

NUMERICAL ASSESSMENT OF KNEE ARTHRODESIS USING EXTERNAL FIXATION

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Keywords: Knee arthrodesis, finite element method, biomechanics

Summary: This work presents the numerical results of arthrodesis using a bilateral-monoplanar external fixator for the treatment of septic sequelae of the knee joint. The knee arthrodesis serves as an option of salvage treatment for failed total knee arthroplasty procedures [1]. The arthrodesis technique used in this work was promoted with external fixation consisting of the union of two or more femoral pins with two or more tibial pins through lateral bars. Biplanar fixation has higher sagittal stability and higher fusion rates than the monoplanar fixation, but the level of compression on the fusion area as well as the extension of contact area can have a great impact on the bone union [2]. Hence, in this work, the influence of orthostatic positioning on factors that contribute to the compression process of femur and tibia cutting surfaces was evaluated. The arthrodesis technique was implemented using the CAD Solidworks® software and the numerical analysis was carried out on ADINA® software. With this methodology it was possible to recreate the procedure performed in knee arthrodesis and the results indicate that parameters which provide the best conditions to the surgery success is to perform the simultaneous load of Steinman pins and to use a correct adjustment of the orthostatic positioning of lower limbs.

References

- [1] Kim, K. snir, N. and Schwarzkopf, R., Modern techniques in knee arthrodesis, International Journal of Orthopedics, 3⁽⁶⁾, 2016
- [2] J. C. Charnley, Positive pressure in arthrodesis of the knee joint, Journal of Bone & Joint Surgery, British Volume, Vol. 30-B(3), 478-486, 1948.