

***Sarcina ventriculi* Related Gastritis with Varying Clinical Presentation: A Report of Three Cases with Short Review**

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Received: June 27, 2022; **Published:** July 29, 2022

Abstract

Sarcina ventriculi, a Gram-positive organism, which has been reported in gastric specimens of patients with delayed gastric emptying, in most cases the organism was found incidentally or with mild gastrointestinal symptoms such as nausea. We report three cases of *S. ventriculi*, the second and third cases are of partial gastric outlet obstruction and the other case presented with post GJ status. Endoscopic biopsies were performed and the final histopathological examination revealed the presence of *S. ventriculi* organisms coexisting with *H. pylori* in the mucosal biopsies in two of our cases. *S. ventriculi*, association with life-threatening conditions like partial gastric outlet obstruction and emphysematous gastritis, requires identification and documentation of this organism in the final histopathological report as the patient may need further workup.

Keywords: Gastric Outlet Obstruction; *Sarcina ventriculi*; Emphysematous Gastritis

Introduction

Sarcina ventriculi, a gram-positive, non-motile, anaerobic coccus was first described by Goodsir J. way back in 1842 [1]. It is mainly found in soil and tolerant to the acidic environment of the stomach and grows via the fermentation of carbohydrates. Patients infected with *Sarcina*, often presented with an acidic, frothy vomitus [2]. As the organism has a peculiar arrangement of tetrads or octets, and usually seen on the surface of the mucosa, they can be identified on light microscopy. It has a thick fibrous wall predominantly composed of cellulose [3]. Extensive review by Gasper, *et al.* [2] over a period of fifteen years (2000-2015) documented 22 cases of *Sarcina*, across globally. The first case from India was reported by Louis, *et al.* [4] in the gastric mucosa. Followed by successive reports from gastric aspirate [5], duodenal biopsy [6] and lung resection [7] which were documented in India, surprisingly from the same institute. Till date, 32 cases of *Sarcina* have been reported. The purpose of this article is to highlight our three cases of *Sarcina* and two cases coexisted with *H. pylori* and to present a short review of cases reported after 2017. To the best of our knowledge, our cases represent the second case of *Sarcina* organisms co existing with *H pylori*.

Clinical Details

Case 1

Twenty-eight years young male with post gastro-jejunostomy (GJ) status (13 years back) presented with anasarca, postprandial abdominal discomfort, and intermittent vomiting for one year. On examination, he was thin built and had pallor, clubbing, ascites, and pedal edema. Investigation showed microcytic hypochromic anemia, and hypoproteinemia (total protein-3.8 g/dl, albumin-1.0 g/dl). Liver, renal and thyroid function tests were within normal limits. CECT showed ascites and pleural effusion. UGI endoscopy showed post GJ status, gastric stasis, antral patchy erythema, abnormal proximal body mucosa, duodenal pseudo diverticula, hiatus hernia and severe reflux esophagitis. Biopsies were taken from both the loops of jejunum, antrum and body mucosa. *Sarcina ventriculi* were seen in all the sites including jejunum. Histopathology from jejunal mucosa showed marked edema, focal clubbing of villi, intercellular widening, edema and mild lymphoplasmacytic inflammation with lymphoid follicle formation. The organisms were noted as cell packet with rounded basophilic bodies and lateral moulding in the intervillous space (Figure 1a). Antrum showed co-existence of *H. pylori* and *Sarcina*. The latter is seen in the surface as well as within the superficial lamina propria (Figure 1b, arrow).

Case 2

The second case is a 50 years male who underwent upper GI endoscopy following a history of recurrent vomiting for last one month. Endoscopy showed antral and incisural superficial ulcers, scarring, deformed antrum with narrowing of pyloroduodenal complex. Histopathology of mucosal biopsies from multiple sites (antrum, incisura and body) revealed *H. pylori* associated chronic pangastritis with moderate activity and focal intestinal metaplasia in the incisura. *Sarcina Ventriculi* were seen on the surface as cell packets in the body mucosa. There were no dysplasia or malignancy (Figure 1c).

Case 3

Third case is a 53 years male who underwent upper GI endoscopy following a history of recurrent vomiting for last one month. Endoscopy showed ulcerated growth in pre-pyloric area with significant pyloric stenosis. Biopsies were taken from the antrum which showed superficial ulceration, covered by acute inflammatory exudate containing colonies of *Sarcina Ventriculi*. The organisms were noted as cell packets with similar morphology (Figure 1d and 1e). Adjoining mucosa was polypoidal with foveolar hyperplasia with few glands showing mild to moderate dysplasia. However, an in-situ or invasive carcinoma was not seen. There was focal fibroblastic proliferation and submucosal extension suggesting healed ulcer.

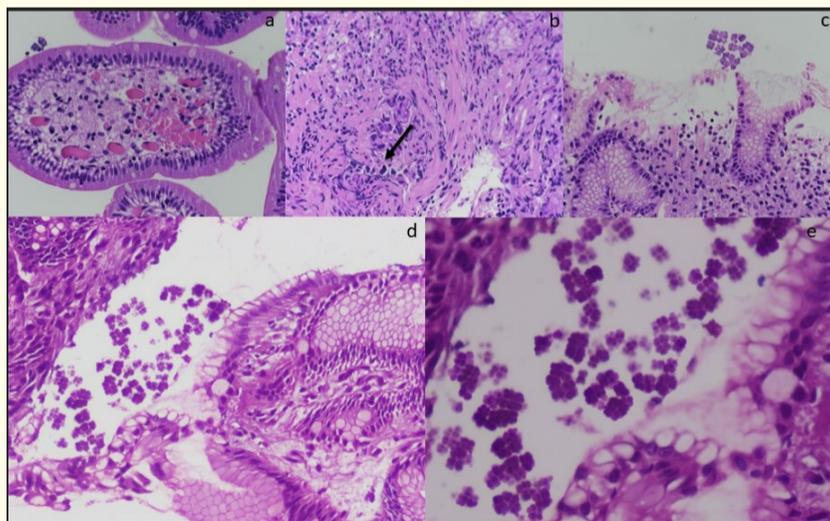


Figure 1: a: *Sarcina ventriculi* in the intervillous spaces of jejunum, H&E 400X. b: *Sarcina ventriculi* in the lamina propria (arrow), H&E 100X. c: *Sarcina ventriculi* in tetrads in gastric antrum, H&E 100X. d: Mucosal ulceration with colonies of *Sarcina ventriculi*, H&E 100X. e: *Sarcina ventriculi*, H&E 200X.

Discussion

Since their first isolation in humans, many observers have considered *Sarcina* as pathogenic and others have suggested them as natural habitat. *Sarcina* is commonly found in stomach due to delayed gastric emptying from pathologic conditions such as diabetic gastroparesis, gastric surgeries, pyloric stenosis or an obstructing mass. *S. ventriculi* thrives and multiplies rapidly in the acidic pH of the stomach. In the gastrointestinal tract, stomach is the most common site of involvement (85%) followed by esophagus (10%) and duodenum (5%) [2]. Our case 1 showed *Sarcina* infestation in the jejunum, probably because of close proximity of jejunal loop to the distal stomach in a post

gastrojejunostomy patient. *Sarcina* is known for surface infestation, but our case is a bit different due to its presence in the lamina propria indicating its invasive nature. Our experience with respect to these cases emphasizes that *Sarcina* infestation is not because of natural habitat, rather a pathogen. We speculate that these organisms are present in more cases of active gastritis than are currently documented and that increased awareness will lead to greater recognition.

We encountered only 3 cases of *Sarcina*, out of 1214 endoscopic mucosal biopsies received during the last one year by the department of anatomical pathology, incidence being 0.2% in the local population. Sauter, *et al.* identified the concurrent presence of *H pylori* and *S ventriculi* [8]. Other coinfections that can co exist are *Candida*, giardia, hepatitis A and C [5,6,9]. Two of our cases (case 1 and 2) show *H. pylori* infestation along with *Sarcina*. *H pylori* and Hepatitis A coinfections can be related to the existing environmental conditions [2].

Sarcina, often is mistaken as a vegetable matter due to its birefringent cellulose coating [10]. The tetrad arrangement can be seen in *Micrococcus* species, which is also a gram-positive coccus that occurs in tetrads or packets. However, *Micrococcus* species are considerably smaller than the *Sarcina* and it tends to form tightly packed clusters [3]. In addition, *Micrococcus* is aerobic and does not form spores. Other differential diagnosis for *S ventriculi* are *Sarcina maxima* and *Staphylococcus* species. *S. maxima* does not have the thick extracellular layer and *Staphylococcus* is smaller in size and is arranged in characteristic grapelike clusters unlike the tetrad form seen in *Sarcina* species [11].

We have reviewed additional 10 cases [12-18] of *Sarcina* reported from 2017 to 2019 after a thorough literature search and found a slightly female preponderance (M:F = 3:7), contrary to our cases where all the three cases were male patients. Clinical profile and pathological features of patients with *Sarcina* infection reported from 2017 - 2019 are summarized in table 1. All patients had a history of prior gastrointestinal surgery except one. To note Zare., *et al.* [13], Dey., *et al.* [15], Aggarwal., *et al.* [16] and Shetty., *et al.* [17] identified organisms on cytology smears. They reported from transgastric endoscopic aspirates of pyloric stricture, sputum cytology, gastric brush cytology and esophageal brushings respectively. In addition, Aggarwal., *et al.* also documented the yeast forms of candida coincidentally with *Sarcina* on cytology [16]. It is important to identify this organism both in aspirates or in mucosal biopsies with good H&E stained section, as the presence of *Sarcina* may herald an underlying gastric pathology.

Authors, year ref	Case	Age(yrs), Sex	Clinical History	Endoscopic finding	Pathological Findings
Propst., <i>et al.</i> 2019 [12]	1	8/M	Pyloric stenosis undergone pyloromyotomy	Friable mucosa in the esophagus with white patches and sloughing	<i>Sarcina</i> organisms seen in mid-esophagus with ulceration
	2	55/M	Esophagectomy for mod diff adenocarcinoma	Large amount of retained food material and focal erythema at the anastomotic site	Acute esophagitis with <i>Sarcina</i> organisms found in neo-esophagus site
	3	65/F	GERD on PPI with H/O fundoplication	Retention of solid food material in the body of the stomach	Mild chronic gastritis and superficial <i>Sarcina</i> organisms
Zare., <i>et al.</i> 2019 [13]	1	69/M	Delayed gastric emptying, type 2 diabetes mellitus	Linear esophagitis, pylorus obstruction with hypertrophic inflammatory tissue, and a large amount of retained food and fluid in the stomach	FNA from pyloric stricture, showed acute and chronic inflammation with scattered macrophages and numerous <i>Sarcina</i> organisms
Singh., <i>et al.</i> 2019 [14]	1	86/F	Hypertension and type 2 diabetes mellitus	Not mentioned	Emphysematous gastritis in the presence of bacterial overgrowth by <i>S. ventriculi</i>
Dey., <i>et al.</i> 2019 [15]	1	52/F	Type 2 diabetes mellitus with pulmonary tuberculosis	Not mentioned	Sputum smears showed acid fast bacilli along with <i>Sarcina</i> .
Aggarwal., <i>et al.</i> 2018 [16]	1	45/F	Abdominal discomfort and vomiting with GOO	Edematous distal antrum causing luminal narrowing of pyloric channel	Gastric brush cytology revealed colonies of <i>Sarcina</i> and yeast forms of <i>Candida</i>
Shetty., <i>et al.</i> 2018 [17]	1	48/F	Epigastric pain and vomiting	Esophagitis	Mucosal brushing of the esophagus showed <i>Sarcina</i> .
Meij., <i>et al.</i> 2017 [18]	1	12/F	<i>H. pylori</i> -associated gastritis, successfully eradicated with triple therapy	Severe, erosive esophagitis, antral and corporal gastritis was observed, next to two circular antral ulcers	Severe ulcerative esophagitis and gastritis, presence of <i>Sarcina ventriculi</i> in the gastric and esophageal mucous surface
	2	15/F	Neurological impairment and epilepsy due to intracranial hemorrhage from cerebral AVM	Diffuse erosive gastritis and a large gastric circular ulcer with a diameter of 10 mm at the gastro-esophageal junction	Active gastritis with the presence of <i>S. ventriculi</i>

Table 1: Clinical profile and pathological features of patients with *Sarcina* infection reported from 2017-2019.

Abbreviations: GERD: Gastroesophageal Reflux; PPI: Proton Pump Inhibitors; FNA: Fine Needle Aspiration; GOO: Gastric Outlet Obstruction; AVM: Arteriovenous Malformation.

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Volume 9 Issue 8 August 2022

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