

Pongnarin Jeamwattthanachai 2009: An Evaluation of Existing Antegrade and Retrograde Humeral Nail in the Thai Humerus. Master of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Assistant Professor Supasit Rodkwan, Ph.D. 104 pages.

This study presents the virtual simulation method to evaluate geometric mismatch of the standard humeral nail and biomechanical study of intramedullary nailing of the humeral shaft fracture using finite element method. In geometric mismatch study, the analysis was performed with nail inserted in the seventy-six cadaveric Thai humeri. The region was considered at 50-mm from the proximal to the distal part with 10-mm interval using two techniques; antegrade and retrograde insertion. The results showed 1) the diameter of the medullary canal averaged 7.85-13.78 mm, 2) the minimal reaming diameter to accommodate the nail insertion virtually averaged 8.84-14.83 mm for antegrade approach and 8.77-29.26 mm for retrograde approach.

A finite element method was employed to analyze the bone having the fracture gap on the humeral shaft with the humeral nail at normal and severe abduction using antegrade and retrograde approaches. The muscle forces of rotator cuff and deltoid were applied in loading conditions. Although the analysis showed that the intramedullary nail of retrograde nailing produced the von Mises stress on the nail slightly higher than antegrade nailing, the retrograde approach gave better results in biomechanical stability. Therefore the retrograde technique was preferred than antegrade technique. In addition, for the post operative of humeral shaft fracture, the patient should hang their arm in zero degree abduction or natural position and the ninety degree abduction should be avoided.

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