

Medial Pivot Knee and the Quest for Natural Movement in KNEE REPLACEMENT

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Knee arthritis rarely begins with sudden, sharp pain. More often, it starts quietly, with morning stiffness, a mild ache while climbing stairs, or a growing reluctance to sit cross-legged or squat. Over time, people may begin to plan their day around their knee, avoiding long walks, skipping family gatherings that involve sitting on the floor, or holding onto railings more tightly. When knee replacement is eventually recommended, the question is increasingly not just whether the pain will go away, but whether the knee will feel *natural again.*

According to **Dr. Santosh Kumar, Robotic Joint Replacement & Orthopaedic Surgeon Momentum Orthocare, Kolkata** this change in patient expectations is becoming increasingly evident in clinical practice.

"Patients today are well informed and want a knee that functions predictably during everyday activities, whether walking, climbing stairs, rising from a low seat, or even squatting," he says.

Dr. Kumar explains that understanding how a healthy knee moves can help put these expectations into perspective. "During everyday movement, the inner side of the knee provides a stable pivot, while the outer side moves in a controlled manner. This balance between stability and mobility is important for everyday movement and has influenced the development of knee designs intended to provide a more natural-feeling experience after replacement," he explains.

While conventional knee replacement can provide substantial pain relief and improve function, Dr. Kumar notes that some patients may continue to experience a sense of stiffness or a mechanical feeling in certain positions. "Even after the deformity has been corrected, some patients may feel less confident during activities such as climbing stairs, rising from low seats, or making twisting movements," he says.

These considerations have contributed to growing interest in **Medial Pivot Knee (MPK)-based implant designs** worldwide, including in India. According to Dr. Kumar, these designs are based on the principle of providing a more stable medial side while allowing controlled movement laterally, with the aim of reproducing aspects of natural knee kinematics.

> Knee replacement is no longer just about pain relief. According to Dr. Santosh Kumar, patients today want a knee that feels natural and functions predictably during everyday activities such as walking, climbing stairs, rising from low seats, and squatting, reflecting a major shift in what patients expect from surgery.

"Medial Pivot Knee designs are intended to replicate some of the movement characteristics of the healthy knee," says Dr. Kumar. "The objective is to provide a balance of stability and mobility that can support everyday activities." Clinical studies evaluating medial pivot designs have reported favorable patient-reported outcomes and functional results, although outcomes can vary depending on the implant design, surgical technique, patient characteristics and rehabilitation.

The relevance of such movement-focused approaches may be particularly important in the Indian context, where daily activities can place considerable demands on the knee. Sitting on the floor or on low seats, deep knee bending during prayer, cooking or cleaning, and repeatedly squatting and rising are common activities for many people.



"Every patient's lifestyle and functional requirements are different," Dr. Kumar points out. "A knee replacement should therefore be considered not only in terms of pain relief, but also in the context of the patient's expectations, activity levels and individual anatomy." He adds that Medial Pivot principles may offer one approach to addressing the functional demands associated with activities requiring stability and controlled movement, although no single implant design is appropriate for every patient.

Another important consideration for patients is how their knee replacement will perform over the long term. Modern knee replacement strategies increasingly focus on implant durability, wear characteristics and material selection alongside movement and function.

Dr. Kumar explains that advances in materials have contributed to this evolution. **Vitamin E–stabilized polyethylene**, for example, may help address polyethylene wear over time. Similarly, **titanium niobium nitride (TiNbN) coatings** can provide a hard, wear-resistant and biocompatible surface and may be considered in selected patients, including those where metal sensitivity is a consideration. "These technologies are not necessarily suitable for every patient, but they demonstrate how knee replacement has evolved toward greater attention to material properties, implant performance and individual patient needs," he says.

> Medial Pivot Knee implants aim to replicate healthy knee movement by providing a stable inner side with controlled motion on the outer side. Dr. Kumar says this balance may suit Indian lifestyles involving floor sitting and deep bending, though the right implant should always be individualized to each patient.

According to Dr. Kumar, knee replacement has evolved considerably over the past two decades. The focus is no longer limited to removing damaged joint surfaces and replacing them with artificial components. Greater attention is now being given to alignment, kinematics, implant design, materials, stability and the patient's functional requirements.

"The conversation today is increasingly about what patients want their knee to do after surgery," Dr. Kumar says. "For many patients, the goal is not simply to be free from pain. They want a knee that feels steady, familiar and reliable during the activities that matter to them every day."

Ultimately, the choice of knee replacement design should be individualized. Factors such as the patient's anatomy, activity level, ligament balance, bone quality, expectations, and the surgeon's experience all play an important role in determining the most appropriate approach.