

In vivo kinematic comparison before and after open wedge high tibial osteotomy

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INTRODUCTION: Open wedge high tibial osteotomy (OWHTO) is an established surgical procedure for knee osteoarthritis (OA) with varus alignment. Pre/postoperative evaluations primarily focus on two-dimensional static evaluations such as lower long leg anteroposterior X-ray. The purpose of this study is to compare the three dimensional in vivo knee kinematics before and after OWHTO.

METHODS: We analyzed 3 knees (3 patients, 1 female and 2 male) who underwent successful OWHTO. They provided informed consent for participation in this study. Mean age at the time of surgery were 74.0 ± 2.3 years. Each patient was asked to perform squatting. To estimate the in vivo knee kinematics, a 2D/3D registration technique was used (Fig 1). The technique uses 3D bone models to reproduce the spatial position of the femur and tibia from single view fluoroscopic images. 3D bone models were created from pre/postoperative computed tomography, respectively. We evaluated the knee flexion angle, varus/valgus angle femoral external rotation angle relative to the tibia.

RESULTS SECTION: The preoperative flexion angle was $6.8^\circ \pm 1.8^\circ/104.9^\circ \pm 24.7^\circ$, while the postoperative angle was $4.8^\circ \pm 0.5^\circ/118.1^\circ \pm 3.3^\circ$ (Fig 2 and 3). The valgus angle was $-16.9^\circ \pm 10.2^\circ/-4.3^\circ \pm 7.5^\circ$ preoperatively and $-12.4^\circ \pm 6.1^\circ/0.2^\circ \pm 7.9^\circ$ postoperatively. The external rotation angle was $-8.7^\circ \pm 8.5^\circ/10.8^\circ \pm 7.2^\circ$ preoperatively and $-8.6^\circ \pm 5.6^\circ/3.8^\circ \pm 5.9^\circ$ postoperatively.

DISCUSSION: The postoperative flexion angle improved in both extension and maximum flexion. The postoperative valgus angle became larger in parallel with the preoperative valgus angle by the amount of the corrected angle. The pattern of external rotation varied before and after OWHTO. These suggest that OWHTO produced unpredictable kinematic changes in two-dimensional analysis.

SIGNIFICANCE/CLINICAL RELEVANCE: (1-2 sentences): In vivo three dimensional analysis suggests that OWHTO produced unpredictable kinematic changes in two-dimensional analysis.

IMAGES AND TABLES:

Figure 1. 2D/3D registration technique using single plane fluoroscopy.

2D/3D registration technique

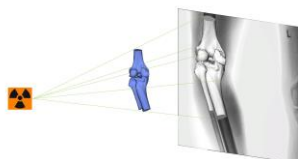


Figure 2. In vivo 3D kinematics before OWHTO



Figure 3. In vivo 3D kinematics after OWHTO

