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(Citation)
Acute Medicine & Surgery,10(1):e816

(Issue Date)
2023-01

(Resource Type)
journal article

(Version)
Version of Record

Acute Medicine & Surgery 2023;**10**:e816 doi: 10.1002/ams2.816

Case Report

Severe left kidney laceration after minor fall in a patient with lumbar spine scoliosis

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Background: The kidneys are one of the organs most commonly affected by blunt trauma; however, the anatomical variations that predispose kidney injury are poorly understood.

Case Presentation: An 80-year-old Japanese woman with lumber scoliosis was brought to our hospital because of severe flank pain after a minor fall at home. Contrast-enhanced computed tomography showed a severe left kidney laceration at the level of an acute angle in the vertebral column caused by scoliosis. Extravasation of contrast medium from the left renal artery branches was also noted. Selective arterial embolization achieved hemostasis. The patient was transferred to a rehabilitation facility without sequelae.

Conclusion: Patients with scoliosis could be at higher risk of severe kidney laceration because of intrusion of the vertebral column into the retroperitoneal space. Therefore, even after low-impact trauma, active exploration for kidney injury could be warranted in patients with spinal curvature disorders.

Key words: Cobb angle, fall, low-impact injury, selective arterial embolization, spinal curvature disorder

BACKGROUND

TRAUMATIC INJURY, AN important global public health concern, places a tremendous economic burden on society. The kidneys are one of the organs most commonly affected by blunt trauma. Kidney injuries account for 24% of traumatic injuries to solid abdominal organs[1] and are generally associated with high-energy trauma, such as traffic accidents and falls from heights. Anatomical variations that predispose to kidney injury are poorly understood.[2]

Scoliosis, lateral displacement or curvature of the spine, is defined as a curve in the spine with a Cobb angle of ≥10° in adults.[3] A recent study found an 8.85% prevalence of scoliosis among individuals aged ≥40 years, the prevalence being associated with age.[4] The relationship between scoliosis and kidney injury is not well understood.[2]

We herein describe severe left kidney laceration after a minor fall in a patient with lumbar spine scoliosis. This case illustrates that patients with scoliosis could be predisposed to renal injury because of their skewed retroperitoneal anatomy.

CASE PRESENTATION

AN 80-year-old Japanese woman with a known history of lumber scoliosis stumbled on a flat wooden floor in her home and fell. Following this minor fall, she developed severe flank pain and was brought to the emergency department. The patient had undergone aortic valve replacement with a biological valve for aortic regurgitation 4 years previously. She had also sustained pubic and ischial fractures in another minor fall 5 years previously. She had no relevant family history and was not on any medications, including anticoagulants and antiplatelets. On admission to the emergency department, she was restless, with a consciousness level of 13 on the Glasgow Coma Scale (E3V4M6). She had severe left flank pain around the spinal curvature of the lumbar scoliosis. Her other initial vital signs were as follows: body temperature, 36.8°C; heart rate, 120 b.p.m.; blood pressure, 80/44 mmHg; respiratory rate, 20 breaths/min; and percutaneous oxygen saturation, 99% (on oxygen 10 L/min with a non-rebreather mask). Extended focused assessment

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Received 13 Oct, 2022; accepted 27 Dec, 2022

with sonography for trauma showed echo-free spaces around her left kidney and Douglas' pouch. A physical examination, including assessment of thorax, abdomen, pelvis, and extremities, was otherwise normal. There was no lactic acidosis on blood gas analysis (pH 7.41, pCO_2 31.7 mmHg, pO_2 121.0 mmHg, HCO_3 21.4 mmol/L, lactate 2.4 mmol/L). Laboratory tests showed anemia with hemoglobin concentration 7.8 g/dl, but neither thrombocytopenia (platelet count of 163,000/μl) nor coagulopathy (international normalized ratio of prothrombin time, 1.08; activated partial thromboplastin time, 29.7 s; fibrinogen, 200 mg/dl). After inserting a urinary catheter, red wine-colored urine was drained. Contrast-enhanced computed tomography (CT) showed a severe left kidney laceration with a large perirenal hematoma at the level of an acute angle in the vertebral column caused by scoliosis (Fig. 1, Video S1). Extravasation of contrast medium from the left renal artery branches was also noted. Parenchymal laceration of the kidney extended into the collecting system, forming a hematoma beyond Gerota's fascia in the retroperitoneum and peritoneum. The Cobb angle on initial CT was 100° (Fig. S1). Taking these findings together, we diagnosed American Association for the Surgery of Trauma (AAST) grade IV left kidney injury in a patient with lumbar spine scoliosis.

The patient was considered at a high risk for open repair because of the skewed retroperitoneal anatomy resulting from scoliosis. Therefore, transarterial embolization was planned. After 5F long sheath introduction (Radifocus Introducer IIH; Terumo) through the patient's right femoral artery, a 4F shepherd hook catheter (Terumo) was advanced into her left renal artery. Selective angiography showed extravasation of contrast medium from the branches of the left renal artery (Fig. 2A). After selective arterial embolization using gelatin sponge particles (Serescue; Nippon Kayaku) and embolization coils (Tornado; Cook Medical), the extravasation ceased completely (Fig. 2B). There were no procedure-related complications. Plain abdominal radiography after coil embolization showed that the embolized left renal artery branches were at the level of sharp lateral edges associated with the lumbar scoliosis (Fig. 2C). The patient was returned to the intensive care unit where she received four units of packed red blood cells. In our facility, coagulopathy following trauma is managed by achieving and maintaining the fibrinogen concentration at more than 150–200 mg/dl, as specified by the current guideline.[5] In the present patient, the initial recorded fibrinogen concentration was 200 mg/dl. Thereafter, she received approximately 1 L of crystalloid to maintain her blood pressure. Because she was then at risk of dilutional coagulopathy, four units of fresh frozen plasma were also transfused. Hemostasis having been achieved, further blood transfusion was unnecessary. Follow-up contrast-enhanced CT on hospital day 6 revealed a left renal artery pseudoaneurysm at the injury site. This was successfully embolized using 33% N-butyl-2-cyanoacrylate and 0.014-inch pushable coils (C-Stopper; Piolax) on hospital day 13. The patient's postoperative

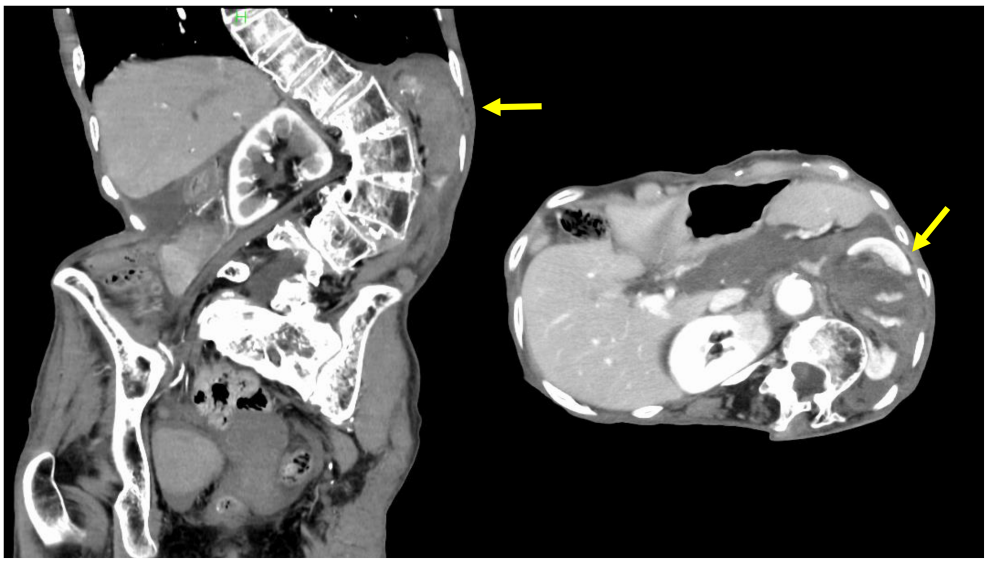

Fig. 1. Severe left kidney laceration at the level of an acute angle in the vertebral column caused by scoliosis in an 80-year-old woman. Computed tomography scan images show that the kidney was likely crushed by the sharp lateral edges of the lumbar spine extruding into the retroperitoneal space (arrows).

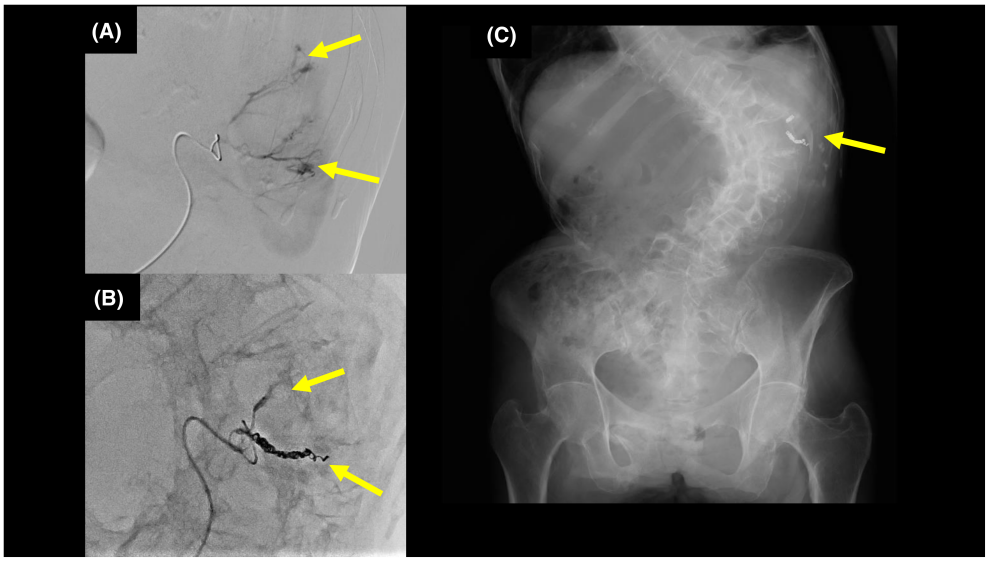

Fig. 2. Extravasation of contrast medium from the left renal artery branches at the level of an acute angle in the vertebral column caused by scoliosis in an 80-year-old woman. (A) Selective arterial angiography showing extravasation of contrast medium from the left renal artery branches (arrows). (B) After selective arterial embolization using gelatin sponge particles and embolization coils, there is no extravasation (arrows). (C) Plain abdominal radiograph after selective arterial embolization showing the embolized left renal artery branches are at the level of an acute angle in the vertebral column caused by scoliosis (arrow).

course was otherwise uneventful and she was transferred to a rehabilitation facility on hospital day 20 without sequelae.

DISCUSSION

THE KIDNEYS ARE one of the organs most commonly affected by blunt trauma.[1] Therefore, determining the potential anatomical risk factors for injury deserves more attention. This case illustrates that patients with lumbar scoliosis could be at higher risk of severe kidney laceration. Our CT imaging demonstrated that protrusion of the lateral edges of the lumbar spine into the retroperitoneal space could crush the kidney, even after a minor impact. Previous researchers have also reported that a skewed retroperitoneal space resulting from scoliosis makes retroperitoneal organs, such as the kidney[2] and aorta,[6] especially vulnerable to injury. These studies[2,6] and the current case collectively indicate the imperative to actively examine the retroperitoneal organs in patients with spinal curvature disorders, even after low-impact injuries.

Falls, a major health-care issue for older persons, occur at least once annually in 29% of community-dwelling adults 65 years or older, a rate of 0.67 falls/person/year.[7] Importantly, patients with spinal curvature disorders could be at even higher risk of falling because of their reduced muscle strength and impaired postural control.[8] Such patients can present to any emergency department at any time. It is therefore important that health-care professionals are aware that patients with lumbar scoliosis could be at increased risk of severe kidney laceration, even after a minor fall.

This case illustrates successful conservative management of AAST grade IV left kidney injury in a patient with severe lumbar scoliosis. Surgical exploration, another therapeutic option, was considered contraindicated in our patient because the altered anatomical relationships between retroperitoneal vessels and the thoracolumbar spine in patients with scoliosis reportedly increase the risk of vascular injury during open repair.[9] We therefore elected not to perform open surgery on this patient with severe lumbar spine scoliosis.

CONCLUSION

WE REPORT AN AAST grade IV left kidney injury after a minor fall in a Japanese woman with lumbar spine scoliosis. Protrusion of the lateral edges of a scoliotic lumbar spine into the retroperitoneal space could crush the kidney, even after a minor fall. Clinicians should be cautious when examining patients with lumbar spine scoliosis because even minor trauma, such as a fall, can result in severe kidney injury.

ACKNOWLEDGMENTS

WE THANK KAZUAKI Shinohara, MD, PhD (Ohta Nishinouchi Hospital) and Nozomi Ono, MD (Hoshigaoka Hospital) for providing assistance in reviewing the manuscript. We also thank Dr Trish Reynolds, MBBS, FRACP, from Edanz, for editing a draft of this manuscript. This work received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

FUNDING INFORMATION

NO FUNDING INFORMATION provided.

DISCLOSURE

APPROVAL OF THE research protocol with approval no. and committee name: N/A.

Informed consent: Written informed consent was obtained from the patient's family for publication of this case report and the accompanying images.

Registry and registration no. of the study/trial: N/A.

Animal studies: N/A.

Conflict of interest: None.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Fig. S1 Cobb angle measured on a computed tomography image is 100°.

Video S1 Severe left kidney laceration likely arising from protrusion of the lateral edges of the lumbar spine into the retroperitoneal space.