

## References:

1. Bächli H, Perlick L, Tingart M, Lürling C, Zurakowski D, Grifka J. Alignment in Total Knee Arthroplasty, A Comparison of Computer-Assisted Surgery with the Conventional Technique. JBJS 86-B:682-7. 2004.
2. Vidalain JP. Arthro Group. Can We Propose a HA THR to a Patient Younger Than 50 Years Old? Paper Presented at the European Hip Society Meeting, Beaune, 1998.

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Cat No: 9111-11-139 Version 1



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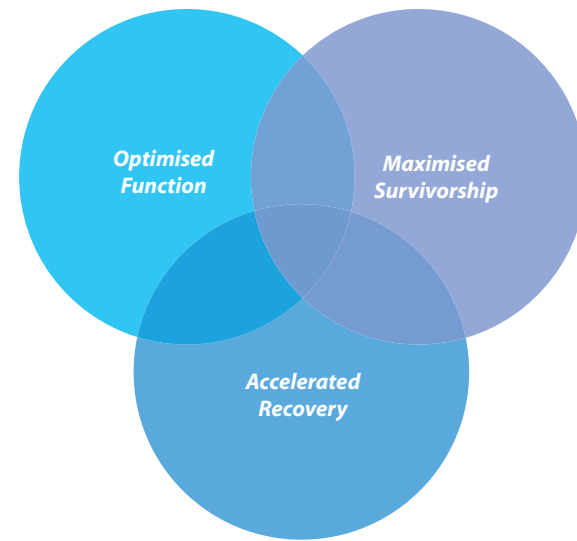


**Guidance**  
Computer Precision Surgery

System Rationale



# COMPUTER ASSISTED SURGERY (CAS) FOR JOINT REPLACEMENT



## *Intelligent Surgery*

*Intelligent surgery is an approach to total joint replacement that places equal importance on:*

*Optimising function*

*Maximising survivorship*

*Accelerating recovery*

*Its success is founded on leadership in the development of:*

*Advanced information technology*

*Precision in minimally invasive surgery*

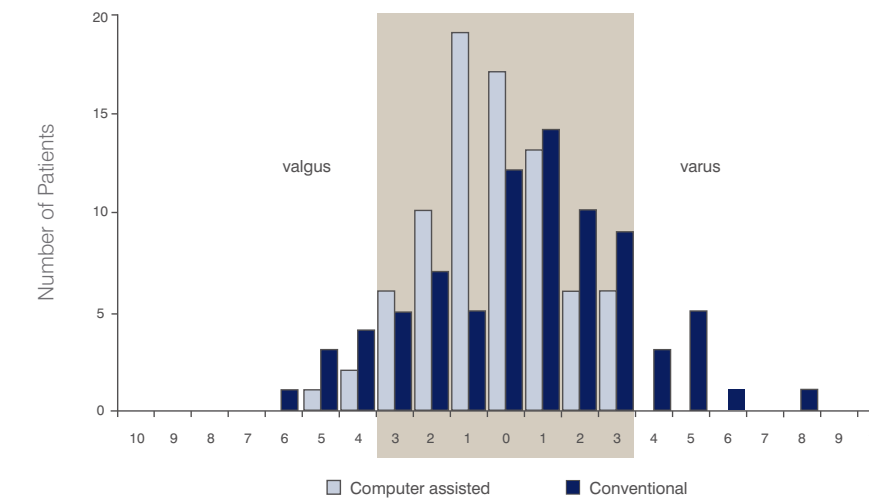
*Professional education*

Tracks instrument location and alignment relative to the patient's anatomy

Provides a new level of intra-operative data to support precise implant alignment

Leads to fewer outlying clinical results

Supports consistent, predictable joint surgery



Histogram\* showing the distribution of the post-operative mechanical axis of the leg between the computer-assisted and the conventional groups.<sup>1</sup>

\*Reproduced with the permission and copyright © of the British Editorial Society of Bone and Joint Surgery.

Bringing together advanced data management and imaging technologies, CAS creates the potential for a new level of information and control in joint replacement. With the ability to track instruments relative to the patient's anatomy on-screen throughout the procedure, the surgeon is able to plan, position and verify the alignment of implants with much greater precision. The effect is to improve the conditions for accurate reproducible surgery, and to reduce significantly the incidence of outlying results.

# Ci™ COMPUTER PRECISION SURGERY



Enhanced surgical vision for precise, less invasive surgery

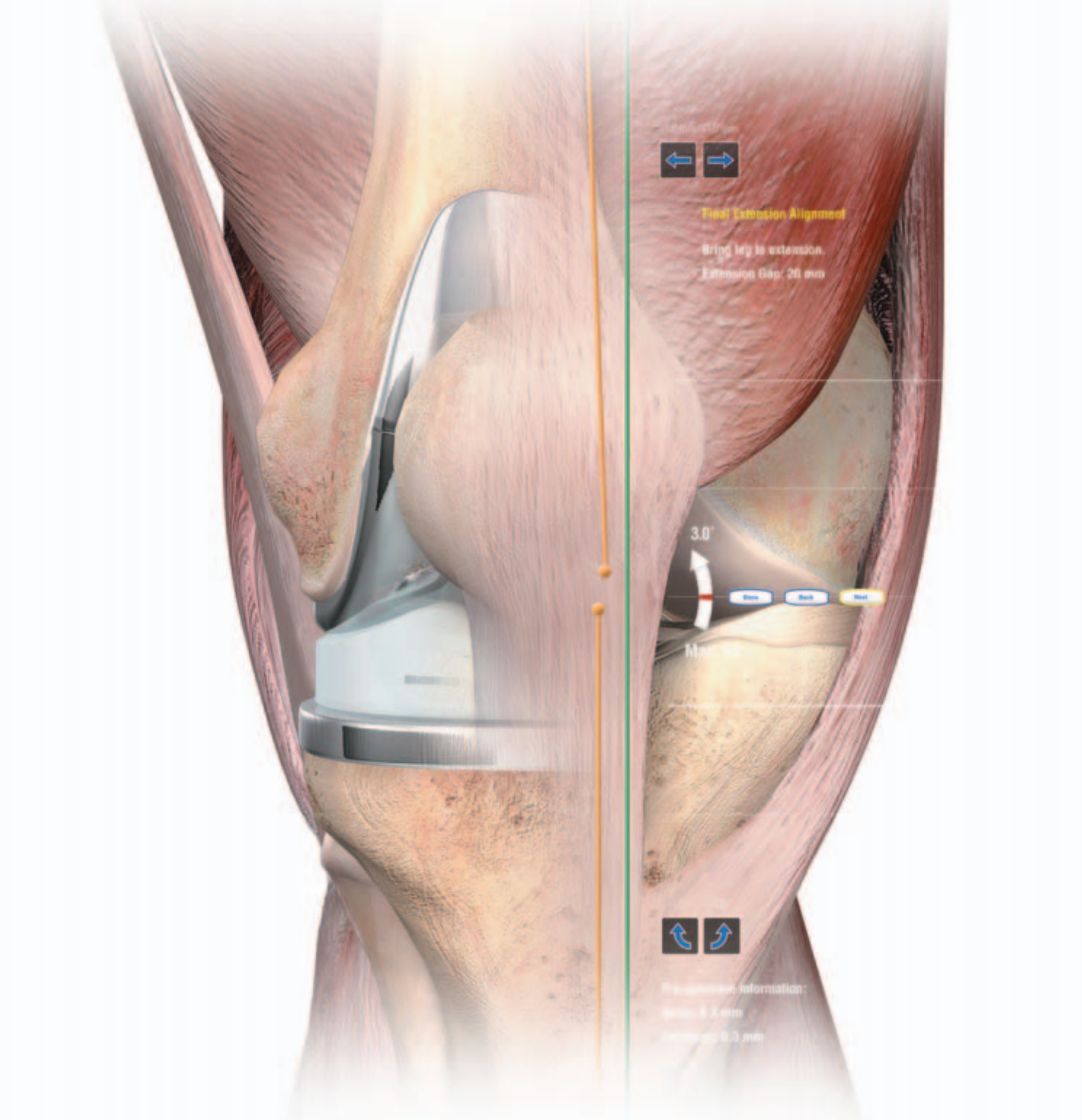
Fully visualised patient-specific anatomy

Efficient, technique specific workflows

Real time data flow for informed decision making

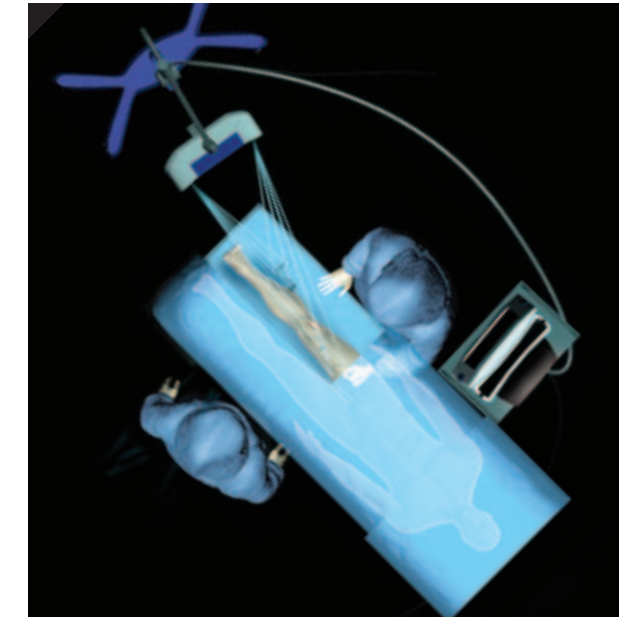
Intuitive, easy to interpret interface

The Ci™ System is a powerful surgical solution that is designed to help surgeons visualise individual joint anatomy with greater clarity and accuracy. Each workflow is planned for a specific surgical technique and is guided by a continuous flow of accurate data and therefore enabling informed decision making and less invasive surgery. Quick interpretation and interaction with the Ci™ System is guaranteed by an easy to understand graphical user interface. Relevant detailed data is delivered at every stage of the procedure. At any time earlier data can be recalled when it is needed.





## Ci™ SYSTEM IN YOUR SURGERY

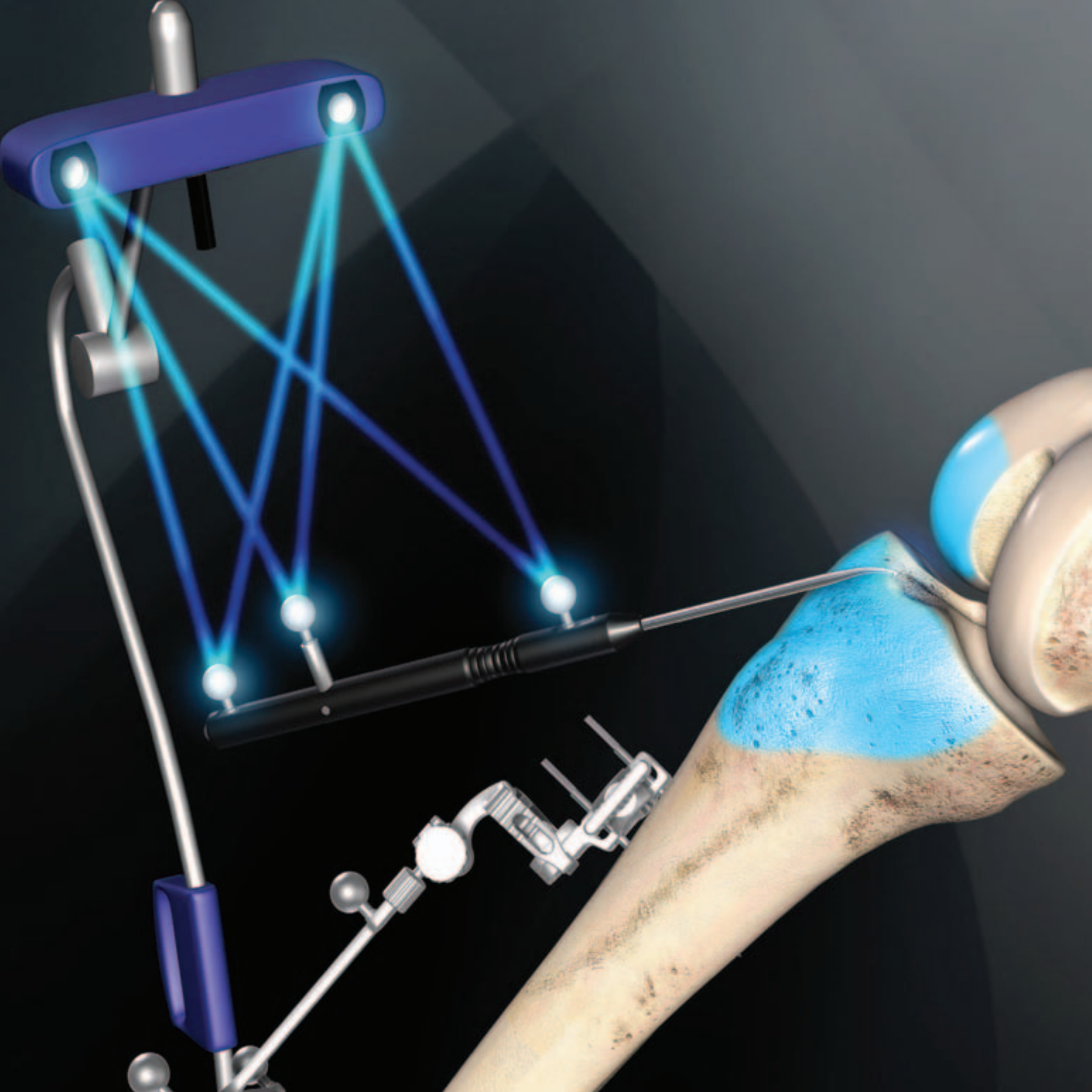


Fast efficient set-up

Ci™ Optical Tracking System helps to keep the operating room clear of wires and batteries

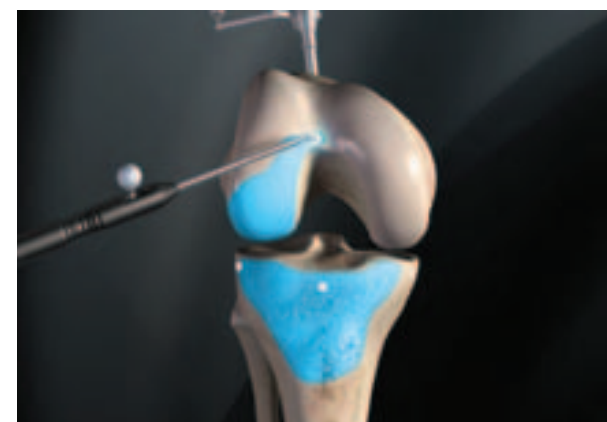
Full integration of hardware, software and surgical instruments,  
combine to create the powerful CAS operating environment

The development of the Ci™ System has achieved a smooth integration of software and instruments for optimum CAS effectiveness. All the components are designed for ease and flexibility of use. The equipment is light and portable, and set-up in the OR can be completed in minutes. The Ci™ System uses optical, wireless tracking technology keeping the operating site free of obstacles. The graphical user interface is intuitively easy to read, and may be controlled through a touch screen or the Ci™ Footswitch.

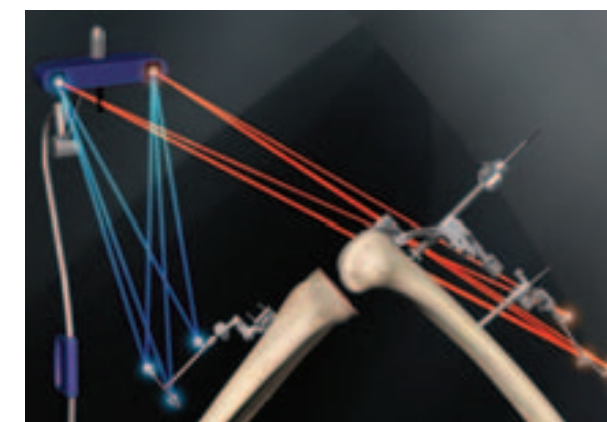


# Ci™ TRACKING TECHNOLOGY

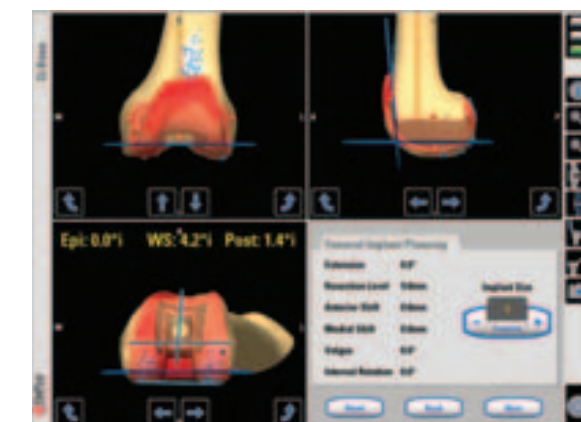
Optical tracking...



Key landmarks are point-picked and the surface anatomy is mapped to create a 3D bone morph.



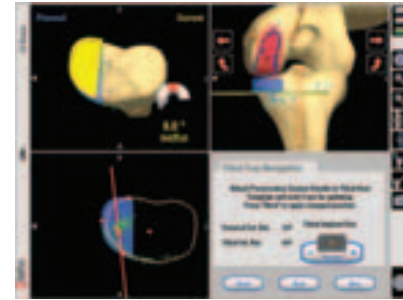
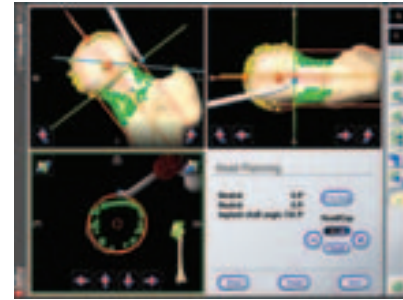
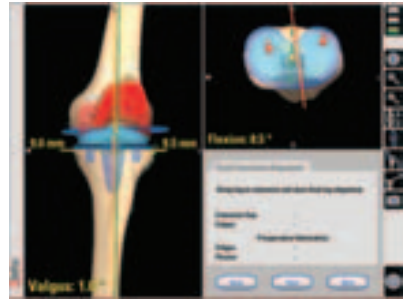
Infrared optical tracking monitors the precise position of the instruments relative to the bone.



Accurate, real-time data is displayed in 3D and digital form on screen within an easy to understand interface.

Ci™ Optical Tracking monitors the exact location of surgical instruments relative to the patient's position on the operating table. That process begins by tracking the pointer as it pin points key landmarks and maps the surface of the patient's bony anatomy during intra-operative registration. References are attached to both the patient and relevant instruments. The camera tracks the references to provide a constant flow of data to the computer. There are no wires within the operating room and the surgeon is free to perform the operation without any distraction.

## Ci™ Software Packages



MITKR P.F.C.® Sigma™ Knee System,  
MITKR P.F.C.® Sigma™ RP Knee System,  
MITKR P.F.C.® Sigma™ RP-F Knee System,  
MITKR LCS® Knee System,  
TKR P.F.C.® Sigma™ Knee System,  
TKR P.F.C.® Sigma™ RP Knee System,  
TKR LCS® Knee System,  
Preservation® Unicompartmental Knee System and  
DePuy ASR™ Resurfacing System

## DePuy Hip Navigation Software



Available for: Corail® AMT, Summit™, AML®, G2™, Pinnacle™ and Duraloc® Hip Systems

## TECHNIQUE SPECIFIC SOFTWARE



Simple, progressive workflow

Review and fine tune each step before moving to the next

Intra-operative decisions can be made quickly and with confidence

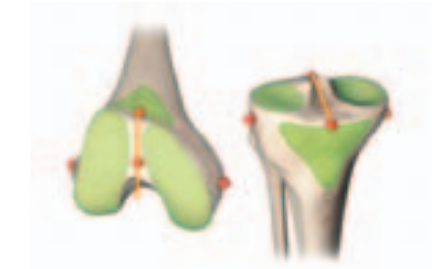
Choose only the software you need, when you need it

Unique MITKR software dedicated to P.F.C.® Sigma™ Knee System and LCS® Knee System

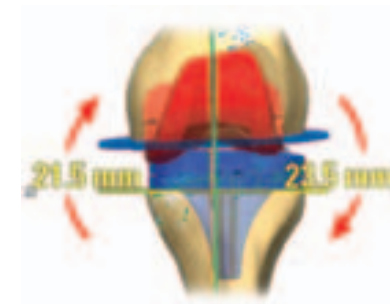
Each Ci™ System software option is planned around an efficient and progressive workflow, and is designed specifically to support the surgical technique appropriate to the implant. Relevant information is displayed so that it assists the surgeon in making well informed judgements quickly, and with confidence. A full range of software is available for you to build a variety of surgery options that best suits your practice.



## OPTIMISED SURGERY FOR EVERY PATIENT



Accurate registration increases the information available for pre-operative planning and supports fully informed decision making throughout the procedure

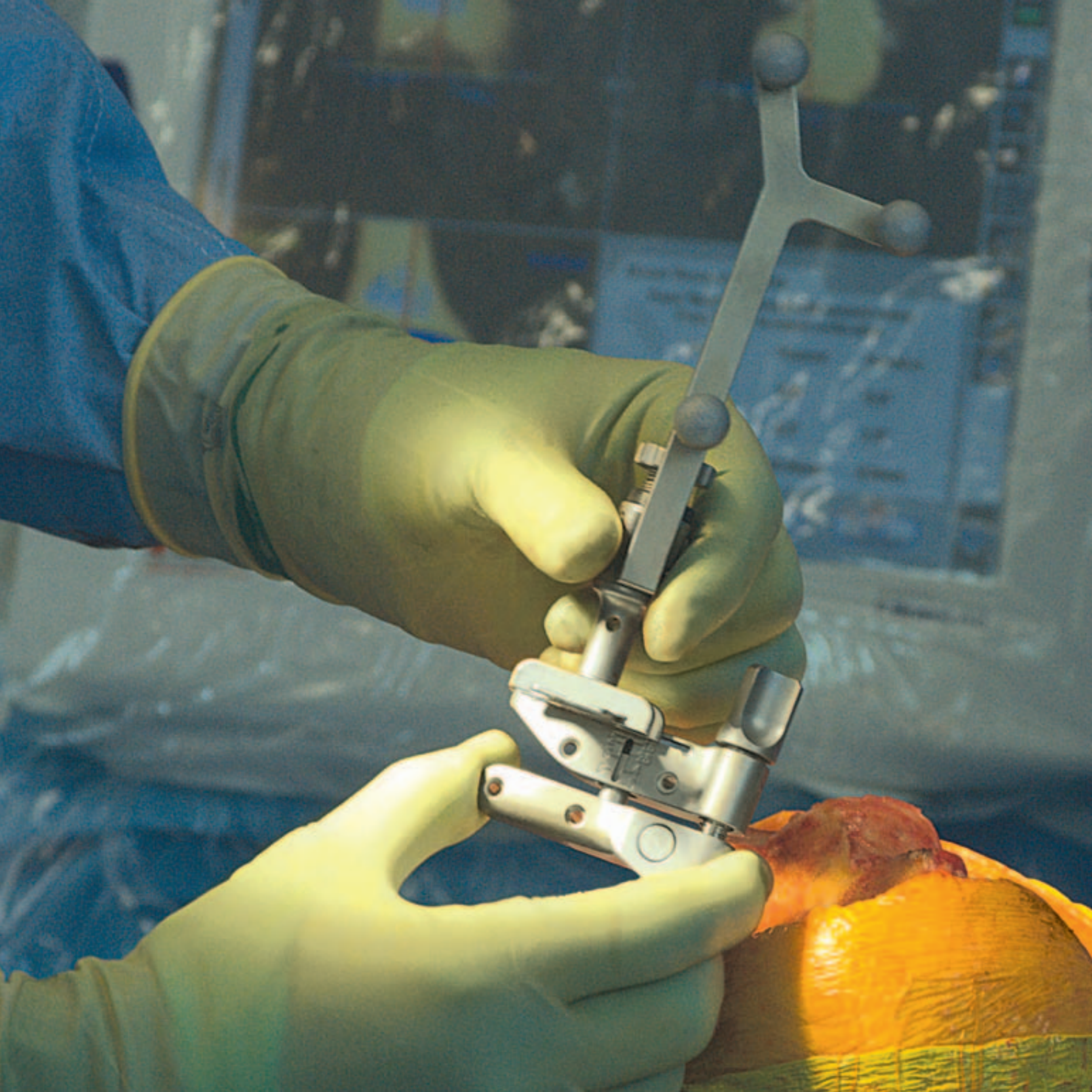


Measured alignment and soft tissue management allows for natural femoral rotation to ensure joint stability and balanced ligament tension throughout the range of motion



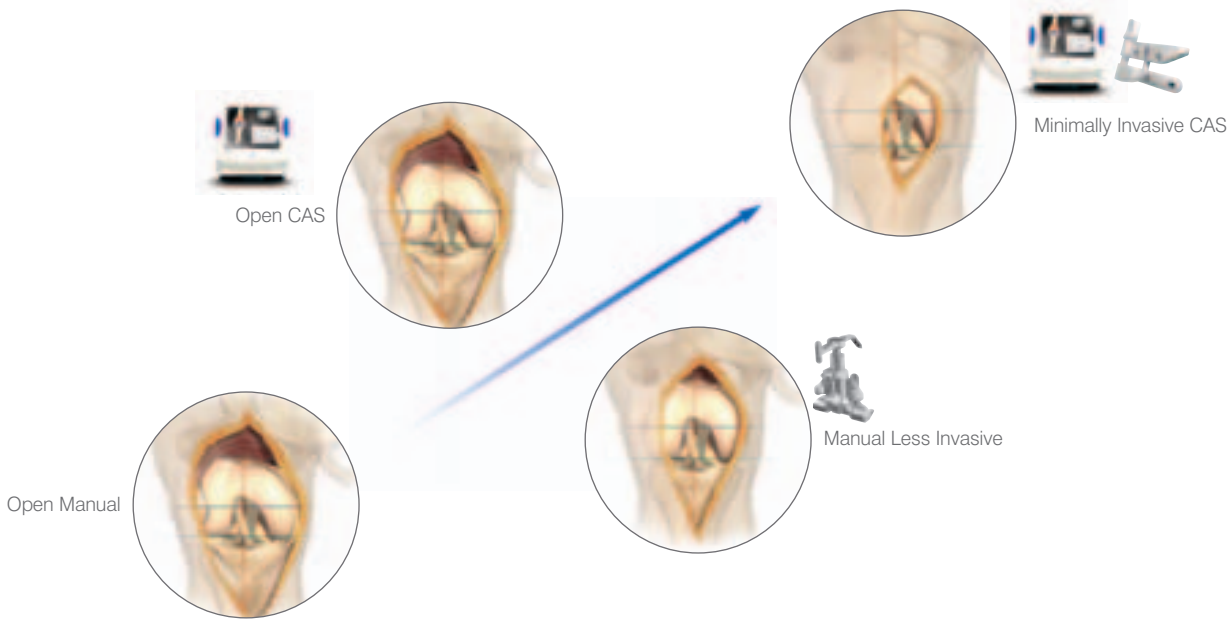
Bone preparation can be fine-tuned throughout the procedure to ensure precise implant placement and alignment

Soft tissue balancing begins with measured long-leg alignment and correction of deformity. The software takes full account of the patient's natural femoral rotation and will define and equalise the flexion and extension gaps. The size, position and alignment of the implants are established, and an assessment of the plan is completed before any femoral bone cuts are made. Decisions can be fine-tuned throughout the procedure to optimise the outcome for each patient.



# UNIQUE Ci™ MI SOFTWARE WITH DEDICATED INSTRUMENTATION.

A PATHWAY TO MI COMPUTER PRECISION KNEE SURGERY



Pathway Instruments and the Ci™ System enhance visualisation for minimally invasive surgery

Ensures reliable, reproducible minimal access total knee replacement

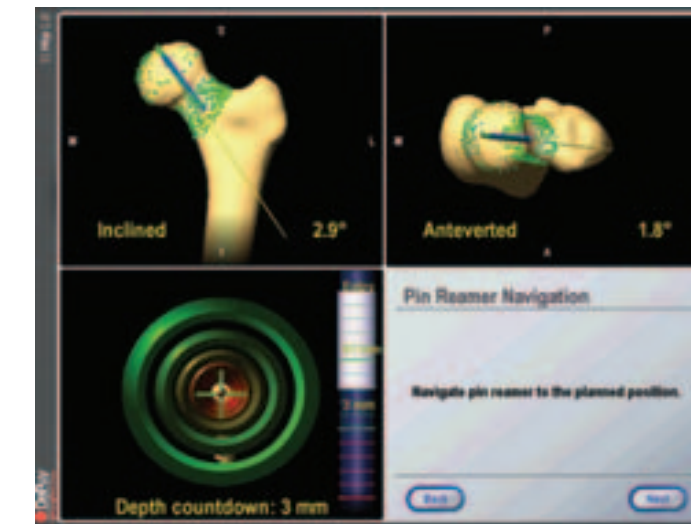
Precise control over navigated Pathway Instruments ensures accurate implant placement

The unique MITKR software on the Ci™ System allows the surgeon to finish the tibial cut before registering the femur. This creates more space in the joint allowing better femoral registration through a reduced incision. A single set of Pathway Instruments supports each implant for both a manual and a computer assisted surgery. This allows the surgeon to build experience, moving progressively from an open exposure to a less or minimally invasive technique with computer assistance. It also means that a single technique allows you to choose the most appropriate approach for each patient, at the time of surgery. Throughout, the goal is to reduce trauma to the surrounding tissues without compromising correct implant placement. The combination of small precise Pathway Instrumentation, a unique MI software and fully informed CAS decisions leads to reproducible and reliable implant and leg alignment within a balanced soft tissue envelope.





## DEDICATED HIP SOFTWARE



The guided pin reaming establishes an accurate platform for implant placement,  
to preserve bone and potentially reduce the risk of neck fracture

DePuy Hip software guides implant sizing, position and alignment  
for good joint stability and a reduced risk of dislocation

Dedicated software supports simple, safer surgery for the DePuy ASR™ Resurfacing System and implantation of the Corail®, Summit™, Pinnacle™ and AML® components. Ci™ Software defines the natural axis of the femoral neck, regardless of head deformity. It allows the surgeon to adjust the size and varus / valgus alignment of the head component and therefore optimise load transfer through planned bony landmarks. The precision of this approach helps the surgeon to preserve bone and to avoid femoral neck fracture. Ci™ Software supports informed surgery through a reduced exposure. Real time digital feedback guides cup position and alignment, and stem anteversion, to avoid impingement, dislocation and cup displacement. Measured adjustment of the centre of rotation, neck length, offset and correct leg length optimises joint biomechanics.

# SUPPORTS THE WORLD'S LEADING IMPLANT SYSTEMS



P.F.C.® Sigma™ Knee System

P.F.C.® Sigma™ RP Knee System

P.F.C.® Sigma™ RP-F Knee System

LCS® Complete Knee System

Preservation® Unicompartmental Knee System

—

DePuy ASR™ Hip System

Corail® Hip System

Pinnacle™ Acetabular Cup System

The Ci™ System has been developed specifically for use with knee and hip implants that are already clinically proven. Using the Ci™ System should help enable the best results achieved with these implants to be replicated more widely and improved on. For knee replacement, the implants include P.F.C.® Sigma™ Knee System, LCS® Knee System and the Preservation® Unicompartmental Knee System. Hip replacement systems with Ci™- specific programs include the uncemented Corail® that has reported 99.1% survivorship at 10 years for patients under 50 years old.<sup>2</sup> The Ci™ System also offers dedicated software for the DePuy ASR™ surgical technique for hip resurfacing.



## SUPPORTING CAS WITH PROFESSIONAL EDUCATION

Specialist training centres in Cincinnati, Hamburg and Melbourne

Dedicated learning environment that is fully equipped to teach computer assisted surgery

Course that develops your CAS knowledge and practical skills

Firm commitment to training before clinical use

A training programme that allows you to focus on your patient and not the technology

It is a pre-condition of using the Ci™ System that surgeons must complete a training programme, and DePuy is committed to a standard of excellence for professional education in support of computer assisted surgery. It is planned and managed to give orthopaedic surgeons a firm foundation in CAS techniques. The course develops knowledge and practical skills, quickly and effectively - with a minimum of lectures and along with the opportunity to carry out a large number of simulated procedures fully supported by our in-house education team. An experienced user surgeon is also on hand to provide learning tips and advice.



## PATHWAY THROUGH LEARNING

### **Learning Centres:**

Interactive, hands-on workshops  
Live surgery with world leading orthopaedic surgeons

### **Visitation Centres:**

Visit surgeons experienced in CAS  
The opportunity to learn and share experiences during surgery

### **Professional Education Courses:**

Really learn to integrate the software into your surgical procedure  
An effective balance of theory and practical experience

For surgeons wishing to explore the potential for integrating the Ci™ System into their own clinical practice, there is a clear pathway of increasing exposure to learning opportunities with the system. Learning Centres provide the opportunity for hands-on experience in the company of leading CAS surgeons. At Visitation Centres you can be present during surgery. Professional Education Courses are designed to enable surgeons to optimise their use of the Ci™ System in knee and hip replacement surgery. For more information about these and the Training Centres' programmes, contact your local DePuy representative.