

Total Knee Arthroplasty Following High Tibial Osteotomy – a Radiological Evaluation

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ABSTRACT

The purpose of this study was to evaluate the results of total knee arthroplasty (TKA) following a closed wedge high tibial osteotomy (HTO). A total of 16 TKAs were performed in 16 patients who had previously undergone a closed wedge (HTO) as a treatment for knee osteoarthritis. The radiographic results were evaluated with respect to the femurotibial angle (FTA), joint line height (JLH), tibial bone resection and Insall-Salvati ratio. The FTA improved in average, from 6.5 degree of varus preoperatively at 5.7 degree of valgus postoperatively. The JLH averaged 14.34 mm preop and 13.81 mm at the last follow-up. The amount of tibial bone resection averaged 5.98 mm, face to 7.5 mm for knees without HTO. The Insall-Salvati ratio was 1.127 preop and 1.172 postop. A meticulous surgical technique may lead to satisfactory results in TKA after HTO, considering the correction of the deformity, the re-establish of JLH and the amount of the tibial bone resection.

Keywords: knee arthroplasty, tibial osteotomy, radiological evaluation

INTRODUCTION

The main objectives of both types of interventions (TKA and HTO) are the same: axis realignment, loading redistribution, mobility recovering and pain relief, but in different stages of arthritis. The clinical results of high tibial osteotomy deteriorate with time despite the initial satisfactory results (1,2). Because of the

loss of the correction angle and the pain caused by the progression of degenerative arthritis, most cases require conversion to total knee arthroplasty. It is said that clinical and radiological outcomes of TKA after HTO are similar to those of primary TKA, using a proper surgical technique (3-6). The interval between HTO and TKA varies with indications of HTO (1).

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The clinical and radiological results after TKA were analysed in patients, who had previously undergone a closed wedge HTO and with a review of the literature. □

MATERIALS AND METHODS

This study reviewed 16 patients who underwent conversion to TKA following a closed wedge HTO for degenerative arthritis of the knee from November 2006 until May 2010. 10 patients were female and 6 male. The mean age at the time of HTO was 64.3 years. 9 procedures were performed on the right knee and 7 on the left side. The mean height and weight was 1.60 m and 66.3 kg, respectively. The mean interval from HTO to TKA was 4.3 years (1-7 years).

The implants in the osteotomy site were removed through the previous skin incision scar in all cases. As a surgical approach, under vast muscle approach was used in all cases. In cases where subperiosteal exposure was difficult due to soft tissue adhesion around osteotomy site, infrapatellar adhesion was dissected carefully. A posterior cruciate ligament substituting pros-

thesis was used in all cases, all Zimmer NexGen implants. The mean thickness of the polyethylene insert was 11.2 mm (9-14 mm) (Table 1). In all cases, the implants were inserted with cement. All cases required lateral release.

The radiographic results were evaluated with respect to the femurotibial angle (FTA), joint line height (JLH), tibial bone resection and Insall-Salvati ratio (ISR). The lateral joint line height, measured from the fibular head on the AP view of the standing X ray, was retrospectively recorded (Figure 1). The amount of bone resection of tibial plateau in TKA was measured on the AP view X ray (Figure 2). The ISR was measured, which is the ratio of length of the patellar tendon to the length of the patella on the lateral view X ray (Figure 3). The preoperative ISR and that at the last follow-up were compared. □

RESULTS

The average FTA was corrected from varus 6.5 degrees before TKA to valgus 5.75 degrees at the last follow-up. The average JLH was 14.34 preoperatively and 13.81 at the last follow-up. The average amount of tibial bone resection was 5.98 mm, less than mean values of bone resection in primary TKA (7.5 mm according to Meding) (7). The average ISR was 1.127 preoperatively and 1.172 at the last follow-up. The mean thickness of the polyethylene insert was 11 mm (9-14 mm). □

Ranges (mm)	Number of knees
9	2
10	6
12	6
14	2

TABLE 1. The thickness of inserts



FIGURE 1. The JLH was measured from the fibular head on AP X ray view. The postoperative JLH was raised from the preoperative JLH



FIGURE 2. The amount of bone resection at the tibial plateau in TKA was measured on AP X ray view. "c" was defined as the shortest vertical distance between the fibular head and the lateral tibial plateau before TKA. "d" was defined as the shortest vertical distance between the fibular head and the tibial cut surface at the last follow-up. The amount of bone resection at the tibial plateau in TKA was calculated as "c-d"

DISCUSSION

The reason for performing TKA after HTO were pain caused by recurrence of the varus deformity and the progression of the osteoarthritis to the other compartments. All our patients were older than 60 years, with a varus deformity greater than 15 degrees, an arthritis

Ahlback score 3.4 or 5, and with knee instability, at the time of HTO. This means that HTO indications were exceeded, and that is because of financial reasons.

All our patients underwent conversion TKA at an average of 4.3 years.

Surgical methods have been recognized to be important factors in the longevity of knee

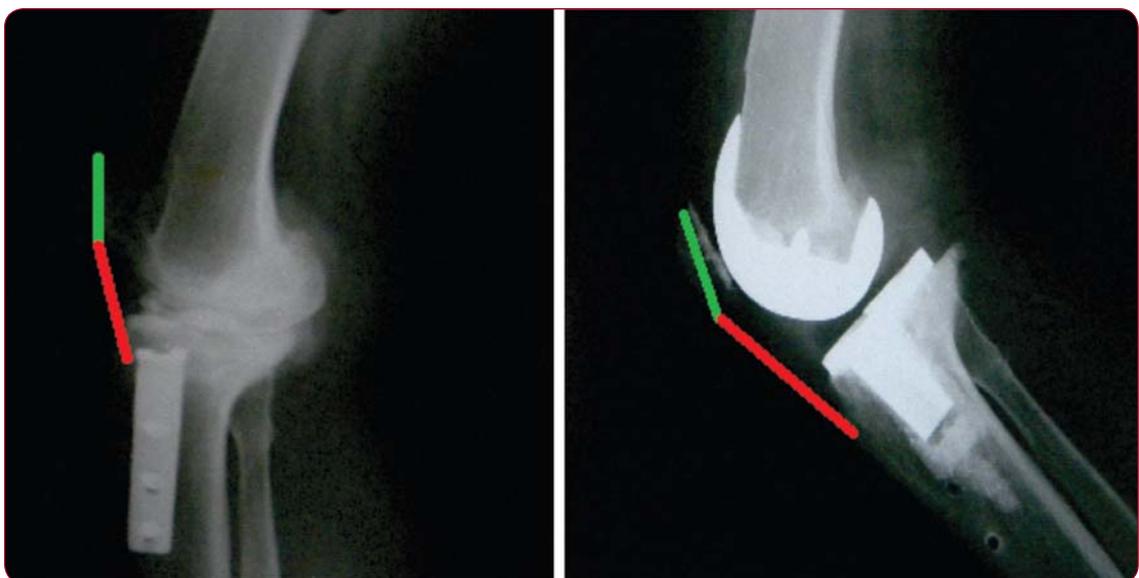


FIGURE 3. The ISR on the lateral view of the X-ray. The preoperative ISR is the ratio of the length of the patellar tendon to the length of the patella. The ISR at the last follow-up is the ratio of the length of patellar tendon to the length of the patella. Preoperative ISR and I SR at the last follow-up were compared

implants (3,8-10). Subperiosteal exposure of the proximal tibia and eversion of the patellar mechanism are more difficult in the post-osteotomy knee due to soft tissue scarring (11,12). Ligamentous imbalance may also compromise the implant procedure. Studies reported that more lateral ligamental releases were necessary for the post-osteotomy patients, and found that more tibial tuberosity osteotomies were performed. These additional procedures may contribute to a significantly prolonged operation time for patients receiving TKA after prior osteotomy (13). Exposure difficulties and alterations in knee anatomy may compromise precision and accuracy of the surgical technique. Especially tibial component fixation may be an issue after osteotomy due to the loss of metaphyseal bone stock. Previous osteotomy may also influence patellar tracking leading to subluxation or rotatory instability. Malalignment and instability are major causes of early failure. Literature studies showed that after a median follow-up of 5 years there were no significant differences in TKA failure for the patients receiving TKA after previous osteotomy compared to primary TKA.

This study has some limitations. This was a retrospective study and the number of subjects was small.

TKA after HTO is technically more difficult and lead to a greater rate of perioperatively

complications such as prolonged surgery duration, greater blood loss, and greater risk of wound infection. □

CONCLUSION

Based on our results and other literature studies, we suggest that HTO does not have significant negative effect on TKA outcomes when careful surgical technique it is used. Because of economical issues HTO indications were exceeded in all our cases. This means that we were forced to choose as a method of treatment, HTO in cases that required TKA. The long term results of HTO were poor, and all cases underwent conversion TKA within 7 years, with a mean interval of 4.3 years. We exposed patients to a higher rate of perioperatively complications at the moment of TKA, without long term benefits of HTO. A Mayo Clinic study suggest that a knee prosthesis implant survival rate at 10 years is greater in patients older than 70 years than in patients younger than 50 years at the time of implantation.

We conclude that HTO should be reserved to young, active patients, where indications are maintained, and it has a real benefit with good long term results (mean interval of conversion to TKA - 10 years, according to studies). □

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