

# Case report of gastric distension due to superior mesenteric artery syndrome mimicking hollow viscus perforation

## Considerations in critical care ultrasound

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### Abstract

**Rationale:** Critical care ultrasound identifies the signs of free intraperitoneal air and echogenic free fluid always indicates hollow viscus perforation (HVP) and needs immediate surgical interventions. However, in rare cases, these classic signs may also mislead proper clinical decisions. We report perforated viscus associated large peritoneal effusion with initial critical care ultrasound findings, whereas computed tomography (CT) examination confirmed a giant stomach due to superior mesenteric artery syndrome (SMAS).

**Patient concerns:** A 70-year-old man was admitted to our emergency department with a complaint of recurrent vomiting with coffee ground emesis for 15 hours and worsen with hypotension for 6 hours. During gastric tube placement, the sudden cardiac arrest occurred. With 22 minutes resuscitation, sinus rhythm was restored.

**Diagnoses:** Quick ultrasound screen showed large echogenic fluid distributed in the whole abdomen. Diagnostic paracentesis collected “unclotted blood” and combined with a past history of duodenal ulcer, HVP was highly suspected. However, surgical intervention was not performed immediately as unstable vital signs and unfavorable coma states. After adequate resuscitation in intensive care unit, the patient was transferred to perform enhanced CT. Surprisingly, there was no evidence of HVP. Instead, CT showed a giant stomach possibly explained by SMAS.

**Interventions:** Continuous gastric decompression was performed and 3100 mL coffee ground content was drainage within 24 hours of admission.

**Outcomes:** Abdominal distension was significantly relieved with improved vital signs. However, as the poor neurological outcome, family members abandon further treatment, and the patient died.

**Lessons:** SMAS is a rare disorder, characterized by small bowel obstruction and severe gastric distension. Nasogastric tube insertion should be aware to protect airway against aspiration. Caution should be utilized to avoid over interpretation of ultrasonography findings on this condition.

**Abbreviations:** CT = computed tomography, HVP = hollow viscus perforation, SMAS = superior mesenteric artery syndrome.

**Keywords:** critical care ultrasound, giant stomach, perforated viscus, peritoneal effusion

## 1. Introduction

Critical care ultrasound is an effective tool for making quick diagnoses and guiding therapeutic procedures.<sup>[1]</sup> The Focused

Assessment with Sonography for Trauma (FAST) examination allows for the detection of gastrointestinal perforation on the evidence of pneumoperitoneum and echogenic free fluid.<sup>[2]</sup> Previous studies show that the sensitivity and specificity range from 85% to 93% and 53% to 100%, respectively.<sup>[3]</sup> However, this discipline does not fit all conditions. Herein, we report a rare case. The initial diagnosis with critical care ultrasound highly indicated hollow viscus perforation (HVP), whereas further enhanced computed tomography (CT) demonstrated severe gastric distention possibly due to superior mesenteric artery syndrome (SMAS).

This study adhered to the tenets of the Declaration of Helsinki, and the ethics committee of the First Affiliated Hospital of Chongqing Medical University approved the study. Informed consent was obtained from the patient for publication of this report and its related images.

## 2. Case report

A 70-year-old man was admitted to our emergency department with a complaint of recurrent vomiting with coffee ground emesis for 15 hours and worsen with hypotension for 6 hours. He was extremely weak with cachexia and anemic appearance. The heart rate was 123 bpm and the blood pressure was 77/40 mmHg.

Editor: N/A.

Y-MF and DW contributed equally to this work.

This study is funded by the National Nature Science Foundation of China (No. 81201173).

The authors declare no conflicts of interest.

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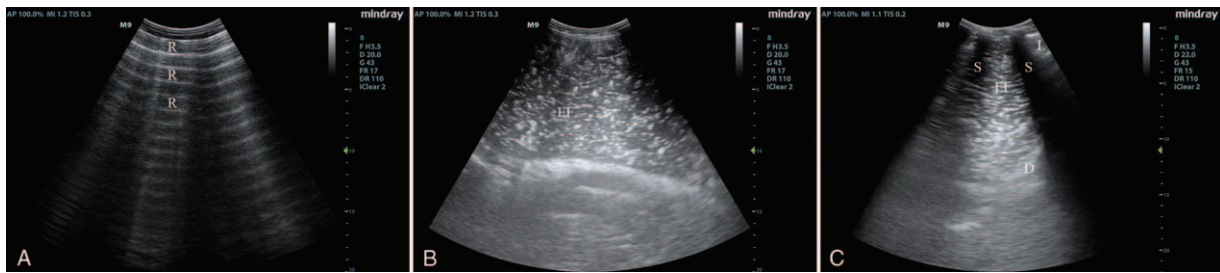
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Medicine (2018) 97:20(e10757)

Received: 16 February 2018 / Accepted: 25 April 2018

<http://dx.doi.org/10.1097/MD.00000000000010757>



**Figure 1.** Critical care ultrasound findings at the McBurney's point (A), reverse McBurney's point (B), and left upper quadrants (C). D= diaphragm, EF=echogenic fluid, L=lung, R=reverberation, S=rib shadow.

Physical examination showed generalized abdominal protuberance with tympany on percussion. Therefore, nasogastric tube (NG) insertion was routinely used for gastrointestinal decompression. However, the sudden cardiac arrest occurred when NG placement. Cardiopulmonary resuscitation was initiated and urgent endotracheal tube intubation was performed subsequently. With 22 minutes resuscitation, sinus rhythm was restored. During nearly 2 hours admission to the emergency room, 1950 mL coffee ground emesis was drainage from the NG tube. As vital signs were unstable, he was transferred to the intensive care unit (ICU) for further resuscitation.

Further medical history taking showed that, 40 years ago, he was diagnosed with duodenal bulbar ulcer while without regular treatment. Taken past history, abdominal signs, gastric contents and hypotension into consideration, upper gastrointestinal hemorrhage or even perforation were highly suspected. However, he was not allowed to complete CT examination as unstable blood pressure. Therefore, critical care ultrasound was used to identify the evidence of HVP. At McBurney's point, ultrasound detected several reverberation lines which highly indicated free air. The large echogenic free fluid was identified at reverse McBurney's point and even in the left upper quadrant of the abdomen (Fig. 1). However, there was no pleural effusion and satisfactory images in Morison's pouch were not obtained. The above imaging findings seem to support HVP. Further diagnostic puncture at the reverse McBurney's point collected dark "unclotted blood," which seem to further confirm the initial diagnosis of HVP.

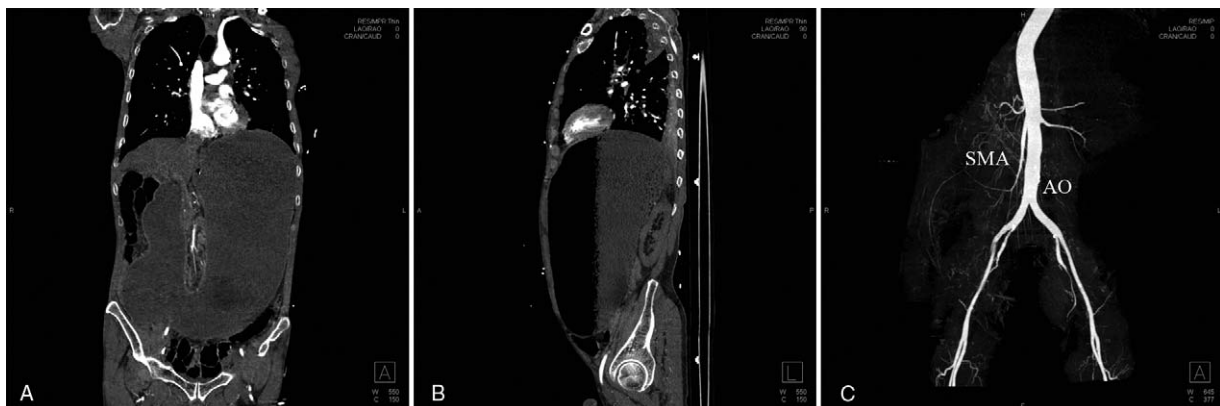
But curiously, the hemoglobin value fluctuated around 100 g/L, which did not support hemorrhagic shock and family members

denied there was a complaint of sudden abdominal pain during the entire course of the disease. Hence, HVP alone was not able to explain all the questions based on the theory of monism. In addition, the vital signs were not stable and physical examination showed mydriasis without light reflex, which highly indicated the poor neurological outcome. Thus, surgical consult did not support emergency laparotomy. After advanced life support, his condition was relatively stable and enhanced CT examination was planned to facilitate locating the rupture of HVP. The imaging findings showed the angle between the superior mesenteric artery and the abdominal aorta was about  $15^\circ$ . The stomach and the descending, horizontal duodenum had a significant expansion, which highly indicated SMAS (Fig. 2). Meanwhile, CT scanning also supported aspiration pneumonia and bronchoalveolar lavage also aspirated a lot of gastric contents in the lung.

Therefore, a look back into this case suggested that cardiac arrest may account for aspiration and the above mentioned "unclotted blood" of diagnostic puncture was gastric contents in nature. With continuous drainage of 1150 mL coffee ground emesis during the first day of ICU, the abdominal signs improved significantly. However, as predicted poor neurologic outcome, the family members abandon further treatment and the patient died.

### 3. Discussion

SMAS is a rare form of the gastrointestinal disorder, caused by the compression of the duodenum between the aorta and superior mesenteric artery.<sup>[4]</sup> Retrospective studies suggest that this syndrome is more prevalent in young adult and women are



**Figure 2.** CT images in the coronal view (A) and sagittal view (B) of severe gastric distension. CT angiography showed the angle between the superior mesenteric artery and the abdominal aorta was about  $15^\circ$ (C). AO=abdominal aorta, CT = computed tomography, SMA=superior mesenteric artery.

more likely to be affected.<sup>[5]</sup> In this case, we reported the SMAS presented in a 70-years-old man. We speculate that 40 years history of the duodenal bulbar ulcer may decrease the appetite for food intake. In addition, further past history collecting revealed that he experienced recurrent nausea and vomiting in recent 1 year. All these factors together may affect the overall energy intake, promoting rapid loss of the mesenteric fat pat, and therefore lead to the occurrence of SMAS.

However, there were no specific symptoms. Hence, the diagnosis of SMAS is very difficult and is very often delayed. Imaging is frequently used to confirm the suspicion of SMAS. CT angiography is considered as the gold standard for diagnosis.<sup>[5]</sup> Recently, critical care ultrasound is used to illustrate and measure the reduced aortomesenteric angle with color Doppler imaging in the early stage of SMAS.<sup>[6]</sup> However, in this case, it is difficult to detect abdominal aorta due to the interference of both air and gastric contents.

On the other hand, ultrasound findings of free intraperitoneal air and echogenic free fluid in SMAS should be interpreted with caution. Because in rare conditions, just like the case presented here, the stomach extremely enlarged due to SMAS and hence occupied the whole abdomen. Thus, the stomach wall fitted tightly on the abdominal wall. Therefore, inexperienced physicians may mistake the gastric contents (the mixture of fluid and air) for intraperitoneal air and echogenic free fluid due to HVP. And diagnostic abdominal paracentesis on this condition should be avoided in case of iatrogenic gastric perforation. However, back in this case, we found that the structures of intestinal were not identified within the large echogenic fluid that may help to differentiate gastric contents from free fluid due to HVP.

Finally, manual decompression of the duodenum and stomach with an NG tube is often preferred for treating the symptoms. However, due to severe gastric distention, this procedure is not without dangerous.<sup>[7]</sup> In this case, nearly 2000 mL gastric contents were decompressed within 2 hours and aspiration related cardiac arrest was observed during NG tube insertion. Therefore, airway protection before NG tube placement may be necessary for the acute setting of SMAS.

#### 4. Conclusions

SMAS is a rare gastrointestinal disorder, resulting in proximal intestinal obstruction and severe gastric distension. Critical care

ultrasound is cautious to interpret, especially to the differential diagnosis from large gastric contents to free fluid due to HVP. CT examination is necessary to confirm the clinically suspected diagnosis. Diagnostic abdominal paracentesis is not suggested on this condition in case of iatrogenic gastric perforation. Early recognition and early decompression are essential for conservation therapy; life-threatening aspiration should be alert during NG tube insertion.

#### Author contributions

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**Writing – original draft:** Yan-Mei Feng, Rui Guo.

**Writing – review & editing:** Yan-Mei Feng, Dong Wan, Rui Guo.

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