

Splenic injury with right rib fractures- Case report

Kei Jitsuiki, Ikuto Takeuchi, Toshihiko Yoshizawa, Kouhei Ishikawa, Kazuhiko Omori, Hiromichi Ohsaka, Yasumasa Oode, Koichi Asahi, Youichi Yanagawa

Department of Acute Critical Care Medicine, Shizuoka Hospital, Juntendo University, Japan

Department of Radiology, Shizuoka Hospital, Juntendo University, Japan

*Corresponding author

Youichi Yanagawa

Email: yyanaga@juntendo.ac.jp

Abstract: A 62-year-old male wearing a seatbelt drove and stopped his car around a curve. Another car, driving at a right angle to the curve at a speed of 20-30 km, directly collided into the right side (driver's side) of the car. Upon arrival, he showed tenderness on the right lower side of the thorax. A traumatic pan-scan revealed right rib fractures from the 9th to 12th rib. After admission, the level of hemoglobin gradually decreased to 8.6 g/dl until the 3rd hospital day. CT on the same day for detection of the bleeding source demonstrated a moderate amount of fluid collection with low-isodensity around the spleen. Emergent splenic angiography showed splenic injury. After partial embolization and transfusion, the patient's anemia did not worsen. Splenic injury is the most common intra-abdominal injury associated with left lower rib fractures. However, the present case demonstrated that impact to the right side of body can cause internal organ injury of the opposite side, such as splenic injury. Accordingly, physicians should therefore be aware that internal abdominal organ injury on the opposite side may occur through indirect impact delivered during interaction with an external force.

Keywords: Splenic injury; right rib fractures; embolization.

INTRODUCTION

Traditional trauma teaching has ascribed rib fractures, particularly low rib fractures, to be high risk factors for abdominal solid organ injury [1]. Splenic injury is the most common intra-abdominal injury associated with left lower fractures [1-3]. We herein present a case of splenic injury with right rib fractures.

CASE REPORT

A 62-year-old male wearing a seatbelt drove and stopped his car around a curve. Another car, driving at a right angle to the curve at a speed of 20-30 km, directly collided into the right side (driver's side) of the car. The patient was rescued from the smashed car and transferred to our hospital. He had a past history of laparotomy for intestinal injury induced by a previous traffic accident with a permanent filter placed in the inferior vena cava for prophylaxis of a pulmonary embolism. Upon arrival, he had clear consciousness, blood pressure of 160/100 mmHg, heart rate of 98 beats per minute (BPM), and SpO₂ of 99% under room air. He showed tenderness on the right lower side of the thorax. Both a chest roentgen and focal assessment sonography for trauma were negative. A traumatic pan-

scan revealed right rib fractures from the 9th to 12th rib and right lung contusion with pneumatocele (Figure 1). The main results of blood biochemical analyses performed on arrival were as follows: white blood cells, 17,500/ μ l; hemoglobin, 15.2 g/dl; platelets, 31.4 \times 10⁴/ μ l; aspartate aminotransferase, 161 IU/L; alanine aminotransferase, 125 IU/L; and lactate dehydrogenase, 520 IU/l. After admission, the level of hemoglobin gradually decreased to 8.6 g/dl until the 3rd hospital day. CT on the same day for detection of the bleeding source demonstrated a moderate amount of fluid collection with low – is density around the spleen (Figure 2). As occult blood testing of feces was negative, emergent splenic angiography was performed, which showed parenchymal irregularity, mottling and avascular parenchymal areas suggesting splenic injury (Figure 3). However, a celiac angiogram did not demonstrate such findings at the liver. Partial embolization of the upper area of the splenic artery was performed. After transfusion and embolization, the patient's anemia did not worsen. The post-embolization course was uneventful and he was discharged on the 15th hospital day.

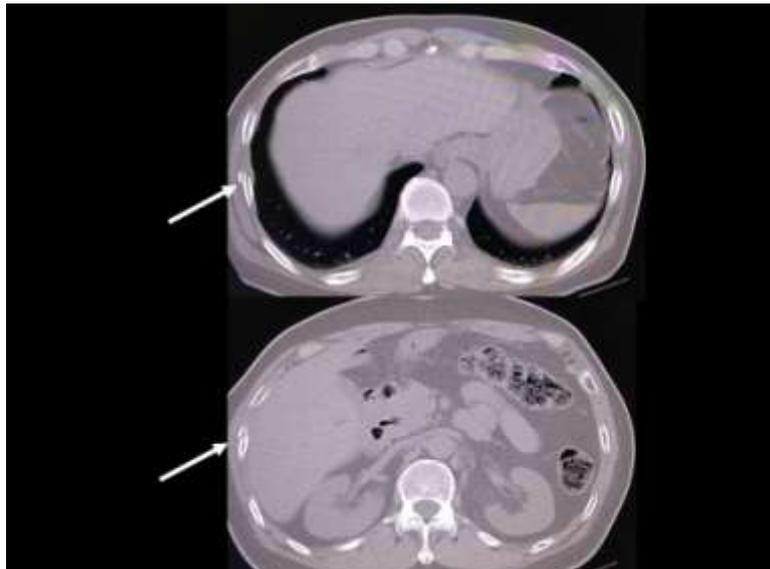


Fig 1: Plain abdominal CT (bony density)

CT demonstrates right multiple rib fractures (white arrow) without left fractures

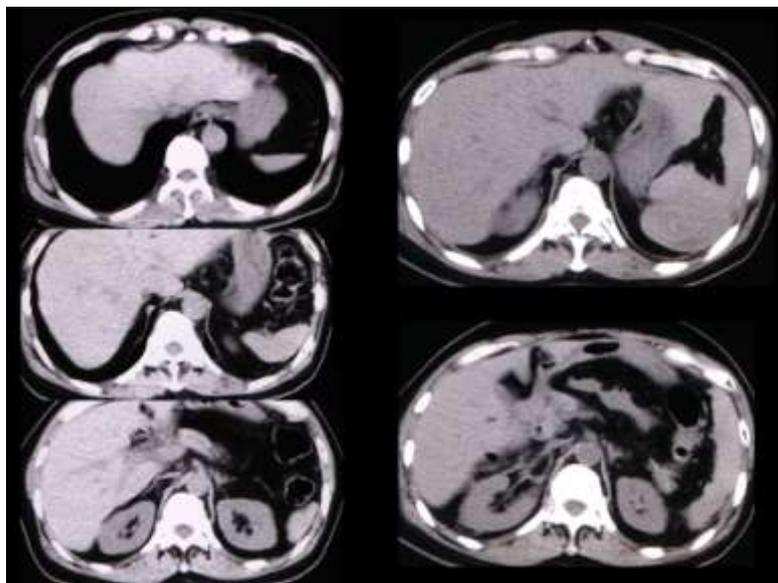


Fig 2: Abdominal CT on arrival (left) and on the 3rd hospital day (right)

CT on arrival does not show obvious fluid collection near the spleen. However, CT on the 3rd day demonstrates a moderate amount of fluid collection with low – is density around the spleen.

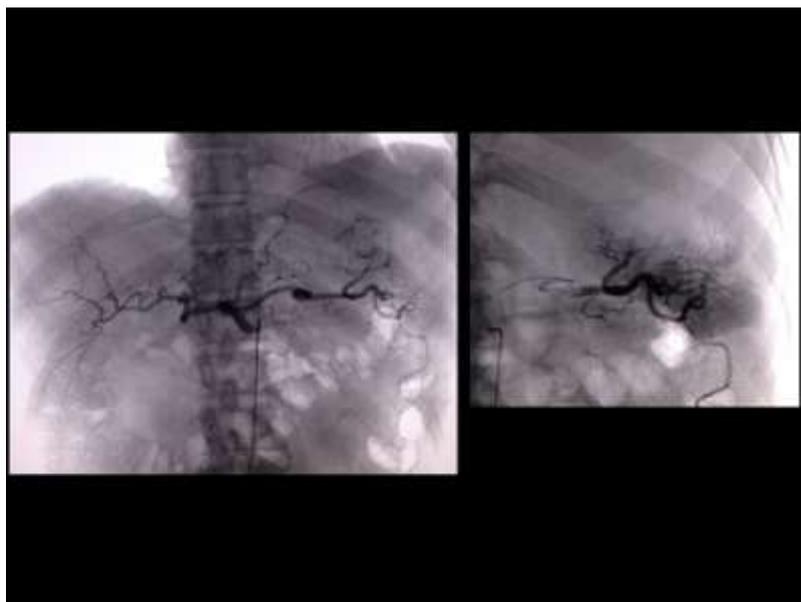


Fig 3: Celiac (left) and splenic (right) angiograms

A splenic angiogram shows parenchymal irregularity, mottling and avascular parenchymal areas, suggesting splenic injury, whereas a celiac arteriogram does not show such findings at the liver.

DISCUSSION

The present case demonstrated that impact to the right side of body can cause internal organ injury of the opposite side, such as splenic injury.

Moore *et al.*; reported that blunt trauma appeared to involve only the neck and upper chest, resulting in two distinct tracheal injuries and no clinical indications for abdominal injury [4]. On the 5th day after injury, this patient developed an indirect inguinal hernia. At subsequent surgery, a ruptured spleen was incidentally found. However, Park *et al.*; reported that among 453 patients suffering from rib fractures due to blunt trauma, intra-abdominal organ injury was more common in patients with lower rib fractures, especially fractures below the 8th rib [3]. In addition, the incidence of splenic injury was statistically significant in left-sided rib fracture patients; however, among 23 patients with splenic injury, 5 cases (21%) involved only lower right-sided rib fractures. Shweiki *et al.*; also reported that the probability of splenic injury increased with the presence of left-sided rib fractures only, however, any low rib fractures, including those on the right side, also caused splenic injury [1]. Park *et al.*; hypothesized that the domino effect interaction continued to the ipsilateral soft tissue, rib, ipsilateral, interpositional, and distant organ injury by an external force of the working area in splenic injury. In addition, the spleen may be injured through the impact delivered by acceleration/deceleration, even during interaction with the external force from the right side, and there is the possibility of injury to organs other than the spleen in cases where an external force is exerted by the thorax and abdomen. Contrecoup injury to the brain is a brain contusion that occurs on the side opposite the area of skull impact [5]. This injury is a result of the initial

movement of the brain in the contrecoup location. During the process of closed head injury, the brain parenchyma is initially displaced away from the site of skull impact toward the contrecoup site, resulting in a more severe brain contusion. A similar mechanism may be involved in the abdomen.

CONCLUSION

Physicians should therefore be aware that internal abdominal organ injury on the opposite side may occur through indirect impact delivered during interaction with an external force.

REFERENCES

1. Shweiki E, Klena J, Wood GC, Indeck M; Assessing the true risk of abdominal solid organ injury in hospitalized rib fracture patients. *J Trauma*. 2001; 50(4):684-8.
2. Wenz W, Goertler U, Kirchner R; Roentgenologic diagnosis of splenic trauma. *Radiologe*. 1976; 16(4):144-8.
3. Park S; Clinical Analysis for the Correlation of Intra-abdominal Organ Injury in the Patients with Rib Fracture. *Korean J Thorac Cardiovasc Surg*. 2012; 45(4):246-50.
4. Moore PG, Gillies JG, James OF, Saltos N; Occult ruptured spleen--two unusual clinical presentations. *Postgrad Med J*. 1984; 60(700):171-3.
5. Drew LB, Drew WE; The contrecoup-coup phenomenon: a new understanding of the mechanism of closed head injury. *Neurocrit Care*. 2004; 1:385-90.