

Delaying Acetabular Fracture Open Reduction Internal Fixation Can Save a Unit of Blood Loss: A Quantitative Analysis

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INTRODUCTION: Recent studies have cast doubt on the theory that delayed fixation of acetabular fractures is associated with reduced intraoperative blood loss (BL). However, existing literature uses highly subjective surgeon estimated blood loss (EBL) as the primary outcome. We hypothesize that when using a formulaic calculated BL, delay to surgery is associated with decreased BL in acetabular surgery, which may substantially impact a subgroup of fragile patients.

METHODS: All patients presenting to our Level 1 trauma center with unilateral acetabular fractures treated with open reduction internal fixation (ORIF) (2008 – 18) were retrospectively reviewed. Using previously examined methods, perioperative BL was calculated using the Gross formula, which requires Nadler's formula to estimate baseline circulating blood volume (Figure 1A)¹. The primary analysis employed multivariable linear regression to estimate the association between hospital day and calculated BL after controlling for age, surgical approach, and tranexamic acid (TXA) use.

RESULTS: A total of 345 patients (74% male, mean age: 50 [SD: 18]) with acetabular fractures (25% associated both column, 41% ilioinguinal approach) received ORIF (median days to surgery: 2 [IQR: 1 -4]). The mean calculated BL 632 mL (SD: 576, Figure 1B) was significantly less than the mean EBL of 928 mL (SD: 775, $p < 0.001$). With every additional day between injury and surgery there was 44 mL less calculated BL (95%CI: -65 to -22, $p < 0.001$, Figure 1B). Surgery on hospital day 0 or 1 was associated with 293 mL greater BL than surgery delayed after hospital day 1 (95%CI: -427 to -159, $p < 0.001$). Among delayed surgery patients, there was an additional associated 26 mL less BL per subsequent day delayed (95%CI: -51 to -0.4, $p = 0.047$).

DISCUSSION AND CONCLUSION:

Intraoperative BL decreases with days from injury when calculated using a quantitative approach based on an unbiased formula that accounts for patient size and is substantially different from subjective EBL. The difference in BL when delaying surgery after hospital day 1 is approximately a unit of blood (250-330 mL). There may indeed be benefit to delay surgery for specific, fragile patients.

¹ Lindsay et al. Surgeon Estimated Blood Loss is Discordant with Calculated Blood Loss in Acetabular and Pelvis Fracture Surgery. *J Orthop Trauma*.

Figure 1A)

$$\text{Blood loss (mL)} = \text{Blood Volume} \times \frac{\text{Hct}_{\text{preop}} - \text{Hct}_{\text{postop}}}{\text{Hct}_{\text{mean}}} + (\text{number of transfusions} \times 200 \text{ mL}) + \text{cell saver volume}$$

Women: $\text{Blood Volume (mL)} = 0.0003561 \times \text{height(cm)}^3 + 33.08 \times \text{weight(kg)} + 183.3$
 Men: $\text{Blood Volume (mL)} = 0.0003669 \times \text{height(cm)}^3 + 32.19 \times \text{weight(kg)} + 604.1$

Figure 1B)

