

4. DAWN OF THE AGE OF ROBOTS



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Special Interest in Robotic Surgery



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Dear colleagues, it gives me great pleasure to share about the use of Robotic Surgery in Orthopaedics in modern medicine. As an avid proponent of advances in healthcare technology, I am thrilled that the age of Robots has finally dawned upon us.

Robotic orthopaedic surgery began in 1992 but has only been more widely adopted internationally over the recent years. This is largely due to the launch of the Mako robot in the orthopaedic industry.

A pre-operative Computed Tomography (CT) Scan is required to formulate a 3-dimensional (3D) operative plan for individual patient anatomy. After this, the surgery is performed with extreme accuracy. The surgeon controls the robotic arm using real-time haptic feedback. The robotic cutting/burring tool shuts off automatically when it goes off tangent or within the proximity of neurovascular structures. This makes robotic surgeries safer and more precise than conventional surgeries. Dynamic soft tissue feedback is acquired intraoperatively, allowing

change in surgical plan to optimise soft tissue tension and tracking. The robot is not fully autonomous (yet), as no surgeon will fully entrust their patient's life or limb to robots.

Types of Makoplasty Procedures

Tan Tock Seng Hospital (TTSB) offers all 3 Makoplasty (robotic-assisted) procedures – namely, Unicompartamental Knee Arthroplasty (UKA), Total Hip Arthroplasty (THA) and most recently Total Knee Arthroplasty (TKA). Mako UKA is currently the most commonly performed Makoplasty procedure.

Makoplasty Procedures



⚡ Mako UKA

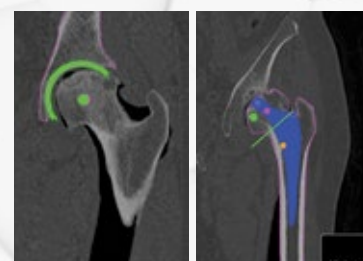
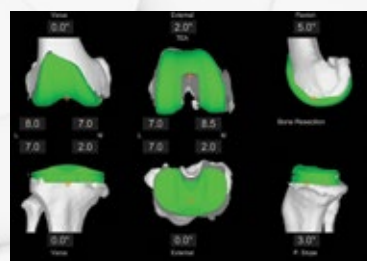
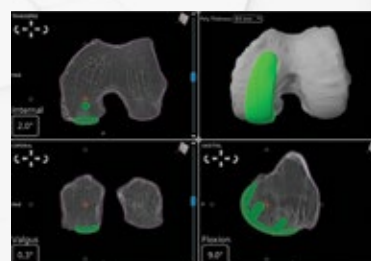


⚡ Mako TKA



⚡ Mako THA

Makoplasty 3D Planning



About 20% of Osteoarthritis (OA) knees are confined to a single compartment (usually medial). A medial UKA could have been performed for this group of patients instead of TKA. The advantages of performing a UKA over a TKA includes a smaller incision, lesser pain, blood loss and bone resection, faster return to work and more normal knee kinematic (due to preservation of all the cruciate ligaments).

Benefits of Makoplasty

Using conventional instruments to perform UKA is susceptible to considerable alignment, rotational, sizing errors as well as complications such as peri-prosthetic fractures. This is likely the cause of suboptimal survivorship compared to TKA data and therefore lack of confidence in surgeons to perform conventional UKA for patients with isolated unicompartmental disease despite the obvious superior benefits for UKA over TKA. Makoplasty UKA has proven to deliver consistently accurate alignment, reproducible results, optimal implant sizing, tracking, soft tissue balancing and better forgotten joint scores (a score that measures patients' awareness of their joint after a joint replacement).

For THA, Makoplasty has consistently allowed for accurate acetabular cup placement compared to conventional 'eyeball methods'. This leads to lower postoperative complication rates such as dislocation and limb length discrepancy. Personally, I find Makoplasty especially useful in patients with dysplastic acetabulum as the robot can help make a typically difficult operation much easier.

Makoplasty TKA was launched worldwide in 2017 with the aim to restore normal knee kinematics by customising the bone cuts to best fit the implants to individual patient's anatomy and taking into account



⚡ Left to right: X-rays of medial unicompartmental OA, medial UKA, TKA, bicompartmental knee replacement



⚡ Left to right: UKA wound, TKA wound

dynamic intraoperative soft tissue balancing feedback. Results of this latest state-of-the-art technology are currently limited but certainly optimistic.

Selection of Patients for Makoplasty

The indications for Makoplasty are the same as our current joint replacement patients, who are predominantly patients with symptomatic osteoarthritis of the hip or knee that have failed conservative management. Selection of patients for Makoplasty UKA is more stringent but their symptoms and radiographic disease should only be isolated to the affected compartment. Robotic bicompartmental knee arthroplasty is an available option, should there be disease in two compartments (typically medial and patella-femoral compartments).

There is no difference in the post-operative care of robot-assisted joint replacement patients from our existing practice, apart from the addition of pin site wounds required to place tracking arrays that communicate with the robot. In fact, because robotic surgery employs minimally invasive incision (particularly so for UKA), faster recovery and therefore same day or next day discharge for this group of patients is achievable.

It took the Australian Orthopaedic Association National Joint Replacement Registry 10 years before

computer navigated TKAs showed better survivorship than conventional TKA, especially among younger patients. Just as with other areas of medicine, only time will tell if robotic technology is superior to current methods of orthopaedic surgery. [GPBUZZ](#)

ROBOTIC TECHNOLOGY MAY BE THE ANSWER FOR SOME OF THE 'UNHAPPY' HIP AND KNEE REPLACEMENT PATIENTS. IT MAY ALSO FORM THE CORNERSTONE OF SURGICAL TRAINING FOR BUDDING ORTHOPAEDIC SURGEONS, AS REPRODUCIBLE AND CONSISTENT RESULTS ARE ACHIEVABLE WITH LOWER SURGICAL VOLUME.

Mako™
Robotic-Arm
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