

## Parameters affecting the stresses within pedicle screw systems in a stabilized lumbar spine

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### Abstract

Several linear and nonlinear finite element models of intact and fixed lumbar spine were analyzed. The intact model was developed based on CT images, and following verification, was employed to simulate the spinal fixation procedure using two different commercial pedicle screw systems. The results including the force-deformation behavior and the stress distribution within the structures were studied in detail. The effects of pedicle morphology, insertion errors and material properties of bone graft on the stress distribution pattern within the vertebrae and implant components were also studied. The results suggest superiority of titanium implants over steel implants, necessity of bone graft insertion, and a higher failure risk for screws due to osteoporosis. It has been recommended that surgeons use thicker screws when dealing with pedicels with larger anterior posterior length and avoid insertion errors to minimize the risk of screw fracture.

**Keywords:** Lumbar spine; Pedicle screw; Stress analysis; Finite element method; Bone graft

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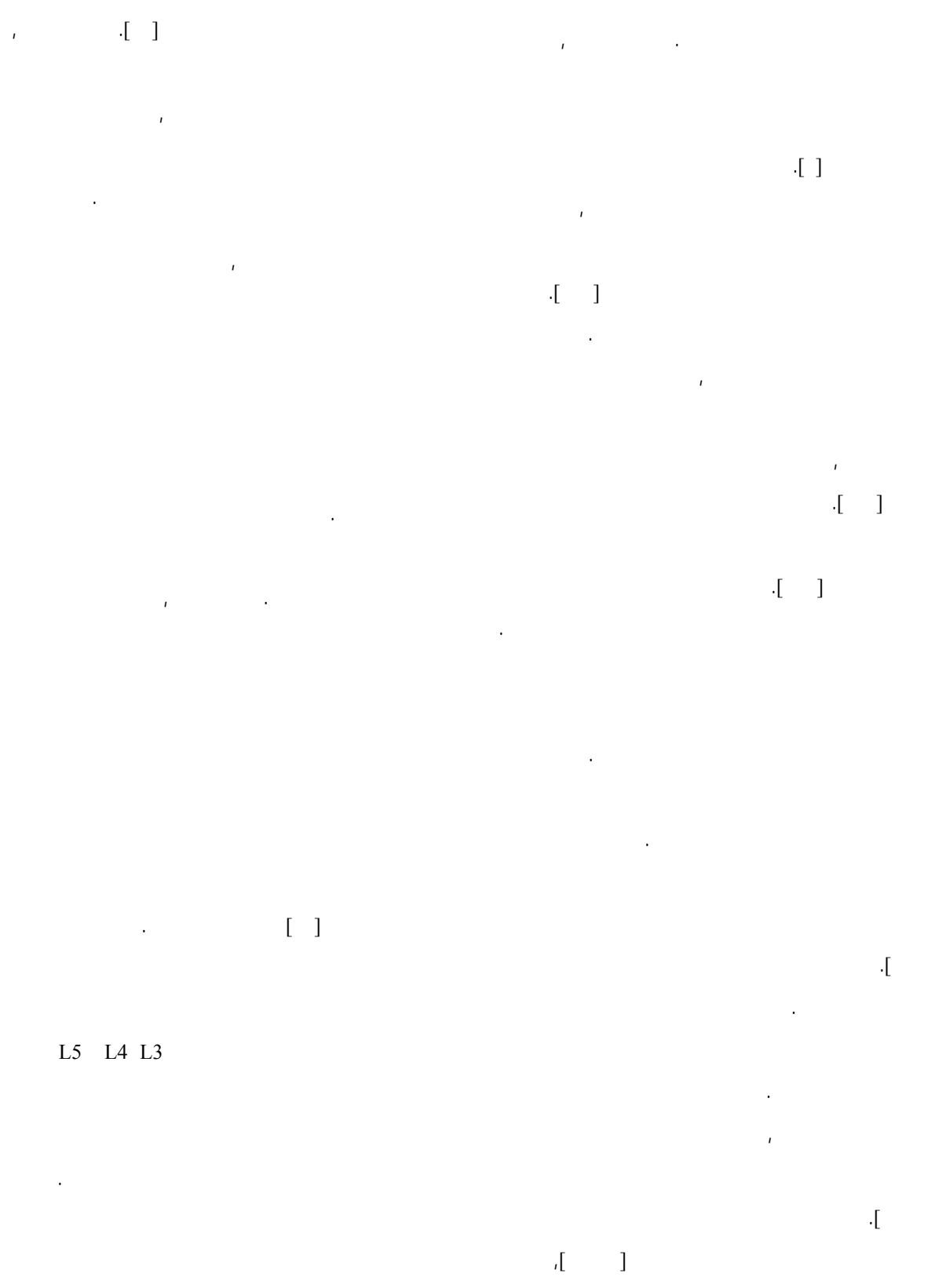
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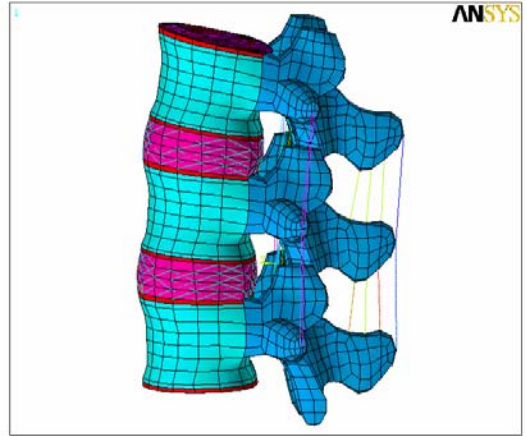
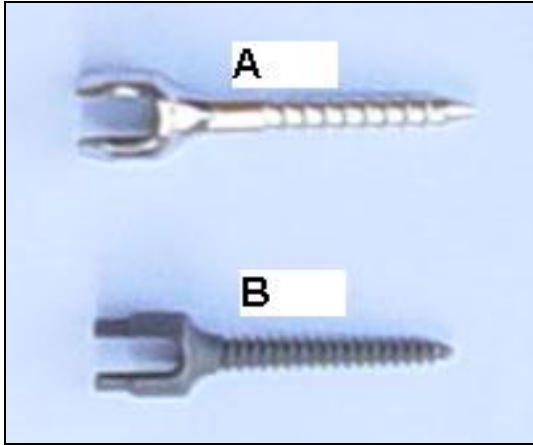
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<sup>1</sup>Scoliosis  
<sup>4</sup>Stress Stiffening

<sup>2</sup>Hyper Kyphosis

<sup>3</sup>Pedicule Screw



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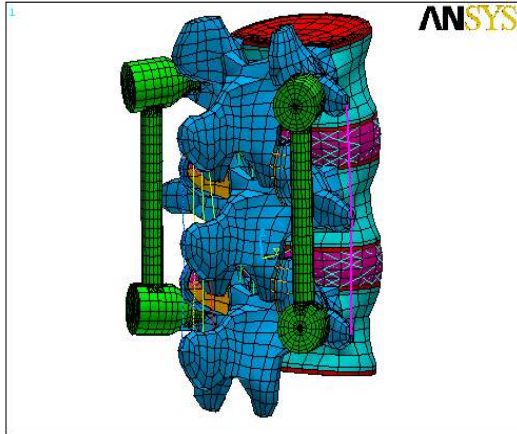
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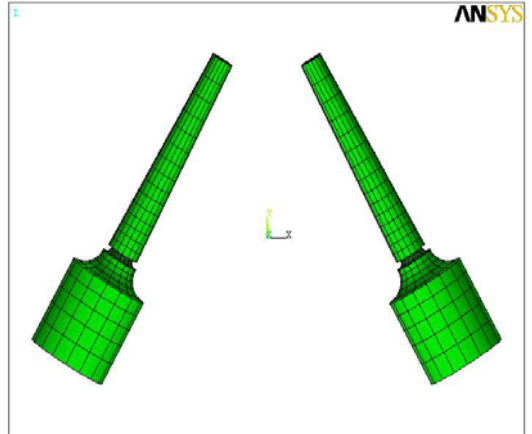
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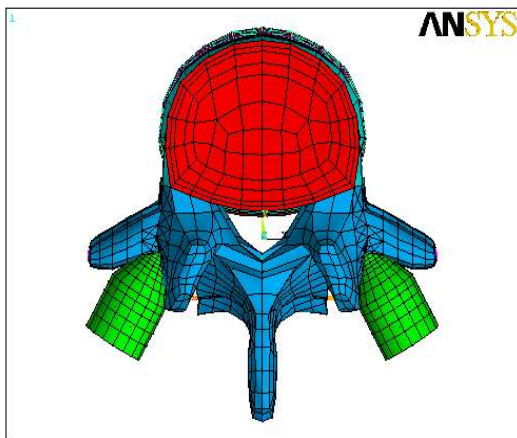
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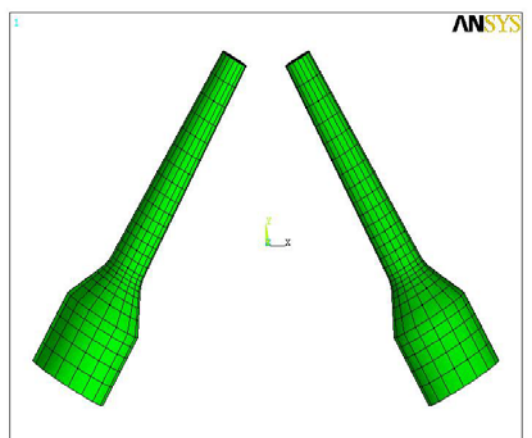
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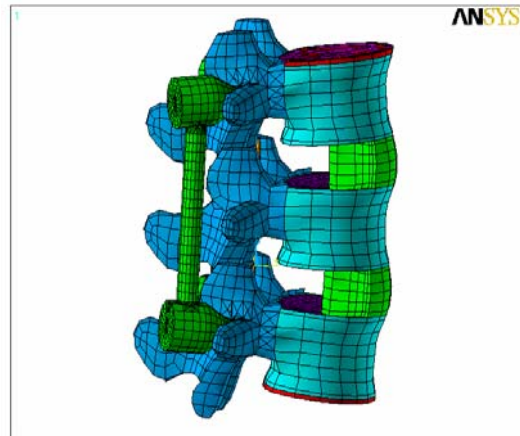
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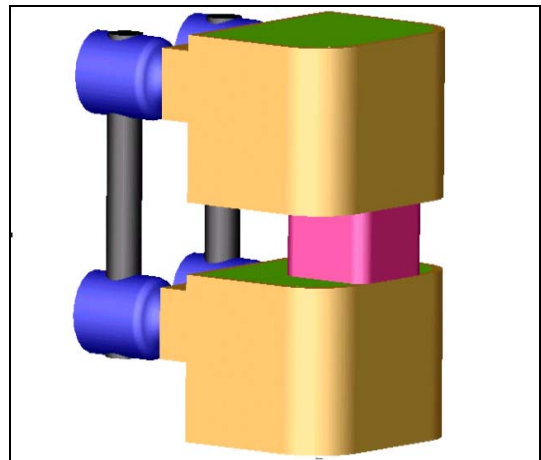
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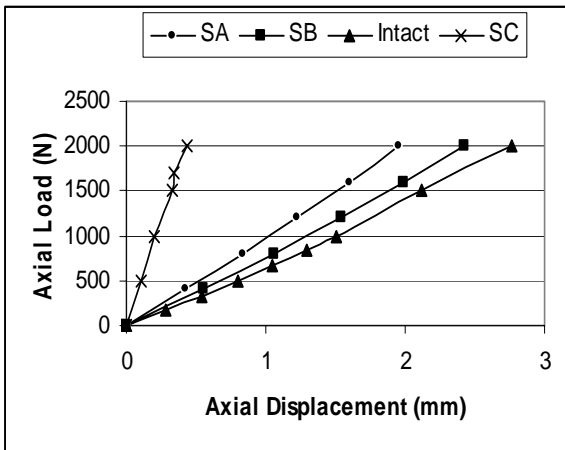
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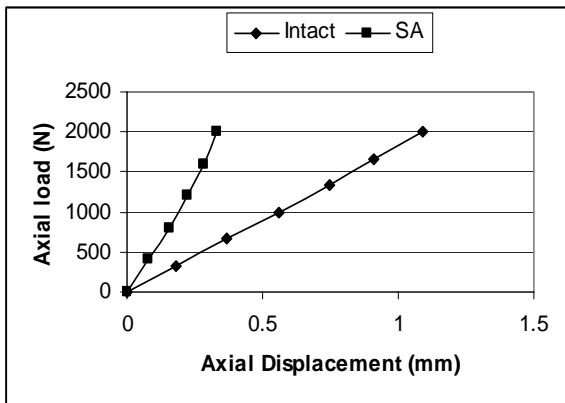


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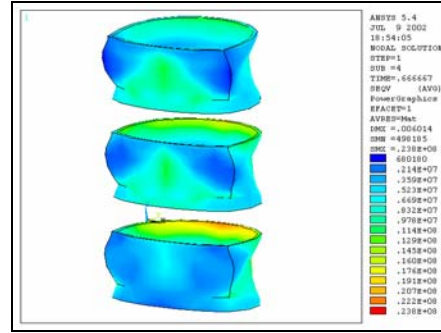
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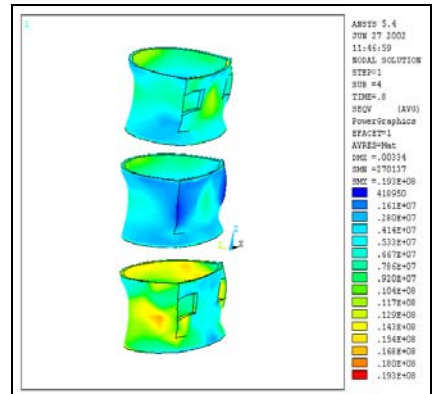
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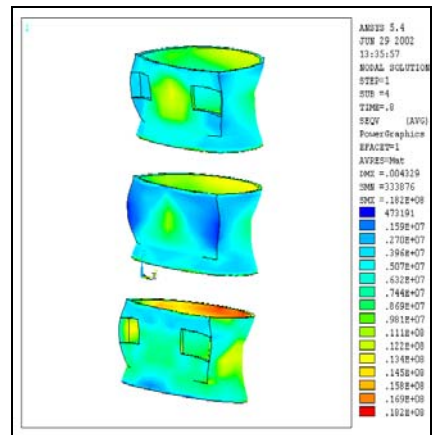


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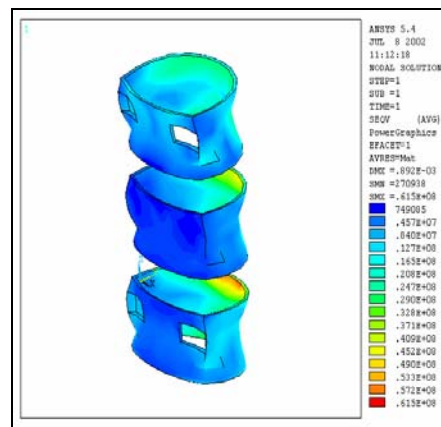
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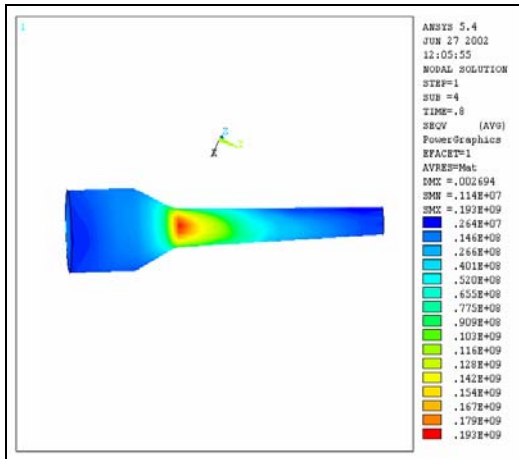
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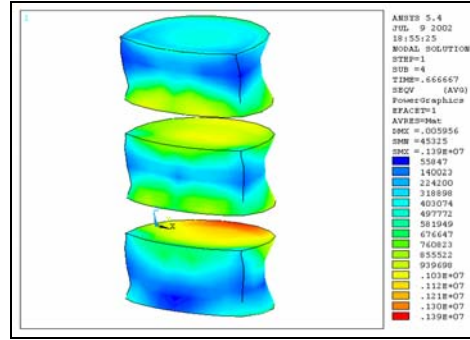
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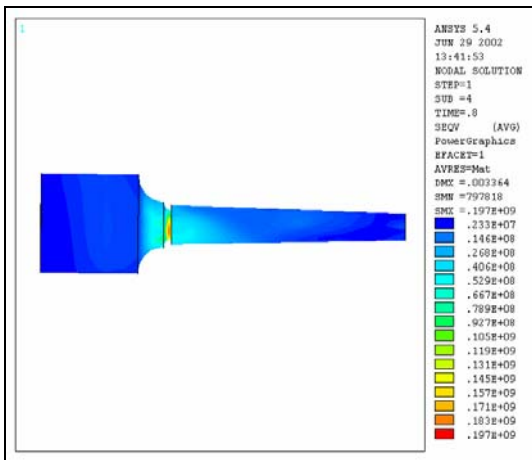




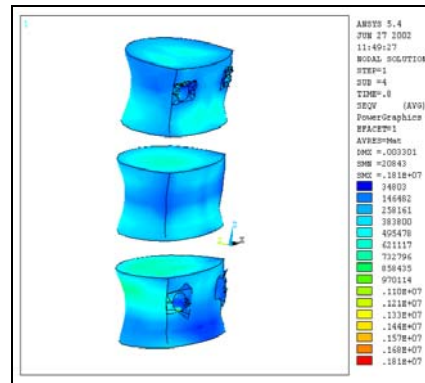
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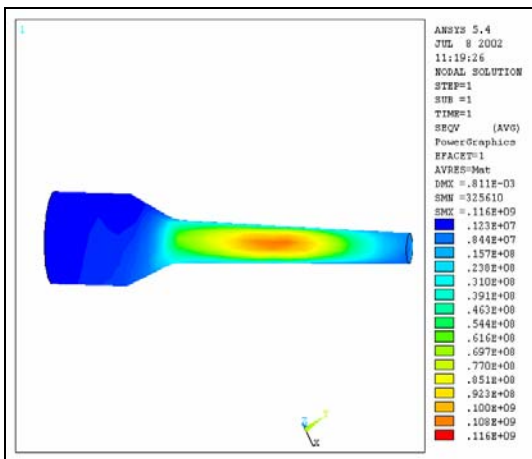
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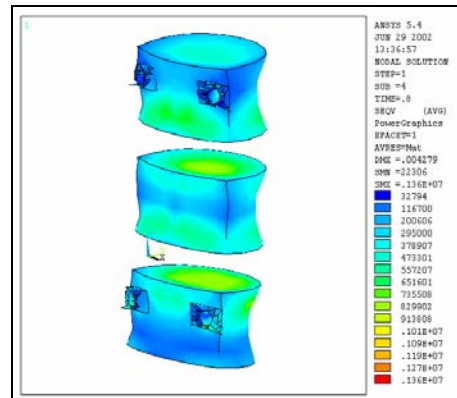
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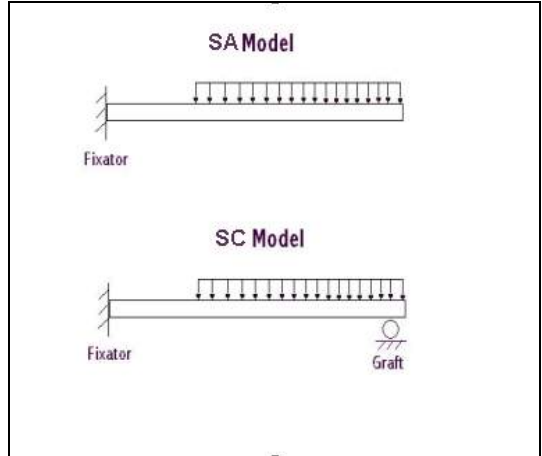
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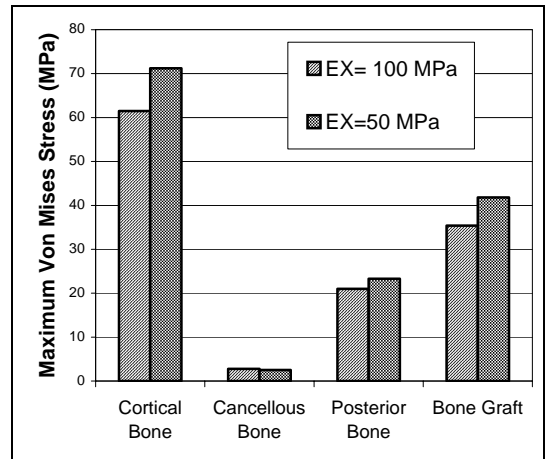
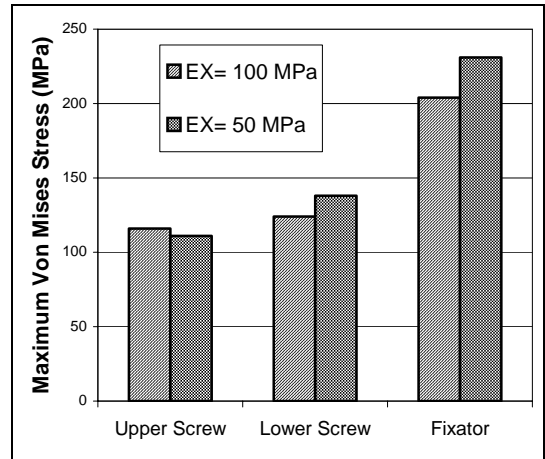
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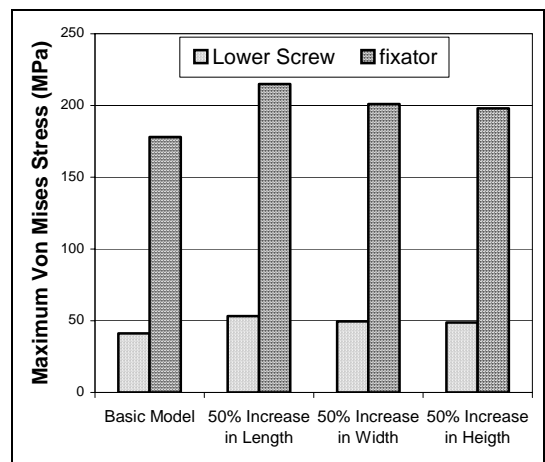


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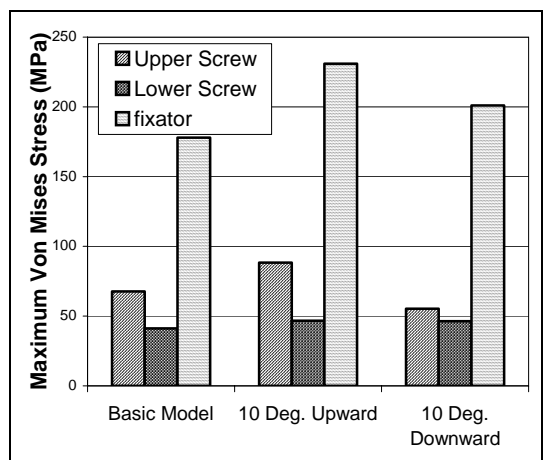
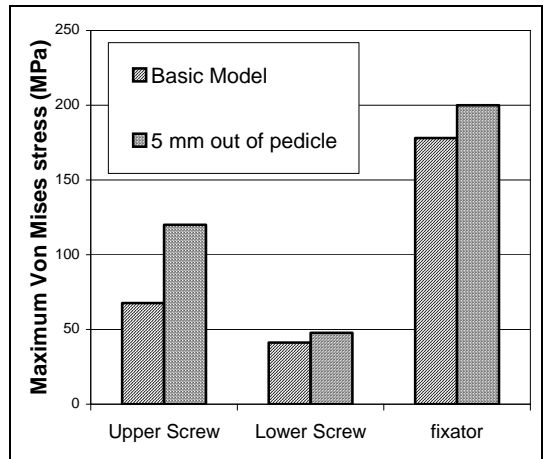
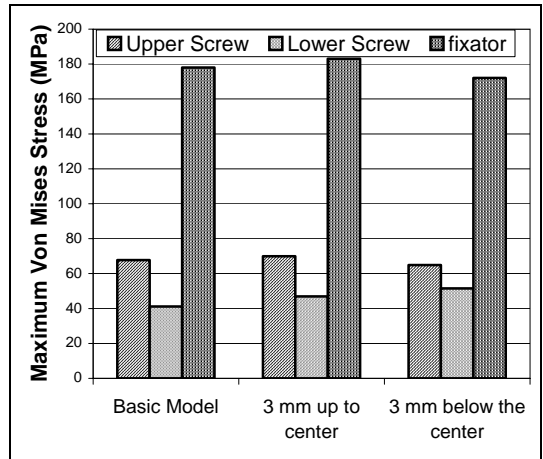
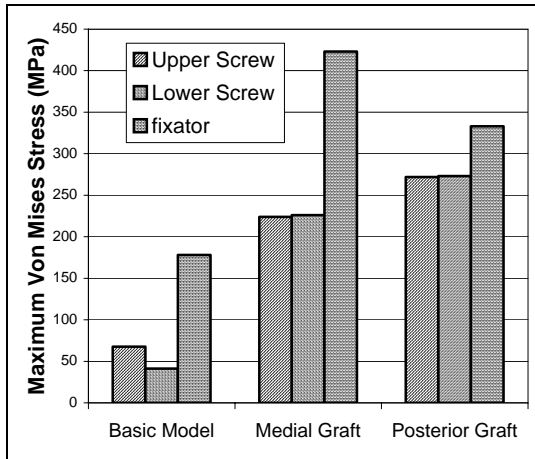
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