A Case of Postoperative Methicillin-Resistant Staphylococcus aureus Enterocolitis in an 81-Year-Old Man and Review of the Literature

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Patient: Male, 81-year-old
Final Diagnosis: Methicillin-resistant Staphylococcus aureus bacteremia • Methicillin-resistant Staphylococcus aureus enterocolitis
Symptoms: Diarrhea • sepsis
Medication: —
Clinical Procedure: Computed tomography • echocardiography • polymerase chain reaction • whipple procedure
Specialty: Gastroenterology and Hepatology • Infectious Diseases • Surgery

Objective: Rare disease
Background: Nosocomial diarrhea affects 12% to 32% of hospitalized patients. Before the development of the Clostridium difficile cytotoxin assay in the 1970s, Staphylococcus aureus was frequently implicated as a cause of hospital-acquired infectious colitis, particularly in association with recent antibiotic therapy or abdominal surgery. Decreased utilization of stool culture has reduced the recognition of S. aureus as a rare, but historically important, cause of enterocolitis.

Case Report: An 81-year-old man with no recent history of travel, exposure to potential infectious sources (e.g., sick contacts, animals, undercooked foods), or antibiotic or proton-pump inhibitor use was admitted for a Whipple procedure (expanded intraoperatively with total pancreatectomy, splenectomy, and portal vein resection) for stage III pancreatic adenocarcinoma. On postoperative day (POD) 5, the patient developed large-volume watery diarrhea that did not improve with tube feeding cessation and oral pancreatic enzyme replacement. He subsequently became clinically septic on POD10, and workup revealed severe radiographic sigmoid and rectal colitis and methicillin-resistant S. aureus (MRSA) bacteremia. Polymerase chain reaction testing for C. difficile was negative twice (POD5 and POD12). He was diagnosed with MRSA proctocolitis and improved with initiation of oral and intravenous vancomycin.

Conclusions: We describe a case of staphylococcal enterocolitis, a previously common cause of nosocomial diarrhea that has become increasingly underappreciated since the advent of culture-independent stool testing for C. difficile. Increased awareness of this entity, especially when Clostridium assays are negative, may guide more effective treatment of hospital-acquired infection.

MeSH Keywords: Clostridium difficile • Cross Infection • Diarrhea • Enterocolitis • Methicillin-Resistant Staphylococcus aureus • Staphylococcus aureus

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/922521

Conflict of interest: None declared

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Background

Before the development of the *Clostridium difficile* cytotoxin assay in the 1970s, *Staphylococcus aureus* was frequently implicated as a cause of infectious colitis, particularly in association with recent antibiotic therapy or abdominal surgery [1]. Decreased utilization of stool culture has reduced the recognition of *S. aureus* as a rare, but historically important, cause of enterocolitis [2]. We present a case of hospital-acquired, *C. difficile*-negative, diarrhea in a postoperative patient who developed sepsis with methicillin-resistant *S. aureus* (MRSA) bacteremia and radiographic pseudocolitis, which was suspected to be the original source of systemic staphylococcal infection.

Case Report

An 81-year-old man with stage III pancreatic adenocarcinoma without neoadjuvant treatment was admitted for a Whipple procedure, which was expanded intraoperatively with total pancreatectomy, splenectomy, and portal vein resection due to repeatedly positive surgical margins. Portal vein reconstruction was performed with end-to-end anastomosis of remaining portal vein to superior mesenteric vein without vascular graft. He received cefazolin 2 g intravenously prior to surgical incision; additional intraoperative or perioperative antibiotics were not given. He had a medical history of hypertension, hyperlipidemia, gastroesophageal reflux disease, glaucoma, genital herpes, asthma, and a prior renal exophytic mass (fine-needle aspiration showed no evidence of neoplasm) status after cryoablation 2 years prior. It was during annual surveillance imaging for this renal mass that a pancreatic head mass was found. He had no recent diarrhea, travel, antibiotic or proton-pump inhibitor use, or hospitalization, and no history of inflammatory bowel disease. MRSA nares screen (routinely performed on admission at our institution) was positive.

Postoperatively, he was hypotensive and hypovolemic, which was suspected to be secondary to intraoperative fluid losses in addition to further fluid losses from peri-anastomotic Jackson-Pratt drains, and he developed prerenal acute kidney injury that improved with bolus and maintenance intravenous (IV) fluids without requiring vasopressors. No central venous access was required, but the indwelling urinary (Foley) catheter placed intraoperatively was continued postoperatively to closely monitor urine output until it was removed on postoperative day (POD) 5, after which he developed urinary retention that was managed with doxazosin and intermittent straight catheterization. He developed brittle diabetes after total pancreatectomy and required an insulin drip, which was transitioned to scheduled subcutaneous insulin injections on POD4. By POD3, the patient was noted to have waxing and waning encephalopathy consistent with hospitalization-associated delirium, which was managed with quetiapine as needed.

On POD5, the patient developed large-volume, foul-smelling, nonbloody loose stools that were attributed to tube feeding via nasogastric tube and pancreatic insufficiency. He was afebrile with an expected postsplenectomy leukocytosis and without vital sign changes, so he was not started on any empiric antibiotics but was given oral pancreatic enzyme replacement. Blood and urine cultures and *C. difficile* testing with polymerase chain reaction (PCR) obtained at this time were negative. By POD9, stool output increased to 26 bowel movements per day despite tube feeding cessation and oral pancreatic enzyme replacement. The patient received postsplenectomy vaccinations against *Streptococcus pneumoniae*, *Haemophilus influenzae* type B, and *Neisseria meningitidis* on the morning of POD10. Between POD5 and POD10, his vital signs remained stable, and quick sequential organ failure assessment (qSOFA) scores ranged from 0 to 1 (due to Glasgow coma score of 14 as a result of intermittent confusion). On the evening of POD10, the patient became clinically septic when he developed acute onset of dyspnea, tachycardia (110–130 beats/min), and tachypnea (30 breaths/min), as well as new fever (38.6°C), hypotension (70/40 mmHg), worsening leukocytosis (from 15.9 cells/mL postsplenectomy to 33.4 cells/mL with 98% neutrophils), elevated procalcitonin (0.9 ng/mL), and evidence of end-organ dysfunction (lactate 3.4 mmol/L and troponin 0.08 ng/mL); his qSOFA score rose from 0–1 to 3. Both peripheral IV and Jackson-Pratt sites were clean, Jackson-Pratt drainage was nonpurulent, and no central venous access or indwelling urinary catheter was present. He was empirically heparinized for suspected pulmonary embolism, trialed on bilevel positive airway pressure for increased work of breathing, and started on empiric broad-spectrum antibiotics (IV vancomycin 1 g every 12 hours and IV piperacillin-tazobactam 3.375 g every 8 h) as well as empiric treatment for *C. difficile* colitis (oral vancomycin 125 mg every 6 h). Vasopressor therapy was not necessary. Computed tomography of the chest, abdomen, and pelvis did not demonstrate pulmonary embolism (empiric heparin drip was subsequently discontinued) or pneumonia; however, it revealed severe sigmoid and rectal colitis evidenced by extensive bowel wall thickening and pericolic fat stranding. Blood cultures at this time grew MRSA in 3 out of 4 bottles within 24 h, after which piperacillin-tazobactam was discontinued. Repeat blood cultures after 24 h of antibiotics also grew MRSA, and a repeat *C. difficile* PCR on POD12 was negative. Erythrocyte sedimentation rate and C-reactive protein were not checked preoperatively or postoperatively until POD12, at which time both were elevated, to 62 mm/h and 14.7 mg/L, respectively. Procalcitonin was not checked during the patient’s hospital course. MRSA isolates from the patient’s nares and blood were not compared during routine clinical practice to determine whether they were from the same strain. Stool samples

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adequate for evaluation and culture could not be obtained until POD15, at which time they demonstrated elevated fecal lacto-erit in and moderate growth of Candida albicans (antifungal treatment was not started because this organism was favored to be an asymptomatic colonizer rather than a gastrointestinal pathogen in the absence of candidemia) [3,4]. Further infectious source workup ruled out endocarditis, sinusitis, skin and soft tissue infection, spinal and psoas abscesses, and thrombophlebitis. An endoscopy was not performed owing to the patient’s high risk for anastomotic perforation. The patient clinically improved and his diarrhea resolved within 48 h of initiating treatment with IV and oral vancomycin (1 g IV every 12 h for 4-6 weeks [5], and 125 mg orally every 6 hours for 14 days). After roughly 2 weeks of IV vancomycin, the patient developed intrinsic renal injury secondary to vancomycin-associated nephrotoxicity, so he was switched from IV vancomycin to IV daptomycin 8 mg/kg (750 mg) every 24 h to complete 6 weeks of antibiotic therapy. The patient was discharged to a skilled nursing facility and was evaluated in general surgery clinic several weeks later, at which time he was found to be in good clinical condition off antibiotics.

Discussion

The history of staphylococcal enterocolitis – from its recognition in the 1940s to its eclipse by C. difficile colitis in the 1970s – is well summarized in prior reports [1,2]. Staphylococcus aureus was previously a commonly recognized cause of infectious colitis; however, the increased recognition of C. difficile and expansion of nucleic acid amplification testing has dramatically altered the workup and treatment of nosocomial diarrhea to favor testing and treatment for C. difficile without utilizing stool culture. As such, the diagnosis of S. aureus enterocolitis has become infrequent or delayed and can result in progression to severe systemic infection (e.g., sepsis with subsequent MRSA bacteremia due to either translocation of S. aureus enterocolitis over >90% and negative predictive value >95%), and toxin-negative C. difficile infection may not require antibiotic treatment as our patient did [15–18]. Nasal colonization with S. aureus (which can occur in about 30% of people, with MRSA colonization occurring in about 1–2% of people) and placement of a nasogastric feeding tube increased his likelihood for gastrointestinal infection, which can also be present in about 15–25% of people [2,19–23]. Several prior studies and reviews have also described clinical features and risk factors (large-volume and high-frequency stool output, age over 70 years, tube feeding), all of which were present in our case, that may favor S. aureus enterocolitis over C. difficile colitis [2,24,25]. Bacteremia with C. difficile has been infrequently reported compared with bacteremia associated with MRSA (although nosocomial diarrhea has been associated with increased risk of nosocomial infection, especially urinary tract infection), so it may be possible that gastrointestinal infection with subsequent MRSA bacteremia may be more characteristic of MRSA colitis than C. difficile colitis [26–28]. Therefore, in the absence of other more common sources, the likely source of his bacteremia was his colon, due to either translocation of non diarrheagenic MRSA due to inflammation caused by noninfectious diarrhea, or MRSA as the principal cause of intestinal inflammation.

Conclusions

The management of diarrhea in hospitalized patients is complex and requires both the investigation of multiple noninfectious etiologies, especially in postsurgical and oncologic
Table 1. Published cases and reports of *Staphylococcus aureus* enterocolitis in adults.

| Reference                  | Year | Country  | N  | MRSA | Predisposing factor | Diagnostic testing | Treatment                          | Notes                                                                                   |
|----------------------------|------|----------|----|------|---------------------|--------------------|------------------------------------|-----------------------------------------------------------------------------------------|
| Gururangan and Holubar (this report) | 2016 | USA      | 1  | Yes  | AA, PS              | CD test: (–) NAAT  | PO+IV vancomycin, IV daptomycin    | Patient developed MRSA bacteremia prior to diagnosis of proctocolitis, switched from IV vancomycin to IV daptomycin due to acute renal injury Outcome: Survival |
| Ackermann et al. [29]      | 2005 | Germany  | 25 | No   | AA                  | CD test: (–) EIA in 24% | NS                                | SCx (+) for SA in 25 of 89 (28%) patients with AA diarrhea Outcome: NS                 |
| Altemeier et al. [30]      | 1963 | USA      | 155| NT   | AA                  | CD test: NT SCx: (+) SA | Various anti-staphylococcal antibiotics, probiotics | 58 patients (37%) were PS Entero-colitis found in 17 of 32 autopsies Outcome: Survival in 107, death in 48 |
| Asha et al. [31]            | 2006 | UK       | 10 | Yes  | AA                  | CD test: (–) cytotoxin assay SCx: (+) MRSA | NS                                | ≥1 pathogen detected in 735 of 4659 (16%) stool specimens; 10 (0.2%) grew SA; 591 (13%) had a (+) CD cytotoxin assay Outcome: NS |
| Avery et al. [32]           | 2015 | USA      | 1  | Yes  | AA                  | CD test: (–) NAAT SCx: (+) MRSA | Vancomycin, probiotics           | Final diagnosis was toxin-negative CD Outcome: Survival                                |
| Bae et al. [33]             | 2011 | South Korea | 1 | Yes  | AA                  | CD test: (–) NAAT LGIS: severe mucosal edema and (+) MRSA | Vancomycin                       | Subsequent lymphocytic colitis Outcome: Survival                                         |
| Bergevin et al. [34]        | 2017 | Canada   | 1  | Yes  | AA                  | CD test: (–) EIA SCx: (+) MRSA LGIS: diffuse acute colitis | Vancomycin                       | ANS (+) Outcome: NS                                                                    |
| Bettenworst et al. [35]     | 2013 | Germany  | 1  | Yes  | IBD                 | CD test: NT SCx: (–) for CD LGIS: acute Crohn’s colitis and (+) MRSA | Linezolid                         | ANS (-) and perianal swab (+) for MRSA Outcome: Survival                               |
| Boyce and Havill [24]       | 2005 | USA      | 11 | Yes  | AA                  | CD test: (–) EIA SCx: (+) MRSA | Vancomycin                       | Patients with MRSA on SCx had greater average stool volume and number per day Patients with ET (–) MRSA had fewer days of diarrhea and stools per day Outcome: NS |
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| Reference                  | Year | Country | N   | MRSA | Predisposing factor | Diagnostic testing          | Treatment                                      | Notes                                                                 |
|----------------------------|------|---------|-----|------|----------------------|-----------------------------|-----------------------------------------------|-----------------------------------------------------------------------|
| Boyce et al. [36]          | 2005 | USA     | 151 | Yes  | NS                   | CD test: NS (see notes)     | NS                             | 1543 patients tested for CD with EIA, 159 (10%) (+) EIA and 151 (9.8%) (+) SCx for MRSA. Number of patients with both MRSA and CD was not reported. Outcome: NS |
| Brown et al. [9]           | 1953 | USA     | 2   | NT   | AA, PS               | CD test: NT                 | Terramycin, streptomycin, sulfisoxazole, aureomycin | Both patients were also reported by Wakefield and Sommers [10]. Outcome: Death in 2 |
| Cheng et al. [37]          | 2006 | Australia | 1  | Yes  | AA, PS               | CD test: (–) cytotoxin assay | Vancomycin                      | Outcome: Survival                                                      |
| Chubachi et al. [38]       | 1993 | Japan   | 1   | Yes  | Neutropenia          | CD test: NT                 | Vancomycin                      | Patient developed sepsis and respiratory distress. Outcome: Survival. |
| Clarke and Baidoo [39]     | 2012 | USA     | 1   | Yes  | Healthcare worker   | CD test: (+) MRSA, (–) CD   | Vancomycin                      | Outcome: Survival                                                      |
| Cope et al. [40]           | 1953 | USA     | 1   | No   | AA, PS               | CD test: NT                 | Aureomycin                      | Outcome: Death                                                          |
| Dalal and Urban [41]       | 2008 | USA     | 2   | Yes  | AA                   | CD test: (–) cytotoxin assay | Vancomycin, piperacillin-tazobactam | Both patients presented with sepsis. Outcome: Survival in 2. |
| Dickinson et al. [42]      | 1980 | UK      | 2   | No   | AA, IBD              | CD test: NT                 | Steroids                        | CD culture and cytotoxin assay were not sought. Outcome: Survival in 2. |
| Estifan et al. [43]        | 2019 | USA     | 1   | Yes  | AA                   | CD test: (+) NS             | Vancomycin, trimethoprim-sulfamethoxazole | Patient had type 1 diabetes and presented in diabetic ketoacidosis. Imaging showed acute appendicitis. Outcome: Survival. |
| Fairlie and Kendall [44]   | 1953 | USA     | 5   | NT   | AA, PS               | CD test: NT                 | Penicillin, dihydro-streptomycin, aureomycin, oxytetracycline | Outcome: Survival in 2, death in 3. |
| Flemming and Ackermann [45] | 2007 | Germany | 198 | Yes/No| AA, hospital stay ≥ 72 hours | CD test: (+) EIA in 25      | NS                             | 121 of 2727 (4%) (+) for CD 198 of 2727 (7%) (+) for SA, of which 29 (15%) were MRSA. Outcome: NS |
Table 1 continued. Published cases and reports of *Staphylococcus aureus* enterocolitis in adults.

| Reference               | Year | Country | N   | MRSA | Predisposing factor | Diagnostic testing | Treatment                                      | Notes                                                                 |
|-------------------------|------|---------|-----|------|--------------------|--------------------|------------------------------------------------|----------------------------------------------------------------------|
| Froberg et al. [1]      | 2004 | USA     | 1   | Yes  | AA                 | CD test: (+) cytotoxin assay BCx: (+) MRSA SCx: (+) MRSA and CD Autopsy: 2 PM lesions, one with SA and one with CD | Vancomycin, metronidazole, amikacin                               | Autopsy also showed colonic perforation Outcome: Survival |
| Furukawa et al. [46]    | 2015 | Japan   | 1   | Yes  | AA, PS             | CD test: (–) EIA SCx: (+) MRSA Pathology: (+) SA | Vancomycin                                      | Emergent laparotomy was performed, revealed cecum perforation Outcome: Survival |
| Gravet et al. [47]      | 1999 | France  | 60  | Yes/No | AA       | CD test: (+) cytotoxin assay and culture in 4 patients SCx: (+) SA, MRSA in 92% | Vancomycin                                      | Outcome: NS                                                             |
| Kalakonda et al. [48]   | 2016 | USA     | 1   | Yes  | None               | CD test: (–) NAAT BCx: no growth SCx: (+) MRSA LGIS: PM colitis | Vancomycin                                      | Patient presented in sepsis Initial SCx had no growth, repeat SCx (+) for MRSA Outcome: Survival |
| Kodama et al. [49]      | 1997 | Japan   | 14  | Yes  | AA, PS             | CD test: NT SCx: (+) MRSA | Vancomycin                                      | 13 of 14 (93%) strains were ET-producing Outcome: NS |
| Konishi et al. [50]     | 1997 | Japan   | 31  | Yes  | P S                | CD test: NT SCx: (+) MRSA, 4 also grew CD in small numbers | Vancomycin                                      | IV antibiotics were given to 19 of 31 patients, 6 received IV vancomycin Outcome: Survival in 31 |
| Kotler et al. [51]      | 2007 | USA     | 1   | No   | HIV, AA           | CD test: (–) cytotoxin assay SCx: (+) SA LGIS: acute colitis | Vancomycin, ceftepime, octreotide | Patient developed toxic-shock syndrome, SA was ET-producing Outcome: Survival |
| Lane et al. [52]        | 2018 | USA     | 1   | Yes  | AA                 | CD test: (–) NAAT SCx: (+) MRSA UCx: (+) MRSA | PO+IV vancomycin                                   | Urine and stool MRSA isolates were found to be genetically identical Outcome: Survival |
| Lepley and Smith [53]   | 1957 | USA     | 16  | NT   | AA, PS             | CD test: NT SCx: (+) SA | Chloramphenicol, erythromycin | Outcome: NS                                                             |
| Lieverse et al. [54]    | 2001 | Netherlands | 2  | No   | Sick contact      | CD test: NT BCx: no growth Gastric fluid, elbow aspirate: (+) SA | Ciprofloxacin or gentamicin                           | Husband with elbow wound growing SA, wife changed his bandages Wife expired, laparotomy showed multiple bowel perforations Outcome: Death in 2 |
| Lo and Borchardt [55]   | 2009 | USA     | 5   | Yes  | AA                 | CD test: (–) EIA SCx: (+) MRSA | Vancomycin                                      | One patient improved without antibiotics Outcome: Survival in 5 |
Table 1 continued. Published cases and reports of *Staphylococcus aureus* enterocolitis in adults.

| Reference       | Year | Country | N | MRSA | Predisposing factor | Diagnostic testing                                                                 | Treatment                                      | Notes                                      |
|-----------------|------|---------|---|------|---------------------|--------------------------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------|
| **McPherson et al. [56]** | 2005 | UK      | 1 | Yes  | AA, PS              | CD test: (–) EIA SCx: (+) MRSA Wound culture: (+) MRSA LGIS: normal                   | Vancomycin, doxycycline                      | Outcome: Survival                          |
| **Ogawa et al. [57]**   | 2014 | Japan   | 1 | Yes  | AA                  | CD test: (–) NAAT SCx: (+) MRSA BCx: (+) MRSA Synovial fluid: (+) MRSA               | Vancomycin                                   | Presented in sepsis, which resolved prior to diarrhea onset Septic arthritis diagnosed followed treatment Outcome: Survival |
| **Okada et al. [58]**   | 2018 | Japan   | 1 | Yes  | PS                  | SCx: (–) CD, (+) MRSA                                                             | Vancomycin, metronidazole, rifampicin         | MRSA strain was resistant to vancomycin Outcome: Survival |
| **Pressly et al. [59]** | 2016 | USA     | 1 | Yes  | IBD                 | CD test: (–) NAAT SCx: (+) MRSA BCx: (+) MRSA Synovial fluid: (+) MRSA               | Vancomycin                                   | Patient reported eating deviled eggs prior to symptom onset Outcome: Survival |
| **Rhee et al. [60]**    | 2004 | USA     | 1 | Yes  | AA                  | CD test: (–) EIA SCx: (+) MRSA                                                     | Vancomycin                                   | Outcome: Survival                          |
| **Rogers et al. [61]**  | 2019 | USA     | 1 | Yes  | AA                  | CD test: (–) EIA SCx: (+) MRSA                                                     | PO+IV vancomycin, piperacillin-tazobactam    | Patient diagnosed with acute diverticulitis Outcome: Survival |
| **Rothman et al. [62]** | 2018 | USA     | 1 | Yes  | HIV, AA             | CD test: NS SCx: (+) MRSA BCx: (+) MRSA                                            | Vancomycin, cefepime, azithromycin           | Presented with enterocolitis in the setting of newly diagnosed acute myeloid leukemia Initial SCx (+) for MRSA felt to be insignificant until symptoms persisted and patient developed septic shock Outcome: Death |
| **Shah et al. [63]**    | 2016 | USA     | 1 | No   | AA, IBD             | CD test: (–) cytotoxin assay SCx: (+) SA                                           | Vancomycin                                   | Outcome: Survival                          |
| **Schiller et al. [64]**| 1998 | USA     | 1 | Yes  | AA                  | CD test: (–) EIA BCx: no growth SCx: (+) MRSA                                      | Vancomycin                                   | Outcome: Survival                          |
| **Sizemore et al. [65]**| 2012 | USA     | 1 | Yes  | AA, PS              | CD test: (–) NAAT SCx: (+) MRSA                                                     | Vancomycin, mupirocin, probiotic             | ANS (+) Outcome: Survival                  |
| **Sonpal et al. [66]**  | 2010 | USA     | 1 | Yes  | IBD                 | CD test: (–) cytotoxin assay SCx: (+) MRSA                                        | Vancomycin                                   | Outcome: Survival                          |
| **Speare [67]**         | 1954 | USA     | 8 | NT   | AA, PS              | CD test: NT SCx: (+) SA                                                           | Aureomycin, magnumycin, sulfadiazine          | Outcome: Survival in 3, death in 5          |
### Table 1 continued. Published cases and reports of *Staphylococcus aureus* enterocolitis in adults.

| Reference                     | Year | Country | N  | MRSA | Predisposing factor | Diagnostic testing | Treatment       | Notes                                      |
|-------------------------------|------|---------|----|------|---------------------|--------------------|------------------|--------------------------------------------|
| Takesue et al. [68]           | 1993 | Japan   | 10 | Yes  | PS                  | CD test: NT Sputum, drain, stool, skin, blood culture: (+) MRSA in 138 samples | NS              | 10 of 503 (2%) PS patients developed MRSA enteritis Outcome: Survival in 10 |
| Takeuchi et al. [69]          | 2001 | Japan   | 17 | Yes  | AA, PS              | CD test: NT Gastric juice, drain output, or SCx: (+) MRSA | Vancomycin       | Outcome: Survival in 15, death in 2       |
| Taylor et al. [70]            | 1993 | UK      | 1  | Yes  | AA, IBD             | CD test: (–) EIA SCx: (+) MRSA, (–) CD | Vancomycin       | Outcome: Survival                         |
| Thakkar and Agrawal [71]      | 2010 | USA     | 1  | NT   | AA                  | CD test: NT SCx: (+) SA LGIS: chronic active necrotizing colitis | Levofloxacin, metronidazole, proton-pump inhibitor | Exploratory laparotomy showed toxic megacolon, and Gram stain of surgical specimens showed gram-positive cocci in clusters Discharged without postoperative antibiotic therapy Outcome: Survival |
| Wakefield and Sommers [10]    | 1953 | USA     | 3  | NT   | AA, PS              | CD test: NT Autopsy: intestinal lining and heart BCx (+) SA | Streptomycin, terramycin, sulfisoxazole, aureomycin, penicillin | Two patients were also reported by Brown et al. [9] Outcome: Death in 3 |
| Wallace et al. [72]           | 1965 | USA     | 7  | NT   | AA, PS              | CD test: NT SCx: (+) SA | Vancomycin       | SA strains resistant to penicillin G Outcome: Survival in 7 |
| Watanabe et al. [73]          | 2001 | Japan   | 13 | Yes  | AA, PS              | CD test: (–) EIA Sputum, pharynx, nasal, gastric juice, or stool culture: (+) MRSA in all 45 samples | NS              | 12 of 13 (92%) patients had MRSA isolates from respiratory and digestive cultures with identical or near-identical molecular characteristics Outcome: NS |
| Wei et al. [74]               | 2015 | China   | 5  | Yes  | AA, IBD, PS         | SCx: (–) CD Gastric juice culture: (+) MRSA | Fecal microbiota transplantation | Outcome: Survival in 5                     |
| Yoshida et al. [75]           | 1992 | Japan   | 2  | Yes  | AA, PS              | CD test: NT SCx: (+) MRSA | Vancomycin       | Outcome: Survival in 2                     |

Includes reports published in English language; for reports published in Japanese, please see the systematic review by lwata and colleagues [8]. AA – antibiotic-associated; ANS – anterior nares screen for MRSA; BCx – blood culture; CD – *Clostridium difficile*; EIA – enzyme immunoassay for *C. difficile* antigen (glutamate dehydrogenase) and toxin; LGIS – lower gastrointestinal scope, including colonoscopy or sigmoidoscopy; ET – *S. aureus* enterotoxin; IBD – inflammatory bowel disease; IV – intravenous; MRSA – methicillin-resistant *S. aureus*; N – number of patients with *S. aureus*; NAAT – nucleic acid amplification test (including polymerase chain reaction); NS – not specified; NT – not tested; PM – pseudomembranous; PO – per os (oral administration); PS – postsurgical; SA – *S. aureus*; SCx – stool culture; UK – United Kingdom; USA – United States of America.
patients, and the consideration of pathogens not included in routine laboratory testing. Our case highlights the potential for staphylococcal enterocolitis or translocation of colonizing staphylococcal species into the bloodstream to cause severe *S. aureus* infection. At present, empiric treatment for *C. difficile* is common in clinical practice, and while vancomycin currently treats both *S. aureus* and *C. difficile*, the emergence of antibiotic resistance may require distinct treatments for these 2 pathogens. As such, recognition of *S. aureus* enterocolitis as a distinct clinical entity may become more important over time because it would necessitate dedicated antibiotic coverage. Although the clinical significance of staphylococcal colonization in the gastrointestinal tract and its potential to cause enterocolitis remains controversial, our case and others summarized in Table 1 should prompt physicians to consider this rare diagnosis, which has a high case fatality rate, in situations in which infectious nosocomial diarrhea is suspected but *Clostridium* assays are negative.

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**Conflict of interest**

None.

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