



Relation of Posterior Tibial Slope Changes To Functional Outcome In Medial Open Wedge High Tibial Osteotomy With Orthofix

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Abstract

Background: Hto (High tibial osteotomy) is a well-accepted and successful surgery for the management of Varus deformity in early osteoarthritis of knee in young patients. There are number of evidence in literature about changes in posterior tibial slope in medial opening wedge high tibial osteotomy (MOWHTO), but data is lacking about relation of this change in PTS to functional outcome. Present study was conducted to find the postoperative modification of posterior tibial slope (PTS) following MOWHTO and relation of this change to clinical outcome at long term follow up.

Material And Methods: This is a retrospective observational study among patients with early Varus OA knee, who underwent MOWHTO in our institute in last 3 years. Orthofix was the method of fixation in these patients. The pre- and post-operative assessment of the PTS was performed using posterior tibial cortex (PTC), and clinical outcome was assessed using Oxford knee score and Lysholm score after at least minimum 2 years following surgery.

Results: There were a total of twenty-five knees from 15 patients, with mean age of 47.2±4.5years and F:M of 2.3: The pre-operative PTS was 13.25 and post-operative PTS was 12.03. The change of PTS was statistically significant (p<0.05) and there was significant difference in clinical outcome i.e., Oxford knee score and Lysholm score (p<0.05). Change in PTS was not significantly related to change in functional outcome.

Conclusion: Functional outcome improves following MOWHTO but this change in outcome is not related to change in PTS

Keywords: PTS, HTO, MOWHTO, Early Varus arthritis, OA

Introduction

HTO (High tibial osteotomy) is a widely accepted procedure for management of uni-compartmental Varus deformity in early OA of knee in young patients. HTO shifts the mechanical axis to realign weight bearing on healthier side of joint. This reduces pain, improve function, and may slow down the s progression of the knee towards advanced osteoarthritis [1,2]. Thus, it delays the need of arthroplasty in early age.

Despite its value in the management of early Osteoarthritis of knee, High tibial osteotomy is a significant cause for the modification of tibial slope, which may cause early failure or technical problems during total knee arthroplasty later in life [3,4]. Increased tibial slope has also been associated with anterior cruciate ligament (ACL) insufficiency in many studies [5,6].

Opening-wedge HTO has recently gained a lot of attention since it has several advantages over closing-wedge HTO, such as not violating the proximal tibiofibular joint, avoiding changes in the length of

the fibular collateral ligament, and allowing for accurate intraoperative correction. However, compared to closing-wedge HTO, it has been observed to enhance the posterior tibial slope (PTS) more [7].

Numerous studies measuring the change in PTS following opening- and closing-wedge HTO have been conducted. While some studies have found that opening-wedge HTO causes a higher shift in PTS, others have found no difference between opening- and closing-wedge HTO [8].

Present study was conducted retrospectively to find the postoperative modification of posterior tibial slope (PTS) following MOWHTO and its relation to clinical outcome at a tertiary care centre with at least two years follow-up post-surgery.

Material And Methods:

The study included patients who were operated for grade 2 Varus OA knee and underwent MOWHTO using ortho-fix fixator. The criteria for patients included in the study was grade 2 Varus, uni-compartment OA, age less than 60 years, Varus less than 20 degree, flexion more than 100 degree and fixed flexion deformity less than 10 degree. Patients with other mode of fixation previous intraarticular fractures of knee and associated ligament injury and procedure were excluded.

The clinical and demographic characteristics of the patients were obtained from medical records. The radiographic assessment of the PTS was performed on lateral X-ray images of the knee before the surgery and at the last follow-up (2years), using posterior tibial cortex (PTC). Clinical outcome was measured using Oxford knee score and Lysholm score at end of 2yrs.

Data Analysis:

Data was entered in Microsoft excel and statistical analyses were done using the SPSS for Windows, version 20. Descriptive continuous variables were expressed as mean and standard deviation (SD) and categorical variables as frequency and percent. Paired t-test was used to compare mean change in outcome variables (PTC, OKS and Lysholm score) before and after HTO. P value of less than 0.05 was regarded statistically significant.

Results

There was a total of 25 knees from 15 patients, with mean age of 47.04 ± 4.5 years and F:M of 2.3:1. Present study had knee deformity of these 25 symptomatic radiologically proven cases medial unicompartmental osteoarthritis ranged from 7 degree Varus to 20 degree Varus. Average preoperative flexion was 110 degree and there were no patient with fixed flexion deformity. 2 (8%) patients had pin track infections which were managed by dressing and oral antibiotics, 1(4%) had loosening of pin which required early removal of fixator, 1(4%) had delayed consolidation of regenerate (5 months).

The pre-operative PTC was 13.25 and post-operative PTS was 12.03. The change in PTS was statistically significant ($p < 0.05$) and also there was significant difference in clinical outcome i.e., Oxford knee score and Lysholm score ($p < 0.05$) but there was no significant relation between change in PTS to change in functional outcome however study with large group of patients is required to determine exact consequences.

Discussion:

The tibial posterior slope is an important for knee flexion, for the correct function of the cruciate ligaments and the normal knee kinematics in general. The physiologic range of slope of the tibial plateau is between 6 degree -10 degree [9-12]. This inclination is optimal for the normal function of the knee, for its stability and for normal movement of the tibia under the femur.

Many studies have found changes in the PTS after opening wedge HTO. LaPrade et al. prospectively assessed the change in tibial slope after opening-wedge proximal tibial osteotomies in 129 patients (130 knees). The mean tibial slope increased dramatically from 9 degree to 11.9 degree after six months, according to their findings. They found that opening-wedge HTO could result in a considerable increase in tibial slope, which could impact patellar height and future ligament reconstructions [13].

Dragosloveanu et al. found a substantial rise in PTS after opening wedge HTO surgery in forty-seven patients during a two-year period [14]. El-Azab et al. observed similar findings after examining radiographs of sixty knees that had undergone opening-wedge high tibial osteotomies. The mean slope increased from 5.0 degree to 8.1 degree when

stabilised with a non-locking plate and from 7.7 degree to 9.1 degree when stabilised with a locking plate, according to their findings [15].

However, it is yet unknown whether opening wedge HTO causes significant alterations in the PTS. Previous research has found that the PTS increases after an open-wedge HTO, although the results are inconsistent. Although the PTS increased after open-wedge HTO in a previous study, Chae et al. found a reduction in post-operatives, though the difference was not statistically significant. They looked at the PTS in 32 individuals who had opening wedge HTO in 34 knees with autologous tricortical iliac bone graft. A non-significant reduction in the posterior slope was seen after a three-year follow-up. Pre- and postoperative PTS were 8.7 degree and 8.2 degree, respectively [16]. Similarly, the study of Chae et al., the present study did not find significant reduction in the PTS of patients after follow up surgery.

Other factors, rather than the measurement technique, may be to blame for inconsistencies in the results of different research. The aetiology of the deformity and the period between surgery and imaging are two criteria that may influence this judgement. Another study [17] included aspects that are important in open-wedge HTO to avoid a change in the slope of the tibia which included the posterior soft tissue release and the position of the wedge during the opening-wedge technique, followed by the position of the plate. When comparing the outcomes of different investigations, several aspects must be considered.

In patients with severe osteoarthritis, the functional result is a crucial aspect of any surgical treatment. Individuals who have had physical and psychological difficulties in their lives are more likely to benefit from this functional result, which has a stronger impact on quality of life and pleasure. We used the Oxford knee score (OKS) and the Lysholm score to assess the functional outcome of HTO in this investigation. At the 6-month follow-up, the mean difference in oxford score between pre and after HTO was 15.64, which was statistically significant ($p < 0.05$). The clinical outcome measures of IKDC, KOOS, OKS, and SF-12 considerably improved post-operatively ($p < 0.05$), with no significant deterioration over time, according to a study by Hantes ME et al [18]. The study also found that clinical and

radiological outcomes were satisfactory, with 95 percent survival rate 12 years following the treatment.

Present study also found that mean difference in lysholm score in pre and post HTO period at 6 month follow up was 25.12 and it was statistically significant ($p < 0.05$). Study by Kim MS et al [19] found that at post-operative 3 and 6 months, the Unicompartmental Knee Arthroplasty group showed superior VAS, WOMAC, and Lysholm scores ($p < 0.05$ for all).

The study had some limitations, which include short duration retrospective study with small sample size. Further study with large, small size will help to generalize study findings.

Conclusion:

Oxford knee score and Lysholm score after minimum of 2 years of follow up showed statistically significant results after high tibial osteotomy and the results are not linked to the minor changes that occurred in the tibial posterior inclination. High tibial osteotomy remains an affordable surgical procedure in the arsenal used for treating unicompartmental osteoarthritis, with excellent functional outcome.

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Tables:

Table 1: The Clinical and Demographic Characteristics of Study Subjects

Variables	Mean±sd/ n (%)
Age	47.04±4.5 yrs

41-45yrs	11(44)
46-50yrs	09(36)
51-55yrs	3(12)
>55yrs	2(8)
Gender	
Female	18(72)
Male	7(28)
Leg	
Right	17(68)
left	8(32)
Complications	
Pin track infection	2(8)
Pin loosening	1(4)
Delayed consolidation of regenerate	1(4)

Table 2: Comparison of Pre- and Post-Operative outcome variables

Outcome variables	Pre-op (mean \pm sd)	Post-op Follow up (mean \pm sd)	p value
PTC	13.25+1.15	12.03+1.25	0.0001
OKS	21.48+5.05	37.12+4.31	0.0001
Lysholm Score	27.88+7.4	53+8.06	0.0001

Images

Figure 1: Pre-operative weight bearing X-ray of showing medial compartment OA



Figure2: Immediate post-operative X-Ray with orthofix insitu



Figure 3: 3 months follow up X-Ray after orthofix removal



Figure 4: Follow up X-Ray after 2 years



Figure 5: Clinical photos of patient after 2 years follow up

