

# Gastrostomy Site Infections: A Review in Patients With Cancer

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**ABSTRACT:** This review highlights the cases of 10 patients with cancer and with culture-confirmed gastrostomy tube site infections. The main causative organisms were gram-negative bacteria, the most common of which were *Pseudomonas aeruginosa*, *Achromobacter xylosoxidans*, *Enterobacter aerogenes*, and *Enterobacter cloacae*, along with gram-positive *Staphylococcus aureus*. Only one patient had methicillin-resistant *S aureus* (MRSA) isolated from his cultures, and he had no history of MRSA colonization. Fungi (*Candida albicans*) were isolated in 5 of 10 patients, of whom only 2 had significant candidal growth on culture. Weight

isolated in 3 of 10 patients, of whom only 2 had significant bacterial growth on culture. Weight loss, a low albumin level, and prolonged neutropenia were the most common associated risk factors in the 10 patients. Most of the gram-positive infections were treated with amoxicillin-clavulanate, and most gram-negative infections were treated with levofloxacin, with a satisfactory response.

**KEYWORDS:** Gastrostomy tube (GT) infection, percutaneous endoscopic gastrostomy (PEG), antibiotics

Percutaneous endoscopic gastrostomy (PEG) is widely used to maintain enteral nutrition in patients who are unable to swallow. The most common complication of PEG tube placement is infection at the PEG tube site. Peristomal irritation at the site occurs commonly, but few infections require antimicrobial therapy or surgical management. The standard pull technique for PEG insertion is associated with infections in 5% to 30% of cases.<sup>1</sup> In a hospital that is endemic for methicillin-resistant *Staphylococcus aureus* (MRSA), it can be the most common organism associated with these infections. In view of the paucity of literature on PEG infections in patients with cancer, this retrospective review describes infections after PEG tube placements at Moffitt Cancer Center in Tampa, Florida.

The main aims of this study were (1) to identify the most common pathogens found within PEG tube infections; (2) to identify the treatments to which these organisms responded; and (3) to identify the risk factors that might have led to these infections.

## **METHODS**

At Moffitt Cancer Center, 205 patients who received PEG tubes from January 1, 2008, to December 31, 2008, were considered for the review. Of the 205 patients, only 10 (<5%) were found to have PEG tube site infections. These patients' cases were then further investigated for microbiology and susceptibility of pathogens and predisposing factors to infection.

## **INCLUSION CRITERIA**

The inclusion criteria for patients in this study were as follows: age greater than 19 years, culture-proven gastrostomy tube (GT) site infection, and a current or previous cancer diagnosis.

## **RESULTS**

In the 1-year study period, 10 of the 205 patients (<5%) who received GTs at Moffitt Cancer Center became infected at the insertion site. Gram-negative organisms were the main causative agents, with the most common being *Pseudomonas aeruginosa*, *Achromobacter xylosoxidans*, *Enterobacter aerogenes*, and *Enterobacter cloacae*, along with gram-positive *Staphylococcus aureus*. Only one patient had MRSA isolated from his cultures, and he had no history of MRSA

*aureus*. Only one patient had MRSA isolated from his cultures, and he had no history of MRSA colonization. Fungi (*Candida albicans*) were isolated in 5 of 10 patients, of whom only 2 had significant candidal growth.

All patients with bacterial infection were initially treated empirically with cephalexin. Depending on further microbiology and culture test results, patients with gram-negative bacterial infection were switched to ciprofloxacin, levofloxacin, or cefepime, depending on sensitivities. Those with gram-positive infections required topical mupirocin at the infection site and amoxicillin-clavulanate. MRSA infection was treated with daptomycin, and no particular treatment was necessary for fungal infections. None of the patients received antimicrobial prophylaxis after PEG tube placement.

Even though most of the noninfected patients (195 of 205) did receive chemoradiation and corticosteroids for cancer during this period, the most significant risk factor for PEG tube infections was weight loss—7 of the 10 infected patients had significant weight loss prior to infection, and 2 had low albumin levels. One of the 10 had a history of longstanding neutropenia. Weight loss and low albumin levels might have resulted in not only the immunological impairment that might have led to the infections, but also the loosening of the external bumper (separation from the skin), leading to entry of pathogens. All of our patients with PEG site infection had loosening of the flap or bumper from the GT site.

## **DISCUSSION**

The general complications associated with PEG tube insertion are aspiration,<sup>1</sup> peritonitis,<sup>2</sup> hemorrhage,<sup>3</sup> gastrocutaneous fistulas,<sup>4</sup> and infections.<sup>5</sup> The GT site is associated with infections in 5% to 30% of cases.<sup>1,6</sup> The presence of wound infection is associated with an increase in morbidity and mortality.<sup>7,8</sup> In their study of GT site infections in noncancer patients, Pien and colleagues reported an infection rate of 4.8%, and the most common infecting organisms were staphylococci, gram-negative bacteria, and yeast.<sup>9</sup> Cancer patients have the additional burden of chemotherapy and in few cases concomitant corticosteroid therapy, which predisposes them to various infections.<sup>10</sup> Rolston and colleagues described the microbiology of PEG tube insertion sites in cancer patients, with the most common organisms isolated being *Candida* species, *S aureus*, and *P aeruginosa*.<sup>11</sup> In that study, all infections were local infections, meaning cellulitis, complicated skin, and skin structure infections including abdominal wall abscesses. These findings were similar to those of our study, in which *Pseudomonas* and *Enterobacter* species were involved in most cases, along with *S aureus* and *Candida* species. There was also the presence of *A xylosoxidans*, *E aerogenes*, and *E cloacae* in 4 of 10 patients, which was unique to our study.

With regard to MRSA infection, Mainie and colleagues concluded that patients with prior MRSA colonization had a significantly higher risk of developing symptomatic MRSA infection of the PEG site.<sup>8</sup> However, there was still a significant risk (15%) of developing MRSA infection at the

PEG site for patients with no known prior MRSA colonization.<sup>8</sup> At least 2 studies have found that nasopharyngeal decontamination of patients with MRSA (in addition to standard prophylactic antibiotics) significantly reduced the incidence of wound infections.<sup>12,13</sup> Another study found that administration of a third-generation cephalosporin intravenously and a povidone-iodine spray to the abdominal wall prior to the procedure reduced the rate of wound infections compared with intravenous cephalosporin or povidone-iodine spray used separately.<sup>14</sup> Studies suggest that antibiotic prophylaxis significantly reduces the risk of peristomal wound infection associated with GT insertion.<sup>15</sup> Antibiotic prophylaxis, therefore, may be considered as a general measure in preventing infection following PEG tube placement.<sup>16</sup> None of our patients were on any prophylaxis following the GT insertion per usual guidelines.

A major complication of GT site infections is necrotizing fasciitis.<sup>17,18</sup> Most of our patients were placed empirically on cephalexin after infection was suspected and prior to culture results. For gram-positive organisms, amoxicillin-clavulanate and mupirocin were used. Antibiotic selection was based on previous studies on gram-positive infections around gastrostomy sites in which  $\beta$ -lactam antibiotics were used; in the case of MRSA infections, vancomycin, daptomycin, or linezolid were used.<sup>19,20</sup> For gram-negative organisms such as *Pseudomonas* and Enterobacteriaceae around the surgical site, Goswami and colleagues found that *P aeruginosa* was sensitive to ciprofloxacin (83.78%) and meropenem (51.35%), and that *Escherichia coli* was sensitive to levofloxacin (72.41%) and ciprofloxacin (62.07%).<sup>21</sup> Ciprofloxacin has been used successfully for the treatment of *P aeruginosa* GT site infections.<sup>22</sup> Mahmood reported that 80% of *Pseudomonas* and Enterobacteriaceae causing PEG tube site infections were resistant to aminoglycosides, especially gentamicin.<sup>23</sup>

Distinguishing colonization of normal skin and gastrointestinal tract flora from infection with a true pathogen is difficult and relies heavily on clinical judgement. Deep-tissue biopsy with quantitative cultures is not recommended unless surgery is required. It is unclear whether all culture-proven pathogens must be included in the coverage of the antibiotic selection, but an antibiotic with activity against the culture isolate should be favored. However, because susceptibility results can take days to become available, if the infection is improving, the current antibiotic should not be changed to include activity against the cultured isolate.

There are a number of risk factors for the development of GT site infections. Among the common causes of surgical site infections are existing infection, low serum albumin concentration, older age, obesity, smoking, diabetes mellitus, and ischemia secondary to vascular disease or irradiation.<sup>24</sup> The most common predisposing factors in our study were weight loss, low albumin levels, and prolonged neutropenia. Another important factor we found to be present in all of our patients was loosening of the flap or bumper from the GT site. This has also been cited as an important complication of GT site insertion due to leaking of contents

onto the skin or internal structures.<sup>25</sup> Skin maceration and irritation from moisture or gastric secretions can produce chemical-induced dermatitis and secondary site infection.

**Table 1** compares the organisms isolated from the GT site in our study with those reported in the literature. **Table 2** compares treatment administered for the involved organisms.

**Table 1. Comparison of Common Organisms Found at the GT Site**

<b>Common Organisms According to the Literature</b>	<b>Common Organisms in Our Study</b>
<b><i>Gram-negative bacteria</i></b>	
<i>Pseudomonas aeruginosa, Proteus mirabilis, Escherichia coli, Klebsiella pneumoniae</i>	<i>Pseudomonas aeruginosa, Enterobacter cloacae, Achromobacter xylosoxidans, Enterobacter aerogenes</i>
<b><i>Gram-positive bacteria</i></b>	
<i>Enterococcus species, Staphylococcus aureus</i>	<i>Staphylococcus aureus</i>
<b>MRSA</b>	
60% of persons with MRSA colonization of the skin before PEG tube insertion develop MRSA infection of the PEG site	Only 1 of our patients had MRSA colonization
<b><i>Fungi</i></b>	
<i>Candida</i> species are the most commonly described organism	<i>Candida albicans</i>

**Table 2. Treatment Comparison for GT Site Infections**

<b>Traditional Treatment According to the Literature</b>	<b>Treatment in Our Study</b>
<b><i>Gram-negative bacteria</i></b>	
Ciprofloxacin and other fluoroquinolones	Ciprofloxacin, levofloxacin, and cefepime
<b><i>Gram-positive bacteria</i></b>	
Nafcillin and clindamycin	Mupirocin and amoxicillin-clavulanate

**MRSA**

Vancomycin and teicoplanin

Daptomycin

**Fungi**

Topical antifungal treatment for 2 weeks (oral fluconazole for severe *Candida* infections)

No particular treatment given

**CONCLUSION**

Infection at the GT site is an important complication in patients with cancer and more so in such patients with associated risk factors. Antibiotic prophylaxis and appropriate wound care may reduce GT insertion site infection. If infection develops, prompt recognition is key, and culture of the area should be obtained. The choice of treatment, whether topical or systemic antibiotics, should be individualized and guided by the severity of the wound and the culture results. Patients with risk factors such as weight loss, low albumin, and immunosuppression should be followed closely for evidence of local wound infection. Finally, loosening of the flap or bumper from the GT site may be the cause of the irritation and infection and may need adjustment to prevent gastric secretion leakage.

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