**Comparison of Femoral Head Rotation and Varus Collapse Between a Single and Integrated Dual Screw Intertrochanteric Hip Fracture Fixation Device Using a Chair Rise Biomechanical Model**

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**Purpose:** This study was conducted to compare the efficacy of two intertrochanteric fracture fixation devices in preventing femoral head rotation and varus collapse using a cadaveric biomechanical model. We hypothesized that an integrated dual screw construct would confer greater stability than a single screw construct.

**Methods:** 11 matched pairs of cadaveric osteopenic female hemipelves (T-scores: –1.5 ± 0.5; age: 72.8 ± 5.8 years) were used. The hip joint and capsule were retained during soft-tissue dissection. An unstable intertrochanteric fracture without calcar support (OTA 31-A2) was created in each specimen using a customized jig prior to reduction and fixation with either a single screw (Gamma3, Stryker Orthopaedics, Mahwah, NJ) or integrated dual screw fixation device (InterTAN, Smith & Nephew, Memphis, TN) under fluoroscopic guidance (Fig. 1, inset). Specimens were secured in fiberglass resin and coupled to a custom biomechanical testing apparatus (Fig. 1) and subjected to 3 months of chair rise simulation using a combination of controlled pelvis rotation (±45°) and corresponding axial loading at 2:1 body weight (BW) ratio for 13.5 K cycles while allowing any passive internal-external femoral shaft rotation. Optoelectronic triads quantified varus collapse and rotation about the neck axis temporally throughout cycling. If specimens survived 3 months of simulated chair rise loading (13.5 K cycles at 2 × BW), an additional 2 K cycles of loading was performed in 0.25 × BW/250 cycle increments to a maximum of 4 × BW or until failure.

**Results:** Femoral head rotation with the integrated dual-screw fixation construct was significantly less than the single screw construct after 3 months of simulated chair rise (3.2° vs. 24.5°, $P = 0.016$, see Fig. 2). Maximum femoral head rotation at the end of 4 × BW loading or until failure was significantly less (7×) for the integrated dual screw than the single screw construct (5.5° vs. 35.4°, $P = 0.006$). Varus collapse was significantly less with the integrated dual screw construct when compared to the single screw construct over the entire cyclic loading protocol (5.4° vs. 8.4° $P = 0.021$, see Fig. 3).

**Conclusion:** An integrated dual screw construct confers significantly greater resistance to multiplanar femoral head rotation and varus collapse over 3 months of simulated chair rise. This laboratory study provides biomechanical evidence that an integrated dual screw fixation device may be favorable and provide more predictable fixation than single screw fixation for the treatment of unstable, extracapsular intertrochanteric fractures in the elderly patient population with compromised bone quality.



- The FDA has not cleared this drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an "off label" use). For full information, refer to page 600.

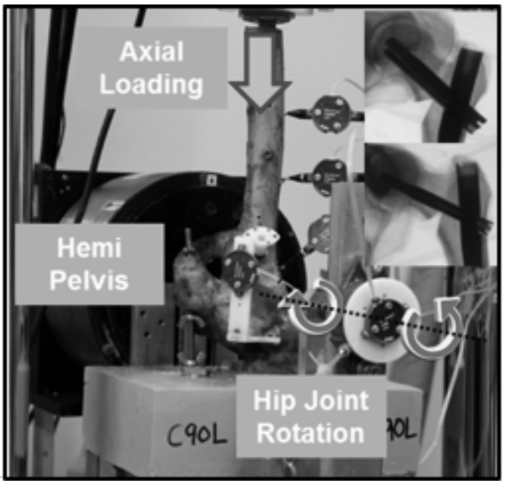


Fig. 1. Chair rise biomechanical test setup.

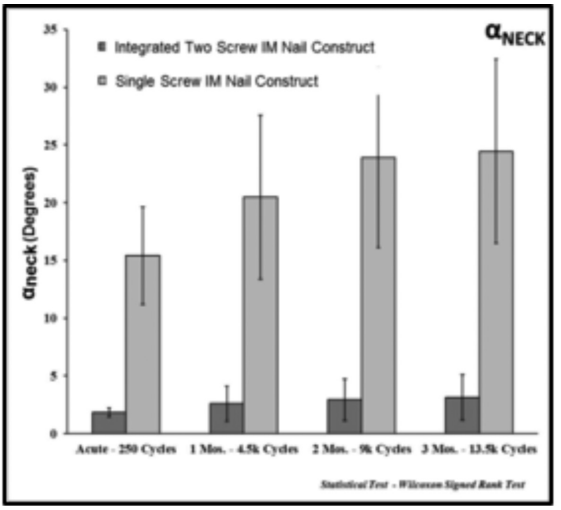


Fig. 2: Rotation about the neck axis ($\alpha_{neck}$) over 13.5 K loading cycles.

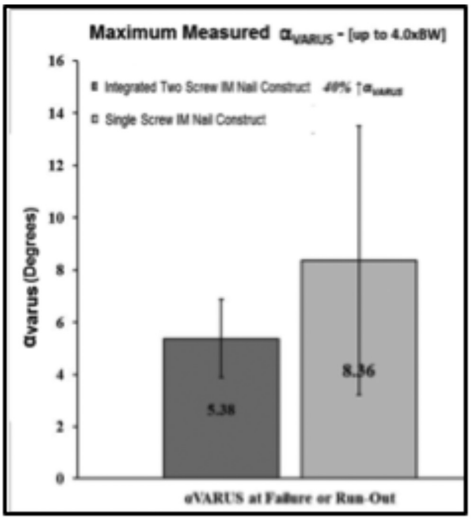


Fig. 3. Varus collapse ($\alpha_{varus)}$ measured over entire duration of cyclic loading.

See pages 99 - 147 for financial disclosure information.