

Double pedicle screw instrumentation in the osteoporotic spine: a biomechanical feasibility study.

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STUDY DESIGN: A biomechanical feasibility test. **OBJECTIVE:** To assess the overall feasibility, safety, and mechanical effectiveness of an intrapedicular double-screw construct in the thoracolumbar spine. **SUMMARY OF BACKGROUND DATA:** The bony purchase of the pedicle screw fixation is often not strong enough in elderly patients with osteoporosis. Our hypothesis was that the elliptical cross-section of the pedicle would allow the insertion of 2 smaller diameter pedicle screws resulting in a bony purchase superior to the standard single-screw technique. **METHODS:** Thirty-six double-screw constructs (5mm diameter AO USS and 5 mm Schanz screw) and 36 standard single pedicle screws (6mm diameter AO USS screw) were placed. Screw pullout, multiaxial flexibility, and axial failure load testing was performed. **RESULTS:** Visual inspection, palpation, and radiograph confirmed that there were no pedicle breaches. In the double-screw group, all but 2 constructs had ideal direction. Pullout strength of the double-screw construct was no different than that of the single-screw construct. However, stiffness increased considerably in all testing modes. Axial load to failure, adjusted for bone mineral density, and dimensional variation, also increased. All differences were statistically significant except for axial rotation that was only marginally significant.

CONCLUSIONS: The double-screw construct appears feasible and safe in the thoracolumbar spine. In this study, the new technique demonstrates a mechanical advantage over the standard single-screw technique. Further in vitro cadaveric safety studies with better adapted instrumentation are needed before the technique can be widely recommended.

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