Open wedge high tibial osteotomy: biomechanical investigation of the modified Arthrex Osteotomy Plate (Puddu Plate) and the TomoFix Plate

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OBJECTIVE: To determine the biomechanical properties of different fixation methods for high tibial medial opening wedge osteotomy in order to determine appropriate surgical and rehabilitation guidelines. DESIGN: A biomechanical testing examined the construct stiffness and the fixation strength of two different plates. BACKGROUND: Although medial opening wedge techniques for high tibial osteotomies have become popular in recent years, biomechanical data of frequently used implants is lacking. METHODS: A 15-mm medial opening gap was stabilized in each of eight medium composite tibial bones either with the modified Arthrex Osteotomy Plate (Puddu Plate) or the TomoFix Plate. RESULTS: Both constructs failed under compression and torsion at the lateral cortex and occurred at higher maximal forces by using the TomoFix Plate. After fracture of the lateral cortex the axial stiffness was reduced by 47% and the torsional rigidity by 54% for the TomoFix. For the Puddu Plate these reductions were 66% and 78%, respectively. The differences between the two groups were significant in all conducted tests (P < 0.05). CONCLUSIONS: This study indicates that an unharmed lateral hinge largely dictates the stability after high tibial osteotomy. If the lateral cortex is injured, the TomoFix plate provides superior stability in both compression and torsion compared to the Puddu Plate. In the latter case additional fixation might be considered. RELEVANCE: These biomechanical tests helped to identify clinical situations in which the mechanical attributes of the plates would prove advantageous.