

Robotic Joint Replacement in India: MAK0 vs VELYS Explained by Dr. Ashish Singh

From image-based 3D planning to CT-free robotic assistance – understanding how modern robotics is changing knee and hip replacement surgery in India.

Joint replacement surgery has come a long way.

For decades, surgeons have relied on clinical experience, anatomical knowledge and conventional surgical instruments to replace damaged knee and hip joints. These procedures have become highly successful and can dramatically improve mobility, reduce pain and restore quality of life.

However, every patient is different. The shape of the bone, severity of deformity, ligament balance, bone quality, limb alignment and functional requirements vary considerably from one patient to another. This is where robotic-assisted joint replacement has emerged as an important advancement.

At [Ashish Joint Replacement Care \(AJRC\)](#) and AIOR Superspeciality Unit, Patna, our journey with robotic joint replacement began in 2020. Since then, we have performed more than 3,500 robotic knee and hip replacement procedures – one of the largest single-surgeon experiences with robotic arthroplasty in India.

Today, technologies such as Stryker MAK0 and DePuy Synthes VELYS demonstrate two different approaches to robotic-assisted surgery. But what exactly is the difference – and what does robotic surgery actually mean for a patient considering joint replacement?

What Is Robotic Joint Replacement?

Robotic-assisted joint replacement does not mean a robot independently performs the operation. This is one of the most common misconceptions about robotic surgery.

The surgeon remains in control throughout the procedure. Robotic technology provides the surgeon with additional information, planning tools, intraoperative measurements and controlled assistance during bone preparation and implant positioning.

In simple terms: **the surgeon makes the decisions; the technology provides additional information and precision.** The goal is to make joint replacement more planned, personalised and reproducible.

MAKO: Image-Based Robotic Joint Replacement

One of the most established robotic platforms in joint replacement is Stryker MAKO SmartRobotics™ – [our earlier coverage of MAKO robotic technology](#) looked at this in detail when we first adopted it.

MAKO uses a CT-based, three-dimensional planning system. Before surgery, a CT scan is used to create a 3D model of the patient's anatomy, which the surgeon uses to develop a patient-specific surgical plan. For knee replacement, this planning helps assess implant positioning, alignment, and the relationship between the implant and the patient's anatomy. During surgery, the plan can be reassessed and modified based on intraoperative information, including soft-tissue balance.

MAKO combines three components:

1. **3D CT-based planning** – the patient's anatomy is

converted into a three-dimensional model, allowing the surgeon to plan the procedure before entering the operating room.

2. **Dynamic joint balancing** – the surgeon can assess soft-tissue laxity and adjust implant positioning before bone cuts are completed.
3. **AccuStop™ haptic technology** – the robotic system creates a virtual boundary that helps the surgeon stay within the planned surgical area during bone preparation.

MAKO for Hip Replacement

For hip replacement, MAKO also provides CT-based patient-specific planning, allowing the surgeon to assess implant positioning and potential impingement in relation to pelvic position.

In simple language: MAKO allows the surgeon to see the patient's anatomy in 3D, plan the operation digitally, and use robotic assistance to help execute that plan.

VELYS: A CT-Free Approach to Robotic Knee Replacement

The VELYS Robotic-Assisted Solution from DePuy Synthes/Johnson & Johnson MedTech takes a different approach. Unlike CT-based systems, VELYS uses a CT-free technology platform for knee replacement – instead of a preoperative CT-generated 3D model, it uses intraoperative information and tracking to assist the surgeon with planning and execution.

According to the manufacturer, VELYS is designed to enhance surgical precision, support implant placement, preserve the soft-tissue envelope, and help the surgeon assess joint stability and knee function.

MAKO vs VELYS: Side-by-Side Comparison

	MAKO (Stryker)	VELYS (DePuy Synthes / J&J MedTech)
Planning basis	CT-based, preoperative 3D model	CT-free, intraoperative tracking
Workflow	CT → 3D model → preoperative plan → intraoperative robotic assistance	Intraoperative data → real-time planning → robotic assistance
Preoperative imaging	Required	Not required
Soft-tissue assessment	Dynamic joint balancing before bone cuts	Real-time intraoperative feedback
Boundary control	AccuStop™ haptic technology	Robotic-assisted execution with real-time data
Used for	Knee and hip replacement	Currently knee replacement
Best suited for	Cases needing detailed preoperative 3D planning	Streamlined workflow without preoperative CT scan

Both platforms share the same fundamental objective: giving the surgeon better information and greater control during joint replacement surgery. Neither is a “better robot” in isolation – the right choice depends on the patient’s anatomy, the specific surgical problem, and the operating surgeon’s experience with each system.

Does Robotic Surgery Mean Better Accuracy?

One of the major reasons for developing robotic-assisted surgery is to address the variability that can occur during conventional joint replacement. Small differences in implant positioning, bone cuts, and soft-tissue balance can influence the biomechanics and function of a replacement joint.

MAKO's CT-based planning and haptic technology are designed to help surgeons reproduce the planned implant position and perform controlled bone preparation, with manufacturer-reported evidence of greater planning accuracy compared with conventional techniques.

However, robotic surgery should not be described as a guarantee of a perfect outcome. A robot is a tool – not a substitute for surgical judgement. Patient selection, diagnosis, surgical experience, implant choice, soft-tissue management, infection prevention, and rehabilitation continue to be fundamental to a successful joint replacement.

Benefits of Robotic-Assisted Joint Replacement

Depending on the patient, procedure, and robotic platform, robotic assistance may offer several advantages:

1. **Patient-specific planning** – the patient's anatomy is assessed and the surgical plan individualised.
2. **Greater control over bone preparation** – robotic assistance helps execute planned bone resections within defined boundaries.
3. **Implant positioning** – additional information helps position implants according to the surgical plan.
4. **Soft-tissue assessment** – intraoperative information

about ligament balance and joint stability.

5. **Reproducibility** – digital planning and intraoperative data may reduce variability associated with manual techniques.
6. **Data-driven surgery** – planned and achieved parameters can be compared, allowing surgeons to continuously refine technique.

Does Robotic Surgery Mean Faster Recovery?

This is an important question, and the honest answer is: potentially, but it should not be promised to every patient.

Some studies of robotic-assisted knee replacement report less postoperative pain, reduced medication requirements, and earlier achievement of postoperative milestones compared with conventional surgery. Outcomes vary depending on the patient, surgical technique, rehabilitation, and other factors.

At AJRC, our approach is not to promise a particular recovery time. Instead, our goal is to combine accurate planning, experienced surgery, appropriate implant selection, early mobilisation, and structured rehabilitation – to give each patient the best possible opportunity for recovery.

Who Is a Candidate for Robotic Joint Replacement?

Most patients who need a knee or hip replacement for arthritis, deformity, or joint degeneration can be evaluated for robotic-assisted surgery. Suitability depends on factors such as:

- Severity and pattern of deformity
- Bone quality and anatomy

- Ligament and soft-tissue condition
- Overall health and fitness for surgery
- Whether a total or partial replacement is indicated

The only way to confirm candidacy is a clinical evaluation by an experienced joint replacement surgeon.

[Book a consultation with Dr. Ashish Singh at AJRC, Patna →](#)

Robotic Knee Replacement Cost in India: What to Know

Robotic joint replacement typically costs more than conventional surgery, reflecting the technology, planning software, and specialised training involved. The exact cost depends on the city, hospital infrastructure, implant type, whether it's a knee or hip procedure, and the complexity of the individual case.

Because these factors vary so much from patient to patient, a generic price figure can be misleading. The most reliable way to understand your likely cost – including insurance eligibility – is a direct consultation. [Get a personalised estimate from AJRC →](#)

3,500+ Robotic Knee and Hip Replacements: Why Experience Matters

Robotic technology is only as useful as the team using it.

At [AJRC-AIOR, Patna](#), robotic joint replacement has been part of our practice since 2020. With more than 3,500 robotic knee and hip replacement procedures – including our earlier [MAKO robotic knee replacement work in Patna](#) – our experience spans routine as well as technically challenging cases.

This experience has taught us an important principle: not every patient needs the same operation, and not every patient needs the same technology. A robot should never be used simply because it is available – it should be selected because it adds value to the specific clinical situation.

From Surgery to Science: Research at AIOR–AJRC

A Centre of Excellence should not simply perform robotic surgery – it should also study it. Our robotic arthroplasty programme has been accompanied by clinical research and scientific publications examining:

- Accuracy of implant positioning
- Acetabular component positioning in robotic hip replacement
- Bone-resection accuracy in robotic knee replacement
- Complex hip reconstruction
- Functional outcomes following robotic arthroplasty
- The relationship between surgical planning and achieved component position

The purpose is simple: we should not just ask whether the technology is impressive – we should ask whether it is clinically useful, reproducible, and worth the investment for the patient.

Robotics Is Not About Replacing the Surgeon

A robot does not replace the surgeon. A successful joint replacement requires far more than accurate bone cuts – it requires correct diagnosis, appropriate indication, understanding of anatomy and biomechanics, soft-tissue management, implant selection, surgical experience, infection

prevention, pain management, and structured rehabilitation. Robotics adds another layer of information and control to this process – clinical judgement remains essential.

MAKO or VELYS: Which Is Better?

This is another question patients frequently ask, and the answer isn't a simple pick-one-side.

MAKO is image-based and CT-driven, providing a detailed three-dimensional model for planning and intraoperative robotic assistance. VELYS uses a CT-free approach, relying on intraoperative information and tracking. Both represent sophisticated approaches to modern arthroplasty.

The more important question is which technology suits this patient, this anatomy, and this surgical problem – a decision best made by an experienced joint replacement surgeon after evaluating individual requirements.

The Future of Robotic Joint Replacement

The next generation of joint replacement will likely combine several technologies, with increasing integration of robotics, artificial intelligence, 3D digital planning, computer navigation, real-time intraoperative data, patient-specific alignment, and digital outcome measurement. The future may not belong to one robot – it may belong to a technology ecosystem where different tools are chosen for each patient's needs.

AIOR–AJRC: Building a Centre of Excellence

Our vision at AIOR–AJRC is not simply to perform robotic joint replacements – it is to build a comprehensive ecosystem around

robotic arthroplasty:

- **Clinical Care** – high-volume knee and hip replacement practice
- **Technology** – access to advanced robotic and navigation platforms
- **Research** – continuous clinical evaluation and scientific publication
- **Education** – training and knowledge-sharing with orthopaedic surgeons and trainees
- **Innovation** – translating technology into meaningful patient benefit

After more than 3,500 robotic knee and hip replacements, our belief remains unchanged: technology should serve the patient – not the other way around. A robot can provide precision. Research can provide evidence. Experience provides judgement. Compassionate clinical care brings everything together.

Frequently Asked Questions

Is MAKO or VELYS better for knee replacement?

Neither system is universally better. MAKO uses CT-based 3D planning with haptic boundaries, while VELYS uses a CT-free, intraoperative approach. The right choice depends on the patient's anatomy, the surgical problem, and the operating surgeon's experience with each platform.

Does robotic knee replacement guarantee a better outcome than conventional surgery?

No. Robotic assistance improves planning precision and reproducibility, but outcomes still depend on correct diagnosis, surgical experience, implant selection, infection prevention, and rehabilitation. A robot is a tool, not a guarantee.

Who is a good candidate for robotic joint replacement?

Most patients who need a knee or hip replacement for arthritis

or joint degeneration can be evaluated for robotic-assisted surgery. Suitability depends on individual anatomy, deformity severity, bone quality, and overall health, and should be confirmed by an orthopaedic surgeon.

How much does robotic knee replacement cost in India?

Cost varies by city, hospital, implant type, and surgical complexity. Because pricing depends on individual clinical factors, it's best confirmed during a consultation rather than estimated generically.

Does robotic surgery mean a faster recovery?

Some studies report less postoperative pain and earlier mobility milestones with robotic-assisted knee replacement, but recovery time varies by patient, technique, and rehabilitation. It should not be promised as a fixed timeline.

The Bottom Line

Robotic joint replacement is not simply about putting a robot into an operating room. It is about changing the way we plan, measure, execute, and evaluate joint replacement surgery. From the CT-based 3D planning of MAK0 to the CT-free intraoperative approach of VELYS, modern robotics is giving orthopaedic surgeons new ways to understand anatomy and execute surgery.

But the most important technology remains the same: an experienced surgeon making the right decision for the right patient.

At AIOR-AJRC, Patna, our journey since 2020 and experience of more than 3,500 robotic knee and hip replacements is only one part of our larger mission – to combine technology, experience, research and education to continuously improve joint replacement care. Because the ultimate goal of every technological innovation is not the robot. It is the patient who wants to walk again.

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3,500+ robotic knee and hip replacements since 2020.

[Schedule your consultation with Dr. Ashish Singh →](#)

Dr. Ashish Singh Medical Director – AIOR Superspeciality Unit
Head of Department – Orthopaedics, AIOR Director – Ashish
Joint Replacement Care Pvt. Ltd., Patna, India