Case Report

# Navigation-Assisted Minimal Invasive Total Knee Arthroplasty in Patients With Extra-Articular Femoral Deformity

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**Abstract:** In the presence of extra-articular femoral deformity, total knee arthroplasty (TKA) is difficult to perform because of altered anatomical axis and distorted landmarks. Although minimal invasive surgery (MIS) has known advantage of earlier rehabilitation, MIS with this deformity may have higher incidence of component malposition due to inadequate exposure. Navigation has been shown to increase the accuracy of alignment and may compensate possible complication of MIS. We report 4 cases with extra-articular femoral deformity that underwent MIS-TKA using an image-free navigation system in which preoperatively planned mechanical alignment was surgically achieved with proper positioning of the implants as well as soft tissue balance. Navigation-assisted MIS-TKA may become a valuable mean especially for a patient with a deformed femur in which conventional instruments are difficult to use correctly. **Keywords:** navigation, minimal invasive surgery, total knee arthroplasty, extra-articular deformity, femur.


In the presence of extra-articular deformity, total knee arthroplasty (TKA) is difficult to perform [1] because of altered anatomical axis and landmarks [2-4]. Additional challenges arise due to deformity, as conventional alignment guides have to recreate the mechanical axis using the distorted anatomical axis and the use of intramedullary or extramedullary referencing may not be feasible [1,5,6]. Total knee arthroplasty using a navigation system is associated with greater accuracy of component position, higher frequency of normal limb alignment, and fewer radiographic outliers [7], and it also has been reported to be effective in patients with extra-articular deformity [1,3,4,6]. Although minimally invasive surgery (MIS) in TKA offers potential advantages like decreased pain, faster recovery, and improved function [7-10], improper component orientation and limb alignment as a result of inadequate surgical exposure has been reported [10,11]. Thus, improper component orientation and limb alignment as a result of inadequate surgical exposure [10,11] can be a potential problem in MIS-TKA in the presence of an extra-articular femoral deformity also. Hence, use of a navigation system with MIS-TKA may provide proper limb alignment and component position [12,13]. We report 4 cases of navigation-assisted MIS-TKA in presence of extra-articular femoral deformity in which preoperatively planned mechanical alignment was achieved surgically with proper positioning of the implants.

## Methods

Four consecutive MIS-TKAs on 3 men and 1 woman with an average age of 64.5 years (range, 60-68 years) were performed by a single surgeon (KIK) for arthritis of the knee with an extra-articular femoral deformity due to old malunited fractures of femur. The average height of the patients was 161.4 cm (range, 151-170 cm), and the average weight was 68.3 kg (range, 58-76 kg). The average body mass index was 26.4 (range, 21.3-31.8). In all cases, the severe extra-articular deformity leading to malalignment precluded the use of conventional alignment guides. Hence, the prosthesis was implanted with the aid of image-free Brain-Lab navigation system (Vector Vision, Brain Lab, Munich, Germany).

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The knee joint was entered through an MIS, mini-midvastus approach in all cases. Skin was incised medially with average 10-cm length. The patella was displaced laterally but not everted. The knee was flexed and extended as necessary to move the surgical window to allow proximal or distal exposure during the surgery. The navigation system was used to assist the surgeon in making accurate bone cuts, orienting the implants, aligning the mechanical axis, and assessing the soft tissue balancing. Once satisfactory results were achieved, the final components were cemented in place. A lateral retinacular release was performed in 2 cases, only the lateral retinaculum was a problem to begin with, and the problem remained after implantation as

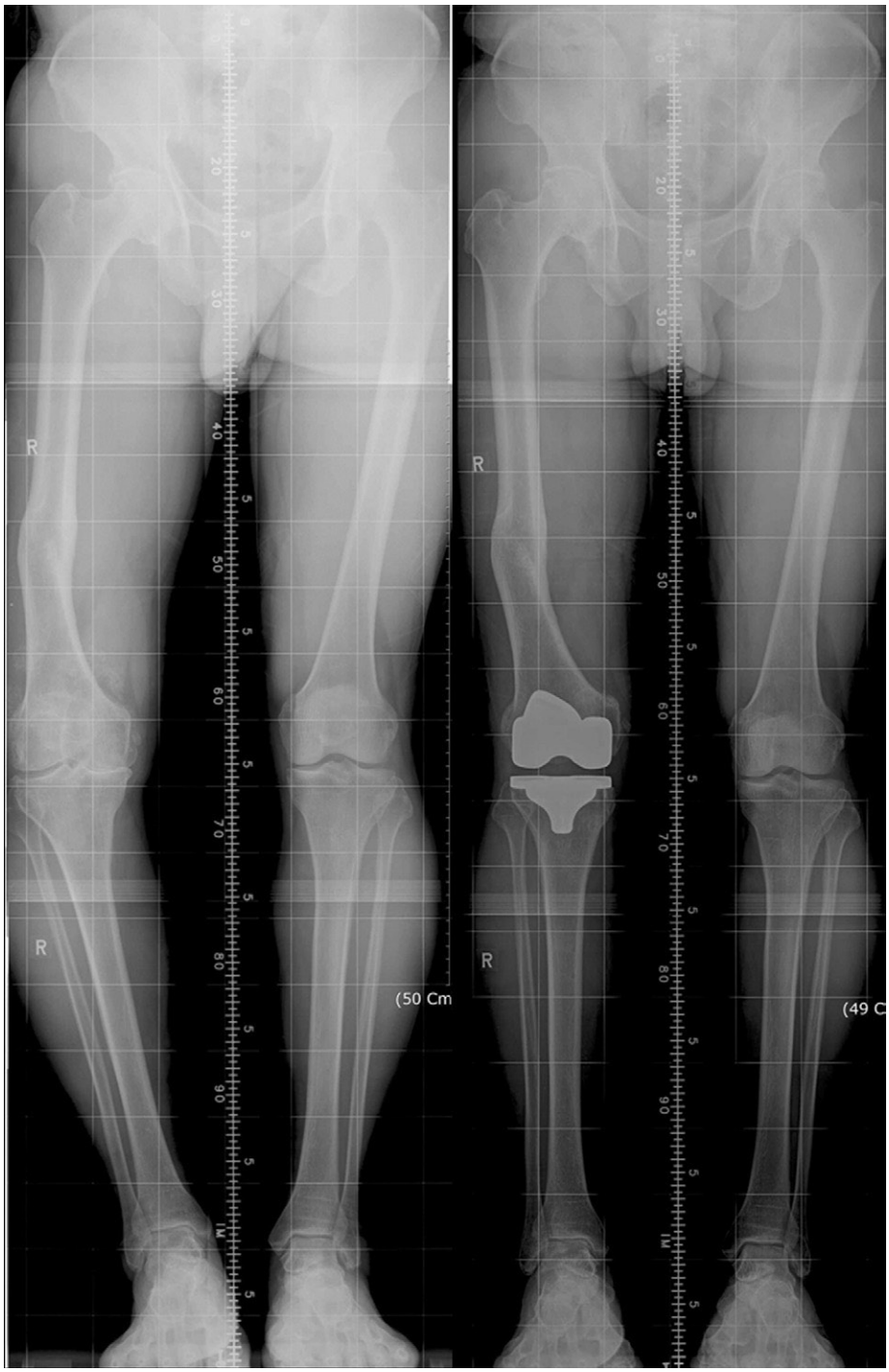


**Fig. 1.** A 60-year-old male patient with extra-articular femoral deformity secondary to malunited femur shaft fracture. Preoperative long leg radiograph (left) showed tricompartmental arthritis with a triplanar deformity precluding the use of an intramedullary alignment rod of a conventional TKA system. There was −20.6° varus mechanical alignment. After the TKA (right), the mechanical alignment is restored to 0.7° varus.