Title: Cross-product comparison of anatomic fit of locking compression plates for olecranon fractures

Background

Pre-contoured fracture plates are a relatively recent technological advancement in orthopaedic traumatology, and they are thought to create stronger fracture repairs due to more optimal screw placement and less bone-plate gapping as well as reduce the incidence of soft tissue irritation. The performance of these plates is dependent on how well they conform to the anatomical surface of the bone. Certain fracture locations, like the olecranon, which has a near-90 degree curvature, can be difficult to accommodate with plating. Nearly all of the major orthopaedic device manufacturers have commercially available pre-contoured, locking plate designs for fixation of olecranon fractures. “Anatomic pre-contouring” is advertised as a key feature of each of these plate designs; however, these claims have not been confirmed with scientific evidence in the literature.

Study Objective

The goal of this study is to compare the anatomic fit of different brands and sizes of pre-contoured locking compression plates for olecranon fractures.

Study Design

• CT scans of 15 unmatched human cadaveric elbows. 76±15 years old; 9 male, 6 female, 8 left, 7 right. Normal condition, no arthritis, deformity, etc.
• Four different plates: (1) Acumed Olecranon Plate, 4-hole; (2) Zimmer Proximal Ulna Locking Plate, 5-hole; (3) Acumed Olecranon Plate, 13-hole; and (4) Zimmer Proximal Ulna Locking Plate, 16-hole. All commercially-available sizes available for each plate design.
• Plates scanned on high-resolution 3D scanner. Vivid 9i, Konica-Minolta; 640x460 pixel resolution, +/-50µm measurement accuracy
• Volume renderings of CT scans and plates imported into 3D image processing software (Mimics & 3-Matic, Materialise)
• Each plate design applied by surgeon to every bone specimen.
• Methodology & outcome measures described in DiStefano 2011 and Schmutz 2008. Only deviation is that congruency of proximal 10 mm was not assessed because clinically there would be a gap to accommodate triceps tendon.
Figures

Figure 1: The four different fracture plate designs considered in this study. From left to right: Zimmer 16-hole plate, Acumed 13-hole plate, Zimmer 4-hole plate, and Acumed 5-hole plate.

Figure 2: Representative sample showing placement of plate and distance between olecranon plate and the bone.

References
Study design & data courtesy of Leslie Sisco, MD, Thuc Quyen Nguyen, BS, Lisa Lattanza, MD, and Jenni Buckley, PhD.
