

## عنوان مقاله:

Is a Complete Anatomical Fit of the Tomofix Plate Biomechanically Favorable? A Parametric Study Using the Finite Element Method

## محل انتشار:

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## خلاصه مقاله:

**Background:** The opening wedge high tibial osteotomy (HTO) fixation using the Tomofix system is at the risk of mechanical failure due to unstable fixation, lateral hinge fracture, and hardware breakage. This study aimed to investigate the effect of the level of anatomical fit (LOF) of the plate on the failure mechanisms of fixation. **Methods:** A finite element model of the HTO with a correction angle of ۱۲ degrees was developed. The LOF of the TomoFix plate was changed parametrically by altering the curvature of the plate in the sagittal plane. The effect of the LOF on the fixation performance was studied in terms of the factor of safety (FOS) against failure mechanisms. The FOSs were found by ۱) dividing the actual stiffness of the plate-bone construct by the minimum allowable one for unstable fixation, ۲) dividing the compressive strength of the cortical bone by the actual maximum pressure at the lateral hinge for the lateral hinge fracture, and ۳) the Soderberg criterion for fatigue fracture of the plate and screws. **Results:** The increase of the LOF by applying a larger bent to the plate changed the fixation stiffness slightly. However, it reduced the lateral hinge pressure substantially (from ۱۸۲ MPa to ۷۱ MPa) and increased the maximum equivalent stresses in screws considerably (from ۱۸۷ MPa to ۲۵۸ MPa). Based on the FOS-LOF diagram, a gap smaller than ۲.۳ mm was safe, with the highest biomechanical performance associated with a ۰.۵ mm gap size. **Conclusion:** Although a high LOF is necessary for the Tomofix plate fixation to avoid mechanical failure, a gap size of ۰.۵mm is favored biomechanically over complete anatomical fit. Level of evidence: V

## کلمات کلیدی:

Failure mechanisms, Fixation stiffness, Hardware breakage, Lateral hinge pressure, Plate contouring

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