

## An unusual etiology of obstructive shock in the emergency department.

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## An unusual etiology of obstructive shock in the emergency department

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### ABSTRACT

Obstructive shock describes any disease process that causes physical obstruction to blood flow into or out of the heart which results in impaired systemic oxygen or nutrient delivery. Common etiologies include cardiac tamponade, tension pneumothorax, and pulmonary embolus. However, several other causes exist and should prompt consideration in the correct clinical circumstances. In this report, we describe a 72-year-old female patient with history of hepatic cysts presenting with respiratory distress, mottled extremities, and abnormal vital signs. Contrast enhanced computed tomography scans showed a massive hepatic cyst which was compressing her vena cava and heart, causing hemodynamic instability. The patient was admitted to the ICU and the hepatic cyst was drained percutaneously, but ultimately, she succumbed to her illness post-operatively. This report highlights the importance of keeping a broad differential when considering etiologies of undifferentiated shock as well as the need for additional research regarding management of rare causes of obstructive shock.

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### 1. Introduction

Hepatic cysts are collections of fluid within the liver and are broadly categorized by their underlying etiology [1]. Acquired hepatic cysts include neoplastic cysts, pyogenic abscesses, and hydatid cysts and frequently present with characteristic features like unexpected weight loss or sepsis. All therapies are directed at reducing cyst size with preference given to laparoscopic deroofing and percutaneous drainage over more invasive procedures [1,2]. If left untreated these cysts can continue to expand and cause increasing mass effect on surrounding structures. This case depicts an interesting presentation of obstructive shock that resulted from a massive hepatic cyst. The objective of this report is to illustrate the importance of keeping a broad differential for shock and the need for further research into the management of rarer causes of obstructive shock.

### 2. Case report

A 72-year-old female presented to the emergency department by ambulance with respiratory distress, mottled extremities, and abnormal vital signs. Her past medical history included cerebrovascular accident,

peripheral vascular disease, hyperlipidemia, pulmonary embolus on rivaroxaban, heart failure with reduced ejection fraction, and hepatic/pancreatic cysts. The patient had been experiencing progressively worsening shortness of breath over the preceding month. She had been admitted two weeks beforehand with shortness of breath. During that admission, the patient had a contrast-enhanced computed tomography (CT) scan of her chest performed which showed no evidence of pulmonary embolism, but did show large hepatic cysts causing compressive atelectasis of the right lung. She also had an echocardiogram performed, which showed an ejection fraction of 45% which was near her baseline. She was ultimately discharged, and her symptoms were attributed to deconditioning. In the following days, she developed poorly localizing abdominal pain for which she was taking acetaminophen and continued to have shortness of breath. The patient had acute worsening in her shortness of breath immediately prior to arrival and Emergency Medical Services (EMS) was called.

On arrival to the emergency department, the patient was tachycardic (116 beats per minute), tachypneic (43 breaths per minute), normotensive (120/84 mmHg), hypothermic (35.8 °C), and had an oxygen saturation in the mid-90s on room air. Her initial complaints included marked shortness of breath as well as nonspecific abdominal and back pain. Physical exam was notable for acute respiratory distress, decreased breath sounds at the right base, cold and mottled extremities, dry mucus membranes, and poorly localizing abdominal tenderness. Broad spectrum antibiotics were initiated. The patient was immediately placed on BiPAP and subsequently had an

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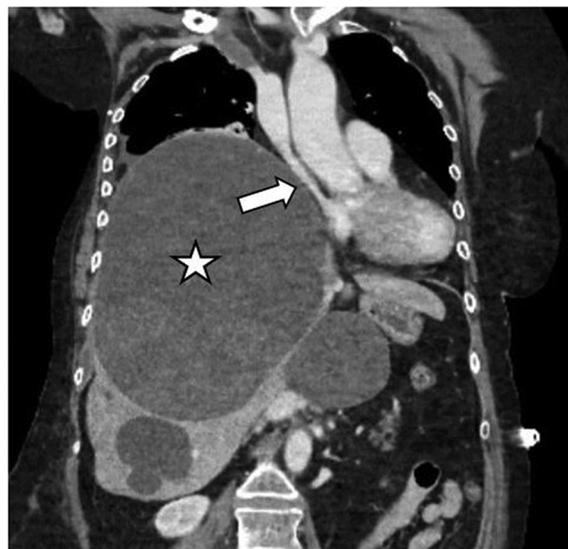
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acute drop in her blood pressure to 89/49 mmHg. She was given 500 mL IV fluids, but blood pressures only mildly improved and with mean arterial pressures remaining <65 while on BiPAP. She was transitioned to OptiFlow to accommodate for CT imaging and had subsequent improvement in her blood pressure. Bedside echo was attempted, but the parasternal long and short axis views were displaced significantly laterally and superiorly which made meaningful data acquisition difficult. Ultrasound of the lungs did not show evidence of pulmonary edema. A portable chest radiograph demonstrated elevation of the right hemidiaphragm with compressive atelectasis of the right lung (Fig. 1). Blood work was remarkable for high anion gap metabolic acidemia, moderate hypoglycemia, acute kidney injury, elevated transaminases, and leukocytosis. Initial lactate was elevated at 12.6 mmol/L. ProBNP was mildly elevated, but troponins were negative. Acetaminophen level was elevated at 23 µg/mL.

A contrast enhanced CT scan of the chest/abdomen/pelvis was performed and showed hepatic cysts, which had increased in size from prior imaging. These cysts were now causing mass-effect on the heart and prominent attenuation of the right atrium and vena cava (Figs. 2–4). Toxicology was consulted for the elevated acetaminophen level and *N*-acetylcysteine was initiated, although ultimately acetaminophen overdose was not considered to be contributing significantly to the patient's condition. The patient was subsequently admitted to the ICU and underwent percutaneous drainage of the largest liver cyst the next day. 1700 mL of dark brown fluid was removed from the cyst. Her postoperative course was complicated by increasing pressor requirements and altered mental status; the patient ultimately required intubation for airway protection. Subsequent laboratory studies were remarkable for elevated troponins. Repeat echocardiogram showed a systolic ejection fraction of 15–20%. Repeat CT imaging showed decreased mass-effect and improvement in right atrial filling. Unfortunately, she developed worsening hypotension despite maximum vasoactive infusions and eventually expired. Blood cultures and cystic fluid analysis showed no evidence of infectious process.

### 3. Discussion

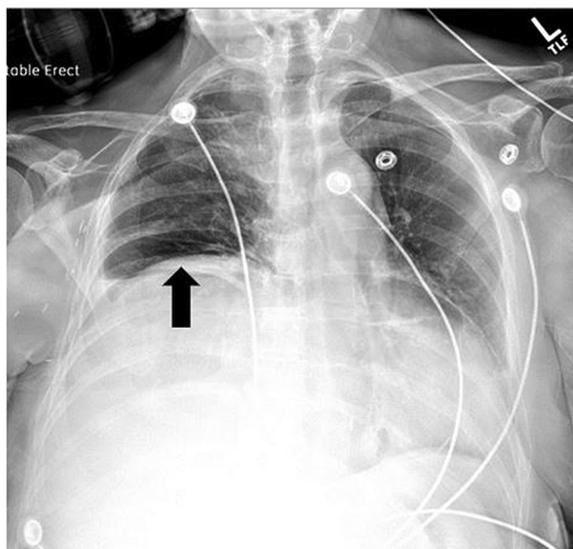
Obstructive shock is a rare condition, with some estimates showing a relative incidence of 1–2% when compared with other causes of shock [3,4]. The well-known causes of obstructive shock include cardiac tamponade, tension pneumothorax, and pulmonary embolus;



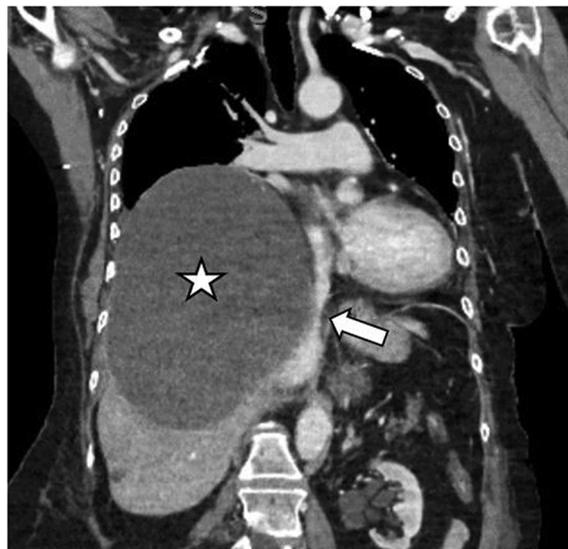
**Fig. 2.** Coronal contrast enhanced CT scan demonstrating massive hepatic cyst (star) causing compression of the superior vena cava (arrow).

however, lesser-known etiologies include abdominal compartment syndrome, mediastinal space-occupying lesion, critical aortic stenosis or coarctation, or AutoPEEP/high PEEP positive pressure ventilation states [3,4]. Presenting signs and symptoms are typically nonspecific but can vary based on the underlying etiology of the obstruction. One feature common to most etiologies is rapid hemodynamic deterioration, although early recognition and management of the underlying obstructive pathology can significantly affect morbidity and mortality [5,6].

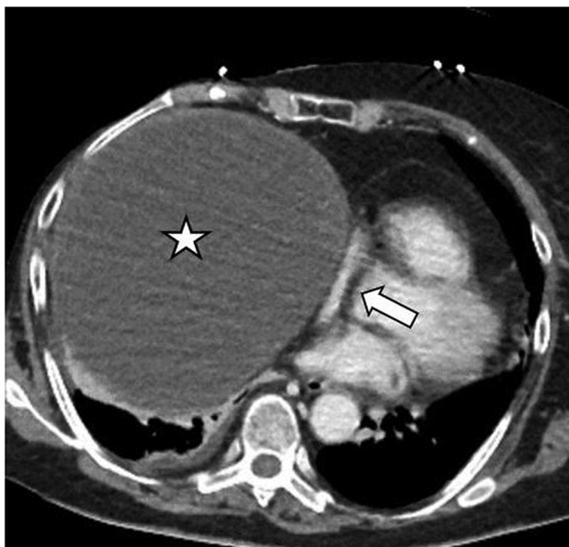
This case demonstrates how challenging it can be to differentiate between forms of shock. The patient's abnormal vital signs and significantly elevated lactate indicated she was in a state of shock [4]. Her respiratory distress and meeting SIRS criteria made distributive shock a possibility. Her cold and mottled extremities favored low cardiac output state and her history of systolic dysfunction made cardiogenic shock a reasonable etiology. When the patient arrived, she had decreased breath sounds in the right lower lung fields, an elevated right hemidiaphragm, and displaced echocardiogram views which indicated



**Fig. 1.** Chest x-ray (anterior-posterior view) showing significant elevation of the right hemidiaphragm with compressive atelectasis of the right lung (arrow).



**Fig. 3.** Coronal contrast enhanced CT scan demonstrating massive hepatic cyst (star) causing compression of the inferior vena cava (arrow).



**Fig. 4.** Axial contrast enhanced CT scan demonstrating massive hepatic cyst (star) causing compression of the right atrium (arrow).

an abnormal anatomy. In addition to this, her blood pressure decreased significantly after being placed on BiPAP. This indicated that the patient was in a preload dependent state in which further insult to preload from positive pressure ventilation resulted in further hemodynamic deterioration [7]. Ultimately, the diagnosis of obstructive shock was made after the patient underwent CT imaging of the chest, abdomen, and pelvis. This diagnosis was supported by the rapid deterioration of cardiac function after the obstruction was not immediately intervened upon [8].

Definitive management for obstructive shock is directed at treating the underlying physical obstruction to blood flow [4]. Emergent intervention for common causes of obstructive shock like chest tube thoracostomy, pericardiocentesis, and thrombolysis are well studied and are performed somewhat regularly in most emergency departments. However, those directed at rarer causes of obstructive shock are less well defined in the literature. A common feature of most obstructive shock is rapid hemodynamic deterioration and there may not be time to call in a specialist to perform an emergency procedure. Although we were unable to discover any studies investigating primary outcomes for patients with obstructive shock secondary to intraabdominal mass, the literature of more common etiologies of obstructive shock is much more thorough. For this reason, we advocate for additional research to be made into the early detection and management of rarer causes of obstructive shock.

#### 4. Conclusions

In this report, we discuss a unique presentation of obstructive shock secondary to a massive hepatic cyst. There have been no prior studies investigating acute management strategies for this specific clinical scenario, although prior research on symptomatic hepatic cysts have reported that minimally invasive procedures like percutaneous drainage

can be a safe treatment modality. Further research is necessary to determine whether early bedside or surgical interventions to help alleviate such obstructions affect morbidity and mortality.

#### Author contributions

All authors provided substantial contributions to manuscript content. All authors gave final approval of the version of the article to be published.

#### CRedit authorship contribution statement

**Matthew P. Murphy:** Conceptualization, Data curation, Formal analysis, Investigation, Writing – review & editing, Writing – original draft. **Hanna R. Warren:** Conceptualization, Data curation, Formal analysis, Investigation, Writing – original draft, Writing – review & editing. **Ryan M. Surmaitis:** Conceptualization, Data curation, Formal analysis, Investigation, Writing – original draft, Writing – review & editing. **Kathleen E. Kane:** Conceptualization, Data curation, Formal analysis, Investigation, Writing – original draft, Writing – review & editing.

#### Declaration of Competing Interest

None.

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#### References

- [1] Antoniou EA, Kontzoglou K, Kouraklis G, Dimitroulis D. Minimally invasive management of hepatic cysts: indications and complications. *Eur Rev Med Pharmacol Sci.* 2018 Mar;22(5):1387–96. [https://doi.org/10.26355/eurrev\\_201803\\_14484](https://doi.org/10.26355/eurrev_201803_14484). PMID: 29565498.
- [2] Mazza OM, Fernandez DL, Pekolj J, et al. Management of nonparasitic hepatic cysts. *J Am Coll Surg.* 2009 Dec;209(6):733–9. <https://doi.org/10.1016/j.jamcollsurg.2009.09.006>. PMID: 19959042.
- [3] Vincent JL, De Backer D. Circulatory shock. *N Engl J Med.* 2013 Oct 31;369(18):1726–34. <https://doi.org/10.1056/NEJMr1208943>. PMID: 24171518.
- [4] Standl T, Annecke T, Cascorbi I, et al. The nomenclature, definition and distinction of types of shock. *Dtsch Arztebl Int.* 2018;115(45):757–68. <https://doi.org/10.3238/arztebl.2018.0757>.
- [5] Gitz Holler J, Jensen HK, Henriksen DP, et al. Etiology of shock in the emergency department: A 12-year population-based cohort study. *Shock.* 2019 Jan;51(1):60–7. <https://doi.org/10.1097/SHK.0000000000000816>. PMID: 27984523; PMCID: PMC6282680.
- [6] Sharma A, Jindal P. Principles of diagnosis and management of traumatic pneumothorax. *J Emerg Trauma Shock.* 2008 Jan;1(1):34–41. <https://doi.org/10.4103/0974-2700.41789>. PMID: 19561940; PMCID: PMC2700561.
- [7] Duke GJ. Cardiovascular effects of mechanical ventilation. *Crit Care Resusc.* 1999 Dec; 1(4):388–9916599883.
- [8] Pich H, Heller AR. Obstruktiver schock [Obstructive shock]. *Anaesthesist.* 2015 May; 64(5):403–19. German. <https://doi.org/10.1007/s00101-015-0031-9>. PMID: 25994928.