Minimally Invasive Total Knee Replacement

Pacharapol Udomkiat, M.D.

Department of Orthopaedics Surgery and Rehabilitation, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

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Total knee replacement (TKR) has been a very successful modality in the treatment of end-stage arthritis of the knee. Long-term results for pain relief and functional improvement have been excellent.[1-4] The procedure, however, traditionally requires an extensile approach. The medial parapatellar arthrotomy is the most common method used to expose the knee. Other exposures include the subvastus, midvastus, and lateral arthrotomy. All these exposures involve patella eversion and generally are done through large incisions of approximately 20 to 25 cm. Although the long-term results of knee arthroplasty have proven to be excellent, the rehabilitation period often is long and painful.

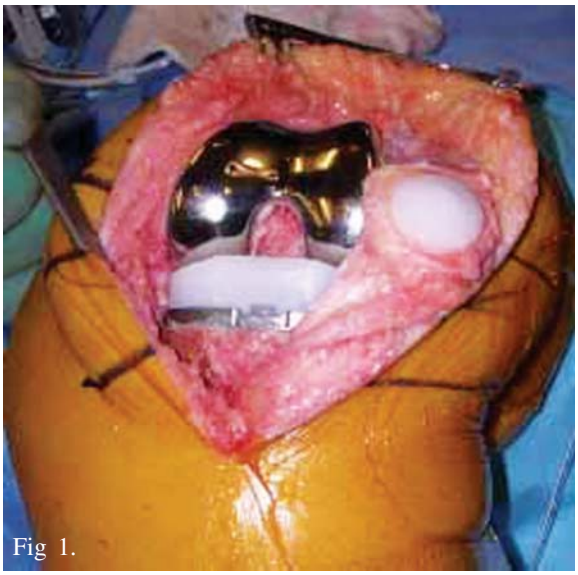
Reports of unicompartmental knee arthroplasty through a smaller arthrotomy without patella eversion have shown considerably more rapid recovery and return to function.[5-6] Similar results have been reported for total hip arthroplasty done through less invasive approaches.[7-8]

With these results in mind, a minimally invasive total knee replacement (MIS-TKR) technique done through a smaller incision was developed. This technique is facilitated with the use of smaller instrumentation and cutting guides. Many techniques were currently reported including the mini-medial parapatellar, mini-midvastus, mini-subvastus, and quadriceps sparing approach (Fig 1&2).

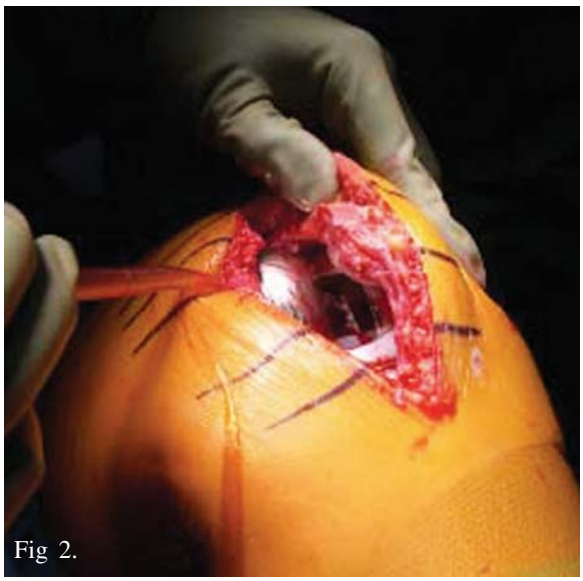
Theoretically, the use of smaller instruments leads to less dissection and avoids excessive retraction, which could lead to wound problems. The use of these instruments should also contribute to the low complication rate and accurate alignment.

In recently published articles, the outcomes of doing TKR through a mini-incision were reported.[9-10] When compared with a comparison cohort of patients in whom a standard medial parapatellar incision with patellar eversion was used, there was less need for pain medication, a more rapid return of flexion, and a more rapid return of the ability to perform functional activities in the patients who had MIS.

However, doing the surgery through a smaller incision requires repositioning the knee in varying degrees of extension and flexion and this is made difficult if the patient has a marked limitation of flexion (less than 80^0) or a marked block to extension (flexion contracture greater than 20^0). Likewise, previous open surgery on the knee with its attendant intra-articular scarring would make exposure difficult. These patients should be excluded. Patients should not be excluded, however, because of weight, height, BMI, or the presence or absence of coronal deformity. Also, it was thought that for patients in whom there was marked skin friability (as from steroid use in rheumatoid arthritis) there might be a higher risk for skin healing problems.


Fig 1.

Marked fixed varus deformities did not compromise the outcome using the mini incision. In patients with a


Fig 2.

severe preoperative fixed varus deformity of 30^0 or more, the skin incision could be extended 2 cm distally to facilitate the subperiosteal medial flap release. For all other patients with a fixed varus deformity the standard medial release could be done easily. There was no difference in knee scores or radiographic appearance of the components in these patients compared with patients in whom there was not a fixed varus deformity.

This was not the case, however, with fixed valgus deformities. The iliotibial band and posterolateral corner of the knee could be released through the mini incision. There was marked difficulty, however in exposing and releasing a lateral epicondylar sleeve.

There is an erroneous concept that minimally invasive knee replacement is related primarily to the length of the skin incision. In fact, the deep dissection should also be done as minimally as possible. However, the essential goal is to limit the surgical trauma only to what is need for a safe exposure. The absolute length of the skin incision is unimportant. In any circumstance, the incision should be extended if there is any indication of undue tension on its ends or there is not enough space to perform a safe operation.

In the patient perspective, they should understand that outcome and long-term performance are the most important issues, and that patients must evaluate how much a quick recovery is worth if there is a risk of possibility of early failure or persistent pain.

The major causes of prosthesis failure are implant or limb malposition, knee imbalance, polyethylene (PE) failure, and infection. In most studies, the implants were not malpositioned and there was no residual coronal or saggital imbalance in minimally invasive TKR performed by experience surgeons.[11-12] Therefore, there is no reason based on these results to suggest that these arthroplasties done using a more limited approach will not have the longevity seen by other knee replacements done using a more traditional incision.

In summary, the minimally invasive approach without patella eversion combined with a small incision was associated with a more rapid functional recovery and improved range of motion in total knee replacement without compromising implant positioning.

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