

# External iliac artery injury with posterior pelvic ring injury in Korea: two case reports

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Pelvic ring injuries associated with external iliac artery injuries are rare and may be life-threatening condition. The most important factors in the managements are the immediate bleeding control and restoration of distal blood flow. We report two cases of pelvic ring injuries with external artery injuries. One case was occlusion of external iliac artery with concomitant rupture of internal iliac artery. The other case was ruptured external iliac artery. Every surgeon must understand the possibility of hidden lesions—for example, arterial rupture and thrombus—and should consider the need for embolization or thrombectomy when treating this type of injury.

**Keywords:** Pelvic ring injury; Pelvic fracture; Vascular system injuries; External iliac artery; Case reports

## INTRODUCTION

In pelvic fractures, hemorrhage originates from the fracture site or owing an injury to the presacral and lumbar venous plexus [1]. Pelvic ring injuries associated with external iliac artery injuries are rare and may arise due to a lacerated or thrombosed on injured artery [2–6]. Injuries to the external iliac artery may be life-threatening. Moreover, vascular injury-induced lower extremity ischemia can worsen the clinical condition and thereby necessitate generalized salvage treatment for the rest of the body. Most surgeons agree that immediate hemostasis and restoration of vascular perfusion constitute crucial interventional strategies for the management of major arterial injuries. This report describes two cases of combined pelvic ring and external iliac artery injuries.

## CASE REPORTS

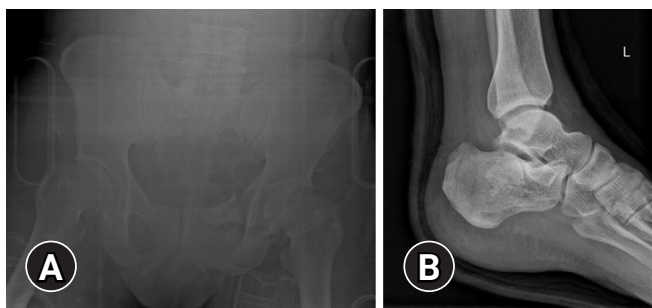
### Case 1

A 48-year-old healthy male construction worker who suffered a traumatic injury when he fell while carrying a 100-lb (45.36 kg) cement bag, which caused compression injuries to his inguinal area, was promptly admitted to Inje University Haeundae Paik Hospital. On admission, his mental status was alert; the initial blood pressure was 120/80 mmHg with tachycardia (110 beats/min); and the initial hemoglobin level was 13.5 g/dL (normal range, 12.0–16.0 g/dL). The patient complained of severe back, pelvis, and left heel pain and hypoesthesia, especially in the right lower extremity. On examination, muscular strength in the left lower extremities was intact according to the manual muscle testing scale; on the right side, the ankle dorsiflexion and plantar flexion power was grade 0, and the extensor hallucis longus pow-

er was grade 0. The peripheral pulses were palpable. Voluntary anal contraction was examined, and the anal and bulbocavernosus reflexes were found to be intact. Radiographic imaging showed an Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic Trauma Association (AO/OTA) C3 pelvic ring injury, which included bilateral sacral fractures, bilateral superior and inferior rami fractures, and right anterior iliac wing fracture; the patient also had a left calcaneal fracture (Fig. 1). A plain radiograph and computed tomography of the lumbosacral spines revealed right L1–L4 transverse process fractures. A computed tomography scan of the patient’s abdomen and thorax showed multiple rib fractures, right-sided pneumothorax, and hemoperitoneum.

After the initial resuscitation, closed reduction of the fracture-induced pelvis widening was attempted by applying a pelvic binder, and the patient was shifted to the angiography suite for vascular assessment. Angiography demonstrated contrast extravasation from the right internal iliac artery, for which an intravascular coil was inserted, hemostasis was ensured, and the patient was transferred to the intensive care unit because of unstable vital signs (blood pressure, 90/50 mmHg; heart rate, 71 beats/min) with a hemoglobin level of 8.6 g/dL. The bilateral palpable femo-

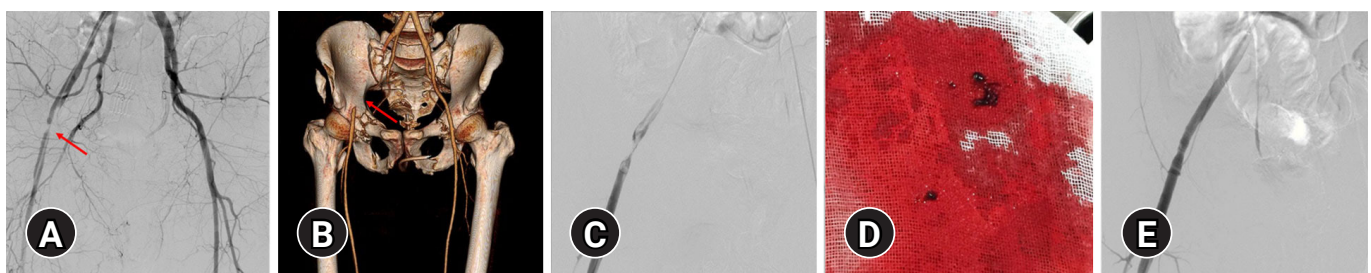
ral pulses were palpable; however, the right dorsalis pedis and right posterior tibial artery pulses were nonpalpable. A repeat angiography was conducted for vascular assessment after 40 minutes of the initial angiography (Fig. 2) and demonstrated a filling defect of the right external iliac artery which was not previously observed. A thrombectomy of the right external iliac artery restored the right lower extremity circulation, and fasciotomies of the right thigh and leg were performed to prevent compartment syndrome. The patient transferred back to the intensive care unit for further resuscitation and, 10 days later, underwent reduction and fixation of the posterior pelvic disruption and right iliac wing fracture; the fracture fragments of both sacroiliac joints and the right iliac wing were reduced and fixed using screws. The postoperative course was uneventful, without any complications; an anteroposterior pelvis radiograph that was obtained at the 6-week postoperative follow-up is shown in Fig. 3. The patient was subsequently discharged to a rehabilitation facility. Normal



**Fig. 1.** Anteroposterior pelvic and lateral ankle radiographs showing (A) both sacral fractures, both superior and inferior rami fractures, anterior right iliac wing fracture, and (B) left calcaneal fracture.



**Fig. 3.** An anteroposterior pelvis radiograph at postoperative 6 weeks.



**Fig. 2.** Angiography of lower extremities. (A, B) An abrupt stoppage of flow was identified in the right external iliac artery (arrows). (C) Balloon angioplasty and thrombectomy were done. (D) The removed thrombus. (E) After the removal of filling defect.

motor power recovery in the affected extremity was restored within 6 months.

### Case 2

A 57-year-old healthy male worker sustained a crush injury under an overturned forklift. He was transferred to and evaluated at a community hospital and was then referred to Inje University Haeundae Paik Hospital. At presentation, the patient had a crushed left thigh and muscle protrusion of the left pelvis from an open wound with active bleeding. On admission, his mental status was alert; the initial blood pressure was 80/50 mmHg and the heart rate was 85 beats/min; and the initial hemoglobin level was 13.8 g/dL. The patient complained of pain in the left pelvis and in both thighs. A radiograph of the pelvis showed AO/OTA C3 pelvic ring injury; left femoral neck, subtrochanteric, and shaft fractures; and a right subtrochanteric femoral fracture (Fig. 4). The patient underwent angiographic vascular assessment in the angiography suite that revealed abrupt flow cessation in the left common iliac artery (Fig. 5). However, 30 minutes after admission, the patient slipped into a semicomatose state with uncheckable blood pressure and bradycardia (50 beats/min). Resuscitation was started with normal saline of 1,000 mL infusion and two packs of universal O group packed red blood cells transfu-



**Fig. 4.** An anteroposterior pelvis radiograph showing Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic Trauma Association (AO/OTA) C3 pelvic ring injury, left femoral neck/subtrochanteric fracture, and right intertrochanteric/subtrochanteric/shaft fractures.

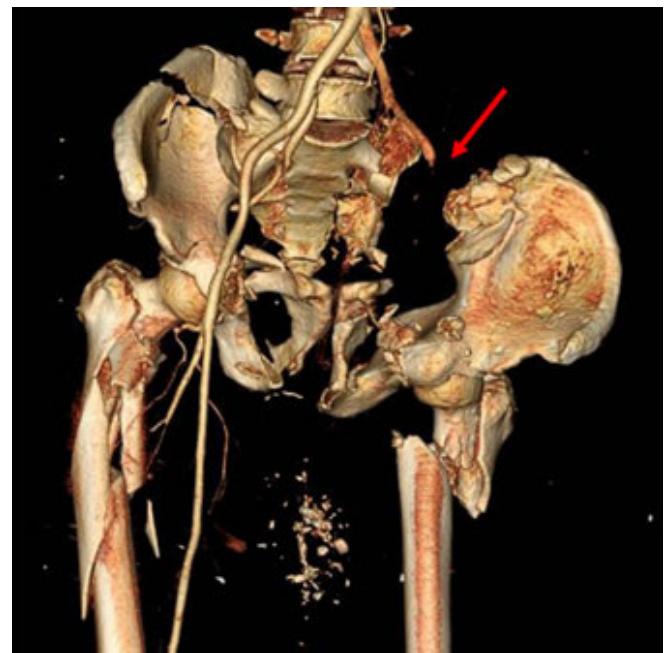
sion. Also, a dopamine infusion (flow rate, 7 mcg/kg/min) was started for resuscitation and increased to 14 mcg/kg/min, but the patient's vital signs remained unstable, and the patient was shifted to the operating room for emergent surgical reduction and external fixation of pelvic fracture and to control hemorrhage. The ruptured left external iliac artery was repaired with a saphenous vein graft and 41 units of packed red blood cells were transfused intraoperatively. Fasciotomies of the left thigh and the left leg were performed to prevent compartment syndrome. Four days later, infection of the fasciotomy site was observed, with a large area of skin necrosis and severe pain of the lower extremity, for which an above-knee amputation and hip disarticulation were consecutively performed. Despite these radical interventions, the infection was not controlled, and the patient died of multiorgan failure and uncontrolled sepsis 34 days after the surgery.

### Ethics statements

The Institutional Review Board of Inje University Haeundae Paik Hospital waived the need for informed consent due to the retrospective nature of the case reports (No. 2017-08-004).

### DISCUSSION

White et al. [7] reported that hemorrhagic pelvic fractures that induce hemodynamic instability have a mortality rate of as much



**Fig. 5.** Angiography of lower extremities. An abrupt stoppage of flow was identified in the left common iliac artery (arrow).

as 40%. Given the high-energy trauma that is needed to disrupt the pelvic ring, associated injuries are common, and mortality is usually a result of uncontrolled hemorrhage from extra-pelvic sources. Large-vessel bleeding secondary to the pelvic ring injury is an important mortality-inducing factor [8].

Most vascular injuries are venous, whereas arterial injuries involve the branches of the internal iliac artery or superior and inferior gluteal arteries [9], which are particularly vulnerable to trauma due to their relationship to the posterior pelvic bones that are disrupted by high-energy trauma. The superior and inferior gluteal arteries and terminal hypogastric branches are vulnerable to injury because of the close anatomic relationship between these arteries and bony structures.

Nonetheless, the external iliac artery is an uncommon source of bleeding in pelvic fractures. Patients at risk of arterial bleeding with continued hemodynamic instability despite resuscitative efforts should undergo immediate angiography and embolization of bleeding pelvic vessels. If this treatment option is unavailable or delayed, or if the patient has other injuries, external fixation and pelvic packing, which can be performed concomitantly with other lifesaving procedures, may be used to further reduce pelvic venous bleeding. For continued hemodynamic lability without an apparent source of blood loss, transcatheter angiographic embolization should be attempted to locate and stop the pelvic arterial bleeding.

Carrillo et al. [2] reported that a 4% incidence of external iliac artery lesions with a pelvic fracture, and, in the absence of autonomous thrombosis, are often life-threatening. The mortality rate associated with iliac artery injuries ranges from 38% to 72% [10,11]. Injuries to the external iliac artery originate from arterial compression over bone in the pelvic ring or from arterial stretching following an injury to the pelvic structures. External iliac artery injury can be detected through a peripheral vascular examination and does not usually demonstrate a delayed pattern. Several reports of unrecognized injuries have been described in the literature [2,12,13], and this type of injury requires prompt surgery to restore vascular perfusion.

The treatment options depend on the kind of pelvic fracture stabilization that is undertaken, and arterial repair or reconstruction can be carried out with a patch or by grafting. In our cases, both patients required external fixation. One patient needed angiographic thrombectomy and intravascular coiling (case 1). The other patient needed arterial repair (case 2). A compartment syndrome in the lower extremity after the artery repair procedure occurred in both patients.

Pelvic ring injuries that are associated with an external artery

injury are uncommon, and few cases have been reported in the literature. As in our cases, associated injuries and open fracture can be catastrophic for the patient. Our case reports emphasize the difficulty of treating combined vascular and peripheral nerve injuries, as one hinders the diagnosis of the other. Every surgeon must understand the possibility of hidden lesions—for example, arterial rupture and thrombus—and should consider the need for embolization or thrombectomy when treating this type of injury.

## NOTES

### Conflicts of interest

The authors have no conflicts of interest to declare.

### Funding

None.

### Data sharing statement

Not applicable.

### Author contributions

Conceptualization: JWK; Data curation: JA; Formal analysis: JA; Methodology: JA; Project administration: JWK; Visualization: JWK; Writing—original draft: JA; Writing—review & editing: JWK. All authors read and approved the final manuscript.

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