

## Does a screw from Bunnings perform better than standard orthopaedic screws – Torque required for Drive or Recess failure in common orthopaedic and household screws.

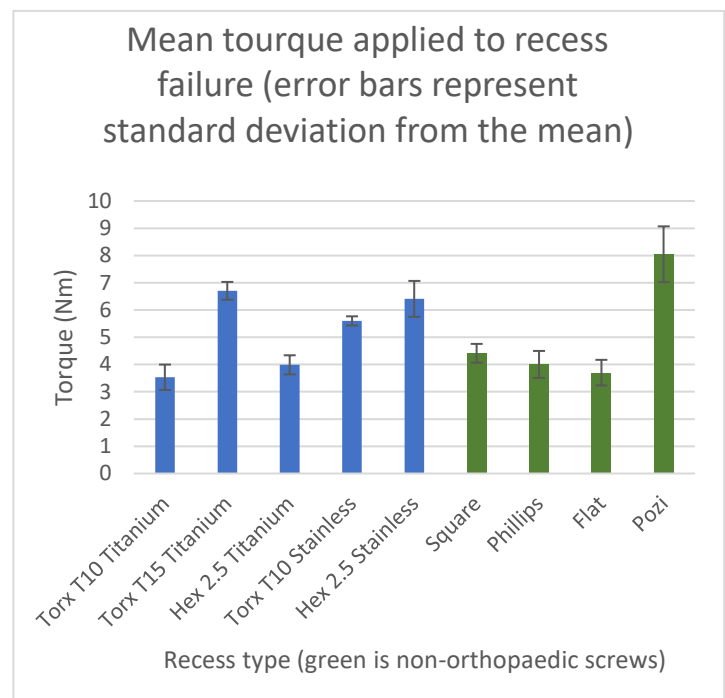
Jack Hanlon (North Shore Hospital – Orthopaedic department, Middlemore Hospital – Orthopaedic department)

**Introduction:** Bone screws are the most frequently used orthopaedic implant. A screw is designed to convert torque into axial load. Slippage at the interface between driver and recess is one of the most commonly observed challenges in orthopaedic applications, this is not often a problem when inserting the screw but upon removal of metalware.

The aim of this study was to assess the torque required to failure of bone screw head recess in both common orthopaedic screws and household screw heads and assess which screw recess/ drive interface is least likely to slip.

**Methods:** The screws were obtained from Depuy Synthes, Stryker and the local hardware store, the screws used had a diameter of 3.5mm with differing recesses, Torx (T15 and T10), Hexagonal drive (2.5mm), Square drive, Pozidriv, Phillips and flat head. We tested titanium in Torx and Hex and Stainless steel in all of the drives. A custom-made jig was constructed to allow the screw to be held steady, while controlled anticlockwise torsional force was applied to the screw. The maximum torque applied to the screw prior to failure of the recess or drive was measured on an electronic torque meter. To reduce operator error, a total of five tests on each screw were applied by two different investigators. The mean torque required and standard deviation from the mean was calculated. Statistical analysis was completed using paired two tailed T tests with a 95% confidence interval.

**Results:(Fig 1.)** Stainless steel performed better than titanium for the same screw head (hex vs torx) ( $p < 0.05$ ). From the commonly used orthopaedic screws we found no statistical significance when comparing titanium hex 2.5mm ( $4.0 \pm 0.35$  Nm) vs T10 torx ( $3.5 \pm 0.47$  Nm) ( $p = 0.12$ ), and stainless-steel hex 2.5mm ( $6.4 \pm 0.66$  Nm) vs T10 torx ( $5.6 \pm 0.17$  Nm) ( $p = 0.05$ ). The best performing orthopaedic screw, of the 3.5mm screws tested, was the T15 torx titanium screw ( $6.7$  Nm  $\pm 0.33$ ) this was not statistically significant when compared to the second best (stainless-steel hex 2.5mm) ( $P = 0.39$ ). We found that the Pozidriv could hold the most amount of torque prior to recess failure, the best out of the 3.5mm screws tested ( $8.0 \pm 1.02$  Nm) ( $p < 0.05$ ).



**Discussion:** There are multiple factors that contribute to recess failure. including the type of metal used, characteristics of the screw head, in our study the highest torque was observed in the stainless steel pozidriv screw heads. Although, the best orthopaedic screw tested was the titanium T15 torx, it is likely that a stainless-steel version would perform the best, thus decreasing risk of metalware removal.