

Unity Knee™

Product overview

Corin
Responsible Innovation

Think **isometry** Feel **balance**™



Unity Knee™

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Whilst patients with total hip replacements often categorise their joint as a 'forgotten' hip, even after 40 years of 'successful' total knee replacement designs, patient satisfaction remains at 70-80%^{1,2,3}. Various studies and registries have reported some of the biggest causes of total knee revisions to be attributable to instability (15-20%) and pain (20-30%)^{4,5,6,7}. Whilst longevity has been addressed in the majority of total knee designs, today further innovation is needed to improve patient outcomes and quality of life post surgery.

Learning from the experience of over 40 years of total knee development, Unity Knee™ is the latest evolution in total knee arthroplasty – unifying key design technologies with advanced knee kinematics, soft tissue preservation concepts and modern surgical principles.



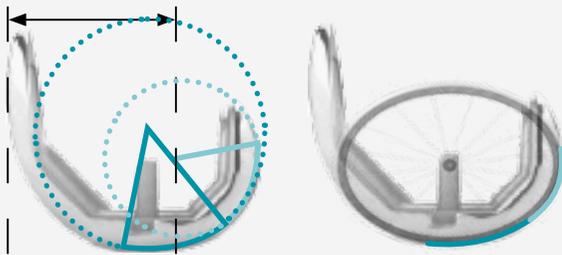


Evidence based innovation

Think isometry

Various knee anatomic studies have demonstrated that the native knee, when viewed through its rotational axis, subtends a single sagittal radius through the active flexion arc^{8,9,10}. Anatomic total knee designs mimic this and with a single centre of rotation in the active flexion arc, have the potential to facilitate collateral ligament isometry, minimising the paradoxical anterior glide seen in traditional 'J' curve knee systems¹¹.

Traditional 'J' curve design

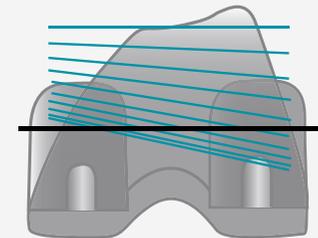


Collateral ligament laxity in mid flexion

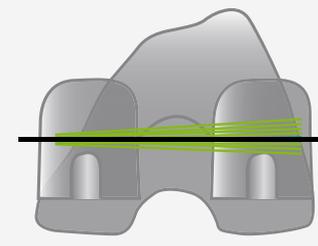
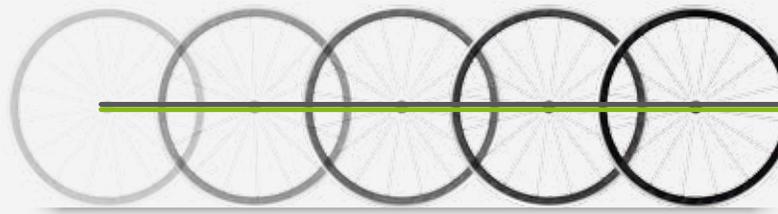
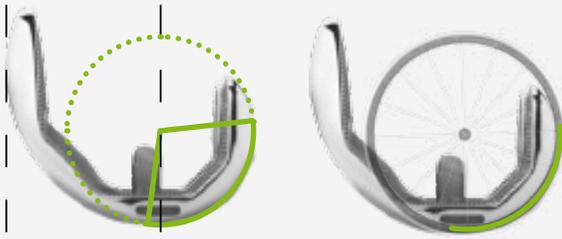
Collateral ligament tension in deep flexion



Motion pathways demonstrating anterior femoral translation from extension to flexion¹¹



Modern single radius design

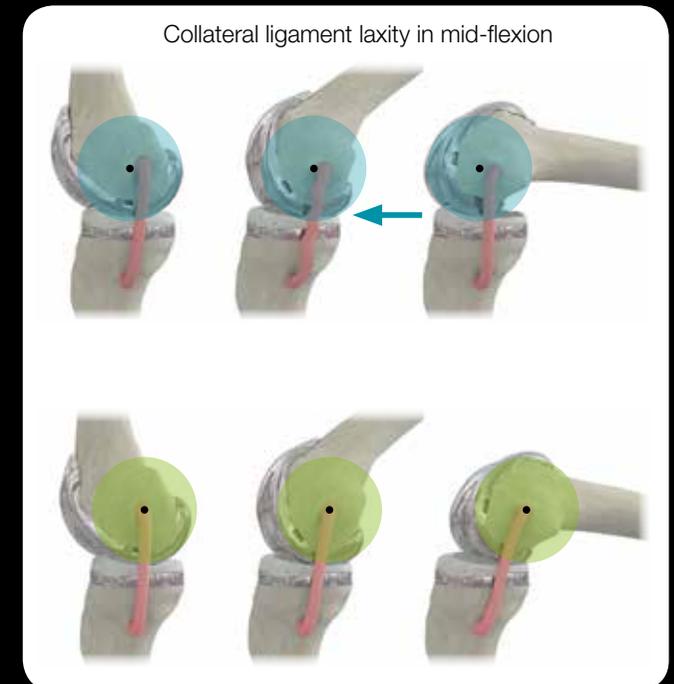
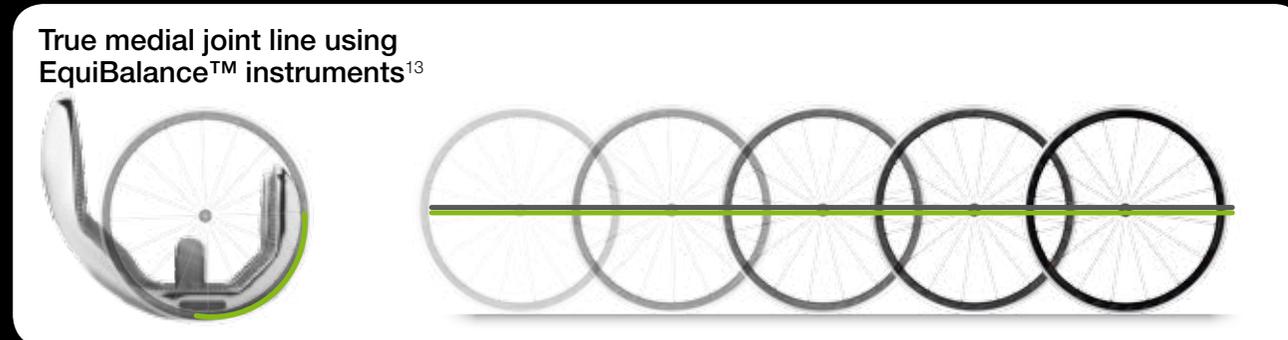
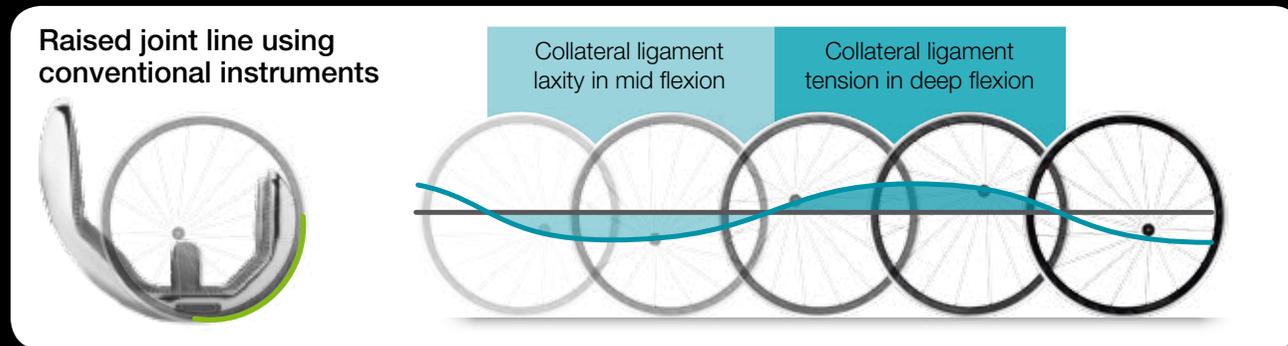


Maintaining a single radius on the femur can lead to improved patient outcomes, reducing mid-flexion instability seen in traditional knee replacements^{11,12}.

This is only half the story...

Joint line **Preservation** = Ligament **Isometry**¹³

Recent studies have demonstrated the importance of joint line preservation in both flexion and extension in providing collateral ligament isometry with a single radius femoral design¹³. However, if a single radius femur is not positioned with its centre corresponding to the rotational axis of the knee, it can still lead to mid-flexion ligament laxity and deep flexion tightness resulting in instability and loss of function^{13,14}.

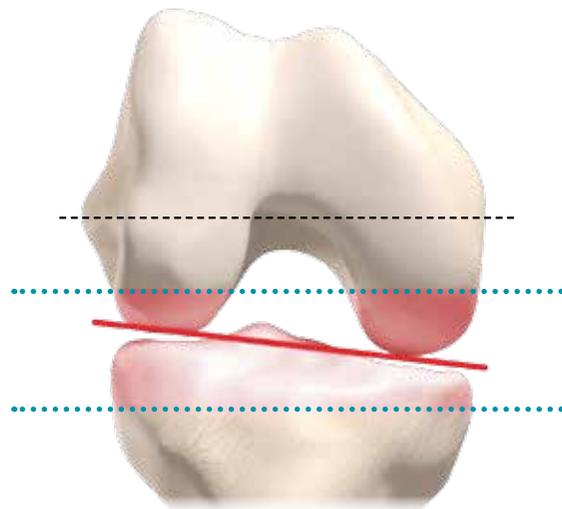


Joint line preservation allows the femur to be positioned with its centre accurately aligned with respect to the knee rotational axis¹³.

Feel **balance**

The challenge

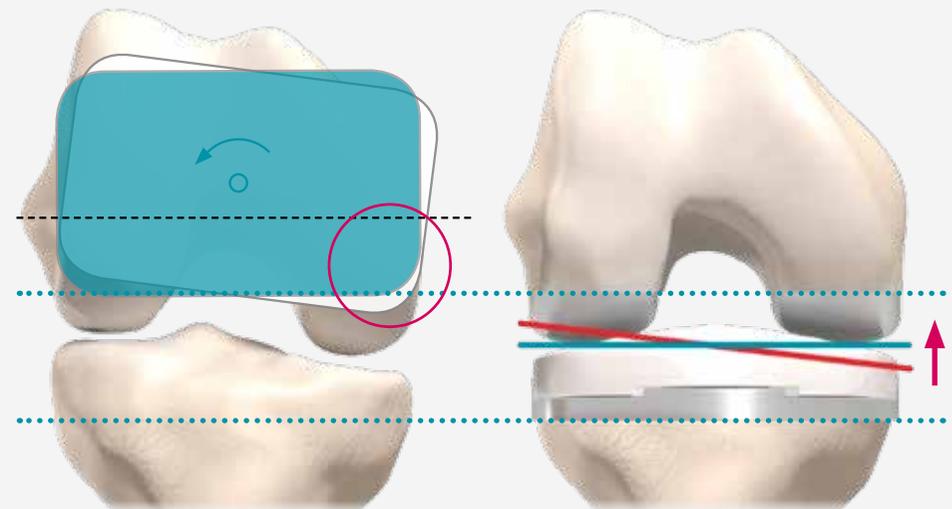
Whilst total knee arthroplasty generally demonstrates good implant longevity, the natural joint line orientation is invariably altered during knee surgery due to unequal medial and lateral condylar resection and replacement with equal thickness medial and lateral implant condylar shapes. This may impact patient satisfaction by influencing ligament function¹⁵.



- Transepicondylar axis
- Natural joint line
- Raised joint line using conventional instruments
- Conventional resection

Traditional instruments rotate around a single central axis which results in elevation of the medial joint line

As joint line orientation is not maintained in total knee surgery, most knee arthroplasty instruments today compromise medial and lateral joint line through range of motion.

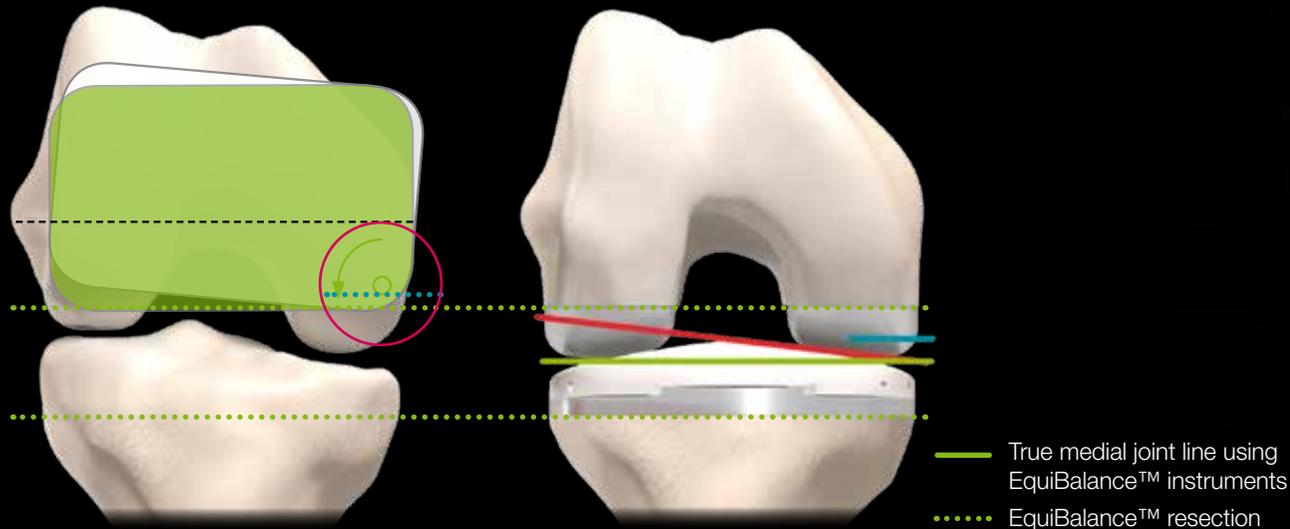


In flexion, conventional instruments provide a central pivoting rotational alignment mechanism which shifts the medial joint line anteriorly and lateral joint line posteriorly resulting in mid-flexion laxity of the MCL followed by tensioning in deep flexion^{13,15}.

Balancing the MCL

Recent studies have demonstrated the importance of medial collateral ligament stability post TKR^{15,16}. The MCL is an isometric ligament susceptible to changes in strain and therefore function with changes in medial joint line position^{13,14,15,17}. With this in mind, Unity utilises advanced kinematic and design principles with the aim to optimise medial joint stability, providing an optimal synergy between implant and instrument designs.

Maintaining the natural joint line with EquiBalance™ instruments



Incorporating EquiBalance™ instrumentation, Unity utilises a medial referencing rotational guide, designed to facilitate medial joint-line preservation throughout range of motion, restoring medial collateral ligament isometry and actively stabilising the medial compartment of the knee.



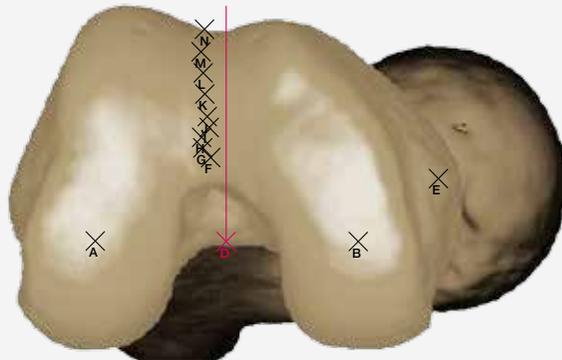
An elegant solution

A balanced patella

Anterior knee pain is a common post-operative complication following total knee replacements, arising from patella imbalance and maltracking post total knee surgery^{7,19}. Recent anatomic studies demonstrate the native patella articulates laterally against the trochlea throughout range of motion^{20,21,22}.

The evidence base

"The natural patella tracks laterally with its most posterior position being 4.2 ± 1.3 mm lateral to the anatomic axis, deviating 1 ± 1.3 mm medio-laterally from this position through range of motion."²⁰



"The translation of the sulcus from the midline in patients requiring TKA was 5 ± 1 mm in a lateral direction ... This study demonstrates that the sulcus of the trochlear groove is not located in the midline as traditionally represented, but is lateral to the midline in both osteoarthritic and normal knees."²²

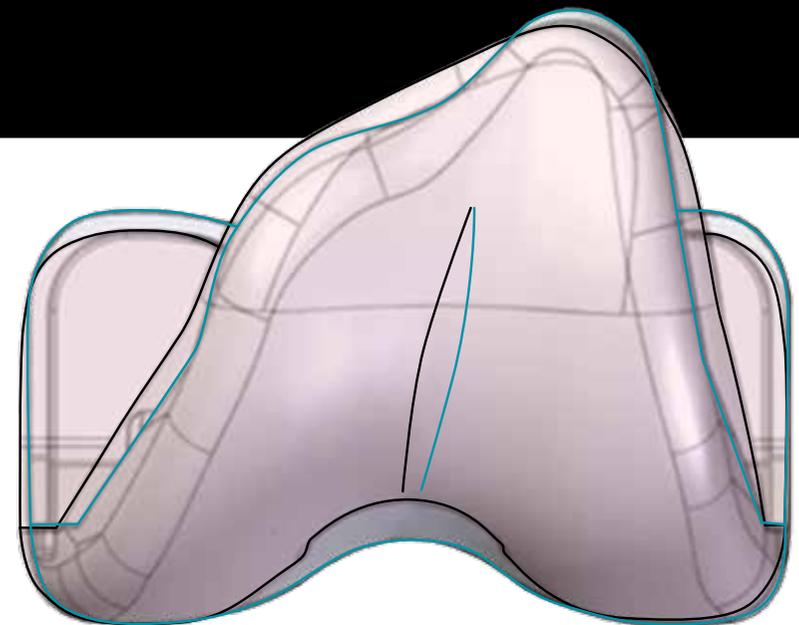


Imagine a patella that tracks naturally

Unlike traditional knee replacements, which track from a medial position in flexion to a lateral position in extension, Unity Knee™ incorporates an anatomic patellofemoral geometry²³. Combined with optimised medial referencing rotation philosophy, this is designed to accommodate lateral patella tracking and balance throughout range of motion, to minimise increased strain on the extensor mechanism. This is particularly relevant in the mid-flexion range where traditional designs tend to medially constrain the patella, resulting in increased forces through the extensor mechanism²³.

Unity provides a lateralised patella articulation compared to traditional knee replacements, designed to accommodate natural patella tracking and balance, to minimise increased strain on the extensor mechanism²³.

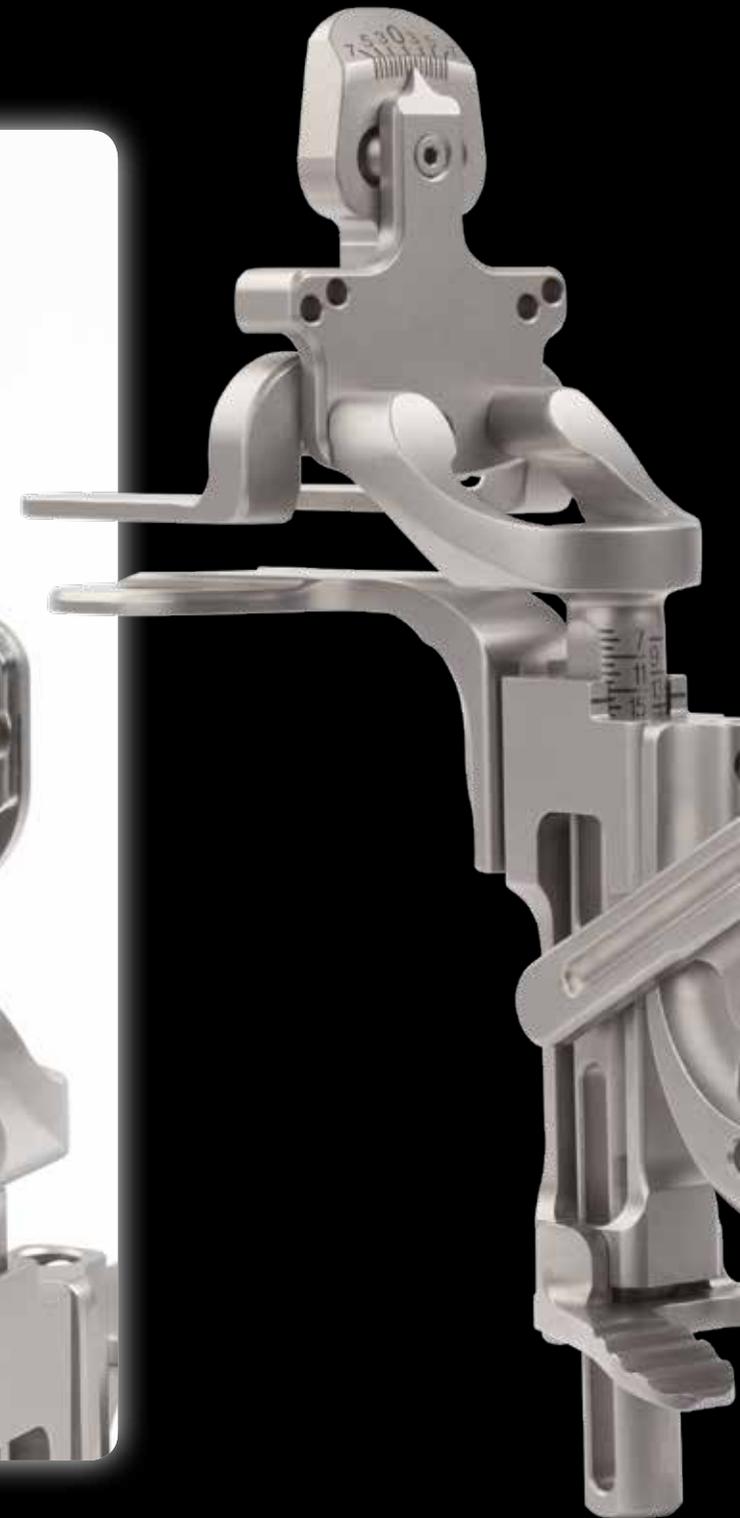
- Unity patella track
- Traditional patella track



Balancing the soft tissue envelope

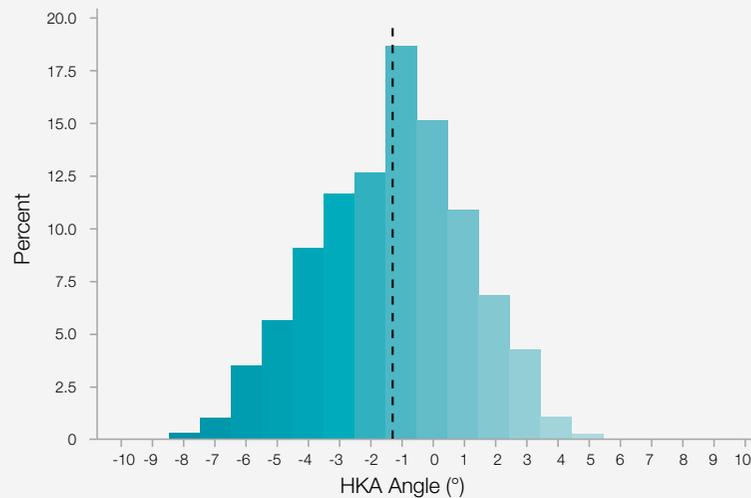
The function of the soft tissue envelope goes beyond structural and mechanical support playing an important proprioceptive role in maintaining knee joint stability and minimising sense of pain post knee arthroplasty²⁴.

To avoid sensory disturbances that occur due to ligament releases during total knee surgery, the Unity implant design, combined with EquiBalance™ instrumentation, is designed to facilitate ligament balancing and MCL isometry throughout range of motion.

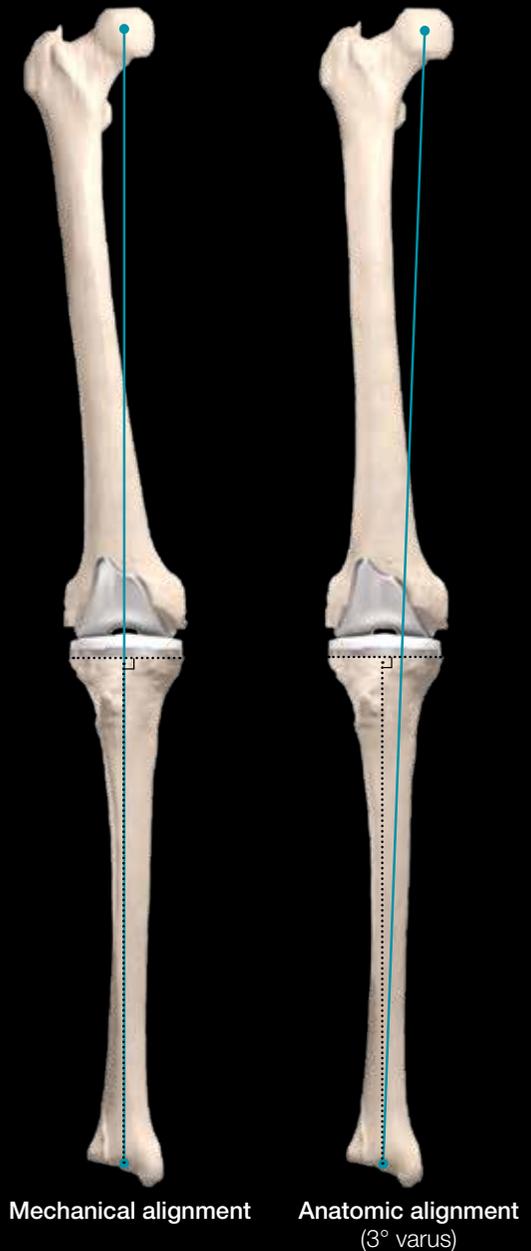


Alignment that feels right

In addition to neutral mechanical alignment, EquiBalance™ offers one of the first comprehensive balancer systems to accommodate anatomic alignment principles, whilst maintaining neutral tibial resection, with the aim to avoid long-term issues noted with varus tibiae^{25,26}. Unity Knee™ is designed to facilitate restoration of natural alignment in patients for whom neutral alignment feels wrong.



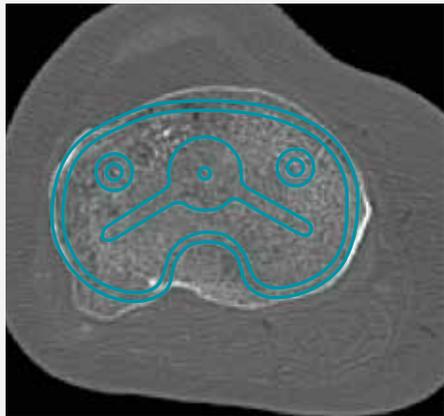
Recent publications on native knee alignment have demonstrated that over 32% of men and 17% of women have a natural alignment of 3° varus or more with their joint-line remaining parallel to the ground^{25,27}. Leaving these patients in mild varus significantly improved their functional and clinical outcomes compared with those patients restored to neutral alignment²⁸. Restoring these patients to neutral mechanical alignment may be unnatural leading to reduced patient satisfaction²⁵.



Mechanical alignment Anatomic alignment (3° varus)

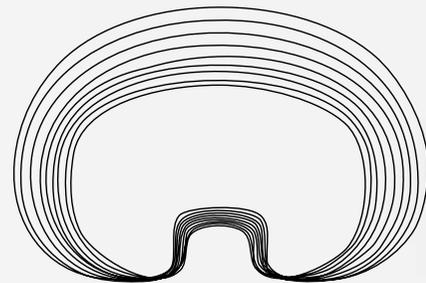
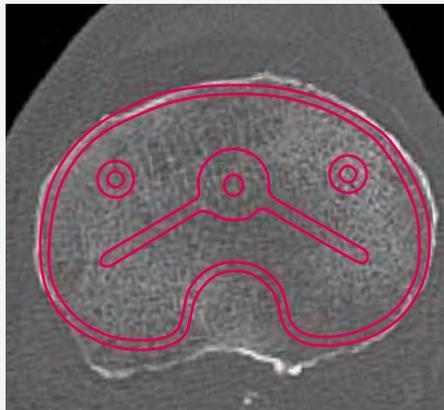
Unity accommodates both mechanical and anatomic alignment philosophies

We didn't just stop there



Size-specific tibial profiles

Utilising advanced design technologies and anthropometric data analysis, Unity incorporates size specific tibial tray geometries with changing cortical profiles²⁹. This results in an enhanced cortical fit, designed to minimise implant overhang and soft tissue irritation post surgery^{29,30}.



Thin anatomic anterior flange

Unlike traditional 'J' curve designs with a thick anterior flange, Unity incorporates a thin, anatomic anterior flange profile designed to minimise the risk of over-stuffing the patellofemoral joint whilst preventing any overhang and soft tissue irritation³¹.



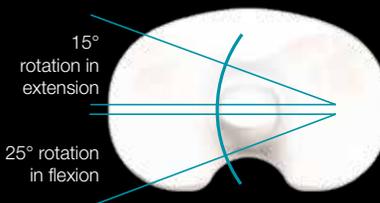
Optimised locking mechanism

A highly polished tibial tray with an advanced locking mechanism facilitates up to 25% reduction in micromotion compared with traditional knee designs³².



Rotational freedom

Modern studies reveal a huge variability in knee kinematics, largely influenced by extent of muscle recruitment and therefore activity and individual studied³³. Unity has been designed utilising rotational freedom principles to accommodate variable knee kinematics with the aim to minimise any conflict with soft tissues through range of motion^{34,35}.



Difficult primary instrumentation

The Unity Knee™ offers the unique ability to stem and augment the primary PS femur and tibia in difficult primary situations. The Unity Knee™ cemented stem extensions are available in 10mm and 14mm diameter and 60mm and 100mm length.



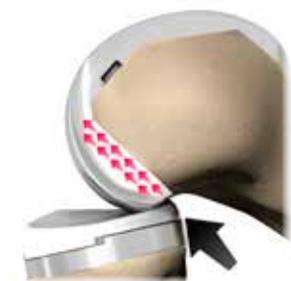
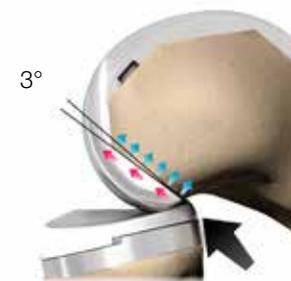
*Augments currently in development

Safe high-flexion principles

In order to allow restoration of patients' natural range of motion, Unity Knee™ incorporates a 3° anterior sloped posterior condylar resection, designed to allow high flexion without additional bone resection³⁶. In contrast, traditional high-flexion knee designs remove 2-4mm additional posterior condylar bone, demonstrating a higher risk of loosening compared to their standard versions³⁷.

Unity Knee™

Traditional high-flex knee



- ← Applied force
- Shear force
- Compressive force

When science becomes reality

Think **isometry**

Learning from the experience of over 40 years of total knee prostheses designs, Unity Knee™ is designed to provide an optimal synergy of modern implant design and EquiBalance™ instrument technology, taking an innovative step forward in addressing today's key concerns in total knee arthroplasty.



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Feel **balance**

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