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Background

Scoliosis is serious disease characterized as the abnormal curvature of spine in three dimensions with vertebral rotation. The degree of severity of the scoliotic deformity is clinically evaluated using the Cobb angle. Scoliosis treatment is attained when the scoliotic spine is surgically corrected into its normal shape by implant rods and screws fixed into the vertebrae. The three-dimensional forces occurred at each implant screw because the implant rod was deformed after the surgical treatment. The objective of this study is to analyze the forces from implant deformation and investigate its effect on the corrected angle of scoliosis deformity.

Methods

The forces were analyzed from implant rod deformation using Finite Element Analysis (FEA). The geometries of implant rod before and after the surgical treatment were measured three-dimensionally. The implant rod before the surgical treatment was reconstructed using an elasto-plastic finite element model. The three-dimensional forces were applied iteratively to the screws such that the rod will be deformed the same after the surgical treatment of scoliosis. The corrected angle is referred to as the difference between the maximum Cobb angle before and after surgery.

Results

The forces that deformed the rod which are acting at the implant screws of scoliosis patients were obtained. The corrected angle did not depend on the magnitude of forces after the surgical treatment of scoliosis. Correction of scoliosis deformity is a result of various mechanisms not only the forces on implant screws.