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Case Report

Sarcina organism of the stomach: Report of a caseAndre Ene^{*}, Morgan H. McCoy, Shadi Qasem

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ABSTRACT

Sarcina Ventriculi is a gram-positive organism, rarely encountered as a human pathogen. It has been described in stomach specimens, often in patients with delayed gastric emptying. The exact role of this organism in human disease is not clear. In this case report, we describe a case of *Sarcina* organism associated with gastric ulceration. This organism is likely underreported and often overlooked, as it may not be obvious on routine staining. Awareness of this organism and further studies are needed to understand its role in human disease.

1. Introduction

Sarcina ventriculi is a gram positive [1], non-motile [2], anaerobic coccus [1] found normally growing in acidic soil environments [3,4]. An exclusive carbohydrate fermenter, it produces ethanol, acetaldehyde, carbon dioxide and hydrogen [4]. As an infectious organism to humans, it was first found in a patient with gastric pain secondary to bloating and vomiting [5]. Patients infected with *Sarcina* were found to have a frothy vomitus termed sarcinate vomit [6]. *S. ventriculi* is thought to be responsible for emphysematous gastritis [7] and perforation [4]. While also found in healthy humans, most notably the feces of vegetarians [8], it is most commonly identified as a veterinary pathogen, e.g. livestock, cats and horses [2,9,10], causing gastric dilation [11] and death, termed “abomasal bloating” [9]. Herein we describe a case of *Sarcina* spp. of the stomach of a 55 year old male patient.

2. Case report

Our patient was a 55 year old male with a medical history significant for type 2 diabetes mellitus, gastroesophageal reflux disease (GERD), heart failure with reduced ejection fraction, hepatitis C virus, right toe osteomyelitis, and intravenous (IV) drug use as recently as 3 days prior to admission. He was admitted for hematemesis and acute on chronic anemia. The patient had hematemesis for 3 days and occasional dark stools, with a hemoglobin of 5.9 g/dL on admission, for which he received two units of packed red blood cells (pRBCs). Upper endoscopy (EGD) showed grade D esophagitis with a 2 cm hiatal hernia. Severe erosions and ulcerations were present at the gastroesophageal junction. Gastritis with bleeding on contact was observed, and a 10 mm non-

bleeding ulcer in the duodenum was identified.

Microscopic evaluation showed ulceration and granulation tissue with fungal yeast forms present, confirmed by Grocott methenamine silver (GMS) stain. The GMS stain also demonstrated cocci in the form of tetrads, which were not clearly visualized on hematoxylin and eosin (H&E) stains. Gram stain highlighted red staining tetrad structures, consistent with *Sarcina* spp. (Fig. 1). The patient was placed on a proton pump inhibitor (PPI), with a repeat EGD scheduled in 8 weeks.

3. Discussion

S. ventriculi was first identified as a human pathogen in 1842 by John Goodsir [12], and it was first isolated in 1911 using strict anaerobic techniques from the stomachs of infected individuals [13]. H&E staining shows a tetrad arrangement [1,14] of *S. ventriculi*, measuring 1.8–3 µm in diameter [15], at the mucosal surface of gastric mucin [16], without mucosal reaction [2]. The tetrad arrangement is due to the organism replicating in 2 planes [15], which can occasionally mimic vegetable matter due to the refractile nature of the cell wall [17].

Two organisms morphologically similar to *S. ventriculi* are *Micrococcus* spp. and *Sarcina maxima*. *Micrococcus* spp., are gram positive cocci, which grow in tetrads and tightly packed clusters [18]; however, they measure 0.5 µm in diameter [19]. *Micrococcus* spp. are catalase positive aerobic bacteria [20], while *S. ventriculi* are catalase negative [21] and anaerobic. In contrast to *S. maxima*, *S. ventriculi* has a thick extracellular cellulose layer on the outer wall, 150–200 nm in thickness [1].

The clinical significance of identifying *Sarcina* spp. in the stomachs of humans has not been well established. Most patients present with gastric

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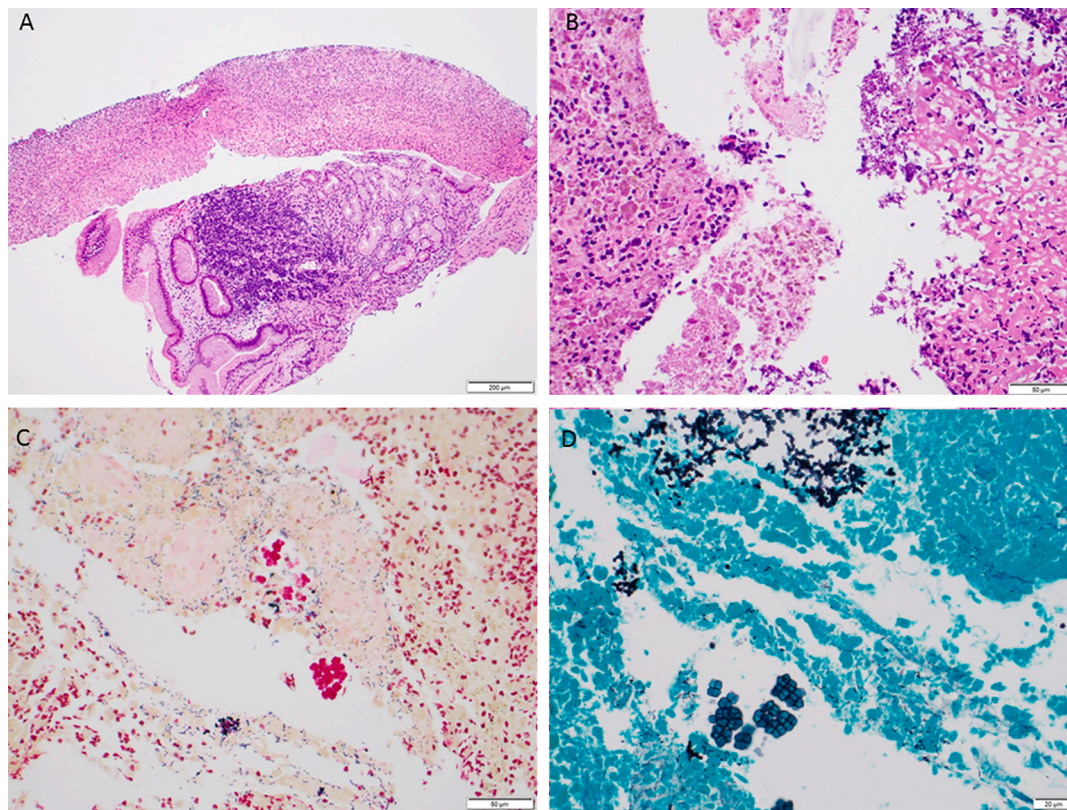


Fig. 1. A, Gastric mucosa showing ulceration. [H&E stain, 10× magnification]. B, Ulceration with yeast forms and debris-like material. [H&E stain, 40× magnification]. C, Tetrad organisms staining red with internal control showing gram positive rods. [Gram stain, 40× magnification]. D, Yeast forms with tetrad organisms stained by GMS. [GMS stain, 40× magnification]. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

symptoms of nausea, vomiting, and abdominal pain [16,17,21], and a history of prior gastrointestinal surgery, gastroparesis and/or gastric outlet obstruction [21]. *S. ventriculi* have also been found in cases of patients with gastric adenocarcinoma and pancreatic adenocarcinoma [16]. Cases with *S. ventriculi* often have food bezoars due to delayed gastric emptying [6,16]. A previous study looking at 8 case reports found 5 of 8 patients had delayed gastric emptying and retained food in stomach during endoscopic examination [4,7,16]. Thus, *S. ventriculi* may be used as a marker for delayed gastric emptying [2]. No correlation between the deadly gastric bloating disease in animals caused by *S. ventriculi* and colonization of human stomachs has been made as yet, however, a few cases of death from gastric perforation due to *Sarcina ventriculi* have been reported [22]. The clinical significance of its identification in human clinical specimens remains uncertain.

Unfortunately, culture material is not available in our case, as it is not customary to collect such material during EGD procedures; therefore, we will only refer to this organism as *Sarcina* spp. The organism in this case is associated with a gastric ulcer and fungal yeast forms. Interestingly, the organism stained red on Gram stain (gram negative), which is curious given the organism should have stained purple (positive). Possible explanations for this are over-decolorization during the staining process, or cell wall damage, e.g. antibiotic exposure. Further studies looking into correlation of *Sarcina* spp. and delayed gastric emptying is warranted. Pathologists should be aware of this unusual organism and its uncertain significance.

4. Patient consent statement

The manuscript contains no patient identifiable information. As such, it is exempt from the requirement to obtain patient consent by our institutional Review Board (IRB).

5. Funding resource

Not applicable

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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