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Robotic assistant brings high level of precision to joint replacement

By [PeaceHealth](#)

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During hip replacement surgery at [PeaceHealth Southwest Medical Center](#), a robotic guiding arm locks up if the surgeon moves to “color outside the lines.”

Is this the rise of the machines?

Orthopedic surgeons reassure that the robotic technology now in use for hip and partial knee replacements enhances precision, but control remains in human hands.

“Using a 3D image, the intraoperative robotic arm is the ‘secret sauce’ that guides surgeons during a MAKOplasty procedure,” said Dr. Todd Borus, an orthopedic surgeon with Rebound Orthopedics in Vancouver, Wash. “As a surgeon, this gives me tremendous peace of mind that I’m executing the surgical plan exactly.”

MAKOplasty is an FDA-approved treatment option for hip and partial knee replacements that’s become available in recent

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years at certain hospitals, including PeaceHealth Southwest Medical Center in Vancouver. The surgical system's name comes from the company that manufactures the technology, the MAKO Surgical Corp. "Plasty" refers to the molding or shaping of a defect to restore form and function to a body part.

Based on a CT scan of the patient's joint, the system provides doctors with a 3D model to create a pre-surgical plan, like a blueprint. Once finalized, this plan is then programmed into the system. During surgery, a robotic arm uses computer-guided mapping software (think GPS) to ensure precision as the surgeon shaves or removes bone to make a perfect fit for the joint implant, customizing to each patient's unique anatomy.

That level of customization is important for ideal alignment of the patient's natural bone and tissue with the new implant, according to Dr. Michael Fleischman, an orthopedic surgeon with The Vancouver Clinic.

"We are able to make decisions during surgery by the millimeter," he said. "Human error is removed."

With improved alignment, both surgeons agree the benefits can potentially mean longer lasting implants, as well as less pain and shorter recovery periods for patients. Longevity of the implant is important, because replacing it means another surgery down the road. As people live longer and the number of younger people having these implants continues to grow, the importance of getting the full 20-year life span of the implant increases.

"If you look at the total hip application, we know that the position of the hip socket component is important for maximizing longevity and for the risks of early wearing or implant dislocations," Borus said. "We've tracked five years of outcome data on 100 patients who had surgery with MAKOplasty and the data is encouraging that this is a better option than standard techniques."

Fleischman said he has seen faster recovery among his



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MAKOplasty patients and a higher degree of postoperative satisfaction, particularly related to leg length.

“One risk factor with hip replacement is leg length discrepancy, but with MAKOplasty, we can measure to the millimeter how long the leg is while the patient is on the operating table,” he said, adding that he now performs 99 percent of hip replacement surgeries using MAKOplasty.

Borus, who has performed more than 1,000 MAKOplasty procedures, said the technology has applications across all demographics and activity levels.

“Our youngest patient to get MAKOplasty was in his 30s, a very active former athlete,” he said. “Our oldest patient was in her 90s.”

Hip and knee replacements are among the most common elective surgeries performed in the United States each year. According to the Agency for Healthcare Research and Quality, more than 285,000 total hip replacements are performed each year in the U.S. The same agency estimates that by 2030, about 11 million Americans will choose to have hip or knee replacement surgeries. Fleishman said osteoarthritis is the most common reason people need hip replacement surgery, followed by hip dysplasia and avascular necrosis. Knees can be troubled with cartilage injuries and normal wear-and-tear from osteoarthritis.

Borus observed that some people may be sitting on the sidelines of life because of bad hips and knees, and be apprehensive about replacement surgeries. Though all surgeries carry risks, the precision allowed through this new technology can reassure some qualms.

Surgeons will soon be able to use MAKOplasty on full knee replacements, Borus said. The future of the technology has exciting implications for all joint repairs and replacements, he added.

Though the assistance of computers and robots enhances accuracy, Borus and Fleischman emphasized the importance

of finding an experienced surgical team when considering joint replacement. The orthopedic groups affiliated with PeaceHealth Southwest Medical Center promote patient education, which has led to better outcomes, the physicians said. This investment in educating patients about expectations, preparation for surgery, physical therapy, postoperative follow-up and return to activities has proven valuable for successful results. [PeaceHealth Southwest Medical Center](#) has a designated unit, called the [Total Joint Center](#), for patients undergoing total hip and knee replacement. Patients are allowed to wear their own clothes, not hospital gowns, during their stay. Trained staff offer preoperative and discharge classes, in addition to physical therapy.

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