Pelvic ring fractures are seen in a bimodal distribution, with younger patients typically sustaining high-energy trauma and elderly patients more commonly sustaining low-energy or insufficiency fractures. The incidence of pelvic fractures in the entire population is 20 to 37 per 100,000 annually; however, for patients older than 85 years, the incidence rises to 446 per 100,000 annually. In most pelvic fractures (90%), the vascular injuries are venous in origin. However, because of the close proximity of internal iliac branches to the bony anatomy of the pelvic ring, as well as reduced vessel compliance in the elderly, the potential for arterial injury exists. The authors present a case of an elderly woman who sustained a superior pubic ramus fracture and arterial injury following a low-energy fall from standing that required angiographic intervention. Elderly patients who sustain low-energy or pelvic insufficiency fractures are unlike the younger population with high-energy pelvic fractures and hemodynamic collapse. Elderly patients can have a delayed presentation of arterial injury and require careful physical examination and close monitoring. Additionally, the authors provide a review of the literature for low-energy pelvic fractures. [Orthopedics. 2017; 40(3):e546-e548.]

Obturator Artery Injury Resulting in Massive Hemorrhage From a Low-Energy Pubic Ramus Fracture

MARK K. SOLARZ, MD; JUSTIN M. KISTLER, MD; SAQIB REHMAN, MD

Pelvic ring fractures are common in the elderly population and are usually a result of low-energy trauma, such as falls from standing. In most cases, low-energy pelvic ring injuries can be treated with appropriate analgesia and early mobilization. Arterial injury resulting in hemodynamic instability from a low-energy pelvic ring injury is rare but, given the poor compliance of vessels in the elderly population, possible. These patients must be carefully monitored after the initial injury. The purpose of this report is to describe an elderly patient who sustained a superior pubic ramus fracture and arterial injury following a low-energy fall from standing that required angiographic intervention. Elderly patients who sustain low-energy or pelvic insufficiency fractures are unlike the younger population with high-energy pelvic fractures and hemodynamic collapse. Elderly patients can have a delayed presentation of arterial injury and require careful physical examination and close monitoring. Additionally, the authors provide a review of the literature for low-energy pelvic fractures.

The initial physical examination included temperature of 36.4°C, pulse of 96 beats/min, blood pressure of 130/47 mm Hg, respiratory rate of 14 breaths/min, and oxygen saturation of 98% on room air. Laboratory tests revealed no elevation in prothrombin time or partial thromboplastin time (12.7 seconds and 28.8 seconds, respectively) and a hemoglobin level of 10.4 g/dL. Radiographs showed a minimally displaced right superior pubic ramus fracture. At the time of initial orthopedic surgery consultation, there was no deformity of the right lower extremity and the patient on the right lower extremity following a mechanical fall from standing. Her past medical history was significant for hypertension and bilateral proximal femur fractures treated with a right hemiarthroplasty and a left dynamic hip screw. Her only medications were 5 mg/d of amlodipine and 81 mg/d of aspirin.

The authors are from the Department of Orthopaedic Surgery and Sports Medicine, Temple University, Philadelphia, Pennsylvania.

Drs Solarz and Kistler have no relevant financial relationships to disclose. Dr Rehman is a paid lecturer for DePuy Synthes.

Correspondence should be addressed to: Justin M. Kistler, MD, 415 Fort Hill Cir, Fort Washington, PA 19034 (jkistler75@gmail.com).

Received: September 19, 2016; Accepted: December 5, 2016.

doi: 10.3928/01477447-20161229-03
had full, albeit painful, range of motion of the right hip. Neurovascular examination of the affected extremity was unremarkable. The abdomen was soft but the right lower quadrant was exquisitely tender to palpation with a palpable fullness compared with the left lower quadrant.

Given the physical examination findings, the general surgery trauma service was emergently involved and the patient underwent evaluation in the trauma bay using the standard Advanced Trauma Life Support protocol. Results of the primary survey were negative for any compromise of the patient’s airway, breathing, or circulatory status and results from the focused assessment with sonography in trauma were negative for free peritoneal fluid.

Initial radiographs of the pelvis showed a minimally displaced right superior pubic ramus fracture (Figure 1). Computed tomography with intravenous contrast was performed and showed a large extraperitoneal hematoma with active extravasation of contrast at the posterior aspect of the right superior pubic ramus (Figure 2). The extensive hematoma was compressing the bladder and extended along the right side of the retroperitoneum to the level of the inferior pole of the right kidney. The patient was taken emergently to interventional radiology for angiography. Active hemorrhage was identified in a small branch of the right obturator artery adjacent to the superior pubic ramus fracture, which was embolized with endovascular coiling and Gelfoam (Pfizer, New York, New York) (Figure 3).

The patient was monitored in the surgical intensive care unit following embolization. Immediate postprocedural hemoglobin level was 7.1 g/dL, a decrease of 3.3 g/dL since presentation to the emergency department. Her blood pressure had dropped to 80/62 mm Hg, but her heart rate remained stable at 82 beats/min. One unit of packed red blood cells was transfused and she responded appropriately with a posttransfusion hemoglobin level of 8.3 g/dL. Her hemoglobin level continued to decrease to a nadir of 6.3 g/dL the following day. A second unit of packed red blood cells was transfused and again she responded appropriately with a posttransfusion hemoglobin level of 8.3 g/dL. Her hemoglobin level continued to be checked in a serial manner and remained stable throughout the remainder of her hospital stay. On the fifth hospital day, her vital signs and hemoglobin level were stable and she was discharged to a skilled nursing facility.

**DISCUSSION**

Low-energy pelvic ring fractures are commonly seen in the elderly and have been associated with significant morbidity in this population. Fractures of the pubic rami in particular account for two-thirds of osteoporotic pelvic fractures. Arterial injury following low-energy pelvic fractures is uncommon, with only sporadic case reports in the literature. According to a cadaveric study by Henning et al., when it does occur, it most commonly results from injury to the corona mortis, which is an anatomic variant with anastomoses between the internal and external iliac vasculature specifically from the inferior epigastric (external iliac) and obturator (internal iliac) vessels. This is seen in up to 65% of the population.

Anatomical variants of the pelvic vasculature are well documented in the literature. Specifically, there are known variants of the obturator artery and the corona mortis. Pick et al. described the obturator artery arising from the external iliac artery as a branch off the epigastric artery in 30% of cadaveric specimens. In 27% of cadaveric specimens, the inferior epigastric artery arises from the external iliac artery and is the origin of the obturator artery. The current patient did not have a corona mortis present as shown with angiography. Instead, she had a variation of an internal obturator artery.

There are other anatomical differences that may account for arterial injury in elderly patients with low-energy pelvic fractures. Elderly patients who sustain low-energy pelvic fractures typically have atherosclerotic vessels. Atherosclerosis results in reduced vasospasm and decreased vessel compliance, which can ultimately lead to a higher likelihood of vessel rupture. Additionally, poor soft tissue turgor will de-
crease the tamponade effect of the pelvic contents that would normally be seen in the younger population.1

At the authors’ institution, stable pelvic ring fractures, regardless of mechanism, are initially evaluated using the Advanced Trauma Life Support protocol. An antero-posterior pelvic radiograph is mandatory for patients with hip or pelvic pain, and additional views (pelvic inlet and outlet) are added when the patient is stable. Computed tomography scans along with 3-dimensional reconstructions of the pelvis are obtained to further define injury patterns. Even those with low-energy pelvic ring fractures are admitted for a minimum of 24 hours, and serial hemoglobin levels are taken every 8 hours to identify potentially life-threatening hemorrhage. Ten Broek et al3 reported that injuries to the corona mortis can occur hours to days following low-energy pubic ramus fractures in the elderly population, emphasizing the need for close observation of these patients. Stable fracture patterns are mobilized as soon as possible with physical therapy. Postambulatory radiographs are compared with those obtained at admission to confirm stability.

**CONCLUSION**

The current case involved an elderly woman who sustained an obturator artery injury and subsequent massive hemorrhage as a result of a low-energy pubic ramus fracture that required angioembolization and multiple blood transfusions. This case shows the importance of careful hemodynamic observation after low-energy pelvic ring injuries, particularly for the elderly population, whose poorly compliant vessels are more easily injured.

**REFERENCES**