Evolution®

MEDIAL-PIVOT KNEE SYSTEM

Kinematic Alignment
DESIGN RATIONALE

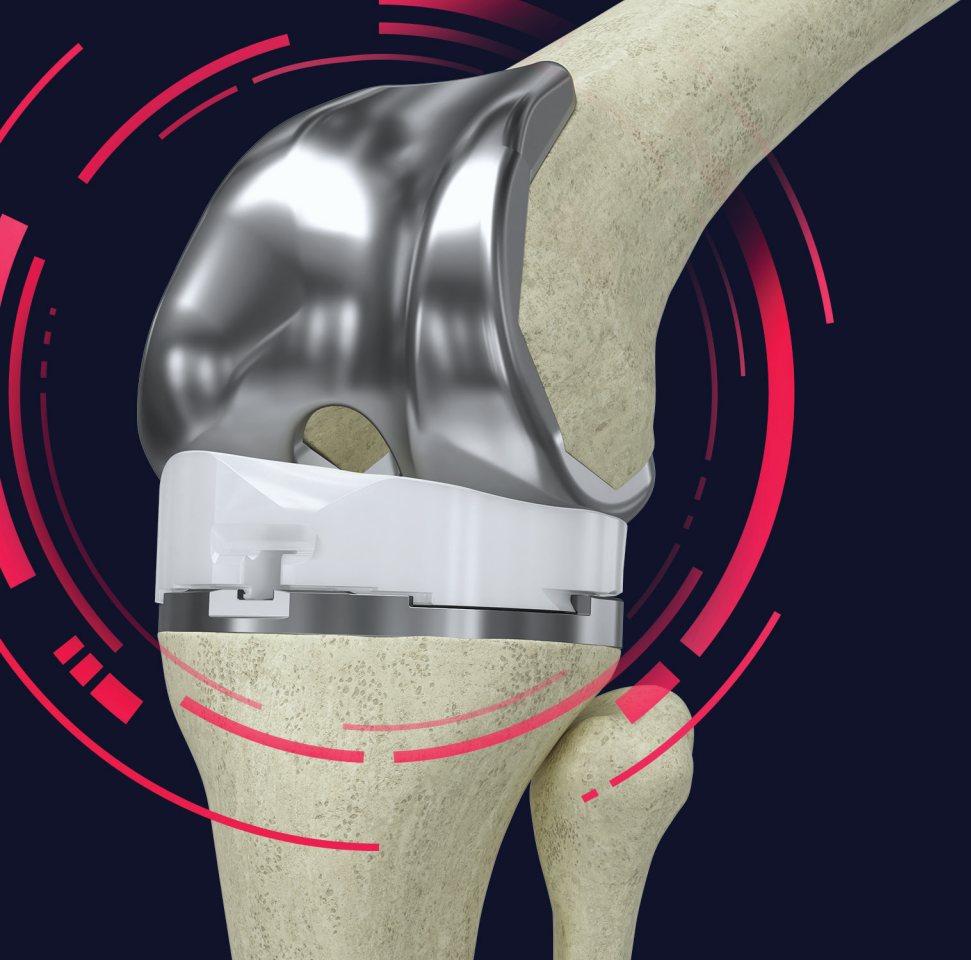
MicroPort

Introduction

Over 20 years ago, the MicroPort Medial-Pivot Knee System created a legacy of focusing on fitting the implant to the patient by using implant design to replicate normal knee kinematic patterns and stability throughout the range of motion increasing patient satisfaction.[1,2] Now MicroPort is combining the Medial-Pivot implant with the Kinematic Alignment (KA) technique to restore a patient's pre-arthritic joint line and continue the legacy of striving for the highest patient satisfaction in total knees through personalizing the total knee replacement procedure to the patient.

The objective of the Kinematic Alignment technique is to duplicate the pre-arthritic native joint line. Unlike mechanical alignment, where the surgeon focuses on making a perpendicular tibial resection, non-anatomic distal and posterior femoral cuts, and ligament releases if needed, Kinematic Alignment prioritizes the femoral cuts to replicate the native joint line. The KA technique compensates for wear on the femur to attain the pre-arthritic joint line and strives for natural ligament tension.

As varus and valgus knees have been shown to have different flexion-extension axes, KA will account for these differences through matching the pre-diseased state of the joint. Kinematic Alignment accounts for this. With the Evolution® Kinematic Alignment technique, the priority is to place the joint line where it was prior to the development of arthritis.



THE BENEFITS OF **MEDIAL-PIVOT** KINEMATICS AND **KINEMATIC ALIGNMENT** COMBINE TO INDIVIDUALIZE KNEE IMPLANTATION FOR EACH PATIENT.[2,3]

Fit to the Patient

Kinematic Alignment allows the surgeon to fit the implant to the patient instead of the patient to the implant through restoration of the patient's pre-diseased anatomic joint line.

Traditional mechanical alignment revolves around the need for a tibial cut perpendicular to the Mechanical Axis. This approach became the gold standard alignment technique to create a reproducible surgical dogma to prevent potential tibial failure through varus or valgus tibial alignment of the implants, which were not designed to perform under those stresses.

As a result of this approach, non-anatomic cuts are necessary on the distal femur to "match" the non-anatomic tibial cut. These compromises result in mechanical alignment fitting only 2.2% of the overall population perfectly based on the pre-diseased state.[4]

58%

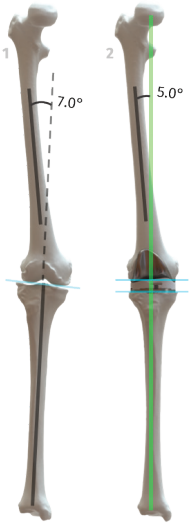
of mechanically aligned knees resulted in a change of limb alignment greater than 2°[5]

Mechanical Alignment Limitations

Different pre-operative conditions, same approach.

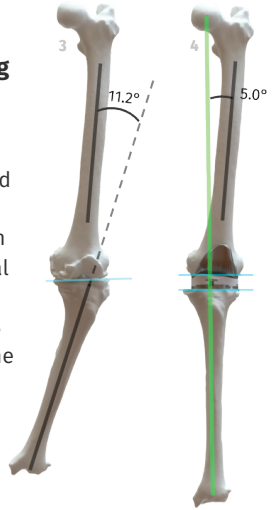
Patient A: Right leg

Pre-operative condition of 7.0 degrees valgus[1] and the resulting post-operative condition by using Mechanical Alignment Approach with cuts perpendicular to the Mechanical Axis[2]



Patient B: Left leg

Pre-operative condition of 11.2 degrees varus[3]and the resulting post-operative condition by using Mechanical Alignment Approach with cuts perpendicular to the Mechanical Axis[4]



- **Fitting the Patient to the Implant:** Using the same dogma for every patient, neutral/perpendicular cut on the tibia, a fixed valgus angle cut on the distal femur, and 3˚ external rotation of the femur, ignores each patient's individual anatomy.
- **Alignment:** 28.6% of patients are outside of the standard 5˚ (+/- 2˚) femoral valgus angle with patients measuring in a range as large as 2˚ to 9.6˚.[6]
- **Balancing:** Neutral tibial cuts are made independent of the femur resulting in ligament releases to accommodate the implant to achieve a balanced knee.

Problem

20% patient dissatisfaction (instability, stiffness, pain, inability to perform at high level)[1,7,8]

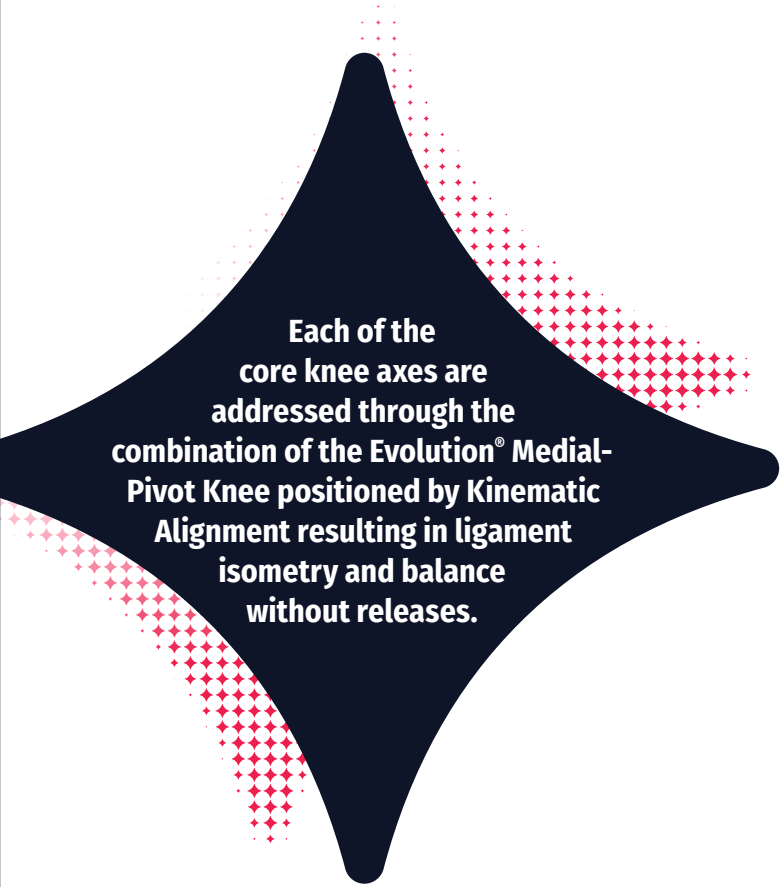
Cause

Non-anatomic knee reconstruction (change in limb alignment, ligament tension, knee kinematics)[1,9]

Solution

An anatomic approach to both the alignment technique and implant design that restores natural knee alignment and kinematics

Following decades of improvement to technique and implant design, **approximately 20% of knee replacement patients continue to remain unsatisfied**[8]



Unique to the patient

Personalize each total knee replacement to each by recreating the patient's normal kinematics. Modern day implant designs and materials have enabled more physiological matching through implant motion and alignment. Kinematic Alignment locates the implant in the patient's physiologic position without disrupting the patient's ligaments.

To properly match the patient's natural physiological state, the knee replacement must match the core 3 axes that dictate normal kinematics:[1,10]

- The rotational axis of which the tibia internally and externally rotates around the femur
- The flexion-extension transverse axis of the femur about which the tibia flexes and extends
- The patella transverse axis of the femur about which the patella flexes and extends

Evolution®

To achieve normal kinematics, implant design must match the native articular surface in the native position.

WE'VE REMOVED THE GUESSWORK AND THE ADDED TECHNOLOGY COSTS BY UTILIZING MECHANICAL INSTRUMENTS AND THE MEASURE TWICE, CUT ONCE METHODOLOGY...

One of the most critical instruments is the Cartilage Thickness Gauge to measure each patient's natural cartilage thickness and the precise amount of cartilage wear intra-operatively. Once the exact cartilage wear is determined, the Distal Femoral Alignment Guide is adjusted on both the medial and lateral side to compensate for the patient's cartilage wear.

Believing that big bones drive little bones and the optimal end result should be accomplished with minimal resections and releases, the MicroPort Kinematic Alignment technique utilizes Gap Spacers, or spoons, to tension the ligaments and set the tibial resection based directly on the femoral resection. Once proper ligament tension is accomplished, a Dual Tibial Stylus is dialed per the medial and lateral Gap Spacers to properly set the tibial resection angle and depth. Combining the ligament tension and the medial and lateral femoral resections results in measuring twice and cutting once.

By placing priority on establishing the pre-arthritic femoral joint line and directly tying the tibial resection to the femoral resection through native ligament tension, little to no bony recuts or ligament releases are required. Restoring the patient's native anatomy becomes simple and straightforward through repeated intra-operative measurement and limited guesswork.

The Kinematic Alignment Approach

Unique instruments designed for reproducibly

Easily measure cartilage wear and reproducibly dial in medial and lateral bone resections.

Optimize ligament tension intra-operatively

Personalized alignment for each patient

The MPO approach allows surgeons to offer patients the combined benefits of KA and Medial-Pivot

The key thing is that this gives the surgeon control over medial resection, lateral resection on the femur. You know the angle—you can change the angle if you need. It gives you control over medial resection, lateral resection, and angle on the tibia. You're a very informed surgeon. You can measure the cartilage wear. You can measure gaps. Any number you need to know, these instruments can help tell you.

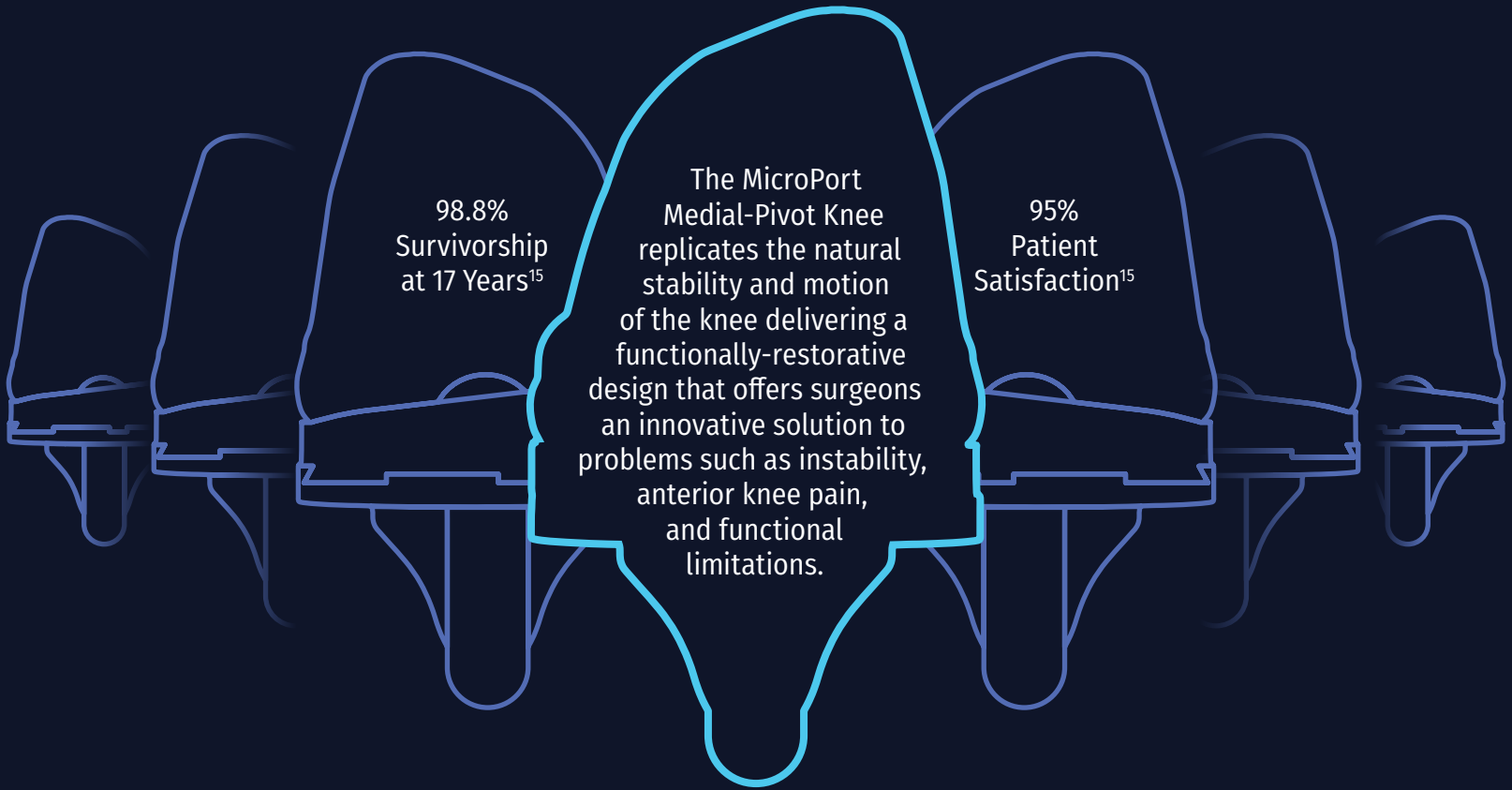
Dr. Robert Steensen

5 Clinical Reasons to Combine Evolution® and Kinematic Alignment

1. Kinematic Alignment total knees restore function without increased risk for failure of components[9]
2. By restoring normal anatomic ligament balance, satisfaction rates significantly jump to 92.4%[11]
3. No difference in complication rate between kinematic and mechanical alignment total knees[12]
4. KA has shown better outcomes than MA in standard and combined Knee Society Scores, WOMAC scores, and knee flexion at short-term follow-up[13]
5. Treatment of patients with Kinematic Alignment did not adversely affect the 10-year implant survival, yearly revision rate, and level of function[14]

I've been in practice for 30 years and I think I do my best knees now because I'm combining Medial-Pivot and Kinematic Alignment. While we've made other advances in anesthesia techniques and rehab techniques, I still feel there's an element for improvement from the implant that I use and the alignment technique that we're using. I have patients coming in, who I think are doing better, faster, because it's more natural to put the knee in where the joint line was originally before they had arthritis.

Dr. Robert Steensen


98.8%
Survivorship
at 17 Years[15]
The MicroPort
Medial-Pivot Knee
replicates the natural
stability and motion
of the knee delivering a
functionally-restorative
design that offers surgeons
an innovative solution to
problems such as instability,
anterior knee pain,
and functional
limitations.
95%
Patient
Satisfaction[15]

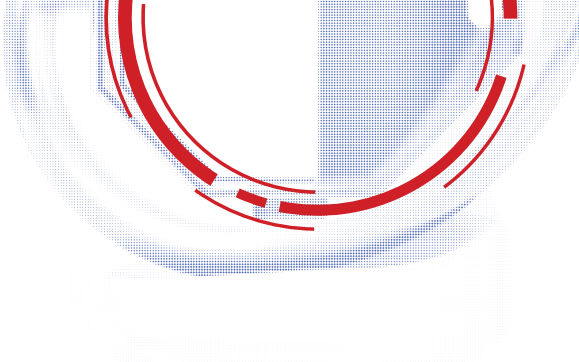
Stability Without Compromise

Innovative knee design with a single radius in sagittal and coronal planes within each femoral condyles forming a true ball and socket, medial-pivot design.

Faster Functional Recovery[16,17]

Increased flexion and enhanced quadriceps efficiency is achieved through longer constant flexion radius with a more posterior, and medial dwell point.

Patients who underwent total knee arthroplasty (TKA) with the medial-pivot knee scored significantly better on the Forgotten Joint Score (FJS) than those who underwent a TKA with a modern posterior stabilized (PS) knee, particularly with regard to deep knee flexion and stability of the prosthesis.[18]



Restoring Natural Motion

Constant radius from 0° to 100° provides patients the stability throughout the full range of motion, leading to a better experience like going up and down stairs.

The Evolution® Medial-Pivot insert substitutes for the ACL, PCL, and medial and lateral meniscus which replicates the natural stability and motion of the knee, helping to delivering consistent patient outcomes.

Notes

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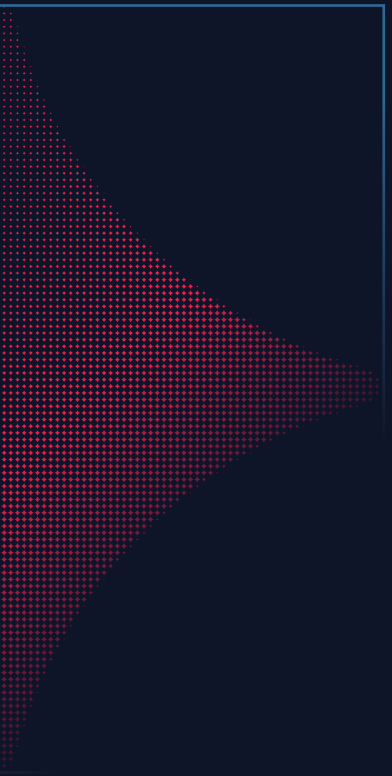

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