



Sarcina ventriculi in a 23 Year Old Patient: A Case Report

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Abstract

Introduction: *Sarcina ventriculi* is an anaerobic, gram-positive, non-motile, and exclusive carbohydrate fermenter bacterium that thrives in acidic environments, particularly in gastric biopsies of patients with delayed gastric emptying. Some known symptoms of a *Sarcina* infection include nausea, dyspepsia, abdominal pain, and rarely more serious manifestations like emphysematous gastritis and gastric perforation. Nevertheless, it was also isolated in healthy, asymptomatic individuals, suggesting that it could be present as a harmless organism.

Case: A 23 year-old male with GERD presented with intermittent epigastric pain. Esophagogastroduodenoscopy (EGD) was performed and endoscopic biopsy revealed erythematous gastritis caused by *S. ventriculi* infection.

Discussion: Although *Sarcina ventriculi* is a known pathogen in animals, its pathogenic role in humans is not well established. *S. ventriculi* is commonly reported in patients with delayed gastric emptying, as this bacterium thrives in environments with acidic pH and rich in carbohydrates, as in GERD-related, diabetic, and post-surgery gastroparesis. Currently, there is no evident consensus on the treatment of *S. ventriculi* due to the lack of follow-up biopsies that confirm pathogen eradication, and the presence of cases of pathogen eradication without the need for antibiotics.

Conclusion: *Sarcina ventriculi* is a rare bacterium of the stomach whose significance is not well established. Reported cases of *Sarcina ventriculi* are increasing over the years; this increase can be attributed to lifestyle and diet changes. As of today, there is still no established medical regimen approved for the treatment of *Sarcina ventriculi*.

Keywords: *Sarcina ventriculi*; Gram Positive; Gastroparesis

Introduction

Sarcina ventriculi is a gram-positive coccus whose name comes from the Latin word “sarcina” which means “package”. *Sarcina* forms a pack of four or eight basophilic staining bacteria with refractive properties on light microscopy [1]. Although similar in appearance to *Micrococcus*, these bacteria can be distinguished from one another by a larger size and non-cluster forming features of *Sarcina* [2]. This anaerobic, non-motile, and exclusive carbohydrate fermenter thrives in acidic environments, particularly in gastric biopsies of patients with delayed gastric emptying. It was first reported by Goodsir in 1842, and isolated in pure culture from the stomach in 1911. Since then, very few cases were reported [3]. Some known symptoms of a *Sarcina* infection include nausea, dyspepsia, abdominal pain, and rarely more serious manifestations like emphysematous gastritis and gastric perforation. Nevertheless, it was also isolated in healthy asymptomatic individuals, suggesting that it could be present as a harmless organism [2]. We report a rare case of *Sarcina ventriculi* infection complicated with erythematous gastritis in a patient with chronic gastroesophageal reflux disease.

Case Report

A 23-year-old Lebanese male with chronic gastroesophageal reflux disease (GERD) presented with relapsing and remitting postprandial epigastric pain occurring 2-3 hours after meals. He reported experiencing vertigo during strenuous exercise and denied any episodes of emesis, diarrhea, or constipation. The patient has no surgical history and no allergies. He takes no chronic medications and only consumes vitamin D supplements and magnesium. Abdominal ultrasound (US) and general lab results were normal.

Esophagogastroduodenoscopy (EGD) was performed, and the cardia was found to be patulous with Hill’s grade 2 and LA Grade A esophagitis. There is marked diffuse erythematous petechial pangastritis and a non-erosive submucosal nodule of 5mm in the antrum. Diffuse erythema is noted in the second and third parts of the duodenum (D2 and D3). Biopsy results revealed focally enhanced chronic gastritis without intestinal metaplasia. *Sarcina ventriculi* was identified using hematoxylin-eosin (H&E) stain, revealing cells with basophilic staining arranged in cuboidal structures (figure 1). The patient was then given a course of proton pump inhibitor (PPI) for the relief of GERD symptoms.

Discussion

Sarcina ventriculi is a rare carbohydrate-fermenting gram-positive anaerobic bacterium, most commonly reported in patients with gastroparesis and delayed gastric emptying. Although it is a known pathogen in animals, its pathogenic role in humans is not well established [4]. *Sarcina ventriculi* is well identified by its distinct morphology on histopathology. It is characterized by basophilic staining of cuboidal pathogens organized in a tetrad of red blood cell-sized packets [3]. Since 2010, the incidence of *S. ventriculi* has been on the rise [5]. This increase can be attributed to changes in eating habits, food quality, and hygiene. *Sarcina ventriculi* is typically found in soil, where it forms spores at an alkaline pH. Humans and animals get infected by ingesting those contaminated soil particles. In veterinary literature, several cases of death in livestock, horses, and cats were attributed to this bacterium [6]. Most patients present with nausea, vomiting, and epigastric pain, although some may be asymptomatic with incidentally positive tissue biopsies [3]. In this case, we report a 23-year-old male with GERD presenting with intermittent epigastric pain whose endoscopic biopsy revealed erythematous gastritis caused by *S. ventriculi* infection.

S. ventriculi is commonly reported in patients with delayed gastric emptying as this bacterium thrives in environments with acidic pH and rich in carbohydrates, such as GERD-related, diabetic, and post-surgery gastroparesis [7]. Bartolli, *et al.* reported a case of *S. ventriculi* bacteremia in a patient with acute pseudo-obstruction (Ogilvie’s syndrome) post orthopedic surgery. Some complications of this infection include emphysematous gastritis, gastric perforation, peritonitis, and gastric adenocarcinoma [8]. Lam-Himlin, *et al.* suggested that patients with celiac disease and cystic fibrosis were more likely to develop *S. ventriculi* which highlights that GI mucosal defects are conducive to the replication of *S. ventriculi* [6]. From the same token, patients with preexisting gastric mucosal defects are more likely to suffer from life-threatening outcomes after a *Sarcina ventriculi* infection, since the bacterium requires a breach of the stomach mucosa as a nidus for invasion and is incapable of directly invading an intact gastric wall [6]. It is postulated that *S. ventriculi* triggers mucosal damage by the accumulation of acetaldehyde [6]. Cases of co-infection with *H. pylori* and giardia were also reported [5]. Thus, it becomes clear that both GI mucosal damage and gastric emptying can favor the occurrence of *S. ventriculi*. In parallel,

S. ventriculi's predilection for patients with gastroparesis should raise the question whether or not the bacterium should be used as a marker for gastroparesis and delayed gastric emptying.

Concerning the treatment of *S. ventriculi* infection, the antibiotic regimens used are metronidazole alone or combined with ciprofloxacin and/or a proton pump inhibitor and a prokinetic agent. Currently, there is no evident consensus on the treatment of *S. ventriculi* due to the lack of follow-up biopsies that confirm pathogen eradication and the presence of cases of pathogen eradication without the need for antibiotics [6]. In general, patients should be classified based on symptoms and endoscopic findings. For patients with ulcers and erosive gastritis, antibiotic regimens are recommended to successfully eradicate the pathogen, as reported in many cases [3]. If the patient presents with delayed gastric emptying and GERD, treatment should be based on treating the underlying causative pathology [7]. Fasting has been proven to be effective in managing *S. ventriculi* because fasting eliminates the source of carbohydrate essential for *S. ventriculi* viability and replication. Hillman, *et al.* reported a case of a 73-year-old with severe refractory GERD and decreased gastric emptying, who was found to have *S. ventriculi* infection. In this patient, antibiotic treatment with Metronidazole and Ciprofloxacin failed, necessitating surgical intervention with fundoplication to increase gastric emptying and clear the organism [7]. In our case, given that the patient presented with chronic GERD and EGD showed non erosive gastritis, PPI therapy was initiated, and further assessment will follow to assess the need for surgical intervention with fundoplication if medical treatment fails.

Conclusion

Sarcina ventriculi is a rare bacteria of the stomach whose significance is not well established. Reported cases of *Sarcina ventriculi* are increasing over the years. Such an increase can be attributed to lifestyle and diet changes. As of today, there is still no established medical regimen approved for the treatment of *Sarcina ventriculi*. Further studies are needed to assess the significance of *Sarcina ventriculi*, to elucidate its mechanism of pathogenicity, and to develop appropriate treatment regimens.

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