Traumatic dissection and rupture of the abdominal aorta as a complication of the Heimlich maneuver

Shaun C. Desai, BA,[a] Dennis J. Chute, MD,[b] Bharati C. Desai, MD,[c] and **Eugene R. Koloski, MD,[d]** *Washington, DC, and Poughkeepsie, NY*

Although the Heimlich maneuver is considered the best intervention for relieving acute upper airway obstruction, several complications have been reported in the literature. These complications can occur as a result of an increase in abdominal pressure leading to a variety of well-documented visceral injuries, including the great vessels. Acute abdominal aortic thrombosis after the Heimlich maneuver is a rare but recognized event; however, to date no case of traumatic dissection and rupture of the abdominal aorta has been described. We report the first known case, to our knowledge, of a traumatic dissection and rupture of the abdominal aorta after a forcefully applied Heimlich maneuver. (J Vasc Surg 2008;48: 1325-7.)

The Heimlich maneuver has become widely accepted as the universal method for relieving foreign-body upper airway obstruction. Although this maneuver is remarkably effective, various complications have been reported in the literature. Acute abdominal aortic thrombosis after the Heimlich maneuver is a rare but recognized event; however to date, no case of traumatic dissection and rupture of the abdominal aorta has been described. We report herein the first known case, to our knowledge, of a traumatic dissection and rupture of the abdominal aorta as a complication of the Heimlich maneuver. Potential etiologic factors as well as management and diagnosis of this rare injury are discussed.

CASE REPORT

A 78-year-old frail woman with a medical history of schizophrenia and hypothyroidism began choking on food, and a male nursing aide correctly administered the Heimlich maneuver. However, the patient soon went into respiratory arrest and was transferred to a nearby medical facility. Upon examination, a large amount of food material was suctioned from the upper trachea. Despite an initial improvement in oxygen saturation, the patient subsequently became unstable and required intubation. The patient became hypotensive and was started on dopamine and phenylephrine.

An initial electrocardiogram demonstrated moderate ischemic changes with ST segment depression. The patient became unresponsive with dilated pupils, no detectable blood pressure, and a massively distended abdomen. A full code was initiated. Initial laboratory results demonstrated a hemoglobin level of 1.9 g/dL, which had decreased from 12.4 g/dL on initial presentation. The patient received a total of 12 units of packed red blood cells during the code. She regained vital signs and underwent a noncontrast emergency computed tomography (CT) scan of the abdomen and pelvis, which revealed a large soft-tissue mass in the upper abdomen adjacent to the pancreas in addition to retroperitoneal stranding and free intraperitoneal blood (Fig 1).

An emergency exploratory laparotomy was performed, and upon entry into the abdominal cavity, >900 mL of blood was immediately suctioned. A massive retroperitoneal hematoma was found extending from the upper abdomen in the retrogastric area involving both the root of the small bowel and extending down the entire left side into the pelvis. No active bleeding could be visualized, but within several minutes of entry into the peritoneum, the patient went into ventricular tachycardia and then a wide complex rhythm with accompanying severe hypotension. The patient died soon thereafter.

Autopsy revealed a laceration and dissection of an atherosclerotic abdominal aortic wall with extension of hemorrhage into the left common iliac artery. The postmortem examination revealed a true dissection: The dissection split the media apart and away from the intima, with the tear located at about the level of the renal artery ostia, and extending down to the bifurcation of the common iliac arteries. The abdominal aorta was found to have moderate calcified atheromatous plaque and mild to moderate calcified plaque in the descending thoracic aorta (Fig 2). A large retroperitoneal and mesenteric hemorrhage was found as well.

DISCUSSION

Although the Heimlich maneuver is considered the best method for relieving acute upper airway obstruction, a wide range of complications have been reported. These include frequent minor injuries such as retinal detachment, rib fractures, and incidental pneumopericardium to rupture of the thoracic and abdominal organs.[1,2] The most common complications described, in order of increasing number of cases reported, include rupture of the diaphragm, jejunum, liver, esophagus, and stomach.[3] Similarly, injury to major vascular structures have been reported, including aortic stent graft displacement,[4] rupture of the aortic valve,[5] acute aortic regurgitation,[6] laceration of a mesenteric vessel,[7] and acute aortic thrombosis in both an aneu-

From The George Washington University School of Medicine, Washington, DC[a]; and the Dutchess County Medical Examiners Office[b]; the Department of Medicine, Hudson River Psychiatric Hospital[c]; and the Department of Surgery, Vassar Brothers Medical Center, Poughkeepsie.[d]

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Reprint requests: Bharati C. Desai, MD, Department of Medicine, Hudson River Psychiatric Hospital, 10 Ross Circle, Poughkeepsie, NY 12601 (e-mail: bcdesai@hotmail.com).

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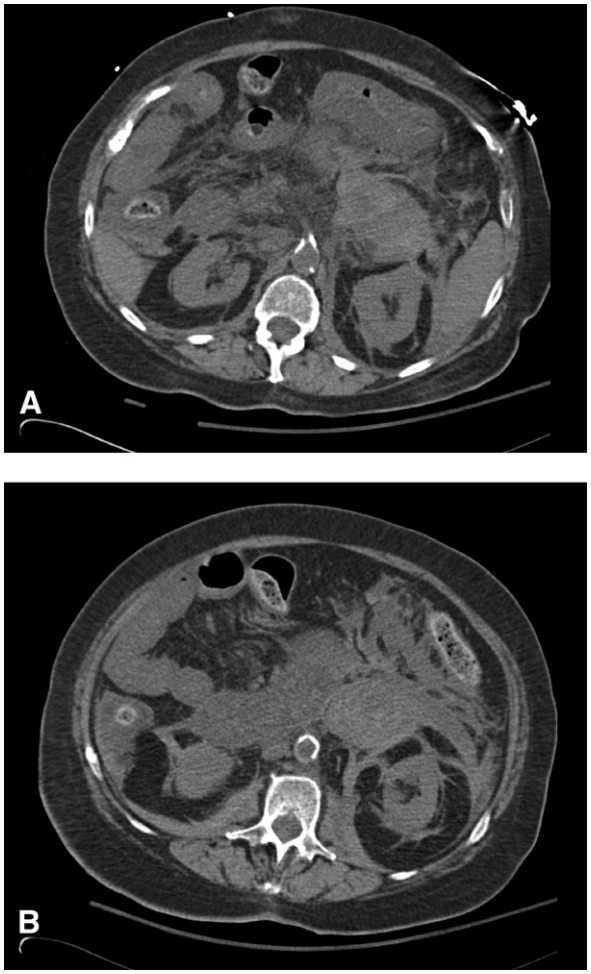

Fig 1. Preoperative abdominal computed scans without contrast show **(A)** extensive blood surrounding the colon in the right retroperitoneum with a large peripancreatic hematoma and **(B)** blood in lateral gutters and a massive preaortic hematoma.

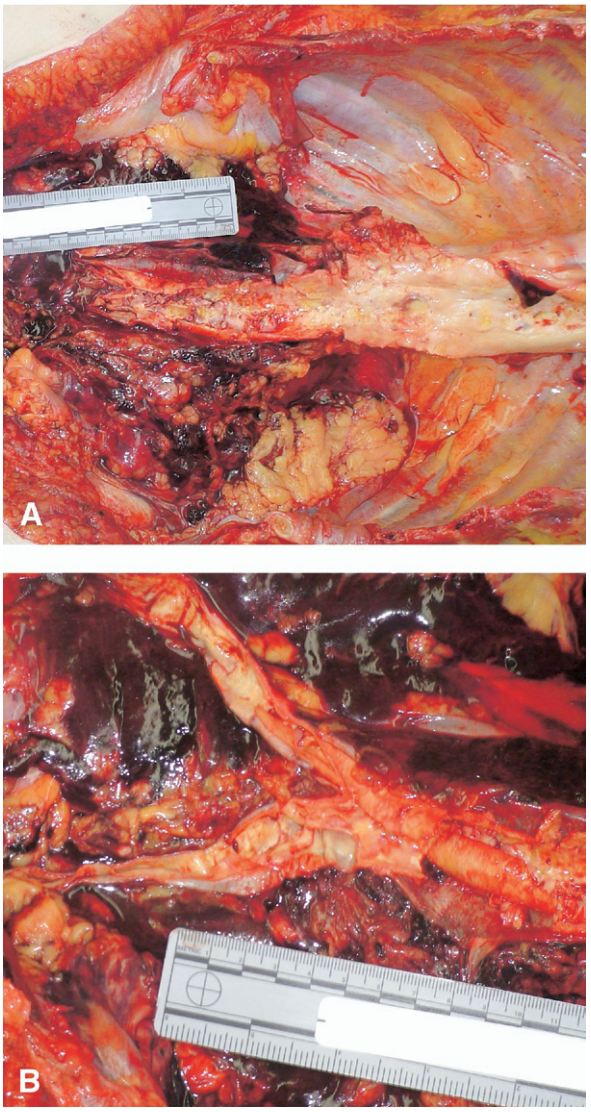

Fig 2. Photos of abdomen at the autopsy show **(A)** the aorta opened up, with dissection of wall evident and calcified complicated atheromatous plaque in the intima, and **(B)** the abdominal aorta and common iliac arteries with dissection of wall; calcification of intima holds it in a curled-up appearance.

rysmal and nonaneurysmal aorta.[8-12] Of the six documented cases of acute thrombosis of the abdominal aorta after the Heimlich maneuver, only one patient survived; however, it is also important to note that the Heimlich maneuver was performed incorrectly in three of these six patients. Incorrect application consisted of forceful infraumbilical thrusts instead of the correct method of applying supraumblical abdominal thrusts in an upward direction.

To date, no cases of traumatic dissection and rupture of the abdominal aorta after the Heimlich maneuver have been described. Although not as common as thoracic aortic dissections, blunt trauma to the abdomen is a well documented cause of abdominal aortic dissections, with one study reporting an incidence as high as 8% in a group of 87 patients.[13,14]

It is not surprising that this 78-year-old patient had an abdominal aorta that was moderately calcified. Moderate calcification along with marked atheromatous aortic plaques could have made her more susceptible to intimal injury.[15,16] Furthermore, the repeated forceful blunt abdominal thrusts of the Heimlich maneuver could have disrupted this vulnerable intimal lining and eventually caused a true aortic dissection that led to subsequent rupture after compression on the bony surface of the spinal column.

It must be noted that no prior CT imaging of the abdomen was available for this patient, and therefore, the possibility of a pre-existing aneurysm or dissection cannot be ruled out. However, she had no history of hypertension, which makes a pre-existing dissection less likely, given that

77.8% of patients were reported to have a history of systemic hypertension according to the International Registry of Aortic Dissection (IRAD).[17] Furthermore, the patient had no smoking history and no family history of aneurysmal disease. Thus, her acute unstable presentation after the Heimlich maneuver makes this seemingly benign intervention the most likely etiology.

Acute abdominal dissection can present in a variety of ways, the most common of which is the sudden onset of ripping or sharp pain, classically in the posterior chest (interscapular), back, or abdomen.[17] According to IRAD, 11.8% of patients with acute abdominal dissections presented with hypotension.[17] However, acute hypotension after a trauma rarely implicates the aorta and often leads to a delay in diagnosis. One study has even found a delay in diagnosis in up to 34.3% of cases.[14] This is especially true in multitrauma patients, including rupture of various abdominal viscera or evidence of retroperitoneal bleeding, where the limited focused assessment and sonography for trauma (FAST) examination is less likely to pick up acute aortic injury.[13]

This patient had a positive FAST examination result, evidence of intra-abdominal hemorrhage on noncontrast CT, and was hemodynamically unstable, so it was not unusual for her to have undergone an emergency exploratory laparotomy. Because the patient was unstable, contrast was not used on the CT scan, which is most likely why the dissection could not be fully visualized. Furthermore, a large soft-tissue mass was present in the upper abdomen, further distorting the image of the aorta.

In the preoperative resuscitative portion, ultrasonography could have theoretically been used if time permitted; however, this would have required a very high index of suspicion for aortic pathology. Graham et al[18] found that the combined use of real-time abdominal ultrasonography and Doppler flow studies was an effective means of demonstrating intimal flaps as well as evaluating blood flow in both false and true lumens of the abdominal aorta. However, as Berthet et al[14] comments, such modalities can still not reveal the diagnosis in cases of retroperitoneal hematoma and associated injuries, such as in our presented case, and also require well-trained operators who may not be available in an emergency.

CONCLUSION

Although the Heimlich maneuver should be considered the standard method for relieving acute foreign-body upper airway obstruction, incorrect application of the maneuver can lead to fatal visceral or vascular injury. Specifically, frail or elderly patients are especially vulnerable to abdominal aortic injury resulting from incorrect or exceptionally forceful application of the Heimlich maneuver. Successful management requires a high index of suspicion with prompt recognition for this rare and catastrophic complication.

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