

# **Preperitoneal Pelvic Packing is Associated with a Greater Risk of Venous Thromboembolism than Angioembolization for Refractory Hypotension in Closed Pelvic Ring Injury**

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**INTRODUCTION:** Traumatic pelvic ring disruption may present with hemodynamic instability secondary to hemorrhage. Preperitoneal pelvic packing (PPP) is suggested as an alternative to angioembolization (AE) for management of hypotension associated with pelvic ring injury refractory to resuscitation and circumferential compression. It is not known whether PPP independently increases venous thromboembolism (VTE) risk in these patients. We hypothesized that PPP may be independently associated with increased risk of venous thromboembolism compared to AE in hypotensive patients with pelvic ring disruption.

**METHODS:** Adult patients with pelvic ring disruption and hypotension managed with PPP or AE were identified and retrospectively reviewed via the Trauma Quality Improvement Program (TQIP) database from 2015-2019. Patients with disseminated cancer, bleeding disorders, anticoagulant use, death on arrival, or missing data for covariables and outcomes were excluded. Patients who received resuscitative endovascular balloon occlusion of the aorta (REBOA) or who received both PPP and AE were excluded to limit potential confounding. Patients were matched on a propensity score for receiving PPP based on age, smoking status, Injury Severity Score (ISS), Tile B or C pelvic ring disruption, bilateral femur fracture, serious head injury, units of plasma and platelets given within first four hours of admission, use of exploratory laparotomy, and level 1 trauma center designation of the treating facility. The treatment effect of PPP on developing in-hospital VTE was estimated by 1:1 Mahalanobis distance neighbor (MDN) matching without replacement on the propensity using a caliper of 0.25 of the standard deviation of the logit of the propensity score after testing caliper ranges from 0.1-1.0 and dichotomized covariable thresholds. The primary outcome was risk of venous thromboembolism (VTE) with adjustment for the propensity score for receiving PPP. Secondary outcomes included rates of deep vein thrombosis (DVT), pulmonary embolism (PE), respiratory failure, inpatient mortality, unplanned reoperation, sepsis, surgical site infection, hospital length of stay (LOS), and intensive care (ICU) LOS.

**RESULTS:** A total of 502 PPP and 2,493 AE patients met inclusion criteria. In total, 183 PPP and 183 AE patients remained after propensity score matching, with no significant differences in demographic, injury, or treatment characteristics predictive of study intervention or primary outcome. Neither provision of chemoprophylaxis for VTE nor chemoprophylaxis agent were significantly different between PPP and AE patients after matching ( $p > 0.05$ ). After matching, PPP was associated with 9.8% (95% CI 3.5 to 16.1) greater absolute risk of VTE (relative risk [RR] = 1.5 [95% CI 1.2 to 1.9],  $p = 0.003$ ), 6.5% (95% CI 1.2 to 11.9) greater absolute risk of DVT (RR = 1.4 [95% CI 1.1 to 1.8],  $p = 0.04$ ), and 4.9% (95% CI 0.6 to 9.2) greater absolute risk of respiratory failure (RR = 3.3 [95% CI 1.1 to 9.8],  $p = 0.03$ ) compared to AE. The incidence of PE (Absolute risk difference (ARD) = 3.8% with PPP [95% CI -0.2 to 7.7], RR = 2.8 [95% CI 0.9 to 8.5],  $p = 0.07$ ) and mortality (ARD = 7.1% with PPP [95% CI -0.8 to 15.0], RR = 1.2 [95% CI 0.9 to 1.6],  $p = 0.08$ ) were not significantly different by treatment. Treatment was not associated with significantly different total hospital days, total ICU days, days on respiratory support, or other measured complications (all  $p > 0.05$ ).

**DISCUSSION AND CONCLUSION:** Preperitoneal packing for the treatment of refractory hypotension secondary to pelvic ring injury was independently associated with greater risk of VTE, DVT, and respiratory failure despite similar times to intervention and similar times to initiation of, choice to use, and agents of VTE prophylaxis compared to angioembolization. Preperitoneal packing may be an appropriate, lifesaving intervention – particularly when angioembolization is not readily available. However, personnel involved in the care of patients with severe pelvic ring injuries should be aware of the greater risks associated with preperitoneal packing compared to angioembolization and perhaps consider preferential use of angioembolization if available. Prospective randomized studies are indicated to validate these findings.