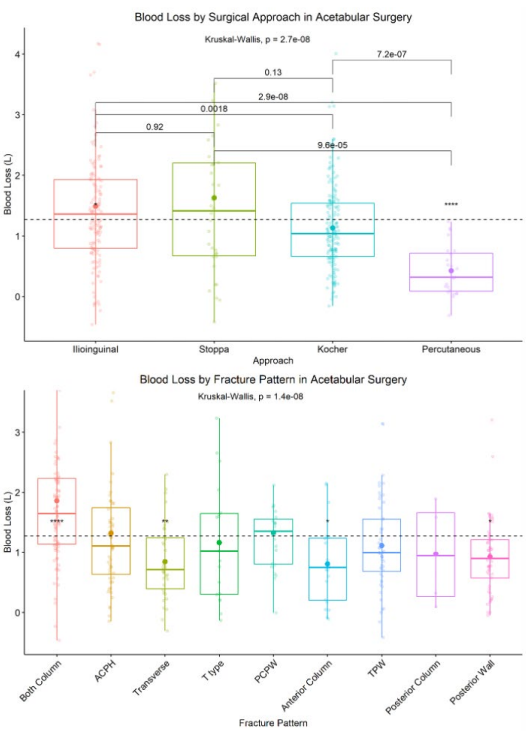
Quantifying Blood Loss in Acetabular ORIF:
Fracture Pattern, Surgical Approach, and Delay to Surgery

Natalie Lacey Zusman, MD; *Erik Woelber, MD; Natasha McKibben, BS; David Gallacher, BS; Darin M. Friess, MD; Zachary Mark Working, MD*
Oregon Health & Science University, Portland, OR, United States

Purpose: The purpose of this study was to investigate factors impacting perioperative blood loss (BL) in acetabular open reduction and internal fixation (ORIF), using a quantitative, formulaic approach to minimize error and bias.

Methods: Adult patients receiving unilateral acetabular ORIF (academic, Level I, 2008-2018) were reviewed for demographics, injury patterns, surgical outcomes, and perioperative laboratory data. BL was calculated using a hemoglobin mass-loss formula (International Council: Standardization in Haematology), which adjusts for change in total blood volume by height, age, weight and gender. Key inputs included pre- and postoperative hemoglobin, transfusions, and fluids delivered including cell-saver. A multivariate model was created using a backwards stepwise multivariate linear regression.

Results: 345 patients with complete data were included (median BL 1001 mL; interquartile range [IQR] 700-1700). Our model identified male sex (+391 ± 112 mL, $P<0.01$), time to surgery, surgical approach, and fracture pattern as significant factors. Approaches: Patients receiving a Stoppa only or an ilioinguinal approach did not bleed differently (median 1.41 L vs 1.36 L, $P = 0.92$) but lost significantly more than Kocher approaches (median 1.04 L, $P<0.01$). Percutaneous surgery resulted in the least BL (median 0.32 L, IQR 0.09-0.71; $P<0.01$, all 3 comparisons). Fracture Pattern: Associated both-column fractures bled the most (median 1.65 L, IQR 1.13-2.23; $P<0.01$) while transverse fractures bled the least (median 0.72 L, IQR 0.39-1.24); posterior wall injury was also a low BL pattern ($P<0.01$) in the model. Surgical delay resulted in 80 ± 1.6 mL less BL/day ($P<0.01$). While formula-driven BL highly correlated to surgeon-estimated BL, surgeons underestimated relative to objective measures (0.88 ± 0.05 L, $P<0.01$).



Conclusion: Blood loss in acetabular ORIF is influenced by male sex, time to surgery, surgical approach, and fracture pattern. Use of quantitative measures should be considered for adoption in BL analysis in orthopaedic trauma.