

Intraperitoneal Injury Due to a High-Pressure Water Jet

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Abstract

High-pressure water jet injuries to the abdomen are extremely rare, but can cause serious damages to intraperitoneal organs. A case of 53-year-old man was injured on the right-side of the abdomen by a high-pressure water jet from sprinkler truck. On laparotomy, ischemic change of the terminal ileum and ascending colon, hemoperitoneum with mesenteric tearing, and inferior vena cava injury were noted.

Keywords: High Pressure Water Jet, Injury, Abdomen, Intraperitoneal Organ

1. Introduction

High pressure water jet injuries are relatively uncommon despite the increased use of high pressure equipment in various industries (1). Extremity injuries due to a high-pressure water jet have been reported. However, intraperitoneal injuries due to a high pressure water jet have been rarely reported in the literature (2-4). Here, we present a case of 53-year-old man after injury to his abdomen by a high pressure water jet resulting in serious intraperitoneal injuries.

2. Case Presentation

A 53-year-old man presented to the emergency department after being injured by a high-pressure water jet from a sprinkler truck. When a water jet hit the umbilicus, the pressure washer was operating at approximately 5000 psi. After falling on his back, he complained of severe pain chiefly in multiple sites such as the neck, back, and abdomen. He was hemodynamically stable except for tachycardia (heart rate 123/min). Physical and neurologic exam revealed mild abdominal tenderness with nonspecific neurologic findings. Radiologic imaging showed multiple fractures on spinous process of cervical vertebrae, compression fractures of 11th thoracic vertebrae and first lumbar vertebrae, hemoperitoneum and retroperitoneal hematoma without extravasation of contrast (Figure 1). The decision was made to admit the patient to the ICU for close observation.

Four hours after admission, he suddenly complained of severe abdominal pain and agitation. He was hemody-

namically stable, but on examination he had more tenderness and muscle guarding compared to his physical exam at the time of admission. So, we decided to perform exploratory laparotomy without further evaluation suspecting bowel injury. Upon laparotomy, we found about 1,000 mL of intraperitoneal hematoma and ischemic change at the terminal ileum and ascending colon with mesenteric tearing (Figure 2). In the process of right hemicolectomy, upon removing hematoma around the hepatic flexure of the ascending colon, the bleeding from pin-point injury of the inferior vena cava (IVC) was observed. Primary repair was done for the injured IVC and right hemicolectomy with ileo-colic end-to-end anastomosis was performed. The postoperative period was uneventful and the patient was discharged without any complications.

3. Discussion

The pressure washer generates 750 to 50000 psi of water pressure (5). Injuries from a high-pressure water jet can be classified as direct injury, secondary injury from the pressure, and chemical injuries depending on the compound. Injury degree of the direct contact area is determined by the pressure over area. Overt pressure over the abdomen can inflict injury not only to the soft tissue of abdominal wall, but also to the organs inside the peritoneal cavity. The abdominal wall injury varies from simple contusion to hematoma, perforation, or defect (1). Intraperitoneal organ injuries include solid organ injury, intestinal and mesentery injury, which may result in massive hemoperitoneum or peritonitis. Retroperitoneal organs are also susceptible, especially the great vessels such as the

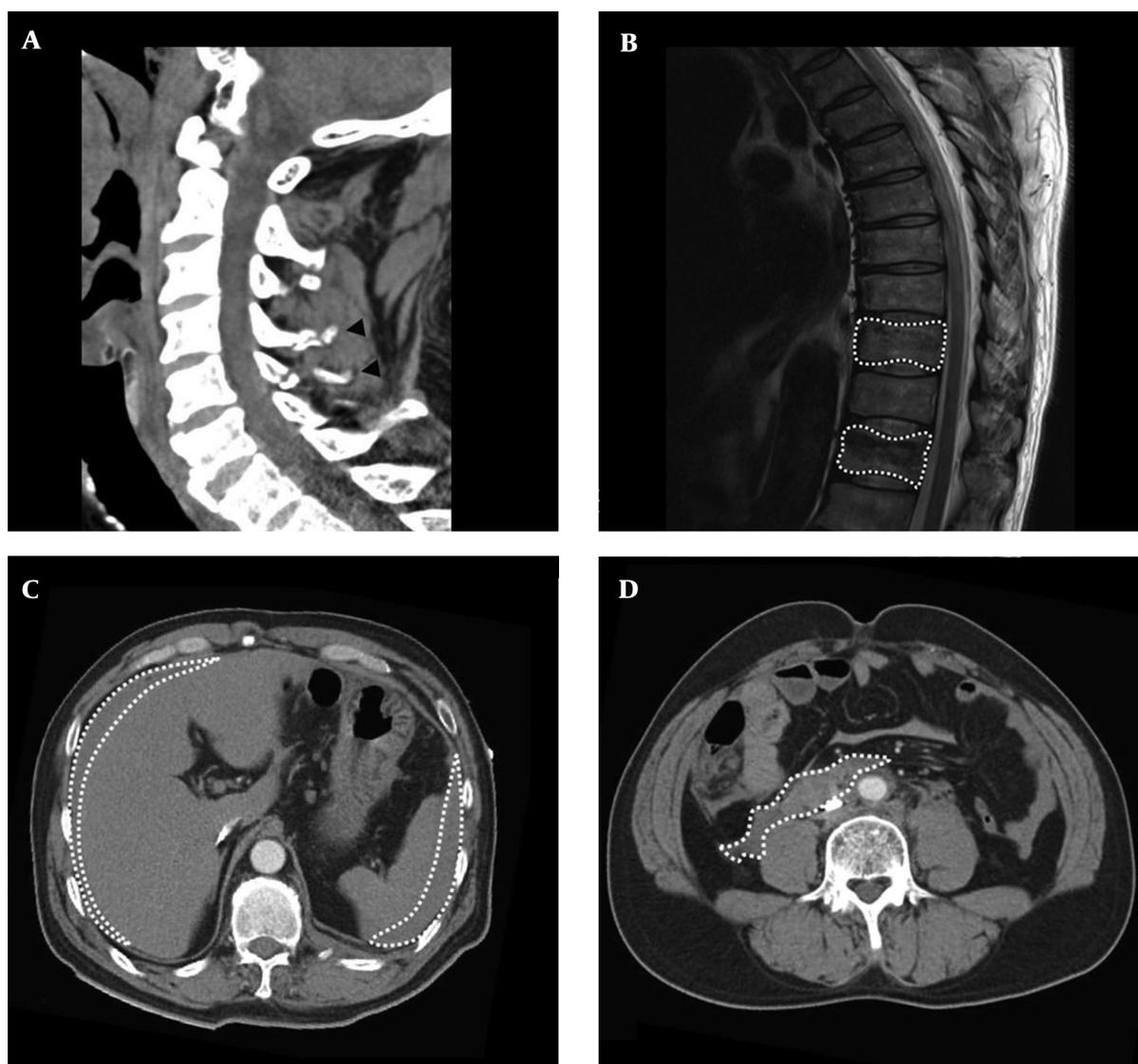


Figure 1. Initial radiologic images; (A) CT scans showed multiple fractures (black triangles) on spinous process of cervical vertebra; (B) MRI showed compression fractures (white dot) on 11th thoracic and first lumbar vertebra; (C) CT scans showed small amount of hemoperitoneum (white dot) in perihepatic and perisplenic spaces; (D) small amount of retroperitoneal hematoma (white dot) around inferior vena cava.

aorta or vena cava. The injuries observed in our case were mesentery injury, serosal injury of ascending colon, and injury to the inferior vena cava.

Depending on the pressure, a water jet can hit a person on the torso and throw the person off balance. This may not be observed in limb injuries. The person usually falls toward the direction of water jet, which inflicts secondary injury. Our case was hit and fell on his back, causing multiple fractures on his cervical and thoracic spines.

Should the jet contain specific chemical, this can inflict additional injuries. As with our case, a water jet was chem-

ically inert thus no chemical damage was observed. However, if the jet contained corrosive chemicals, it could have caused severe chemical burns on the skin. This may have been aggravated if there was open wound or penetration of the abdominal wall, in fatal complications.

The high-pressure water jet can create massive soft tissue and internal organ injury, but covered by rather small external wound (2, 6). The symptoms may be subtle at initial stage, delaying early detection and management. Our case complained of fracture site pain more than abdominal pain. An initial physical exam of the abdomen was also



Figure 2. Operative finding; Ischemic change in terminal ileum and ascending colon with mesenteric tearing were noted.

unremarkable. However, as ischemic change of intestine from hemorrhage of mesentery progressed, abnormal abdominal signs and symptoms were noted hours after admission.

In conclusion, even if the external wound is small and initial signs and symptoms are subtle, patients with high-energy traumas such as a water jet require careful and repetitive assessment.

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