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INFLUENCE OF LOWER-LIMB TORSION ON LONG-TERM OUTCOMES OF TIBIAL VALGUS OSTEOTOMY FOR MEDIAL COMPARTMENT KNEE OSTEOARTHRITIS

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Background: The results of tibial osteotomy used to treat osteoarthritis of the medial compartment of the knee deteriorate over time even when the initial correction is optimal. Studies have shown that tibial and femoral torsion and the femorotibial index (tibial torsion minus femoral torsion) contribute, together with coronal malalignment, to the development of single-compartment knee osteoarthritis. The objective of our study was to evaluate the impact of femoral and tibial torsion and of coronal realignment on the long-term clinical and radiographic outcomes of valgus tibial osteotomy.

Methods: A function score was calculated for sixty-eight patients at a mean of thirteen years after the osteotomy. Anteroposterior single-leg-stance radiographs were used to evaluate loss of the femorotibial joint space. Goniometry was used to measure coronal malalignment preoperatively, at one year, and at the time of the last follow-up, and postoperative computed tomography was performed to measure femoral anteversion and tibial torsion and to calculate the femorotibial index. We looked for associations linking body mass index, initial loss of joint space, coronal malalignment, femoral and tibial torsion, the femorotibial index, and functional outcomes.

Results: Worse outcomes were associated with changes in coronal alignment ($\geq 2^\circ$) over time, which were associated with deterioration of the femorotibial space. Femoral anteversion was significantly greater in patients in whom valgus increased over time than in those in whom valgus decreased over time. Stability of coronal alignment seemed to be dependent on a linear relationship between the femorotibial index and the degree of postoperative realignment. A body mass index of $>25 \text{ kg/m}^2$ was associated with a long-term loss of coronal realignment. Preoperative loss of the medial femorotibial joint space, coronal alignment at one year, and age were not associated with secondary malalignment or functional outcomes.

Conclusions: Long-term success of a valgus tibial osteotomy is related to the stability over time of the postoperative coronal realignment. Therefore, the results of our study suggest that modifying the realignment according to the extent of femoral anteversion may improve long-term outcomes.

Level of Evidence: Prognostic Level II. See Instructions to Authors for a complete description of levels of evidence.

The rationale for using a valgus tibial osteotomy to treat osteoarthritis of the medial compartment of the knee stems from studies of load distribution between the medial and lateral compartments according to the malalignment of the mechanical axis in the coronal plane as assessed with goniometric measurements¹. Maquet et al.²⁻⁴ showed that, when varus was present, loads through the medial compartment were greater than those through the lateral compartment. Thus, genu varum may cause progressive medial femorotibial osteoarthritis. It was reasonable to assume that correcting the varus defor-

mity would stop the progression of the arthritis. Valgus tibial osteotomy results in good short-term functional outcomes, with stabilization or improvement of the affected joint space.

Overcorrection to 183° to 186° of valgus produced the best success rates at thirteen years following the osteotomy, but these results tended to deteriorate over time^{5,6}. Progressive osteoarthritis seems to be the reason for the deterioration of functional outcomes³⁻¹⁰. Factors associated with deterioration have been an older age at the time of the surgery^{11,12}, obesity (more than 1.32 times the ideal weight)⁷, less constitutional preopera-