

## *Sarcina ventriculi* of the stomach: A case report

Shiva K Ratuapli, Dora M Lam-Himlin, Russell I Heigh

Shiva K Ratuapli, Russell I Heigh, Division of Gastroenterology and Hepatology, Mayo Clinic Arizona, Scottsdale, AZ 85259, United States

Dora M Lam-Himlin, Department of Pathology, Mayo Clinic Arizona, Scottsdale, AZ 85259, United States

**Author contributions:** Ratuapli SK performed literature search and drafted the manuscript; Heigh RI saw the patient, conceived the idea and critically revised the manuscript; Lam-Himlin DM reviewed stomach biopsies and critically revised the manuscript.

**Correspondence to:** Russell I Heigh, MD, Division of Gastroenterology and Hepatology, Mayo Clinic Arizona, 13400 East Shea Blvd, Scottsdale, AZ 85259,

United States. [heigh.russell@mayo.edu](mailto:heigh.russell@mayo.edu)

Telephone: +1-480-3016737 Fax: +1-480-3016990

Received: December 20, 2012 Revised: January 16, 2013

Accepted: January 23, 2013

Published online: April 14, 2013

© 2013 Baishideng. All rights reserved.

**Key words:** *Sarcina ventriculi*; Gram negative; Emphysematous gastritis; Gastric perforation; Bacterial overgrowth

**Core tip:** *Sarcina ventriculi* is a rare bacterium, seen in gastric biopsies of patients with gastroparesis. Only eight cases have been reported so far, where in it has been implicated in the development of gastric ulcers, emphysematous gastritis and gastric perforation. In our case, gastric erythema improved with antibiotic treatment. Given its association with life threatening illness in two reported cases, it may be prudent to treat with antibiotics and anti-ulcer therapy, until further understanding is achieved.

### Abstract

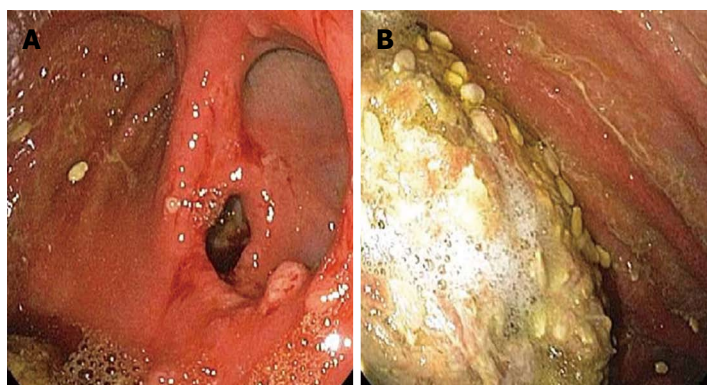
*Sarcina ventriculi* is a Gram positive organism, which has been reported to be found rarely, in the gastric specimens of patients with gastroparesis. Only eight cases of *Sarcina*, isolated from gastric specimens have been reported so far. *Sarcina* has been implicated in the development of gastric ulcers, emphysematous gastritis and gastric perforation. We report a case of 73-year-old male, with history of prior Billroth II surgery and truncal vagotomy, who presented for further evaluation of iron deficiency anemia. An upper endoscopy revealed diffuse gastric erythema, along with retained food. Biopsies revealed marked inflammation with ulcer bed formation and presence of *Sarcina* organisms. The patient was treated with ciprofloxacin and metronidazole for 1 wk, and a repeat endoscopy showed improvement of erythema, along with clearance of *Sarcina* organisms. Review of reported cases including ours suggests that *Sarcina* is more frequently an innocent bystander rather than a pathogenic organism. However, given its association with life threatening illness in two reported cases, it may be prudent to treat with antibiotics and anti-ulcer therapy, until further understanding is achieved.

Ratuapli SK, Lam-Himlin DM, Heigh RI. *Sarcina ventriculi* of the stomach: A case report. *World J Gastroenterol* 2013; 19(14): 2282-2285 Available from: URL: <http://www.wjgnet.com/1007-9327/full/v19/i14/2282.htm> DOI: <http://dx.doi.org/10.3748/wjg.v19.i14.2282>

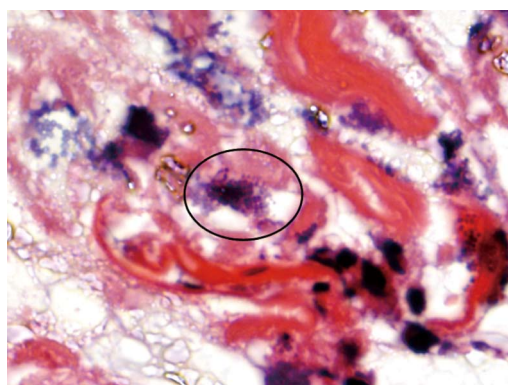
### INTRODUCTION

*Sarcina ventriculi* is a Gram positive anaerobic bacterium, with carbohydrate fermentative metabolism as its sole energy source<sup>[1]</sup>, and is able survive in very low pH environment<sup>[2]</sup>. Even though it is similar in appearance to *Micrococcus* species, certain morphological features (*i.e.*, larger size, non-cluster forming pattern) help differentiate it from the latter organism<sup>[3]</sup>.

Various reports in veterinary literature have implicated *Sarcina* in the development of gastric dilatation<sup>[4]</sup> and death of livestock, cats and horses<sup>[5,6]</sup>. *Sarcina* has also been reported to be found in feces of healthy humans consuming a predominantly vegetarian diet<sup>[7]</sup>. Recently, several reports have shown an association between *Sarcina* in the stomach and chronic nausea, dyspepsia, abdominal pain, gastric ulcers<sup>[3]</sup>, and rarely emphysematous gastritis<sup>[8]</sup> and



**Figure 1** Esophagogastroduodenoscopy. A: Polyps at the anastomosis; B: Gastric erythema and food bezoar.



**Figure 2** Characteristic 8-10 micron tetrads of *Sarcina* organisms (circled) were identified on endoscopic biopsy. The background shows abundant bacterial overgrowth and debris from retained food. Separate fragments of ulcer bed were present (not pictured) (hematoxylin and eosin; original magnification  $\times 1000$  oil lens).

gastric perforation<sup>[9]</sup>. However *Sarcina* has also been found in gastric specimens without any other pathologic changes<sup>[5]</sup>, suggesting that it may be a bystander rather than a pathogenic organism. To date, only eight cases of *Sarcina ventriculi* isolated from gastric biopsy specimens have been reported. We now report a case of *Sarcina ventriculi* of the stomach, associated with iron deficiency anemia and gastroparesis.

## CASE REPORT

A 73-year-old male presented to the clinic for further evaluation of iron deficiency anemia. The patient had a history of medically refractory gastric ulcers in his 20 s, for which he underwent antrectomy and gastrojejunostomy (Billroth II) along with truncal vagotomy in 1985. He continued to be anemic since the surgery, with intermittent intake of oral iron replacement.

On initial evaluation for an incidentally detected anemia prior to unrelated urologic surgery, he did not have any gastrointestinal symptoms. The patient specifically denied nausea, vomiting, abdominal pain or weight loss. His complete blood count revealed decreased hemoglobin of 8.5 g/dL, decreased mean corpuscular volume of 63.2 fL, normal white cell count of  $9.8 \times 10^9$  L (normal  $4.2 \times 10^9$ - $10.2 \times 10^9$  L) and elevated platelet count  $415 \times 10^9$  L (normal  $151 \times 10^9$ - $355 \times 10^9$  L). Iron studies showed



**Figure 3** Repeat esophagogastroduodenoscopy showing improvement of gastric erythema.

markedly reduced iron level of 12 mg/dL (normal 50-150 mg/dL), with an elevated total iron binding capacity of 490 mg/dL (normal 250-400 mg/dL) and reduced iron % saturation of 2% (normal 14%-50%).

Three years prior, an esophagogastroduodenoscopy (EGD) had revealed an anastomotic ulcer and polyps at the anastomotic site, the biopsies of which showed acute inflammation, but were otherwise unremarkable. A colonoscopy at that time was unremarkable except for diverticulosis. An EGD done during the current evaluation demonstrated diffuse gastric erythema, along with two 4mm polyps at the anastomosis (Figure 1). There was also a large amount of retained food in the stomach.

Tissue biopsies of the erythematous stomach revealed marked inflammation with ulcer bed formation, along with abundant bacterial overgrowth including the presence of *Sarcina* organisms (Figure 2). The *Sarcina* organisms were identified on routine hematoxylin and eosin (HE) stain, and no additional special stains or immunolabeling was performed. Based on prior studies<sup>[3]</sup>, the tetrad morphology and size are characteristic enough to establish a diagnosis without further ancillary testing. Biopsies were negative for *Helicobacter pylori*, both by routine HE staining and by immunohistochemical staining. Aspirates from the small bowel also came back positive for small intestinal bacterial overgrowth, with  $> 100\,000$  cfu/mL of mixed Gram-positive and Gram-negative flora.

The patient was treated with metronidazole 250 mg three times a day and ciprofloxacin 250 mg twice daily

**Table 1** Clinical, endoscopic and histological features of the eight reported cases of *Sarcina ventriculi* in the literature

Case No.	Age	Sex	Symptoms/clinical findings	Endoscopic findings	Histologic findings	Treatment	Follow-up
1	14	Male	Abdominal pain CT showed pneumoperitoneum. Intraoperatively there was necrotic stomach and gastric perforation and peritonitis	Not performed	Diffuse acute hemorrhagic gastritis and <i>Sarcina</i> organisms	Gentamicin and metronidazole	Symptoms improved after 5 d and patient discharged
2	50	Male	Chronic nausea, vomiting	Esophagitis, duodenal lesion	Chronic superficial gastritis and ulcer with <i>Sarcina</i> organisms	Not available	Not available
3	3	Female	Vomiting, hematemesis Abdominal X-ray showed dilated stomach with intramural air	Gastric inflammation, blackening of mucosa, cobblestone appearance	Polymorphic inflammatory infiltrate with <i>Sarcina</i> organisms and gas bubbles	Imipene, fluconazole and omeprazole	Repeat endoscopy 6 mo later showed complete normalization
4	58	Female	Nausea and vomiting	Gastritis, food bezoar, inflammatory mass in duodenum	Active chronic gastritis with <i>Sarcina</i> organisms	Partial gastrectomy for obstruction	Treated for adenocarcinoma of pylorus
5	44	Female	Dyspepsia and substernal burning	Gastric ulcer and retained food	Non malignant gastric ulcer with <i>Sarcina</i> organisms	Omeprazole, ranitidine, metoclopramide	Symptoms improved
6	36	Male	Nausea, vomiting, epigastric pain in the setting of narcotic use	Retained food	<i>Sarcina</i> organisms without other histologic abnormalities	Received jejunostomy for malnutrition	Repeat biopsy negative for <i>Sarcina</i> organisms
7	12	Female	Dysphagia in the setting of esophageal atresia status post gastric pull through	Retained food, anastomotic stricture	Reflux esophagitis, <i>Sarcina</i> organisms	Information unavailable	Information unavailable
8	46	Female	Epigastric pain in the setting of pancreatic adenocarcinoma status post pancreatico-duodenectomy	Retained food and bile	Active chronic duodenitis with <i>Sarcina</i> organisms	No treatment	Continues spasms after 1 mo

CT: Computed tomography.

for 1 wk, along with daily sucralfate. He also received intravenous (IV) iron 300 mg  $\times$  2 doses followed by oral iron and achieved normal iron stores and hemoglobin levels. Subsequent follow up with a repeat EGD 3 mo later showed improvement of gastric erythema, and absence of food bezoar (Figure 3). Aspirates from the small bowel continued to suggest small intestinal bacterial overgrowth, with  $> 100\,000$  cfu/mL. However, repeat biopsies from the stomach were negative for *Sarcina* organisms, and showed features of chronic gastritis. Clinically, the patient's perception of overall health improved with the above treatment, and he continued to be free of gastrointestinal symptoms.

## DISCUSSION

While the pathogenic role of *Sarcina* in the veterinary literature is well established, its role in human disease is not entirely clear. Since the initial description in 1842, the pathogenic role in humans has been questioned, as it has been found in the blood<sup>[10]</sup> and feces<sup>[7]</sup> of healthy humans.

Over the last three years, 8 cases<sup>[3,8,9]</sup> of *Sarcina* associated with endoscopic biopsies have been reported. While all these patients presented with various gastrointestinal symptoms (nausea, vomiting, epigastric pain, dyspepsia) only two patients had associated life threatening complications of emphysematous gastritis<sup>[8]</sup> and gastric perfora-

tion<sup>[9]</sup> (Table 1). Our patient did not have any gastrointestinal symptoms, and *Sarcina* was found incidentally, when gastric biopsies were performed for erythematous mucosa.

Another interesting feature is the presence of delayed gastric emptying in five of the eight reported cases. All of these patients had retained food in stomach during endoscopic examination. Similarly, our patient had a Billroth II with truncal vagotomy, which predisposed him to have delayed gastric emptying, as was evident by the gastric bezoar seen during endoscopic examination. Hence impaired emptying of stomach could potentially lead to the growth of *Sarcina* in the stomach.

The need for antibiotic treatment, when *Sarcina* is found in endoscopic biopsies of clinically stable patients is unknown. Of the reported cases, two patients with associated life threatening disease (*i.e.*, emphysematous gastritis and gastric perforation) received intravenous antibiotics and recovered. One patient with non-life threatening disease was treated with combination of proton pump inhibitors and prokinetics, with good relief of symptoms. Some authors suggest that an underlying mucosal defect, such as erosion or ulceration, may predispose patients to more serious sequelae, from this otherwise ubiquitous organism<sup>[3]</sup>. We elected to treat our patient with antibiotics, as there was significant gastric erythema and ulceration, as well as small intestinal bacterial overgrowth.

In summary, *Sarcina ventriculi* is a rare bacterium, seen

predominantly in patients with delayed gastric emptying. Review of the published cases along with our case suggests that it is more frequently an innocent bystander rather than a pathogenic organism. Given its association with life threatening illness in two reported cases, it may be prudent to treat with antibiotics and anti-ulcer therapy, until further understanding is achieved.

## REFERENCES

- 1 **Claus D**, Wilmanns H. Enrichment and selective isolation of *Sarcina maxima* Lindner. *Arch Microbiol* 1974; **96**: 201-204 [PMID: 4599711 DOI: 10.1007/BF00590176]
- 2 **Lowe SE**, Pankratz HS, Zeikus JG. Influence of pH extremes on sporulation and ultrastructure of *Sarcina ventriculi*. *J Bacteriol* 1989; **171**: 3775-3781 [PMID: 2738022]
- 3 **Lam-Himlin D**, Tsiatis AC, Montgomery E, Pai RK, Brown JA, Razavi M, Lamps L, Eshleman JR, Bhagavan B, Anders RA. *Sarcina* organisms in the gastrointestinal tract: a clinicopathologic and molecular study. *Am J Surg Pathol* 2011; **35**: 1700-1705 [PMID: 21997690 DOI: 10.1097/PAS.0b013e31822911e6]
- 4 **Edwards GT**, Woodger NG, Barlow AM, Bell SJ, Harwood DG, Otter A, Wight AR. *Sarcina*-like bacteria associated with bloat in young lambs and calves. *Vet Rec* 2008; **163**: 391-393 [PMID: 18820327]
- 5 **DeBey BM**, Blanchard PC, Durfee PT. Abomasal bloat associated with *Sarcina*-like bacteria in goat kids. *J Am Vet Med Assoc* 1996; **209**: 1468-1469 [PMID: 8870748]
- 6 **Vatn S**, Gunnes G, Nybø K, Juul HM. Possible involvement of *Sarcina ventriculi* in canine and equine acute gastric dilatation. *Acta Vet Scand* 2000; **41**: 333-337 [PMID: 11126583]
- 7 **Crowther JS**. *Sarcina ventriculi* in human faeces. *J Med Microbiol* 1971; **4**: 343-350 [PMID: 5116255 DOI: 10.1099/00222615-4-3-343]
- 8 **Laass MW**, Pargac N, Fischer R, Bernhardt H, Knoke M, Henker J. Emphysematous gastritis caused by *Sarcina ventriculi*. *Gastrointest Endosc* 2010; **72**: 1101-1103 [PMID: 20538273]
- 9 **Tolentino LE**, Kallichanda N, Javier B, Yoshimori R, French SW. A case report of gastric perforation and peritonitis associated with opportunistic infection by *Sarcina ventriculi*. *Lab Med* 2003; **34**: 535-537 [DOI: 10.1309/CDF04HE9F-HDQPAN]
- 10 **Ferrier D**. The Constant Occurrence of *Sarcina Ventriculi* (Goodsir) in the Blood of Man and the Lower Animals: With Remarks on the Nature of Sarcinous Vomiting. *Br Med J* 1872; **1**: 98-99 [PMID: 20746505 DOI: 10.1136/bmj.1.578.98]

P- Reviewer Fujiya M S- Editor Gou SX L- Editor A  
E- Editor Zhang DN

