

Which Headless Compression Screw Produces the Highest Interfragmentary Compression Force in Scaphoid Fracture?

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Abstract:

Background : Interfragmentary compression at the fracture site facilitates healing. Headless compression screws used to treat scaphoid fractures can be grouped as shank screws, conical tapered screws and double component screws. There has been no meta-analysis of biomechanical studies to compare interfragmentary compression produced by the above screws.

Methods : A computerised search of Pubmed, Embase and OVID database was undertaken to identify the studies. We estimated the weighted mean difference of interfragmentary compression (in Newton) with 95% confidence intervals. Random effects model was selected for meta-analysis.

Results : The pooled estimate of nine studies demonstrated that conical tapered screw produced significantly higher interfragmentary compression force compared to the shank screw (WMD 19.96, 95% CI 11.2–28.8, $p < 0.0001$, $I^2 = 99\%$). The pooled estimate of four studies demonstrated that dual component screw produced significantly higher interfragmentary compression force compared to the shank screw (WMD 16.93, 95% CI 12.3–21.6, $p < 0.0001$, $I^2 = 97.7\%$). The pooled estimate of four studies showed that there was no significant difference in the interfragmentary compression force generated by either conical tapered screw or dual component screw (WMD 3.93, 95% CI 8.3 to 16.2, $p = 0.53$, $I^2 = 99.7\%$). There was evidence of minimal publication bias.

Conclusion : Conical tapered screws and dual component screws produced statistically significant higher interfragmentary compression force at the scaphoid fracture site compared to shank screws. There was no difference in the compression force generated by either conical tapered screw or dual component screw.

Keywords : Scaphoid bone, Bone screws, Fracture fixation, Internal, Meta-analysis, Fracture fixation