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SPECIALIST ORTHOPAEDIC SURGEON

PATIENT INFORMATION

Robotic-Assisted Shoulder Replacement

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What is it

Robotic-assisted shoulder replacement is an anatomic or reverse shoulder replacement in which a robotic arm helps carry out the plan made before surgery. The operation itself does not change: it treats a worn joint (arthritis) and, with a reverse replacement, a shoulder with a badly damaged rotator cuff.

Before the operation, a CT scan of your shoulder is turned into a three-dimensional plan that sets the size, angle and depth of each part of the new joint. During the operation, the robotic arm positions the cutting guide for the top of the arm bone and holds the reamer that shapes the socket, at the angles and depth in that plan, then holds still while your surgeon makes the cut or shapes the socket. The robot does not operate on its own or make decisions; your surgeon performs every step.

What it's made of

The system has four parts: a robotic arm on a wheeled base beside the operating table; a camera that tracks small reflective markers; the tracking pins those markers sit on, placed in the arm bone and in the coracoid (a bony knob at the front of the shoulder blade) through the same incision as the operation; and the plan made from your CT scan. The pins come out at the end of the operation, and nothing robotic stays in your body. The implants are those of an anatomic or reverse shoulder replacement, described on those pages.

How your surgeon uses it

Dr Kieran Hirpara, an upper-limb surgeon at Mater Private Hospital Rockhampton, uses the ROSA robot (Zimmer Biomet) with the Zimmer Biomet Comprehensive shoulder replacement, planned with the Signature ONE planning software. We already plan every shoulder replacement on a CT scan, so a robotic operation needs no extra scan. We use robotic assistance routinely for both anatomic and reverse replacements. If the robot has a problem during the operation, we continue with patient-specific guides made from the same plan,

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and with standard instruments if needed. Other surgeons use other systems, such as Mako, or other aids such as navigation or patient-specific guides, and many use none.

What to expect

Your anaesthetic, hospital stay, sling and rehabilitation are the same as for any shoulder replacement, and the anatomic and reverse replacement pages describe them in detail. The robot adds no extra wounds or appointments. The operation may take a little longer at first while the theatre team becomes familiar with the system.

What the evidence says

The clearest finding so far is about accuracy. With robotic assistance, the position of the implant matches the plan more consistently, and the occasional large miss that can happen when parts are placed by hand is removed [1]. That is what the robot has been shown to do.

It has not yet been shown to change how the shoulder feels or how long the implant lasts. No study has shown better pain relief, better function or a longer-lasting implant in the shoulder with robotic help [2]. Related technologies point the same way. Navigation, which guides the surgeon's hand rather than holding the instrument, placed the socket more accurately [3], with results at two years at least as good as standard instruments and no extra complications [4]. Patient-specific guides showed no major differences in results over the long term [5].

The evidence is still building. Most published accuracy studies used a different robot, and outcome studies of the ROSA shoulder system are still to come [6]. Longer follow-up is needed before anyone can say whether greater accuracy changes how long a shoulder replacement lasts [7]. In robotic hip and knee replacement, where most of the experience lies, reported device problems have been uncommon, and the rate has fallen over time [8].

In short, the robot helps carry out the plan precisely and consistently. Whether that leads to a shoulder that works better or lasts longer is a question research has not yet answered.

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