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Original article

Factors predicting the outcome of non-operative management of high-grade blunt renal trauma

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Abstract

Objectives: In this retrospective study we reviewed the outcome of non-operative management of high-grade blunt renal injuries (grade III–V) and evaluated the predictive indicators of management failure.

Subjects and methods: The data review included the patients' demographics, the mechanism of trauma and the clinical characteristics, as well as the laboratory and imaging data upon admission and at follow-up. The data of the patients who were successfully managed non-operatively and of those who needed intervention for renal injuries were compared.

Results: Two hundred and six patients were enrolled in this study. Grade III, grade IV and grade V renal injuries were found in 39.8%, 44.2% and 16% of the patients, respectively. The overall success rate of non-operative management was 87.9%, including all patients with grade III, 86.8% of patients with grade IV and 60.6% of those with grade V injuries. Multivariate analysis revealed that trauma secondary to motor vehicle accident, hypotension at presentation, associated injuries to other organs, grade V renal injury

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and computed tomography (CT) imaging features, namely medial renal parenchymal laceration, perirenal hematoma ≥3.5 cm and intravascular extravasation were significant predictors for failure of non-operative management.

Conclusion: Our findings suggest that high-grade renal injuries in hemodynamically stable patients can be managed conservatively with a high success rate. Multiple clinical and radiological variables can predict the treatment outcome.

Introduction

Renal trauma is the most common urologic trauma and represents approximately 10% of all significant abdominal traumas [1,2]. The morbidity and mortality rates of renal trauma vary with the severity of renal injuries, associated injuries to other organs and the management plan utilized [3]. Most of the renal injuries occurring as a result of blunt trauma are of low to moderate grade, and in such cases conservative management has been clearly demonstrated to be an effective therapeutic option.

The management plan for high-grade renal injuries remains controversial [4,5]. As exploring high-grade renal injury usually, inevitably, leads to nephrectomy, many authors advocate non-operative management which has been increasingly applied with success [6–9]. However, the decision must be weighed against related morbidity and mortality, and the exact criteria for patient selection must be identified. In an attempt to help increase the rate of renal salvage, we retrospectively reviewed the outcome of non-operative management of high-grade blunt renal injuries and evaluated the clinical and radiological determinants for non-operative management failure and related complications.

Subjects and methods

This hospital-based retrospective observational study was carried out at King Abdullah Hospital, Bisha, King Khalid Hospital, Al-Kharj and El-Iman Hospital, Riyadh, KSA, from September 2007 to March 2014. It included all adult patients with high-grade blunt renal injuries diagnosed and graded using computed tomography (CT) scan. The data review included the patients' demographics, the mechanism of trauma and the clinical characteristics, as well as the laboratory and imaging data upon admission and at follow-up. Patients with insufficient data or those without initial CT films were excluded from the study.

As per the protocol of our hospitals, patients with blunt abdominal trauma were initially resuscitated according to the advanced trauma life support (ATLS) guidelines provided by the American College of Surgeons [10] and evaluated by a rapid bedside ultrasound examination. After initial resuscitation, the hemodynamically unstable patients were shifted immediately to the operating room to undergo emergency laparotomy. When a lateral retroperitoneal hematoma was found on exploration, the hematoma was inspected for expansion or pulsations without exploring the retroperitoneum in order not to interrupt the tamponade effect of the hematoma. When the hematoma was pulsatile or expansile, renal exploration was mandatory to control bleeding. Hemodynamic instability was defined as a systolic blood pressure of less than 90 mmHg in spite of adequate colloid and crystalloid fluids and packed RBC replacement. The hemodynamically stable patients were further evaluated by contrast CT scan of the chest, abdomen and pelvis. If an evidence of renal injury was found, the injury was graded according to the American Association for the Surgery of Trauma (AAST) injury scale [11].

In the present study, we included only high-grade injuries (grade III–V) with the exception of cases with renal vascular pedicle injury.

Conservative management generally consisted of the patient's admission to the intensive care unit or a monitored setting with bed rest, hydration, analgesics and antibiotics. Serial hematocrit was obtained, and the patients were routinely subjected again to ultrasonography and/or CT scan within 24–72 h to allow early detection of complications. The need for intervention and follow-up imaging was planned according to the patient's clinical course. Failure of non-operative management of renal injuries was defined by the need for invasive interventions, including open surgery and angiographic intervention.

The multidetector computed tomography (MDCT) protocol was pre-programmed and was the same for all patients. CT scan was performed in supine position, using 64-slice scanners. Scan parameters were 0.6 mm detector collimation, 0.75 mm slice thickness, a reconstruction interval of 0.5 mm and 120–140 Kvp; 250 mAs, with the data reconstructed at 0.5-mm intervals. The MDCT-protocol for renal trauma included three axial helical acquisitions. The first acquisition without contrast medium of chest, abdomen and pelvis was performed, followed by a second acquisition after intravenous administration of contrast media with the image taken within 60–70 s of administration. A delayed scan of the urinary tract was obtained after 3–5 m. Contrast media (1.5–2.0 mL/kg of nonionic contrast material) were given by means of a double-syringe automatic injector, at a rate of 4–5-mL/s, followed by injection of 80 ml saline. The images were reconstructed in the axial plane with a section thicknesses and intervals of 2–5 mm. Coronal and sagittal multiplanar reformatted (MPR) images were acquired at 4 mm intervals. The CT images were reviewed by an independent radiologist who was blinded to the clinical outcome of the patients. Special consideration was given to the presence or absence of recently evaluated CT features, namely the presence of medially sited parenchymal laceration, perinephric hematoma ≥3.5 cm and intravascular contrast extravasation in the perirenal hematoma [12,13].

Intravascular contrast extravasation was defined as a linear extension or pooling of extravascular fluid with a density equal to that of adjacent intravascular contrast medium during the CT portal venous phase (Fig. 1), suggesting active bleeding. The size of perirenal hematoma was measured by obtaining the largest measure from the