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Commentary

Posterior Tibial Slope Importance in Total Knee Arthroplasty

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DESCRIPTION

The surgical procedure most frequently used to treat severe knee pain is total knee replacement. Each surgical procedure is distinct because the qualitative and quantitative extent of each patient's knee joint damage varies. During surgical planning and while determining the variables to be taken into account during joint replacement, factors like the knee condition before surgery play a key role. The tibial slope of the knee is one such element.

The most successful and effective treatment for knee osteoarthritis is Total Knee Arthroplasty (TKA), which has a high success rate across a variety of implant types. TKA helps an arthritic knee regain some of its mobility while reducing knee pain. TKA's primary objectives are to lessen knee joint pain and preserve range of motion so that patients can continue with their everyday activities. With the development of current technologies, the effectiveness of TKA is now measured by the knee's increased range of motion and kinematic scores. Poor post-TKA outcomes due to premature implant failure and revision surgeries. More than 20% of TKA failures, according to studies, are caused by malposition and malalignment, which can be avoided with careful surgical technique. It has been determined that changes in contact kinematics are the primary cause of wear in TKA, necessitating revision surgery. Furthermore, a crucial mode of failure initiation is the loosening of components, which frequently begins at the tibial surface.

In patients undergoing TKA, the posterior inclination of the tibial plateau is known as the posterior tibial slope, or PTS. It affects the flexion angle of the knee by affecting the kinematics of the knee and the postoperative stability of Cruciate-Retaining (CR) and Posterior-Stabilized (PS) knees in both the sagittal and coronal planes. The PTS on the tibial surface caused by the tibia's resection during TKA has been regarded as a significant factor affecting the knee's kinematics after TKA. The PTS was established by the American Knee Society to assess the tibial component sagittal alignment, reflecting its significance. There is an understanding of an ideal tibial slope to be taken into consideration prior to TKA because excessive tibial slope may cause loosening of the posterior cruciate ligaments. Without this knowledge, the range of motion may be restricted, resulting in stiffness in the knee. 3° to 9° is the optimal tibial slope. However, depending on the patient's needs, age group, and ethnicity, the tibial slope may differ in intensity.

The bilateral collateral ligaments, the anterior and posterior cruciate ligaments, and other soft tissues of the knee help to maintain the correct dynamic equilibrium of the knee. Following TKA, the typical knee kinematic patterns alter, resulting in a new dynamic knee balance. Gap balancing is regarded as another crucial factor in TKA. This can be accomplished by maintaining equal gap lengths during flexion-extension and balancing the soft tissues to produce a rectangular gap tension between the medial and lateral sides. Rarely do narrow flexion gaps result from cruciate retaining TKA, which limits the range of motion in the knee because of the posterior cruciate ligament's tightness. On the other hand, in the Posterior Stabilized (PS) type of TKA, the removal of the posterior cruciate ligament results in an increase in flexion gap of 7–10 m, aiding in the maintenance of the equilibrium between flexion and extension gaps. A smaller posterior tibial slope is thought to significantly help with flexion gap maintenance, particularly with PS type TKA. The favorable impact of PTS in TKA on postoperative knee flexion angles is widely believed by surgeons. Several experimental studies suggest that PTS assists in improving knee flexion prior to the formation of tibiofemoral impingement and results in decreased posterior cruciate ligament loading during flexion. Few surgeons, however, favor a PTS at 0° or 3°, which is steeper than the normal slope of an undamaged knee.

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