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Amputation of the Bilateral Legs due to the Lower Limbs Continuously Hanging Upside down after Becoming Trapped in a Chest of Drawers

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Abstract An 81-year-old woman was trying to reach something up high by stepping on the highest drawer of a chest of drawers. However, she fell off, and both of her both legs became trapped between the chest and the drawer. Her lower limbs and hips were stuck in an upside-down position, with her head and upper back on the floor. She was found in this awkward position by another person two days later. As the patient was hemodynamically unstable, she underwent venous infusion and bilateral tourniquets before rescue. On arrival, she was still in a shock state with hypoxia. Initially, she underwent tracheal intubation, and then the tourniquets were released one by one. She received a diagnosis of bilateral leg infections, ischemic left leg and multiple organ failure due to sepsis and unstable circulation, pulmonary embolism, and ischemic colitis with anemia. She underwent infusion of antibiotics, transfusion, noradrenaline, left lower limb amputation, renal replacement therapy, and then delayed right leg amputation. She was complicated with ischemia-reperfusion injury, ulcerative colitis and urosepsis during the hospital course, but she ultimately obtained a survival outcome after intensive care. This unique case adds another item to the list of documented etiologies of drawer-related injury and ischemia-reperfusion injury.

Keywords: *ischemia-reperfusion injury, drawer, leg*

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1. Introduction

Ischemia-reperfusion injury is associated with serious clinical manifestations, including systemic inflammatory response syndrome and multiple organ dysfunction syndrome. The mechanism underlying ischemia-reperfusion injury is as follows: the ischemic state induces anaerobic metabolism, leading to a lower level of adenosine triphosphate (ATP) production and failure of ion-exchange channels. [1,2] This channel failure leads to cell swelling and impaired enzymatic activity in the cytoplasm. Mitochondrial damage and electrolyte imbalance in the reperfusion state promote oxidative stress. Reactive oxygen species (ROS) retention induces cell damage, leading to cell death.

We herein report an unusual mechanism of leg injury involving ischemia-reperfusion injury in a patient who required amputation of both legs due to her lower limbs continuously hanging upside down after becoming trapped in a chest of drawers.

2. Case Presentation

An 81-year-old woman was trying to reach something up high by stepping on the highest drawer of a chest of drawers. However, she fell off, and both of her both legs became trapped between the chest and the drawer. Her lower limbs and hips were stuck in an upside-down position, with her head and upper back on the floor (Figure 1).

She was found in this awkward position by another person two days later, and they called an ambulance. After the emergency medical technicians checked the patient, the patient was found to have unstable circulation (unmeasurable blood pressure with a heart rate of 160 beats per minute), and she underwent venous infusion of lactate Ringer's solution with bilateral tourniquets applied at the thighs before rescue to prevent sudden cardiac arrest due to ischemia-reperfusion injury. She was then transported to a nearby medical facility. However, the physicians were unable to treat such a patient, so she was transported again to our hospital.

Before arrival, she underwent infusion of 3000 ml of saline. On arrival, her vital signs were as follows: Glasgow Coma Scale, E4V4M6; blood pressure, 90/64 mmHg; heart rate, 110 beats per minute (BPM); respiratory rate, 20 breaths per minute; percutaneous saturation of oxygen under room air, 86%. She had cyanotic legs with anterior bruises due to the tourniquets and bloody stool. Her potassium level was 2.6 mEq/L

according to a venous blood gas analysis. Her chest roentgen and cardiac ultrasound findings were negative. An electrocardiogram showed sinus tachycardia. Initially, she underwent tracheal intubation with mechanical ventilation using sedation, and then the tourniquets were released one by one while confirming the level of potassium. After the release of both tourniquets, her left leg remained cyanotic (Figure 2) and did not respond to pain stimulation.

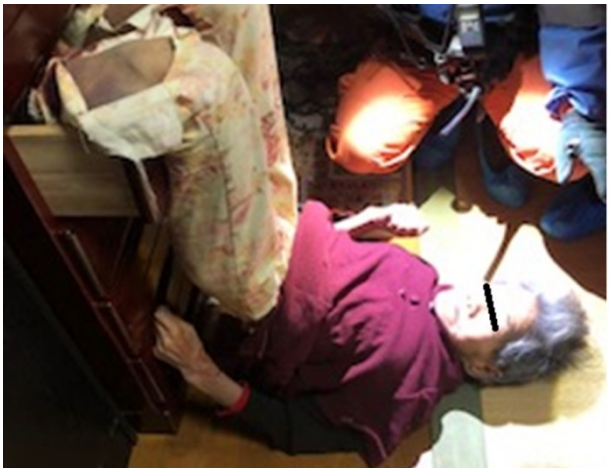

Figure 1. The patient at home. The patient was found hanging with her lower limbs upside down due to both being trapped by a chest of drawers

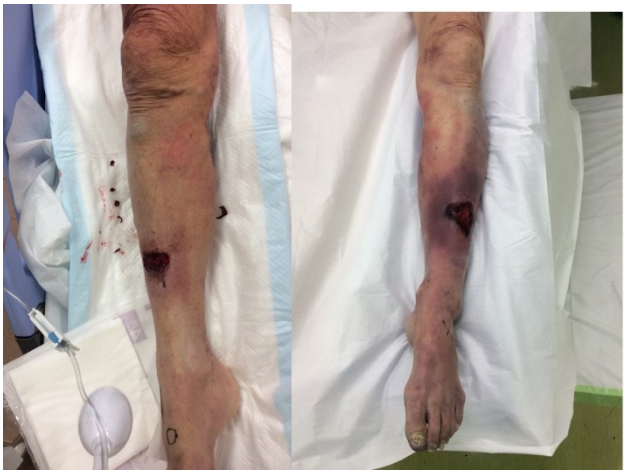

Figure 2. The patient's legs on arrival after the removal of the tourniquets. Both legs were cyanotic and edematous with necrotic skin changes at the middle of the anterior surface. The left leg did not move, and the patient claimed to feel nothing

The main results of a biochemical analysis of the blood showed a positive inflammatory response, anemia, rhabdomyolysis, and renal and hepatic injury (Table 1).

Enhanced whole-body computed tomography showed pulmonary embolism, edematous enhanced descending colon, occlusion of the left posterior tibial and fibular arteries, and gas production at both legs. She received a diagnosis of bilateral leg infections, ischemic left leg and multiple organ failure due to sepsis and unstable circulation, pulmonary embolism, and colitis with anemia.

She underwent infusion of antibiotics, transfusion, noradrenaline, left lower limb amputation above the knee, and subsequent colonoscopy, which revealed multiple erosions and ulcers in the whole colon initially treated as ischemic colitis. As she showed oliguria even after massive infusion and amputation, continuous hemodialysis filtration (CHDF) was started (Figure 3).

The results of a biochemical analysis of blood on the second hospital day are shown in Table 1. Rhabdomyolysis deteriorated from 2526 to 21382 IU/L, and oliguria continued, so she also received a diagnosis of ischemia-reperfusion injury. As she obtained stable circulation on the third hospital day, continuous infusion of noradrenaline was ceased. She had had intermittent bloody stool, and colonoscopy revealed multiple ulcers at the descending colon, which was initially treated as ischemic colitis requiring intravenous hyperalimentation. Her oliguria improved on the fifth hospital day, and the CHDF was ceased, with tracheostomy performed. As her inflammatory response had not improved and the signs of infection at the right leg had deteriorated, she underwent amputation of the right leg above the knee on the ninth hospital day. On the 12th hospital day, her respiratory function was improved, and mechanical ventilation was ceased. When enteral nutrition was started, her bloody stool deteriorated, so intravenous hyperalimentation was continued, and Salazopyrin was started under a diagnosis of ulcerative colitis. She was also complicated with urosepsis during the hospital course, which was treated by antibiotics. After confirming the cure of her multiple ulcers at the descending colon and establishing enteral nutrition, she was transported to another hospital for rehabilitation on the 82nd hospital day.

Table 1. Results of the biochemical analysis of the blood

Examination item	1st	2nd	unit
Total protein	2.8	3.6	g/dL
Albumin	1.6	1.7	g/dL
Total bilirubin	0.7	0.7	mg/dL
Aspartate aminotransferase	93	447	IU/L
Alanine aminotransferase	46	107	IU/L
Lactate dehydrogenase	332	967	IU/L
Creatine kinase	2526	21382	IU/L
Blood urea nitrogen	76.6	68.0	mg/dL
Creatinine	1.79	2.56	mg/dL
Estimated glomerular filtration rate	21.5	14.5	eGFR
Sodium	145	145	mEq/L
Potassium	2.8	5.0	mEq/L
C reactive protein	5.84	37.9	mg/dL
White blood cell count	3800	8100	/μL
Hemoglobin	8.7	12.3	g/dL
Platelets	14.9	13.9	$\times 10^4$ /μL
PT-INR	1.37	1.42	
Activated partial thromboplastin time	37.3	86.0	Second
Fibrin degradation products	14.5	12/9	μg/mL

PT-INR; Prothrombin time-international normalized ratio
eGFR; mL/min/1.73m^2

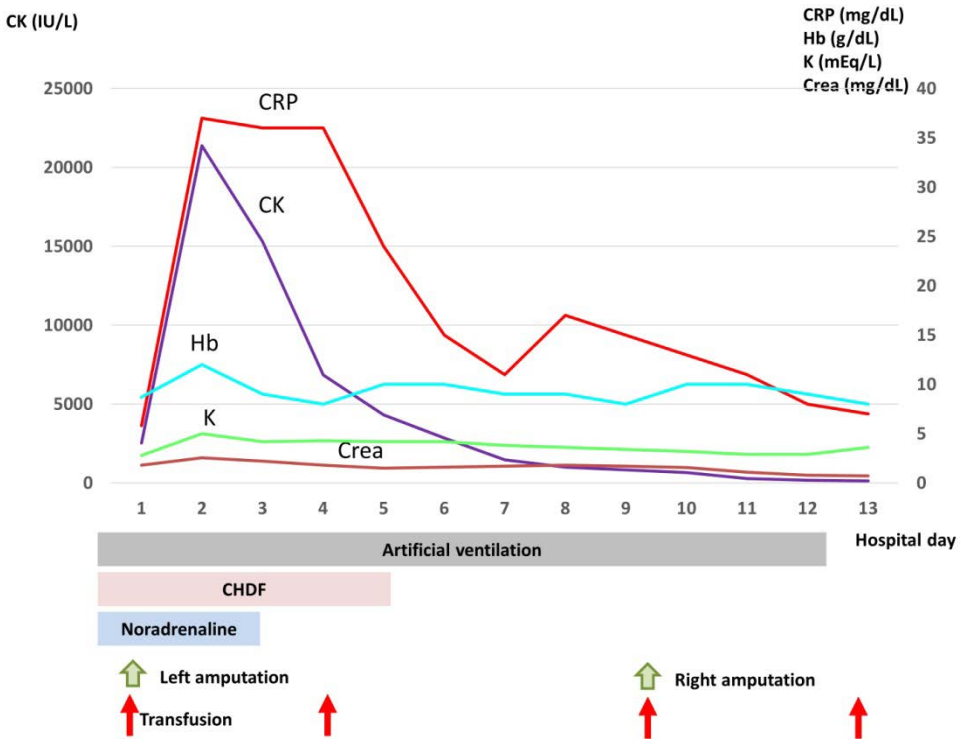

Figure 3. Main clinical course in the acute phase. She received a diagnosis of bilateral leg infections, ischemic left leg and multiple organ failure due to sepsis and unstable circulation, pulmonary embolism, and ischemic colitis with anemia. She underwent infusion of antibiotics, transfusion, noradrenaline, left lower limb amputation, renal replacement therapy, and subsequent delayed right leg amputation

3. Discussion

This is a unique case of leg injuries being caused by the lower limbs and hips continuously hanging upside down due to the legs being trapped in a chest of drawers that was complicated with ischemia-reperfusion injury and ultimately required amputation of the bilateral lower limbs. To our knowledge, no previous report in the English literature has described such a unique mechanism. Concerning cases of drawer-related injury, there have been only three reports of pediatric traumatic asphyxia. [3,4,5] In the present case, the patient recognized the drawer as a drawer but tried to use it as a stool. However, after falling into the draw, she became unable to release herself due to a low strength (because of her elderly age); this, combined with a delayed discovery because she lived alone resulted in the formation of infectious ischemic legs with multiple organ failure complicated by ischemia-reperfusion injury.

The present patient had bilateral tourniquets applied at the thighs and transvenous infusion administered before her rescue. Previous case reports have described instances of patients' lower limbs being trapped in the bathroom and rescue being performed without the application of a tourniquet, leading to cardiac arrest due to crush syndrome, or a case of the lower limbs being trapped in a collapsed house, wherein rescue without a tourniquet similarly led to cardiac arrest from crush syndrome. Both of these reports emphasized the importance of applying a tourniquet to the limbs when ischemia-reperfusion injury was suspected. [6,7] As this case was treated appropriately, a survival outcome was obtained.

Hanging with one's head upside down for a long period of time can be fatal, due to congestion of the heart or brain by gravity inducing increased venous return. [8,9] However, the present patient only had her legs and hips hanging upside down, and her chest and head were resting on the floor. Accordingly, the decreased load might have helped keep gravity from inducing increased venous return and consequently causing congestion of the heart or brain.

4. Conclusion

This is a unique case of leg injuries being caused by the lower limbs and hips continuously hanging upside down due to the legs being trapped in a chest of drawers that was complicated with ischemia-reperfusion injury and ultimately required amputation of the bilateral lower limbs. This unique case adds another item to the list of documented etiologies of drawer-related injury and ischemia-reperfusion injury.

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