Evaluation of Two Different Methods of Unit Rod Fixation

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Purpose: This study tests the hypothesis that a pedicle screw in each pedicle of the L5 vertebrae provides stronger fixation of a unit rod than just wires.

Introduction: A unit rod can successfully be used to straighten severely curved spines. However, common motions of the torso such as forward bending can put large forces on the wires, which hold the unit rod in place, and can cause the wires to pull through the bone. These loads are especially large at the L5 vertebrae. To improve the fixation of the unit rod pedicle screws have been used at the L5 level.

Methods: To test this hypothesis 12 fresh frozen cadaver spines including the pelvis were obtained. Six spines were instrumented with unit rods fixed at L5 with wires, and six with a pedicle screw in each L5 pedicle. The superior end of the spine was rigidly potted to the T_7/T_8 motion segment in hard urethane. The spine was mounted horizontally on the Instron with the posterior spine superior (Figure 1). The actuator was placed over the coccyx and the potted end was fixed to the base of the Instron. The left and right L5 pedicles and L5 spinous process were instrumented with LVDT's to measure their movement relative to the unit rod during loading. The spine was loaded in forward bending to 25 mm at 1mm/second, triangle load form, 10 cycles. The test was then run with the spine rotated 45 and 90 degrees. The spine was then returned to its initial position and loaded to failure at 1 mm/second. Student's t-tests were used to determine if there was a significant difference ($p \leq 0.05$) in bending stiffness, failure strength, spinous process, and pedicle displacements between the pedicle screw and wire fixed unit rods.

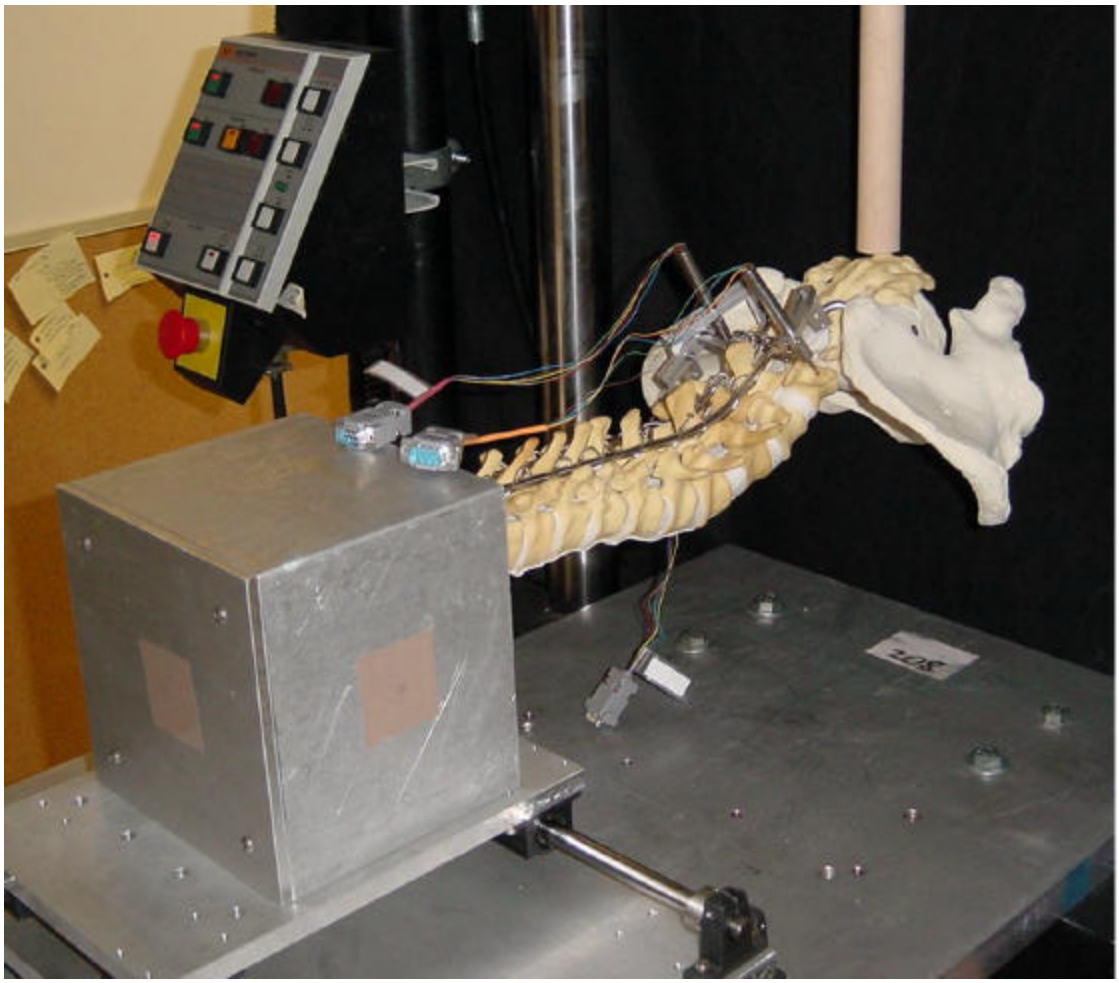

Figure 1 Spine Fixed with Unit Rod Mounted in Instron