INTRODUCTION: The valgus opening-wedge high tibial osteotomy (HTO) is an option for the treatment of varus osteoarthritis of the knee which has recently regained importance through the introduction of improved operative techniques and specialized fixation implants. The goal of HTO is a shift of loading achieved by a correction of the leg axis. The degenerated medial compartment cartilage is thus decompressed with a resulting in relief of pain and delay of the need for total joint arthroplasty. Good clinical short- and mid-term results have been reported, but to date there have been no investigations quantifying the load-transfer effect of shifting the weight-bearing line (WBL) on tibiofemoral joint contact pressure. The amount of correction applied clinically is therefore largely based on personal experience and the outcomes reported in the few published clinical studies. Furthermore, the role of the medial collateral ligament (MCL) in this technique has also not been elucidated. The objective of this study was thus to quantify the outcomes reported in the few published clinical studies. The success of decompression of the medial compartment can lead to effective medial compartment joint decompression, however, only in conjunction with complete release of the superficial medial collateral ligament. The results of this study suggest that in the clinical situation a correction of the weight-bearing axis to 62 % of the width of the tibial plateau led to a satisfactory decompression of the medial compartment. Despite the limitations of transferring these results of this study to the in vivo situation, this study is nonetheless the first to measure changes in medial-lateral load distribution in the knee joint after opening wedge valgus osteotomy.

RESULTS: With non-opened HTO, the distribution of the contact force (CF) between the compartments of the tibiofemoral joint was dependent upon the position of the WBL with respect to the tibial plateau (Fig. 2). The more lateral the WBL intersected the tibial plateau, the lower was the amount of correction applied. Contact force between the medial and lateral compartments is dependent on axial loading, the medial component of CF was much higher than the lateral (71.4 % vs. 28.6 %), although the WBL was set at 62 % of the tibial plateau width. In comparison, in the valgus-62 position without opening HTO, the relationship was almost reversed with 34.6 % vs. 65.4 % medial to lateral CF (Fig. 2). Thus, in comparison to the originally simulated varus malalignment (varus-0), no reduction of CF or CP in the medial compartment was achieved after HTO-max. Instead, the increase of CP in the medial compartment after HTO-max compared to neutral-50 was larger than the increase achieved by shifting the WBL to varus-0 from neutral-50 (180 % vs. 120 % increase, Fig. 3). Sucessive dissection of the superficial MCL resulted in a progressive decrease of the contact pressure in the medial compartment which was observed with and without axial loading. With axial loading, the contact force and contact pressure in the medial compartment decreased significantly from HTO-max to MLR-50 (p=0.043), and to MLR-100 (p=0.043) which was then similar to neutral alignment (neutral-50, Figs. 2 and 3).

DISCUSSION: In conclusion, valgus opening-wedge HTO for decompression of the medial compartment can lead to effective medial compartment joint decompression, however, only in conjunction with complete release of the superficial medial collateral ligament. The success of decompression of the medial compartment can lead to effective medial compartment joint decompression, however, only in conjunction with complete release of the superficial medial collateral ligament. The results of this study suggest that in the clinical situation a correction of the weight-bearing axis to 62 % of the width of the tibial plateau measured from the medial margin leads to a satisfactory decompression of the medial compartment. Despite the limitations of transferring these data to the dynamic in vivo situation, this study is nonetheless the first to measure changes in medial-lateral load distribution in the knee joint after opening wedge valgus osteotomy.

REFERENCES:  

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