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## Bifidobacterium Bacteremia Following Gastrointestinal (GI) Procedures: A Case Report of an Unusual Infection and Review of the Literature

Sheza Malik  
Rochester Regional Health System, sheza.malik@rochesterregional.org

Hajra Khan  
hajrakhan108@yahoo.com

Ali S. Mohamed  
Rochester Regional Health System, ali.mohamed@rochesterregional.org

Gaby Razzouk  
Rochester Regional Health System, gaby.razzouk@rochesterregional.org

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## Abstract

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Bifidobacterium is a rare cause of bacteremia that mostly affects extremes of ages with the majority of cases seen in premature infants. This report details a case of bacteremia caused by Bifidobacterium in a 75-year-old male patient. Our patient was admitted after a mechanical fall resulting in subdural and subarachnoid hemorrhage. His hospital course was complicated by swallowing problems and ultimately needed the placement of a gastrojejunal (GJ) tube for nutrition. He subsequently developed Bifidobacterium bacteremia. It was presumed that the GJ tube was the cause of bacterial translocation into the bloodstream due to invasion of the mucosal barrier. Similar to previous reports the infection was responsive to piperacillin-tazobactam (beta-lactam antibiotic).

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## Conflict of Interest Statement

NONE

## CASE REPORT

# Bifidobacterium Bacteremia Following Gastrointestinal (GI) Procedures: A Case Report of an Unusual Infection and Review of the Literature

Sheza Malik <sup>a,\*</sup>, Hajra Khan <sup>b</sup>, Ali Mohamed <sup>a</sup>, Gaby Razzouk <sup>a</sup>

<sup>a</sup> Internal Medicine, Rochester Regional Health System, Rochester, NY, USA

<sup>b</sup> Internal Medicine, Rawalpindi Medical College, Rawalpindi, Pakistan

## Abstract

Bifidobacterium is a rare cause of bacteremia that mostly affects extremes of ages with the majority of cases seen in premature infants. This report details a case of bacteremia caused by Bifidobacterium in a 75-year-old male patient. Our patient was admitted after a mechanical fall resulting in subdural and subarachnoid hemorrhage. His hospital course was complicated by swallowing problems and ultimately needed the placement of a gastrojejunal (GJ) tube for nutrition. He subsequently developed Bifidobacterium bacteremia. It was presumed that the GJ tube was the cause of bacterial translocation into the bloodstream due to invasion of the mucosal barrier. Similar to previous reports the infection was responsive to piperacillin-tazobactam (beta-lactam antibiotic).

**Keywords:** Bifidobacterium bacteremia, GI procedure, Bacterial translocation

## 1. Introduction

**B**ifidobacterium bacteria is a Gram-positive anaerobic bacterium that belongs to the Actinobacter phylum and is commonly found in the GI tract as part of the human gut flora. The composition of Bifidobacterium species is highest in the gut at birth and declines with age becoming stable in adulthood and being lowest in old age. The species of Bifidobacterium that dominates the gut also change as the person ages and goes through life with high inter-individual variability.<sup>1</sup>

Bifidobacteria along with other gut bacterial species make up a common ingredient of over-the-counter probiotics that are thought to restore the balance of the healthy gut microbiome.<sup>2</sup> Despite their common use in such supplements, Bifidobacterium species are a rare cause of bacteremia. We report a unique case of Bifidobacterium bacteremia in a 75-year-old male following GI procedures, which, to our knowledge, has not been previously documented in the literature.

## 2. Case description

A 75-year-old male with a history of traumatic brain injury, gastroesophageal reflux disease, urethral stricture with a chronic indwelling Foley catheter, and hypertension, was admitted after a mechanical fall, which revealed a subdural and subarachnoid hemorrhage. During his three-month hospital stay, he developed oropharyngeal dysphagia and aspiration (status post 5 days ampicillin-sulbactam). Fluoroscopy confirmed esophageal dysmotility. Endoscopy revealed erosive esophagitis and a long, tight esophageal stricture requiring multiple balloon dilations. A gastrojejunal (GJ) tube was placed to treat his oropharyngeal dysphagia. Subsequently, it required replacement due to a clogged J port.

Following the GJ tube replacement, the patient was discharged to his long-term facility, more than a week after his last procedure. However, he was readmitted after one day with witnessed aspiration and evidence of tube feeding formula in the mouth. The patient was overall stable with

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\* Corresponding author at: Rochester, NY, 14621, USA.  
E-mail address: [Sheza.malik@rochesterregional.org](mailto:Sheza.malik@rochesterregional.org) (S. Malik).

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bilateral vesicular breathing, with normal white blood cell count and lactate levels. Anaerobic blood cultures grew *Bifidobacterium* (species not identified) in 2/2 bottles. Intravenous piperacillin-tazobactam was initiated promptly, and subsequent blood cultures were negative. Urine and Respiratory cultures remained negative during admission. Imaging including CT chest and abdomen were negative for acute infectious process or inflammation, and the GJ tube was in the correct position. HIV 1/2 ab/ag was negative, and patient did not receive any steroids during last admission. He also did not have any history of being on chemotherapy or immunosuppressive agents in the past. Given the patient's stable status, he was transitioned to ampicillin-sulbactam and later discharged on amoxicillin-clavulanic acid to complete a 14-day course of antibiotics. The patient had been on tube feeds with Isosource formula through the J tube for two months before the bacteremia and no documented probiotic administration was noted. The most likely source of bacteremia was due to bacterial translocation across an impaired gastrointestinal tract following multiple GI procedures.

### 3. Discussion

*Bifidobacterium* is a normal constituent of the human gastrointestinal tract, comprising a significant portion of infant gut flora but a smaller proportion in adults.<sup>2</sup> Although *Bifidobacterium* is commonly found in probiotics, its role in bacteremia is seldom seen. Probiotics, however, exhibit protective effects against bacteremia, particularly in adults with colorectal cancer, by promoting intestinal microflora balance and enhancing tight junction expression.<sup>3</sup> Contrarily, probiotics have been linked to bacteremia in preterm infants with necrotizing enterocolitis, and controversially, in pediatric leukemia patients.<sup>4,5</sup> Notably, *Bifidobacterium* bacteremia cases in adults usually aren't linked to probiotic use, unlike preterm infants.<sup>6</sup>

*Bifidobacterium* can cause an array of infections ranging from bacteremia as seen in our patient to pyogenic infections leading to conditions such as sacroiliitis and hydroureteronephrosis.<sup>7</sup> This bacterium has also been implicated in UTIs, pneumonia, and peritonitis.<sup>8–10</sup> However, bacteremia with *Bifidobacterium* in adults secondary to GI procedures has not been reported. Our patient experienced bacteremia secondary to presumed translocation across the damaged mucosal barrier around the GJ tube. Gut flora is composed of 4 major phyla of bacteria which include Bacteroidetes, Firmicutes,

Proteobacteria, and Actinobacteria.<sup>11</sup> It is interesting to note that *Bifidobacterium* species which are part of the Actinobacteria phylum are generally considered protective and are seen to decrease in states of diminished health like in patients with severe burns. Furthermore, antibiotic use in such patients is linked to disruption of gut flora leading to decreased *bifidobacterium* species and increased translocation of harmful bacteria like *Klebsiella pneumoniae*.<sup>12</sup> The most common obligate anaerobe implicated in sepsis is *Bacteroides* which is part of the gut flora known to cause infections through translocation and dissemination.<sup>13</sup> The translocation of *E. coli* from the gut to the mesenteric lymph nodes in surgical patients has also been reported in the literature.<sup>14</sup> One of the rare instances in which *Bifidobacterium* translocation has been reported in adults is in individuals with inflammatory bowel disease which our patient did not suffer from.<sup>15</sup>

The differentials for the cause of bacteremia in our patient included *Escherichia*, *Klebsiella*, and *Bacteroides* among others but cultures ultimately grew *Bifidobacterium* only which was promptly treated.

Typically, *Bifidobacterium* strains isolated from blood cultures are sensitive to certain antibiotics including Vancomycin, piperacillin/tazobactam, and beta-lactams but resistant to fluoroquinolones, aminoglycosides, and metronidazole.<sup>2,7,16</sup> Despite its rarity, *Bifidobacterium* bacteremia, particularly linked to gastrojejunal tube insertion, warrants consideration in patients with compromised gastrointestinal function following procedures, as highlighted by this case. Further research is needed to understand the underlying mechanisms, identify at-risk patients, and implement appropriate interventions.

### Conflict of interest

No conflict of interest to report.

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