Early Intramedullary Nailing of Femoral Shaft Fractures in Polytrauma Patients is Associated with Decreased Mortality and Pulmonary Morbidity

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INTRODUCTION: Femoral shaft fractures are a common orthopaedic injury with an annual incidence of 10-37 per 100,000 persons. They have a bimodal distribution in terms of age with the most common mechanism in younger patients being an MVC compared to a fall from standing in the elderly population. For isolated femoral shaft fractures, outcomes may improve when fixation is performed within 14 hours. However, optimal management for patients with concomitant traumatic injuries is unknown. There is debate on optimal timing. For example, a large retrospective study found that intramedullary nailing (IMN) within 24 hours had improved outcomes even with concurrent head and chest trauma, and a separate study using the national trauma data bank suggested that severely injured patients benefited from delayed fixation. Our study seeks to add to the existing body of literature using more recent data to examine time to IMN of femoral shaft fractures and its effect on mortality and pulmonary morbidity. As the care of trauma patients has progressed significantly over the past 15 years, our hypothesis is that patients who sustain major trauma will have decreased mortality and pulmonary morbidity with early IMN for polytrauma patients.

METHODS: This is a retrospective cohort study of trauma patients admitted to a large hospital system within the United States to examine femoral shaft fractures in patients who sustained multiple traumatic injuries from January 2016 to June 2022. Review of enterprise data from 82 trauma centers using ICD-10 diagnosis and procedural codes were used to obtain the variables examined in this study. The study population included all trauma patients between the ages of 18-89 years who had femoral shaft fracture fixation with intramedullary nailing. Patients were excluded if they had pathological fractures, were part of a vulnerable population (prisoners, pregnant), or coded before arrival. Patients were grouped into 4 cohorts based on timing of surgery. Odds ratios and p values between these groups were risk adjusted using multivariable regression analysis to account and adjust for confounding factors.

RESULTS: 1,603 patients who met inclusion criteria were included in the study. Patients who had IMN on the day following admission (HD 1) had the lowest mortality among the 4 cohorts based on timing of surgery (2.6% vs. 0.7% vs. 3.0% vs. 1.8%, p=0.05). These patients also had the lowest rates of pneumonia (2.1% vs. 1.2% vs. 3.0% vs. 6.6%, p=0.0004) and acute respiratory failure (2.6% vs. 2.2% vs. 10.1% vs. 6.0%, p<0.0001). Patients with an ISS ≥ 15 had an increased mortality rate if IMN was performed on the same day of admission compared to those with an ISS < 15 (20.6% vs. 0.6%, p=0.01). The lowest mortality for patients with an ISS ≥ 15 was seen when IMN was performed on HD 1 compared to the other timepoints (20.6% vs. 0.0% vs. 9.1% vs. 4.2%, p=0.0004). Patients with an ISS <15 who had IMN after HD 2 had over 10x the risk of pneumonia than those who had IMN on HD 1 [OR = 10.26(1.82, 57.82)]. Patients with an ISS < 15 with non-isolated femoral shaft fractures did not show the same mortality benefit as isolated fractures with early IMN (0.6% vs. 0.7% vs. 1.3% vs. 0.9%, p=0.92).

DISCUSSION AND CONCLUSION: Optimal timing of intramedullary nailing of femoral shaft fractures for the entire cohort was on HD 1, where both mortality and pulmonary morbidity were the lowest. When stratified by severity of injury, IMN on HD 1 for severely injured patients (ISS ≥ 15) was associated with decreased mortality, while IMN of patients with less severe injuries (ISS < 15) after HD 2 was associated with higher rates of pneumonia.