

Cervical Subcutaneous Emphysema, Pneumomediastinum, and a Femur Fracture: An Unusual Presentation of Hinchey III Diverticulitis

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Background	A 62-year-old male patient presented to the emergency room as a trauma activation after a fall from standing. Imaging was significant for a right subtrochanteric femur fracture, cervical subcutaneous emphysema, pneumomediastinum, pneumoretroperitoneum, and pneumoperitoneum.
Summary	The patient presented to the trauma bay after a fall from standing. He was found to have extensive subcutaneous emphysema of the neck on exam and imaging, in addition to pneumomediastinum, pneumoretroperitoneum, and pneumoperitoneum. The patient had no abdominal symptoms but complained of a two-day history of neck pain and progressive confusion before falling. After bronchoscopy and esophagogastroduodenoscopy were completed to rule out aerodigestive injury, a diagnostic peritoneal lavage was performed. Results suggested a perforated viscus. The patient then underwent emergent exploratory laparotomy, where he was found to have Hinchey III sigmoid diverticulitis. He underwent a sigmoid colectomy with end colostomy, with a postoperative course complicated by intraabdominal abscess and refractory atrial fibrillation with rapid ventricular rate requiring atrial ablation.
Conclusion	In this case, perforated diverticulitis masqueraded as traumatic injury in a man who presented with a femur fracture. Signs of colon perforation may be subtle, and trauma providers must never forget that sepsis may be an antecedent factor leading to falls or vehicular injury. The presentation of perforated sigmoid diverticulitis as pneumomediastinum, subcutaneous emphysema, and a femur fracture in the absence of abdominal pain has not yet been reported in the literature. Providers must maintain a high index of suspicion for intraabdominal pathology with the goal of emphasizing early diagnosis and intervention.
Key Words	complicated sigmoid diverticulitis; pneumomediastinum; subcutaneous emphysema; trauma; sepsis

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Case Description

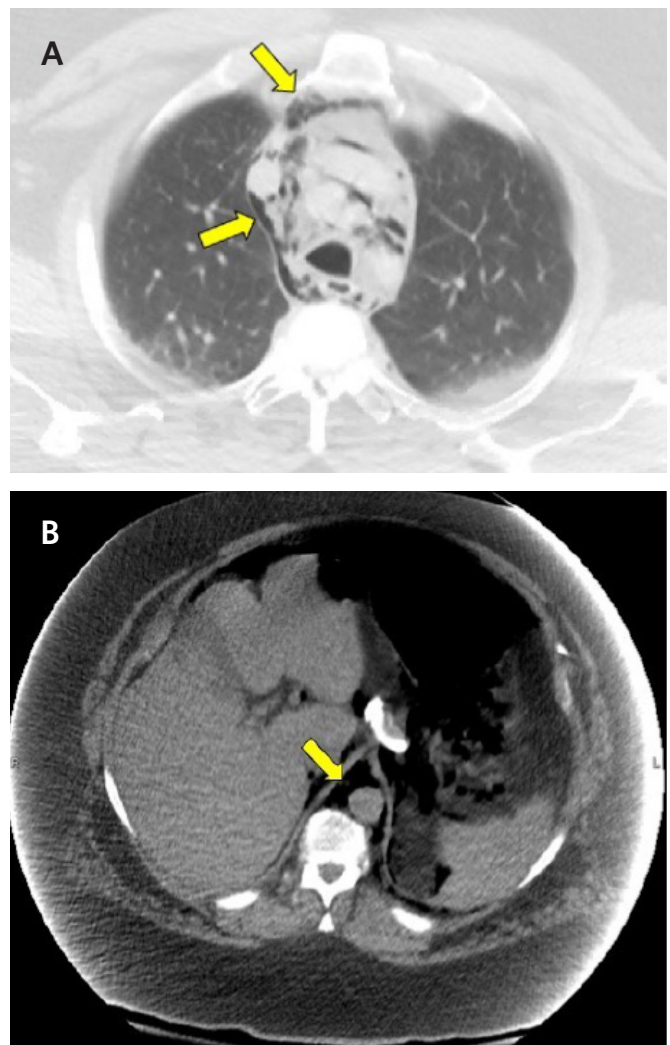
A 62-year-old morbidly obese (BMI = 60) male patient was transferred to the trauma service from an outside hospital after a fall from standing with an obvious right lower extremity deformity. The patient, with a past medical history of gastroesophageal reflux disease, hypertension, hyperlipidemia, and hypothyroidism, reported that he was in his usual state of health when he began experiencing neck pain and progressive confusion resulting in a fall. On arrival, his breathing was tachypneic and labored, with oxygen saturation of 90% on three liters by nasal cannula. Additionally, he was found to be in new-onset atrial fibrillation with a rapid ventricular rate of 120 beats per minute and a blood pressure of 90/50 mm Hg. The sending hospital had initiated continuous amiodarone infusion.

On the secondary survey, he was found to have marked subcutaneous emphysema of the neck. The abdominal exam was benign, though the authors acknowledge that pain may not have been elicited on exam due to the patient's body habitus. There was an obvious deformity of the right lower extremity, confirmed by an X ray as a right subtrochanteric femur fracture. Noncontrast computed tomography images from the outside hospital demonstrated pneumomediastinum with subcutaneous emphysema, pneumoretroperitoneum, and moderate pneumoperitoneum with air infiltrating throughout the nondependent portions of the abdomen and mesentery.

Shortly after arrival, the patient's clinical status deteriorated. He was intubated for airway protection, and norepinephrine was started for hypotension not responsive to fluid boluses. The orthopedics team placed a tibial traction pin to reduce his femur fracture in the trauma bay. Due to concern for aerodigestive injury, the patient underwent bronchoscopy and esophagogastroduodenoscopy, both yielding negative findings. A diagnostic peritoneal lavage was then performed to localize the source of the air considering a normal bronchoscopy and esophagogastroduodenoscopy and an unreliable abdominal exam. The white blood cell count of the sample was 21,000k/uL, with a cell count ratio of ≥ 4 . As such, the patient underwent exploratory laparotomy.

Exploration revealed purulent peritonitis secondary to perforated sigmoid diverticulitis. The abdomen was irrigated, stapled colon resection (perforectomy) was performed, and the patient was left in discontinuity with temporary abdominal closure due to marked hemodynamic insta-

Figure 1. Noncontrast Computed Tomography of the Chest and Abdomen. Published with Permission



A) Chest CT depicting air in pneumomediastinum and B) abdomen CT depicting air in retroperitoneum—yellow arrows show air in both images.

bility intraoperatively. He was subsequently re-explored once stabilized the following day, and an end colostomy was performed. The patient underwent intramedullary nail placement of the right femur by the orthopedics team for definitive management of the comminuted femur fracture once the patient's sepsis had resolved. His postoperative course was complicated by refractory atrial fibrillation with rapid ventricular rate requiring atrial ablation, left lower quadrant abscess requiring an image-guided drain placement by interventional radiology as well as prolonged leukocytosis and fevers requiring 3.5 weeks of antibiotics, as guided by the infectious disease team at our hospital.

Discussion

Diverticulosis and diverticulitis are common in Western society. The incidence of diverticular disease is 10% in individuals younger than 40 and 50-70% in those older than 80. Of those with diverticular disease, 10–25% will develop acute diverticulitis.^{1,2} While bleeding is an ongoing concern in diverticulosis, perforation is the feared sequelae of diverticulitis.³ The classic constellation of symptoms and lab findings of lower quadrant abdominal pain, fever, and leukocytosis should be thoroughly investigated to identify this complication.⁴ Most patients with diverticulitis will present as Hinchey I diverticulitis with pericolic or mesenteric abscesses can be managed non-operatively with drainage and antibiotics. About 15%–20% of cases will be classified as Hinchey II, where patients will present with walled-off pelvic abscesses. In 1–2% of cases, patients will present with generalized purulent (Hinchey III) or feculent (Hinchey IV) peritonitis requiring emergent surgical intervention.⁵ Uncommon presentations of diverticular disease, especially those wherein a patient does not have peritonitis, can delay diagnosis, contributing to worse outcomes.

Subcutaneous emphysema can be caused by esophageal rupture, pneumothorax, barotrauma, tracheal perforation, and necrotizing soft tissue infections,⁶ while the etiology of pneumomediastinum is most often increased intraalveolar pressure secondary to asthma, cough or positive pressure ventilation leading to the rupture of marginal pulmonary alveoli.⁷ However, in rare circumstances, air in the mediastinum and subcutaneous tissues of the neck can result from a colonic perforation.⁸ Diverticula classically occur at the antimesenteric border of the bowel, usually near the point of entry of the vasa recta.⁹ Rarely, perforations can occur into the retroperitoneum rather than into the peritoneum itself. Air can therefore dissect along the anatomic continuum of fascial planes between the retroperitoneum, mediastinum, and neck.⁹ As of 2019, 13 cases of pneumomediastinum and subcutaneous emphysema were reported in the literature as a result of perforated diverticulitis, eight of whom reported no concomitant abdominal pain.⁷

In this case, the team was focused on traumatic injury and became anchored.¹⁰ Diagnostic peritoneal lavage was a key diagnostic adjunct in determining the etiology of this patient's shock. Diagnostic peritoneal lavage has largely been replaced by computed tomography and ultrasound

in managing acute trauma but retains a limited role in the diagnosis of peritonitis. Fang et al. described the use of a cell count ratio to identify hollow viscous injury as a more sensitive and specific test than classic criteria. A cell count ratio greater than or equal to 1 predicted hollow viscous injury with a specificity of 97% and a sensitivity of 100%.¹¹ This patient had a cell count ratio of 4.

Our report is among the more unusual presentations of this common disease described in the literature. Other notable presentations include those of diverticular perforation into the subcutaneous space leading to necrotizing soft tissue infection,¹²⁻¹⁴ inflammation of the spermatic cord and testicle,¹⁵ perianal fistula,¹⁶ and a left lumbar abscess.¹⁷ We are unaware of other reports of patients presenting after injury with subcutaneous emphysema, pneumomediastinum, and pneumoretroperitoneum due to a non-traumatic colonic perforation. This patient's presentation as a fall increased suspicion for hemorrhagic shock as the etiology of his hemodynamic instability and aerodigestive injury was the cause of the air present in his neck, mediastinum, and retroperitoneum. In fact, septic shock secondary to Hinchey III diverticulitis likely led to a syncopal fall and resultant fracture.

Conclusion

In this case, perforated diverticulitis manifested as neck pain, subcutaneous emphysema, pneumomediastinum, and pneumoretroperitoneum, which led to hospitalization for a fall with a femur fracture. Signs of colon perforation may be subtle, and trauma providers must always remember that sepsis may be an antecedent factor leading to falls or vehicular injury. The presentation of perforated sigmoid diverticulitis as pneumomediastinum, subcutaneous emphysema, and a femur fracture in the absence of abdominal pain has not yet been reported in the literature. Providers must maintain a high index of suspicion for intraabdominal pathology to emphasize early diagnosis and intervention.

Lessons Learned

Pre-injury sepsis is uncommon and will only be identified when caregivers maintain suspicion regarding unusual findings and avoid anchoring on traumatic diagnoses.

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