Intra-Abdominal Abscess and Bacteremia Due to Stenotrophomonas maltophilia After Total Gastrectomy: A Case Report and Literature Review

Jun Hirai, Nobuaki Mori, Daisuke Sakanashi, Yuichi Shibata, Nobuhiro Asai, Mao Hagihara, Hiroshige Mikamo

Abstract: Stenotrophomonas maltophilia (S. maltophilia) is increasingly recognized as a pathogen responsible for nosocomial infections, particularly in immunocompromised patients. The most common types of S. maltophilia infections are pneumonia and catheter-related bloodstream infection, and clinical cases of intra-abdominal abscesses due to S. maltophilia are rare. We present a rare case of intra-abdominal abscess and bacteremia as a surgical site infection (SSI) caused by S. maltophilia in a patient following total gastrectomy. We also reviewed previous literature to elucidate the clinical characteristics of intra-abdominal abscesses due to S. maltophilia. The patient, a 75-year-old man with diabetes and polymyositis (treated with prednisolone), developed a fever 17 days after undergoing a total gastrectomy for gastric cancer. Abdominal computed tomography revealed a hypodense solid mass at the esophagojejunostomy site, which appeared to be an intra-abdominal abscess. The culture of both blood and drained abscess pus confirmed only S. maltophilia. Treatment with intravenous trimethoprim-sulfamethoxazole and abscess drainage led to complete resolution. The patient recovered and was discharged and did not experience a recurrence. We reviewed the English literature and found only two additional case reports of intra-abdominal abscesses caused by S. maltophilia. As in our case, the intra-abdominal abscess occurred after abdominal surgery and the source was suspected to be deep SSI. This case highlights the importance of considering S. maltophilia as a potential pathogen in patients with atypical post-surgical abdominal infections. Physicians should be aware that S. maltophilia has the potential to cause intra-abdominal abscesses secondary to SSI, in addition to Enterobacteriaceae, a major causative pathogen of SSI. Further studies are required to elucidate the etiology, epidemiology, and risk factors for SSI caused by S. maltophilia.

Keywords: Stenotrophomonas maltophilia, abdominal abscess, surgical site infection

Introduction

Stenotrophomonas maltophilia (S. maltophilia) is an aerobic, motile, glucose-non-fermentative, gram-negative bacterium that is widespread in aqueous environments including hospitals. This pathogen, which was first isolated from a pleural effusion in 1943 and was initially named Bacterium booker, belongs to the family Xanthomonadaceae. The organism was renamed Pseudomonas maltophilia and subsequently renamed as S. maltophilia in the genus Stenotrophomonas in 1993. A large surveillance investigation of patients with bacteremia revealed that S. maltophilia is the third most common nosocomial pathogen among non-fermentative bacteria after Pseudomonas aeruginosa and Acinetobacter spp. Although S. maltophilia is generally not considered highly pathogenic, it has emerged as an important nosocomial pathogen with reported mortality rates ranging from 21% to 69%.

S. maltophilia frequently colonizes humid surfaces such as the medical tubes used in mechanical ventilation and indwelling blood and urinary catheters. Therefore, ventilator-associated pneumonia, catheter-related bloodstream infections, and other medical device-associated infections, are potential routes of acquisition.
and catheter-associated urinary tract infections are the most common clinical manifestations of *S. maltophilia* infection, particularly in hospitalized immunocompromised patients, such as those taking steroids and receiving chemotherapy for cancer.\(^{10,11}\) Intra-abdominal abscesses caused by *S. maltophilia* have rarely been reported.\(^{12,13}\) In addition, organ/space surgical site infections (SSI) after total gastrectomy are typically caused by aerobes and anaerobes, such as *Streptococcus* spp., *Enterobacteriaceae*, and *Prevotella* spp., which are found in the flora colonizing the oral cavity and stomach, and isolation of *S. maltophilia* is rare.\(^{14}\)

Given the rarity of intra-abdominal abscesses due to *S. maltophilia*, it is not possible to conduct large studies, and case reports are the primary source of knowledge about this condition. We share data of a rare case of a postoperative intra-abdominal abscess and bacteremia caused by *S. maltophilia*. We also summarize what is known about the clinical characteristics of intra-abdominal abscess caused by *S. maltophilia* from a review of previous literature.

**Case Report**

A 75-year-old Japanese man with diabetes mellitus and polymyositis underwent a total gastrectomy for gastric adenocarcinoma of the fundic gland. Cefazolin was administered as a perioperative antibiotic and was discontinued the day after surgery. No additional antibiotics were administered thereafter. Seventeen days after the surgery, he developed fever and chills during hospitalization. He had initially been scheduled to undergo a robot-assisted minimally invasive gastrectomy; however, the surgery was changed to laparoscopy-assisted total gastrectomy because of a rupture of the esophageal wall during resection using an ultrasonic energy device. The operation was completed without any other intra-operative complications after a total operation time of 580 minutes. He had experienced an exacerbation of polymyositis 5 weeks before the surgery, which was treated with oral prednisolone, starting with a dose of 20 mg/day (0.5 mg/kg) for 7 days, which was gradually reduced to 5 mg/day by the time of surgery.

His postoperative recovery after gastric surgery was uneventful. A liquid diet was started on postoperative day 6, the abdominal drain was removed on postoperative day 7, and an oral diet was started on postoperative day 9. However, on postoperative day 17, the day before his scheduled discharge, he developed a fever of 38°C and chills.

The physical findings at the time that the patient developed a fever were unremarkable: His lung sounds were clear, there were no heart murmurs, and there was no abdominal tenderness or rebound pain. The abdominal surgical incision wounds did not have any sign of inflammation or discharge. Blood tests revealed an elevated leukocyte count (17,800 cells/µL; normal range: 3300–8600 cells/µL), and C-reactive protein (9.88 mg/dL; normal: ≤0.04 mg/dL), and procalcitonin (1.11 ng/mL; normal: ≤0.05 ng/dL) levels. Abdominal computed tomography showed a 40 mm hypodense solid mass at the site of the esophagojejunostomy (Figure 1). Piperacillin/tazobactam (4.5 g intravenously every 8 hours) was started immediately on the diagnosis of the intra-abdominal abscess after obtaining two sets of blood cultures.

The following day, two aerobic blood culture bottles and pus obtained by CT-guided drainage confirmed the presence of gram-negative rods using Gram staining (Figure 2). Matrix-assisted laser desorption/ionization time-of-flight mass...
spectrometry (MALDI-TOF MS) (MALDI Biotyper ver. 9.0.0.0; Bruker Daltonics, Billerica, MA, USA) confirmed that the microorganism isolated from blood culture was *S. maltophilia* with a spectral score of 2.351. Therefore, we initiated intravenous trimethoprim-sulfamethoxazole (SXT), which is the first-line drug for treating *S. maltophilia* infection, intravenously (480 mg/2400 mg per day) and inserted a pigtail catheter to drain the abscess. Two days of aerobic and anaerobic cultures of the blood and abscess confirmed only *S. maltophilia*, and hence, piperacillin/tazobactam was discontinued and the antibiotic was changed to SXT alone (Figure 3). Antimicrobial susceptibility was measured using the MicroScan WalkAway system with an NM2J panel (Beckman Coulter) according to the Clinical and Laboratory Standards Institute guidelines (M-100-ED32:2022). The results revealed that the *S. maltophilia* isolate was sensitive to SXT, levofloxacin (LVFX), and minocycline (MINO).

Abdominal CT after 14 days of drainage revealed complete resolution of the abscess. Therefore, the pigtail catheter was removed, and the intravenous SXT was changed to oral SXT (480 mg/2400 mg per day), which was continued for a further 2 weeks (for a total of 4 weeks). The patient recovered without any recurrence and was discharged.

Written informed consent was obtained from the patient accompanying the image, and the present case was in line with the surgical case report guidelines.15

---

**Figure 2** Gram-stain of pus obtained by computed tomography-guided abdominal abscess drainage (a) and a positive anaerobic blood culture 20 hours after collection (b). The Gram-stain shows gram-negative rods with phagocytosis of leukemic cells in the pus obtained abdominal abscess (a) and gram-negative rods in the anaerobic blood culture (b) (magnification; ×1000).

**Figure 3** Clinical course of the patient after the onset of fever.
Discussion

This case of intra-abdominal abscess and bacteremia due to *S. maltophilia* occurred in a patient who had undergone total gastrectomy and was successfully treated with drainage and SXT. Infection due to *S. maltophilia* typically occurs in severely immunocompromised and debilitated individuals.16 Risk factors for *S. maltophilia* infection include admission to an intensive care unit, blood and solid tumors, neutropenia, central venous catheters, mechanical ventilation, recent surgery, and previous therapy with broad-spectrum antibiotics, such as carbapenems and cephalosporins, and *S. maltophilia* isolation within the previous 30 days.17–19 Although our patient was taking a low dose of prednisolone for polymyositis and had recently undergone surgery for a solid tumor, he did not have other major risk factors for *S. maltophilia* bacteremia. Only a few case reports of intra-abdominal abscesses due to *S. maltophilia* have been published; therefore, the risk factors for intra-abdominal abscesses due to *S. maltophilia* are unclear.

The incidence of *S. maltophilia* hospital-acquired infections is increasing, ranging from 7.1 to 37.7 cases per 10000 discharges.1,3,20,21 *S. maltophilia* has been reported as a common cause of peritonitis, particularly in patients on peritoneal dialysis.22–26 In patients on continuous ambulatory peritoneal dialysis, predisposing factors for *S. maltophilia* peritonitis include diabetes mellitus, anemia, and malnutrition.23 However, reports of intra-abdominal abscesses caused by this organism are rare. A search of the PubMed database on July 16, 2023, yielded only two case reports on *S. maltophilia*-induced intra-abdominal abscesses published in English, one from Japan and one from Korea (Table 1).12,13 One patient was a 68-year-old woman who developed an intra-abdominal abscess caused by *S. maltophilia* 10 days after a resection of the transverse colon for colon cancer and partial resection of the left kidney for renal carcinoma.12 She was treated with intravenous MINO for 2 weeks and oral LVFX for 2 weeks in addition to drainage of the abscess, which resulted in complete resolution.12 The other case was a 14-year-old boy who developed an intra-abdominal abscess caused by *S. maltophilia* 14 days after a laparoscopic appendectomy for a perforated appendix. He was treated with percutaneous drainage and 2 weeks of SXT and recovered.13 All three cases of *S. maltophilia* intra-abdominal abscesses, including our case, occurred after abdominal surgery. Therefore, abdominal surgery may be a risk factor for intra-abdominal abscesses caused by *S. maltophilia*.

The presence of two intrinsic, inducible β-lactamase enzymes (L1 and L2) makes β-lactam agents unsuitable as a treatment option.27 Therefore, non-β-lactam drugs such as SXT and fluoroquinolones are the primary antibiotics used, although their activity is limited by the vast array of efflux pumps present in *S. maltophilia*.28 SXT is generally considered the preferred antibiotic for *S. maltophilia* infections; however, there is no established PK/PD index or target threshold for effectiveness to optimize its clinical use.29 In addition, the limited clinical data available are from

| Table 1 Case Reports on Intra-Abdominal Abscesses Caused by *Stenotrophomonas maltophilia* Published in English |
|---------------------------------------------------------------|---------------------------------|---------------------------------|
| **Reference** | **This Case** | **Sawai et al** | **Lim et al** |
| **Year** | -- | 2023 | 2017 |
| **Country** | Japan | Japan | Korea |
| **Age (year)** | 75 | 68 | 14 |
| **Sex** | Male | Female | Male |
| **Underlying disease** | Gastric cancer, diabetes mellitus, and polymyositis | Transverse colon cancer and renal carcinoma | Appendicitis and autism disorder |
| **Past surgical history** | Gastrectomy for gastric cancer | Transverse colon resection for transverse colon cancer and partial left kidney resection for carcinoma | Laparoscopic appendectomy |
| **Suspected source of the infection** | Surgical site infection | Surgical site infection | Surgical site infection |
| **Time from surgery to diagnosis (days)** | 17 | 10 | 14 |
| **Treatment** | Drainage of abscess and administration of trimethoprim-sulfamethoxazole | Drainage of abscess and administration of minocycline | Drainage of abscess and administration of trimethoprim-sulfamethoxazole |
| **Outcome** | Cured | Cured | Cured |
observational studies rather than randomized controlled trials. No prospective trials comparing treatment options for S. maltophilia have been conducted. In this case, we selected SXT as the antibiotic for treating the S. maltophilia intra-abdominal abscesses. Although several clinical studies have been conducted on SXT for pneumonia and bacteremia, evidence of the clinical effectiveness of SXT for treating intra-abdominal S. maltophilia infections is limited. Further studies, including studies on new antibiotics such as cefiderocol, are essential to identify the optimal antibiotics for treating S. maltophilia abdominal infection.

The origin of the infection in our patient was unclear. One possibility is contamination of the abdominal cavity by S. maltophilia from surgical instruments or the hospital environment during surgery. Our patient had a prolonged operation time because of esophageal rupture, so the S. maltophilia infection may have occurred during the operation. Until the isolation of S. maltophilia in this patient, there had been no instances of postoperative intra-abdominal abscesses caused by S. maltophilia at our hospital. Another possibility is that some patients have S. maltophilia colonization of the gastrointestinal tract, because the gastrointestinal tract is the most likely source of infection. The route of S. maltophilia infection was also unclear in the two previous case reports.

In summary, we have described a case of an intra-abdominal abscess due to S. maltophilia. In patients with SSI after gastrectomy for gastric cancer, the most common pathogens are E. coli (28 of 64; 36.8%) and K. pneumonia (11 of 64; 15.1%). Therefore, S. maltophilia is rarely considered as a potential causative organism in patients with intra-abdominal SSI. SSI due to S. maltophilia is very rare, Ince et al reported that the S. maltophilia accounted for only 1.5% (1 of 61) in their 6-year single-center retrospective study in patients with S. maltophilia infection. However, S. maltophilia is resistant to antibiotics, such as piperacillin/tazobactam, meropenem, and ceftriaxone, which are commonly used for abdominal SSI; therefore, if S. maltophilia infection is detected, appropriate alternative antibiotics must be selected.

The outcome of this and the two previous cases of intra-abdominal abscesses due to S. maltophilia was favorable, with complete resolution by drainage and use of antibiotics. The isolate in our patient was sensitive to SXT, MINO, and LVFX. We continued SXT for the treatment of intra-abdominal abscess due to S. maltophilia because both blood and abscess cultures confirmed only S. maltophilia. SXT is the first-line drug for S. maltophilia infection, and there have been no reports of the development of resistance to SXT during treatment, in contrast to reports of resistance to MINO and LVFX. Further research is needed to assess the most appropriate antibiotics for the treatment of deep SSI due to S. maltophilia.

This report has some limitations. First, it is a single case and the literature review revealed only two previously reported cases, so further reports are needed. However, these three cases reveal that S. maltophilia has the potential to cause intra-abdominal abscesses secondary to SSI. Second, we were unable to identify the source of S. maltophilia. To date, no studies regarding risk factors for intra-abdominal abscesses due to S. maltophilia have been published. Further studies are needed to clarify the epidemiology and clinical features of intra-abdominal abscesses caused by S. maltophilia.

### Conclusion

In summary, we have described a case of an intra-abdominal abscess due to S. maltophilia after total gastrectomy in a patient with diabetes mellitus, polymyositis, and gastric cancer. Physicians should be aware that in addition to Enterobacteriaceae, a major cause of SSI, S. maltophilia has the potential to cause intra-abdominal abscesses secondary to SSI. Further studies are required to clarify the etiology, epidemiology, and risk factors for S. maltophilia-associated SSI.

### Abbreviations

LVFX, levofloxacin; MALDI-TOF MS, matrix-assisted laser desorption/ionization time-of-flight mass spectrometry; MINO, minocycline; SSI, surgical site infection; SXT, trimethoprim-sulfamethoxazole.
Data Sharing Statement
The data is available from the corresponding author on reasonable request.

Ethics and Consent
Written informed consent was obtained from the patient for the publication of this case report. The present case did not require ethics committee approval based on the Japanese Ethical Guidelines for Clinical Research to publish case details.

Acknowledgments
We thank Editage for English language editing.

Author Contributions
All authors meet the ICMJE authorship criteria. All authors made a significant contribution to the work reported; whether in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding
The authors and co-workers did not receive any specific funding.

Disclosure
The authors report no conflicts of interest in this work.

References