

## Outcomes of Single-Stage versus 2-Stage Bilateral Intramedullary Nail Fixation in Patients with Bilateral Femur Fractures

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**Purpose:** This study aims to evaluate complications in patients with bilateral femur fractures treated with intramedullary nailing (IMN) during either 1 single or 2 separate anesthetic events.

**Methods:** A multicenter retrospective review of patients with bilateral femur fractures from 1998-2018 was performed at 9 Level-I trauma centers. Patients treated during 1 anesthetic event were classified as the single-stage group and those treated during 2 separate anesthetic events were classified as the 2-stage group. Data collection included patient demographics, injury characteristics, and patient outcomes. Analysis consisted of comparative tests and logistic risk regression.

**Results:** A total of 227 patients were included, with 170 in single-stage with a mean of 55.0 hours  $\pm$  145.5 (32.7, 77.4) to definitive fixation and 57 in 2-stage with a mean of 165.5 hours  $\pm$  221.0 (106.9, 224.2) to definitive fixation. The 2-stage group had a mean of 74.6 hours  $\pm$  61.8 (66.4, 82.8) between procedures. Age and gender were similar between groups ( $P = 0.15, 0.21$ , respectively). Mean ISS was 25.2 and 24.3 in the single- and 2-stage groups, respectively ( $P = 0.65$ ); head, chest, and abdominal injuries were comparable between groups ( $P = 0.73, 0.22, 0.67$ , respectively). Patients in the 2-stage group had a longer hospital length of stay (LOS, 28.8 vs 17.0 days;  $P = 0.01$ ) and ICU LOS (11.9 days vs 7.6 days;  $P < 0.01$ ). The 2-stage group had higher rates of the following complications: acute respiratory distress syndrome (ARDS) (14.0% vs 6.5%;  $P = 0.05$ ), rhabdomyolysis (12.3% vs 0%;  $P < 0.01$ ), inpatient dialysis (8.8% vs 1.2%;  $P < 0.01$ ), and stroke (8.8% vs 2.4%;  $P = 0.05$ ). Pulmonary embolism and fat embolism were comparable between the 2 groups ( $P = 0.38, P = 0.32$ , respectively). In-hospital mortality was higher in the single-stage group (3.5% vs 1.8%), but not statistically significant ( $P = 0.68$ ). Early definitive fixation group was at a 72% reduced risk for ARDS when adjusting for age, gender, ISS, GCS (Glasgow Coma Scale), admission lactate, head and chest injury, and institution.

**Conclusion:** Our study did not demonstrate a difference in pulmonary emboli and fat emboli between the 2 treatment strategies, but that there is increased incidence of ARDS, rhabdomyolysis, stroke, and need for inpatient dialysis in the 2-stage group. This is the largest, multicenter study to date evaluating outcomes between single- and 2-stage IMN fixation for bilateral femur fractures.