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Original article

Diagnosis and treatment of rare complications of pelvic fractures

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ABSTRACT

Purpose: To enhance the awareness of rare complications of pelvic fracture and describe the correct diagnosis and effective treatment.

Methods: A total of 188 cases of pelvic fractures were retrospectively reviewed, and four patients who suffered from four types of rare pelvic fracture complications were described, namely ureteral obstruction caused by retroperitoneal hematoma-induced abdominal compartment syndrome (ACS), bowel entrapment, external iliac artery injury, and open scrotal sac injury.

Results: We demonstrated that combined measures should be employed to prevent the occurrence of ACS following major pelvic fractures. Ureteral catheter support may be a good option at an early stage when ACS occurred. Contrast computed tomography examination and sufficient awareness are keys to a correct diagnosis of bowel entrapment following pelvic fractures. Recognition of risk factors, early diagnosis, and prompt treatment of suspected injury of the external iliac artery are keys to patient survival and to avoid limb loss. Scrotal and/or testicular injury complicated by pelvic fractures should be carefully treated to maintain normal gonad function. Additionally, establishment of a sophisticated trauma care system and multi-disciplinary coordination are important for correct diagnosis and treatment of rare complications in pelvic fractures.

Conclusions: Rare complications of pelvic fractures are difficult to diagnose and negatively impact outcome. Recognition of risk factors and sufficient awareness are essential for correct diagnosis and prompt treatment.

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Introduction

Complications can be defined as a secondary disease, accident, or negative reaction that occur during the course of an illness and usually aggravate the illness. Complications of pelvic fractures are always described in a routine way and as associated injuries of pelvic fractures. Pelvic ring fractures require transmission of a tremendous amount of force, and often happen in severely injured patients with multiple organ injuries.¹ The most common associated injuries are bleeding and retroperitoneal hematoma, intra-abdominal and urogenital injuries, and never injuries in addition to severe pelvic fractures.^{1–3} Approximately 12% of trauma patients

admitted to Level 1 or 2 trauma centers in the United States exhibit pelvic ring injury, and injuries to intra-abdominal or urogenital organs are present in an estimated 16% of these patients. Prompt diagnosis and effective management of these injuries is essential to a successful outcome.^{2,3}

Great efforts have been made to improve treatment of pelvic fracture and its complications, and substantial improvements have been achieved. However rare complications of pelvic fractures, such as ureteral obstruction caused by retroperitoneal hematoma induced abdominal compartment syndrome (ACS), bowel entrapment, external iliac artery injury, and open scrotal sac injury are not easily diagnosed and treated. Unawareness of these rare conditions makes the diagnosis difficult, and failure to provide prompt treatment leads to poor outcomes.

In order to increase the awareness of these rare complications of pelvic fracture and describe the correct diagnosis and effective treatment, we present four cases that exhibit the above-mentioned four different types of rare complications.

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¹ Those patients contribute evenly to this paper.

Materials and methods

This study was reviewed and approved by the Ethical Committee of the Daping Hospital, Third Military Medical University, China. All four patients reported in this study have signed informed consent forms, agreeing that we could report their clinical courses.

Patients who suffered from pelvic fractures in our department from June 2009 to July 2012 were retrospectively reviewed. The mechanisms of injuries, the type of pelvic fracture, and the complications are analyzed.

Four cases exhibited the four types of rare complications, namely ureteral obstruction caused by retroperitoneal hematoma induced abdominal compartment syndrome, bowel entrapment, external iliac artery injury, and severe open scrotal sac injury.

Extensive literature search on Medline/PubMed was performed, including articles related to complications of pelvic and acetabular fractures. We carefully reviewed articles related to the above-mentioned four types of rare complications. Suggestions for diagnosis and recommendations for treatment of these rare complications of pelvic fractures were given.

Results

A total of 188 cases of pelvic fractures were treated in our department between June 2009 and June 2012. There were 124 male and 64 female patients, with an average of 41.2 years of age. The mechanisms of injury included traffic injury (122 cases), high fall injury (35 cases), and heavy object pound injury (24 cases). Of the 188 cases, 37 were complicated by or associated with chest injuries, 14 with brain injuries, 45 with upper extremities injuries, 36 with lower extremities injuries, 12 with ureteral injuries, 3 with bladder injuries, 6 with bowel injuries, and 3 with spleen disruption. There were four cases that exhibited four types of rare complications, namely ureteral obstruction caused by retroperitoneal hematoma induced abdominal compartment syndrome, bowel entrapment, external iliac artery injury, and severe open scrotal sac injury. These cases are reported in detail below.

Case one

A 48-year-old male cleaner fell from a 9 m high building when cleaning the outside window in our hospital and was transferred to the emergency room within 6 min following the accident. On admission, his blood pressure was 100/65 mmHg; it decreased to 65–72/40–46 mmHg 10 min after admission. After the patient was hemodynamically stabilized by infusion of 3000 ml crystalloid fluid and 1200 ml suspended red blood cells, plain roentgenogram and three-dimensional computed tomography (CT) were performed and demonstrated type 61-B2.1 pelvic fracture according to Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic Trauma Association (AO/OTA) classification scheme (Fig. 1A). Additional injuries included a compound fracture of the left proximal femur, fractures of the tenth to twelfth ribs on the left side with lung contusion and hemothorax, fracture of the distal radius and proximal ulna and radius on the left side, and laceration of the head (Fig. 1B, C, D and E). Digital subtraction angiography (DSA) performed along with CT revealed no arterial bleeding of the internal iliac artery and its branches, and thus no need to perform embolism.

The patient exhibited oliguria 4 h post-trauma, even following successful fluid resuscitation. Continuous bedside ultrasound examination showed bilateral hydronephrosis and progressively enlarged retroperitoneal hematoma. The bladder pressure measured by a Foley catheter increased from 8 mmHg to 22 mmHg. There were no signs of abdominal, chest, or brain injury. Following

consultation by experts in our trauma center and the Department of Urology, the patient underwent double “J” bilateral ureteral catheter placement, during which no urine was observed in the ureteral orifice into the bladder. Immediately following the replacement of ureteral catheter, urine was observed in the urinary bag and urinary output continued at a rate of 50–105 ml/h. Bladder pressure increased slightly 1 h following the surgical operation, decreased slowly, and then reached approximately 8 mmHg 8 days following surgery. The ureteral catheter was then removed.

Following placement of the bilateral ureteral catheter, external fixation of the pelvis and left femur were performed (Fig. 1F). Ten days after surgery, the patient was discharged from the intensive care unit with good renal function and open reduction and internal fixation for the fracture of distal end of the left radius, proximal end fracture of the left femur. The pelvic fracture was thought to be stabilized with external fixation and no open reduction and internal fixation (ORIF) was performed. Further healing was uneventful. One month following the injury, the patient was released from our department and transferred to the department of rehabilitation for functional recovery. Four month after discharge, X-ray examination showed healing of the pelvic fracture (Fig. 1G).

Case two

The second case involved in a 19-year old man who was injured in a traffic accident, but the victim failed to describe how he was injured. After injury, he was admitted to a level II hospital and demonstrated pain of the left shoulder, waist, and pelvis. The vital signs were normal. CT examination revealed AO/OTA type 61.A2.2 pelvic fracture, left AO/OTA type 62.A3.2 acetabulum fracture (Fig. 2A), and left rib fracture and hemato-pneumothorax. Pelvic external fixation and closed drainage of the thoracic cavity were performed. In the next few days the patient became febrile (range from 37.8 °C to 38.6 °C); the cause was considered to be absorbed fever of damaged tissues. However, his high fever did not resolve in the next 27 days following injury. In addition, abdominal pain developed day 4 after injury and physical examination found no obvious signs of peritoneal irritation. Anal exhaust and defecation were normal. Abdominal X-ray revealed severe distention but no free gas or fluid. Due to the unknown origin of fever and potential of infection, internal fixation and pelvic fixation were not performed, and the patient was transferred to our hospital for further treatment. Again, X-ray radiology found severe bowel distention but no free gas and fluid in the abdomen (Fig. 2B); however, CT examination showed that a small segment of bowel was entrapped in the fracture fragments (Fig. 2C). Immediate laparotomy was performed. The entrapped bowel had perforated and was put outside of the abdomen (Fig. 2D). Seven days after laparotomy, the high fever resolved and ORIF of the acetabulum fracture were performed through posterior approach. No fever developed and the patient was discharged. The next 3 months were uneventful and the patient was re-admitted for bowel reconstruction.

Case three

A 25-year-old man was hit in the lower abdomen and groin region directly by a car with a speed of 50 miles per hour. He was admitted to a primary hospital close to the scene following the accident. At admission, the patient's heart rate was 100 beats per minute, blood pressure 95/65 mmHg, and Glasgow coma scale score 14; X-ray and CT scan revealed pelvic fracture (data were not obtained from this hospital). Eight hours later, he presented with severe pain, swelling, and weakened pulse of the left lower extremity. Injury to the main arteries of the lower limb extremity was suspected, and the patient was transferred to our department 12 h

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