ORTHOPEDIC SURGERY TODAY

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Advances in Hip Preservation & Replacement

Orthopedic interventions for the hip continue to make strides, but not just for hip replacement. Hip preservation has assumed an increasing role, including through repair of early damage (e.g., dysplasia, impingement) to the joint complex. Meanwhile, minimally invasive strategies continue to improve hip replacement surgery using new, visually immersive technology.

"Degradation of the hip can start at a young age, from injuries, abnormalities, and repetitive motions—sometimes sports-related—and we can stabilize the health of the hip in these patients," said Virtua hip preservation and joint replacement surgeon Greg Klingenstein, MD. "In addition, for the typically older patient who needs hip replacement, we now have a 3D visualization capability that provides us with an advantage in the operating room."

Saving Hips: A Preventive Subspecialty

Hip preservation surgery applies to individuals in their teens and 20s, occasionally in their 30s, and rarely in their 40s. Beyond that age, accumulated damage usually dictates an impending or eventual hip replacement. Arthroscopic repair must be employed before the onset of moderate to severe hip osteoarthritis. Common hip preservation procedures—applied when conservative treatment options are inadequate—include abductor, cartilage, or labrum repair; reshaping or reorienting the femur; or removal of impinging bone. However, the need for these procedures may often go undetected and undiagnosed.

"If providers observe younger patients with anterior hip or groin pain that won't go away with rest and activity modification, they should consider ordering imaging or referring to a specialist for evaluation," said Dr. Klingenstein, who is fellowship-trained in hip preservation.

Joint and Imaging Viewed in One Place

Orthopedic surgery has dramatically reduced the invasiveness of hip replacement in the last decade through advancements in 3D CT planning and modelling; use of the surgical robot; smaller incisions; and less disrupting of surrounding and supportive soft tissue, with the preservation of tendons, ligaments, and capsule. Patients typically leave the next day and walk out of the hospital. Patients begin PT the following day and return to activity within weeks.

Virtua is one of the highest-volume centers in the country for minimally invasive, robotic orthopedic surgery. This approach is particularly helpful for patients with obesity or people with complex/fragile bone structure. For cases requiring an alternative approach, Virtua offers a high-tech option that uses augmented reality that superimposes the CT bone reconstruction in the surgeon's visual field, in alignment with the patient's anatomy. The HipInsight™ system registers the 3D hip and pelvic structure on the operative joint site and overlays this image through goggles worn by the orthopedist. This newer approach promotes improved cup placement with the potential to reduce the chance of dislocation and instability.

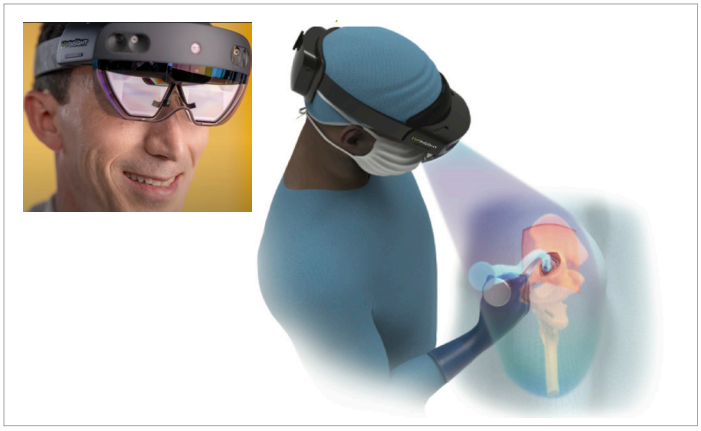

Illustration courtesy of HipInsight

HipInsight™ consists of a fixed system coordinated with Microsoft HoloLens glasses that integrate 3D CT imaging. The experience for the operator simulates seeing through the skin and soft tissue to the bone structure of the hip and pelvis. The technology keeps a hologram-like image within the surgeon's vision, precisely overlapping the joint site. It seamlessly enhances the current nonrobotic hip replacement procedure.

For information or referral, call 866-921-5607.

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Robotic System Aligns Fractured Femurs

Conventionally during repair of the long bones of a patient's leg, surgical teams manually position the leg and bones—a physically demanding and less-than-exacting approach. Now, Virtua orthopedists are collaborating with researchers at Virtua's academic partner, Rowan University, to further develop an automated, image-guided system for precisely aligning these structures during reconstructive operations.

With particular focus on procedures for fractured femur bones, the Robossis system uses X-ray images from two angles and cameras to track and register the fractured pieces of bone. It creates a 3D computer model of the fixed surgical site and recommends a path to precisely realign the broken bone. The surgeon can then manipulate the patient's leg using the haptic controller, while viewing the result in an animated model through a headset.

"Fractures of the thigh bone are common, and surgery using the traditional approach is challenging. Still today, an assistant has to hold the leg in place, pushing against large muscle groups for an extended period," explained Virtua orthopedic surgeon Christopher Haydel, MD. "Robossis will make holding an ensured alignment far easier—and with greater accuracy."

"Up to 28% of all long-bone fractures don't heal correctly because it's difficult for surgeons to align the separated segments of these bones," said Mohammad Abedin-Nasab, PhD, of the Henry M. Rowan College of Engineering, who leads the research team that has won a $1.8 million NIH grant to further develop the system.

Robossis uses only small incisions to fix and retract the bones. It then moves the fractured bones into the correct orientation and dependably holds them there for the duration of the surgery—significantly improving the team's ability to achieve the targeted alignment precisely. Additionally, Robossis could potentially make femur realignment surgery less invasive—using the robot could eliminate the need for large incisions, which can limit blood loss, post-surgical pain, and scarring. Robossis also requires fewer X-rays than traditional surgery, reducing radiation exposure for patients and health care providers.

In the field of orthopedic trauma surgery, the system is expected to reduce malalignment, reoperation, and even mortality for patients with femur fractures. The Virtua-Rowan team also sees potential to use the system on other long bones in the legs and arms.

The project is a collaboration between the Rowan-Virtua School of Translational Biomedical Engineering & Sciences and the Rowan-Virtua School of Osteopathic Medicine—both part of the Virtua Health College of Medicine & Life Sciences of Rowan University.

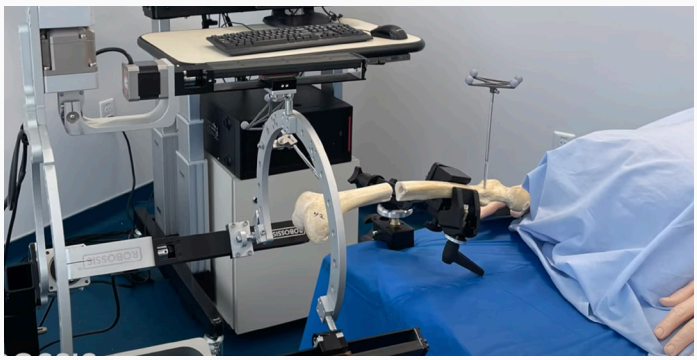

Illustration courtesy of Pulmonx

Seen here under development, Robossis will be the first navigation system to robotically situate femur bones for surgical repair of fractures.