Preperitoneal pelvic packing is effective for hemorrhage control in open pelvic fractures


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ABSTRACT

Background: Open pelvic fractures are life-threatening injuries. Preperitoneal pelvic packing (PPP) has been suggested to be ineffective for hemorrhage control in open pelvic fractures. We hypothesize that PPP is effective at hemorrhage control in patients with open pelvic fractures and reduces mortality.

Methods: Patients undergoing PPP from 2005 to 2015 were analyzed. Patients with open pelvic fractures were defined as direct communication of the bony injury with overlying soft tissue, vagina, or rectum.

Results: During the 10-year study, 126 patients underwent PPP; 14 (11%) sustained an open pelvic fracture. After PPP, 1 patient (7%) underwent angioembolization with a documented arterial blush. PPP controlled pelvic hemorrhage in all patients. Overall mortality rate was 7% with one death due to traumatic brain injury.

Conclusions: PPP is effective for hemorrhage control in patients with open pelvic fractures. PPP should be used in a standard protocol for hemodynamically unstable patients with pelvic fractures regardless of associated perineal injuries.

Open pelvic fractures are historically reported as devastating injuries from bleeding with a mortality rate up to 60%.1–4 Defined as fractures resulting in soft tissue defects with direct communication of the bony injury with overlying soft tissue, vagina, perineum, or rectum, open pelvic fractures comprise only 2–5% of all pelvic fractures.3,5 The most common cause of early death from an open pelvic disruption is hemorrhagic shock.6 The optimal treatment strategy to address hemorrhage in open pelvic fractures remains controversial. Preperitoneal pelvic packing (PPP) has been reported extensively in Europe9–16 and more recently in the United States17 to be an effective modality for hemorrhage control. However, PPP has been suggested to be ineffective for hemorrhage control in patients with open pelvic fractures; the proposed rationale is that the tamponade of the retroperitoneum is already released to the environment.18 With a developing experience in PPP for hemodynamically unstable patients with pelvic fracture related hemorrhage, we questioned this belief. The purpose of this study was to evaluate the role of PPP in patients with open fractures at a level 1 trauma center. We hypothesized that PPP is effective at hemorrhage control for pelvic fracture bleeding in patients with open pelvic fractures and reduces mortality.

1. Methods

At our state certified and American College of Surgeons verified urban Level 1 Trauma Center, pelvic fracture patients with persistent hemodynamic instability despite red blood cell (RBC) transfusion underwent PPP/external fixation (EF), according to our protocol (Fig. 1). Following initial stabilization of the pelvis with pelvic sheeting in the emergency department (ED), skeletal fixation is performed concurrently with PPP in the operating room using EF. The specific indication for PPP is a persistent systolic blood pressure (SBP) <90 mmHg despite two units of transfused packed RBCs. During the patient’s evaluation, careful examination for an open fracture is performed by physical examination, speculum inspection, and rigid proctoscopy. An open pelvic fracture was defined as direct communication of the bony injury with overlying soft tissue, vagina, or rectum. Associated injuries were managed at the discretion of the attending surgeon, and antibiotics were chosen in concert with the orthopedic team.

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Patients undergoing PPP for pelvic fracture related hemorrhage from 2005 to 2015 were reviewed. Descriptive subgroup analysis of those patients with open fractures was performed. Data were managed with Microsoft Excel 8.0 (Microsoft, Redmond, WA). Statistical analyses were performed using SPSS for Windows 10.0 (SPSS, Inc., Chicago, IL). Continuous data are expressed as mean ± the standard error of the mean. Group comparisons were performed using independent sample t-tests, logistic regression analysis, and [chi]² tests as appropriate. The level of significance was set at P < 0.05 for all tests. The Colorado Multi-Institutional Review Board approved this study.

2. Results

During the 11-year study, 126 patients underwent PPP; 14 (11%) patients sustained an open pelvic fracture. In this subgroup of open fracture patients, the sex of the patient was evenly divided between men and women; the mean patient age was 35 ± 4 years and mean injury severity score (ISS) was 46 ± 3. Mechanism of injury included motor vehicle collisions (5), motorcycle collisions (5), falls (2), and autopedestrian accidents (2). Fracture classification included APC-III (5), APC-II (4), LC-III (3), and LC-II (2) patterns. The open fracture classification was defined perineal/sacral wounds (8) and vaginal lacerations (4); perineal wounds often entailed significant tissue destruction (Fig. 2).

All patients had associated injuries with 93% undergoing a mean of 4 ± 0.7 additional procedures during the index operation of PPP/EF. The lowest mean emergency department SBP was 75 mmHg, highest heart rate was 119 beats per minute, and worst base deficit was 12 mmol/L. Patients received a mean of 3 ± 1 units of RBCs in the ED and median time to operation was 44 min. Median RBC transfusions prior to Surgical Intensive Care Unit (SICU) admission compared to the 24 postoperative hours were 12 versus ± 3 units (p < 0.05). At the time of PPP, the majority (78%) had 6 laparotomy pads placed in the preperitoneal space; one patient required 4 packs, one patient 5 packs, and one patient 7 packs for tamponade.
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