

Panya Aroonjarattham 2009: Design of Humeral Nail based on Thai Morphometric Data. Doctor of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Associate Professor Thanya Kiatiwat, Ph.D. 187 pages.

The intramedullary nail fixation was widely accepted for minimal invasive technique with low morbidity, providing simultaneously rapid recovery and prompt return to work but Thai humerus has some geometric different from those Caucasian and it will has some clinical complication when use in Thai patient.

Computerized tomography, medical image processing, and reverse engineering was employed to analyze the geometric of humeral bone with non destructive specimens. A finite element method was employed to analyze the humeral bone that had the fracture gap on the mid-third region with standard humeral nail at normal and severe abduction with antegrade and retrograde insertion technique. The muscular force of rotator cuff and deltoid muscle were derived from magnetic resonance imaging and mechanical testing device which affected to the fracture gap.

The result showed that the ninety degree abduction had maximum strain at the lower gap between 15,422-57,727 microstrain with antegrade insertion. The new design of standard humeral nail with high mechanical performance reduced strain on the gap 84.40 % at lower range and 32.35 % at upper range from the standard humeral nail.

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Student's signature

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Thesis Advisor's signature