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Robotic-Assisted Knee Replacement Surgery: Benefits of This Innovative Procedure

Knee pain can be debilitating, often interfering with everyday activities and quality of life. For individuals facing chronic joint issues or severe osteoarthritis, knee replacement surgery is a proven solution. But today, advancements in medical technology are transforming how this procedure is performed.

Robotic-assisted knee surgery is an innovative technique that combines the precision of robotics with the expertise of orthopedic surgeons to enhance surgical outcomes. Here, John Bonano, MD, orthopedic surgeon with Salinas Valley Health, discusses how this cutting-edge approach improves accuracy, speeds recovery, and leads to better long-term results for patients seeking relief through knee replacement.

Difference Between Traditional and Robotic-Assisted Surgery

Both robotic and traditional knee replacement surgeries aim to restore proper alignment and stability by replacing damaged bone and cartilage with implants. Traditional surgery uses cutting blocks and a handheld saw, often requiring adjustments such as re-cutting bone or releasing ligaments to achieve a stable fit.

In contrast, robotic-assisted knee replacement uses a computer-generated 3D model for precise preplanning, allowing a robotic arm to make accurate bone cuts. This results in a more balanced knee with fewer adjustments during surgery.

“Robotic-assisted knee replacement surgery has been done at Salinas Valley Health for several years, and they actually adopted a new robot that I have been using since August 2024,” states Dr. Bonano. “The robot I use is called the Mako. The main benefit of this technology is the improved precision and accuracy of the bone cuts.”

Those highly precise bone cuts? They are within one millimeter and offer alignment accuracy within one degree as compared to the surgical plan. This approach also improves ligament balancing, resulting in a tighter, more natural-feeling knee. Additionally, because the procedure requires less tissue disruption, patients may experience less pain and inflammation in the early recovery period.



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From Preoperative Preparation to the Surgery Itself

The precision of robotic-assisted knee surgery relies on creating an accurate 3D computer model of the patient's knee using a preoperative CT scan. This model allows surgeons to develop a personalized surgical plan, including optimal implant size and placement.

During surgery, the plan can be fine-tuned based on the patient's ligament flexibility. The robotic arm then precisely guides the saw blade to execute the plan, resulting in highly accurate bone cuts and a consistently well-balanced knee.

What Can Patients Expect After Knee Replacement Surgery?

Recovery after knee replacement varies from patient to patient, depending on their pre-surgery level of function. However, robotic-assisted surgery may lead to a slightly faster recovery due to reduced soft tissue trauma. Studies show it's associated with less inflammation, lower pain levels, and reduced need for opioids in the early days post-surgery.

Most patients begin walking with a walker the same day, transition to a cane with physical therapy, and typically walk unassisted within six weeks. By three months, most have returned to their normal activities.

"I always encourage patients to continue doing their exercises on their own at home because they can continue to build quad strength up to a year after surgery," notes Dr. Bonano.

Are There Risks to Robotic-Assisted Knee Replacement Surgery?

Robotic-assisted knee replacement carries the same rare risks as traditional surgery, such as infection, soft tissue injury, instability, stiffness, and implant wear or loosening. While it's challenging to demonstrate statistically significant differences, the robotic approach may cause less soft tissue damage and offer greater precision, which could improve implant longevity by ensuring better alignment.

Ultimately, Dr. Bonano urges seeking professional advice when it comes to knee pain. "I think all patients can benefit from robotic-assisted knee replacement, but certainly, it can be especially beneficial for more complex cases. For example, patients with ligament instability or altered anatomy due to areas of bone loss or hardware from prior surgeries," he explains. "Younger and more active patients may also benefit from the precise bone cuts, which allow us to use newer press-fit implants and help us avoid using cement, which has the potential to loosen over time."



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