LCS®
COMPLETE
MOBILE BEARING KNEE SYSTEM

SO MUCH BEHIND IT,
SO FAR AHEAD.

DePuy
a Johnson & Johnson company
The LCS® Total Knee System was key in establishing the fundamental design principles of low contact stress and bearing mobility which are now embraced by the majority of today’s implant manufacturers. It was the first design to combine congruency with mobility in a tri-compartmental knee implant, and it was the first mobile bearing system to undergo multi-centre clinical evaluation before its release. Now, with over 23 years of clinical experience, the LCS® Total Knee System has an unparalleled record of success.

Low contact stress at the patello-femoral and femoro-tibial bearing interfaces has reduced the potential for catastrophic polyethylene damage as a cause of failure. Post-operative self-alignment of the mobile bearings maintains extensive bearing contact and diffuses the torsional and shearing forces that can lead to implant loosening. The incidence of patello-femoral complications, a common cause of re-operation after total knee arthroplasty, is reported in notably few cases throughout extensive clinical follow up. The LCS® utilises a single tibial tray which carries both posterior cruciate retaining and posterior cruciate sacrificing bearing options, simplifying implant selection and allowing intra-operative choice. The proven design of the LCS® has been adopted world-wide and, in LCS® Complete, the system range is extended and the design is refined to take full account of anthropometric differences and size variations. By listening to surgeons and by learning from the unique clinical experience of LCS®, we continue to lead through considered innovation.
We listen, we learn, we lead
Proven. The LCS® femur has remained unaltered for over twenty-three years. Its external shape was developed for optimal congruency with the tibial insert, during the load bearing phase of the gait cycle. Internal geometry of the femoral component is designed to minimise the amount of bone to be resected. It incorporates a 15° distal angle to compensate for femoral bow and the physiological posterior slope of the tibia. This allows flexion and extension gaps to be equalised as the femur is resected. Proven fixation interface options are also retained. LCS® Complete offers textured components for cemented implantation and extensively Porocoated patella, femoral and tibial components for cementless fixation.

Refined. Clinical experience, together with global anthropometric data has led to the development of a wider range of femoral sizes, with a slightly narrower and longer anterior flange. This achieves a closer match with the natural femoral anatomy for more patients. By avoiding overhang, the potential for irritation of the collateral ligaments is reduced. Internal geometry of the LCS® Complete femur features a straight trochlea cut. This makes bone resection more straightforward and increases the fixation surface area. Shallower graft pockets bring the Porocote®-to-bone interface into closer apposition, and refined location pegs facilitate extraction. Medial and lateral impaction slots improve instrument location for accurate implantation.
Shallow graft pockets bring fixation interfaces into closer apposition.

Impaction slots for precise instrument interlock.

Cemented and cementless fixation. Extensive Porocoat® coverage of cementless interface.

Extended range of femoral sizes including medium and extra large.

Refined anterior flange for a closer femoral match for more patients.

Straight trochlea cut makes femoral resection straightforward.

Shallow graft pockets

Revised anterior flange

Shallow graft pockets
Proven. The LCS® Knee was designed to overcome the damaging effects of component wear and loosening. The LCS® Complete has congruent femoral and tibial mobile bearing surfaces which diminish contact stresses within the polyethylene insert and diffuse shear and torsional loosening forces.\textsuperscript{13, 14}

The sagittal and coronal curves of the femur reflect natural condylar geometry. Extensive bearing congruency occurs in extension, at heel strike, and throughout the loaded phase of the gait cycle. It is at this stage, when joint force is at its highest and like the normal knee, the LCS® tibial bearing is fully congruent with the largest radius of the femoral condyle, cushioning the impact of the force. This is an important factor in the life of a tibial bearing since walking accounts for approximately 90% of loaded joint function.\textsuperscript{15}

Posteriorly, the S3 and S4 radii reduce to allow full flexion and minimise constraint in deep flexion.

\begin{itemize}
  \item 100\% Survivorship at 8 to 12 Years\textsuperscript{2}
  \item 94.7\% Survivorship at 11 Years\textsuperscript{4}
  \item 94.6\% Survivorship at 9 Years\textsuperscript{5}
  \item 96\% Survivorship at 4 to 8 Years\textsuperscript{9}
  \item 97.4\% of Knees Rated Good/Excellent at 8 Years\textsuperscript{9}
\end{itemize}
The LCS® Rotating Platform was found to have the largest primary contact areas, generating the lowest contact stresses. At the distal interface, LCS® was also found to have the smallest areas of stresses above 2 MPa.12

Bearing congruency in the coronal plane produces extensive area contact to diffuse damaging contact stresses. Congruent bearing contact is maintained during varus/valgus lift-off and edge contact is avoided.

"The LCS® Rotating Platform was found to have the largest primary contact areas, generating the lowest contact stresses. At the distal interface, LCS® was also found to have the smallest areas of stresses above 2 MPa."12

LCS® bearing contact area maintains stress levels well within the recommended limits of the bearing material.
Proven. The LCS® polyethylene patella bearing surface remains fully congruent at its interface with the single radius S2 curve of the femur, from approximately 15° to 110° where compressive loads are highest. The bearing is free to rotate as it tracks along the deep sulcus groove, and the patella follows a natural serpentine motion in response to the differential pull of the quadriceps muscles. A sulcus groove angle of 130° reflects the anatomy of the normal patella.

- Using a modified 100-point HSS score 94.7% of patients recorded scores of excellent or good (2 to 10 years follow up).17

- Low rate of patello-femoral complications - 94.7% survivorship at 11 years.4

- Less than 1% of patella complications at 10 years.16

- No difference in clinical outcome when the patella is resurfaced or retained.18

- 94.6% good to excellent clinical score (long-term results for 1777 cases, patella non-resurfaced).19

The femoral shape provides a congruent path for the unresurfaced patella. More importantly, in the sagittal plane, the unresurfaced patella articulates with a constant radius of curvature (the S2 radii of the LCS® Complete femur). Remodelling of the patella is facilitated under compression by the constancy of the femoral arc.

The clinical outcome is not compromised with the LCS®, whether you retain or resurface the patella.
Proven patella mobile bearing
Extended anterior flange
Three peg fixation

REDUCING PATELLO-FEMORAL COMPLICATIONS
Proven. Two mobile bearing options are available to the surgeon: the rotating platform (RP) bearing and the anterior-posterior glide (APG) bearing. As its name suggests, the RP option provides rotational bearing movement to diffuse torsional loosening forces. Bearing depth and congruency serve to stabilise the implant when the posterior cruciate ligament (PCL) is sacrificed. If the PCL is retained, an APG bearing and guide arm may be implanted. The APG bearing provides both rotation and translation and, in combination with a physiologic posterior slope on the tibia, allows roll-back to occur as the knee flexes. Post-operatively, the knee can self-align within the capsule to maintain congruent bearing contact. No mechanical stops or pegs are used in the design and the implant is naturally stabilised and constrained by the medial and lateral collateral ligaments. During motion, the bearing glides smoothly along the guide arm, avoiding potentially damaging contact stresses. The choice of RP or APG bearings may be made intra-operatively.

Refined. All LCS® Complete polyethylene bearings are manufactured from GUR 1020 polymer. Gamma foil sterilised, GUR 1020 has a modified, more stable molecular structure with increased crosslinking, increased hydrogen recombination and reduced oxidative chain scission. These changes produce a bearing that has increased resistance to both abrasive and adhesive wear.20, 21 The shape of the bearing is also refined. Each radiused edge of the tibial insert is smoothed and blended to avoid soft tissue irritation.
A reduction in the anterior profile of the APG bearing reduces the potential for impingement of the patello-femoral tendon and increases the range of bearing translation. The tibial bearings are also given refined anterior recesses to avoid patella contact in flexion.

An important refinement in cone bearing shape brings additional stability to the bearing when used with the M.B.T. revision tray, resulting in a seamless transition from primary to revision surgery.
Proven. The highly polished superior surface of the tibial tray is designed to facilitate bearing articulation and minimise polyethylene wear. Its central inner cone is also polished, allowing the polyethylene bearing to rotate freely. Conical geometry provides stability under lateral thrust. Simulator tested to 3 million cycles, the APG cone bearing withstood lateral thrust in excess of that normally experienced by the natural knee, with minimal polyethylene wear.

The outer cone of the tray provides stability at the implant to bone fixation interface.

Refined.

The curved DePuy M.B.T. tray achieves maximum coverage of posterior cortical bone and its smooth posterior notch allows a PCL retaining bone block to be preserved. The choice of sizes optimises prosthetic fit and fixation for each patient. Bearing cone rotation axes are also optimised to make tibial alignment common for primary and revision procedures. External cone geometry increases proportionately between the eight sizes of tray, ensuring a ‘no compromise’ approach to preparation and fit.

In addition to the standard ribbed stem, the LCS® Complete Mobile Bearing Knee System offers the surgeon a cemented and cementless keeled option.

- No incidence of loosening or osteolysis at the 9 to 12 year interval.
- Survivorship relating to mechanical loosening of fixation of any component at 8 year interval was 99%.
- Low incidence of revision at 4-8 year interval.
- No aseptic loosenings at 10 years.
Polished superior surface

Anatomical profile

Optimised bearing axis

Refined posterior notch

M.B.T. Cemented Keel Tray

M.B.T. Porocoat® Keel Tray

STABILITY WITH CHOICE
Proven. The LCS® surgical technique is a key factor in the system's record of outstanding success. Balanced flexion and extension gaps ensure equal collateral tension in all phases of movement, for maximum implant stability. The rectangular flexion gap is associated with an increased range of motion and a reduced rate of intra-operative retinacular release and post-operative tibial pain.24

The tibia is cut at 90 degrees to its long axis in the coronal plane, and a physiologic posterior slope is created in the sagittal plane. After the appropriate soft tissue releases, to assure long leg alignment, an AP cutting block is positioned on the femur. This is rotated relative to the previously cut tibia to ensure a rectangular flexion gap with appropriate ligament tension and external rotation. Following anterior and posterior cuts, a distal femoral cut is made to produce an extension gap matching the flexion gap. A spacer block is used to confirm the dimension and check medial and lateral compartment tension. When the flexion and extension gaps are matched, a single guide is used to finish the remaining femoral cuts. Six instrument trays contain all femoral and tibial sizes.

The Milestone™ Instruments now offer the option of glacier ceramic cutting guides. The zirconia ceramic rails improve cut accuracy and reduce metal debris.
A femoral guide positioner is used to establish the rotation of the AP cutting block and to determine the final polyethylene bearing thickness.

Resect the tibia using the chosen 7 or 10 degree cutting block.

A spacer block is used to ensure that a well tensioned, rectangular flexion gap has been created.

The spacer block can also be used to check long limb alignment, using an extramedullary rod.
References: