plan with a high level of accuracy and predictability using haptic boundaries that restricts bone preparation to happen within the predefined region only.

Combinations of these three features can lead to better results and higher patient satisfaction. The accuracy and haptic boundaries ensure that only the required amount and planned part of bone is removed, this helps with bone conservation and availability of more bone stock if revision surgery is required. Lesser retraction of soft tissue is done enabling enhanced recovery.

### **Let us discuss the common things:**



robotic surgery

Robot-assisted orthopedic surgery does have the potential for improving surgical outcomes. These days the robot is a loosely used term and it is important to understand what a true robotic surgery means.

Different types of robotic systems are available that can be utilized in orthopaedics.

The term 'robot' is derived from the Polish word 'robata' meaning forced labor, and describes a machine that carries out a variety of tasks automatically or with minimum external impulse, especially one that is programmable. There are two main types of robotic surgery systems: haptic and autonomous. In Haptic or Tactile systems, the surgeon uses or 'drives' the

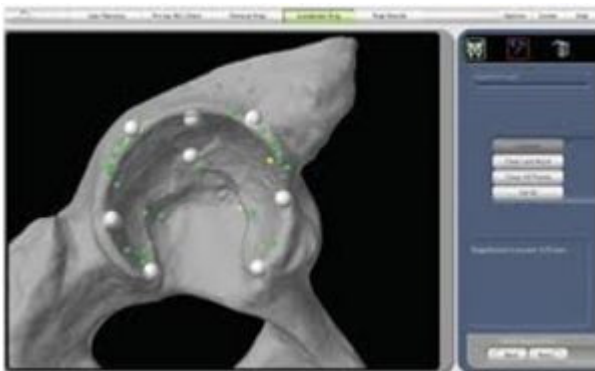
robot to perform the operation.

Constant input is needed from the surgeon for the procedure to proceed. It has a free held burr technology that assists the surgeon in cutting the bony surfaces and it does not let the surgeon go beyond cuts that have been planned.

**Mako Robot Arm assisted technology** at Leo II Center of Excellence uses Haptic system to perform the surgery and aids in precision that is miles ahead to conventional system.

Let us Get There.

Before the procedure, surgeon uploads the digital X ray and computed tomography (CT) scans of the patient's joint. The CT scan and X-Ray images are segmented and analyzed using an advanced precision pre-planning software in **Mako Robotic Arm Assisted Technology**. This pre-planning allows the surgeon to position the virtual knee implants onto the patient's specific virtual knee bone models. Pre-planning allows the surgeon to plan the exact size, the implant depth, alignment sagittal, coronal & transverse rotation, posterior slope, and coronal plane alignment of the chosen implants prior to the procedure.



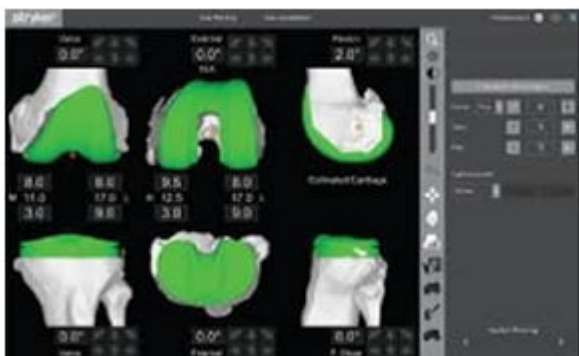
Before the surgeon places the implant during the surgery, he/she uses the robotic arm to accurately shape the surrounding bone. Real-time 3D-video images provide visual reinforcement, which helps surgeons navigate hard-to-see areas. At the same time, the system uses the CT image data to create a predefined, three-dimensional "envelope" of space in

which the surgeon works. The robotic arm will only allow surgeon to operate in that predefined space, so there is no chance of an instrument slipping and injuring adjacent tissues.

### **Steps of How Mako Robotic Arm Assisted Technology at Leo II , Centre of Excellence for Joints Replacement Improves Total joint Replacement for anyone with Arthritis Pain:**

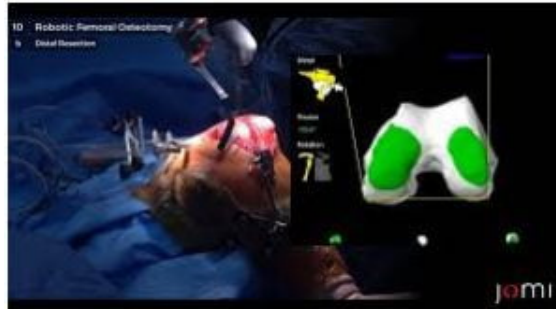
The patient's knee CT scan is segmented and provided to the robot to arrive at a three-dimensional model of the knee joint- the tibia, the femur and the surfaces that have been injured/harmed due to arthritis.

**Figure 1 – Pre-Planning and Segmentation of the CT SCAN image**



The surgeon with his or her own preferences can then preoperatively plan the best location for the femoral component (upper part of knee) and tibia component (lower part of knee) over the model bone, based on factors including patient size, angle of legs, location of articulating surface, and how the femur moves on top of the tibia.

**Figure 2 – Patient Specific Personalized Pre-Operative Planning prior to Surgery**



Robotic Surgery

The pre-operative plan is then uploaded on the robotic arm system. The surgeon compares that plan to the patient's motion. This is done by bending the knee, straightening it out and also flexing it. Simultaneously the surgeon will look at how the motion is getting replicated on the robot's screen.

The surgeon then tweaks the component positioning by fraction of millimeters before concluding the plan. Well, this depends on whether the ligaments are lax or tense.

The robot arm locks the plane of its saw blade into a place that is relative to the position of the final three-dimensional plan. It also helps the surgeon while performing cuts. The surgeons stress the saw but the robot restricts the place till where the saw can go in space.

**Figure 3: Execution of Plan within Predefined Limits of Haptic Boundary so Soft tissue and Neuro vascular damage cannot be done, and accurate position is visualized on a screen whist operating.**



Robotic Surgery

The surgeon performs the surgery but with accuracy and

precision with a specific plan for each patient. This wasn't possible before with conventional methods and manual instruments.

The robot's haptic boundary prevents soft-tissue trauma. Many peer-reviewed publications mention the benefits, which are improved patient satisfaction, less usage of opioid drug, lesser readmission due to complications, increased flexibility, and lesser post-operative pain.

### **Benefits and positive outcomes of Robotic-Assisted Total Knee Replacement**

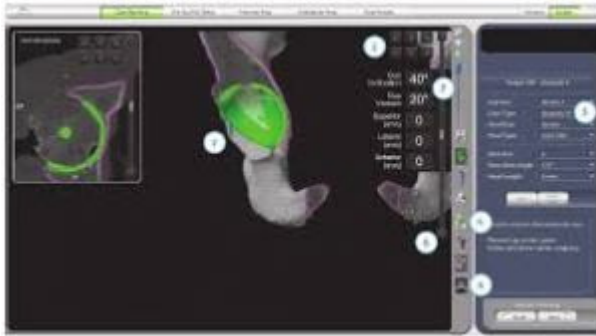
Robotic surgery is being adopted to have the best surgical plan, the best execution and to have a positive clinical outcome for the patient. Robotic surgery has now become a preferred choice as a solution to human errors that could result into misalignment and decreased longevity of the prosthesis.

### **Robotic arm-assisted technology helps in:**

- Lesser risk of injury to adjacent tissues due to lesser retraction.
- Least amount of blood loss
- Quicker discharge from hospital
- The patient gets mobile in fewer days.
- Implant positioning is more accurate so the feeling post-surgery is natural.
- Pre-Op CT provides value and safety.
- Small incisions lead to quicker recovery, lesser time at the hospital and lesser pain.
- Joint mapping is done precisely.
- A Happy Patient.

If you are planning to get a surgery done, you must be wondering if robotic-assisted surgery is suitable for particular patients. But you shouldn't have this inhibition. If you are a candidate for joint replacement surgery then you

can choose to have a robotic joint replacement.



“It’s a technology that’s not limited to any particular type of patient. But it’s ideal if you consult a surgeon who is formally trained in **Robotic and Computer Assisted Surgeries**. Surgeons currently are using robotic technology for partial knee replacements, full knee replacements and hip replacements around the world and there are more than 1500 centers in the United States, which offer Robotic Joint Replacement Surgeries.

Padmashree Dr. R.N.Singh & Dr. Ashish Singh Consultant Orthopedic surgeon and Lower Limb Joints Replacement Surgeon, Medical Director **Anup Institute of Orthopedic and Rehabilitation** feel proud to announce that we would be the first hospital in North India to provide Leo II **MAKO ROBOTIC ARM Assisted JOINT REPLACEMENT SERVICES** at Patna. It would be boon for the people of this state to have world class services at par with international standards at their doorsteps

## **Robotic-assisted surgery India:**

As a patient you are looking for the best solution for the pain and discomfort in your joints and the best hospital equipped with experienced doctors. We at **AIOR** use **Stryker mako robot** for superior results and happy patients. If you are reading this blog post connect with us <https://www.aior.co.in/best-orthopedic-hospital.php> and let us make things easier for you.