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

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Conflict of interest: None declared

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*

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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 proctocolitis, 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/nL postsplenectomy to 33.4 cells/nL 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 lactoferrin 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 bacteremia according to Sepsis-3 [6] and Surviving Sepsis Campaign [7] guidelines), which in our case ultimately suggested the diagnosis.

Prior cases of *S. aureus* enterocolitis in adults (Table 1), at least in the English literature, have been primarily reported from the United States (n=383) and the European Union (n=300, including the United Kingdom); however, the US and EU numbers are dwarfed by the 432 cases reported from Japan (which includes the 91 Japanese cases we identified in addition to the 341 summarized by Iwata and colleagues [8]). The vast majority of prior *S. aureus* colitis cases (74%, 581/782) were reported to be antibiotic associated, and the next most common risk factors were recent gastrointestinal surgery (18%, 140/782) and inflammatory bowel disease (2%, 12/782). Of the 281 patients with reported outcome (excluding 2 patients reported by Sommers and colleagues in 2 separate reports [9,10]), death occurred in 66 (23%), which may be presumed to be at least partially attributable to *S. aureus* infection due to the variable follow-up intervals reported, which were often brief and limited to hospital stay. Based on aggregating these previously published reports, the case fatality rate for *S. aureus* enterocolitis has declined over time, from 74% (1950–1960) to 30% (1960–1970) to 11% (2010–2020), which may correlate with expanded access to antibiotics such as vancomycin (1954), which is a first-line treatment for *C. difficile* colitis and also has a specific indication approved by the US Food and Drug Administration for the treatment of staphylococcal enterocolitis.

Our patient's putative diagnosis of MRSA proctocolitis is a controversial one, especially in the absence of definitive endoscopic evidence (due to high risk of anastomotic compromise) or confirmatory stool culture, which is infrequently performed in current clinical practice and is often limited by delayed results and low negative predictive value [11–14]. However, our diagnosis is supported by the following lines of evidence. The likelihood of clinically significant *C. difficile* colitis was low given the absence of *C. difficile* antigen and toxin on 2 consecutive tests (each with sensitivity and specificity >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 staphylococcal colonization (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 nondiarrheagenic 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

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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 BCx: (+) MRSA SCx: (–) for SA ANS: (+) MRSA	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% SCx: (+) SA, 60% also (+) CD	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 Enterocolitis 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
Bettenworth 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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Table 1 continued. Published cases and reports of *Staphylococcus aureus* enterocolitis in adults.

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) SCx: (+) MRSA	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 Autopsy: PM colitis and (+) SA	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 SCx: (+) MRSA	Vancomycin	Outcome: Survival
Chubachi et al. [38]	1993	Japan	1	Yes	Neutropenia	CD test: NT SCx and BCx: (+) MRSA	Vancomycin	Patient developed sepsis and respiratory distress Outcome: Survival
Clarke and Baidoo [39]	2012	USA	1	Yes	Healthcare worker	SCx: (+) MRSA, (–) CD LGIS: pancolitis	Vancomycin	Outcome: Survival
Cope et al. [40]	1953	USA	1	No	AA, PS	CD test: NT BCx: (+) SA Autopsy: PM colitis and (+) SA	Aureomycin	Outcome: Death
Dalal and Urban [41]	2008	USA	2	Yes	AA	CD test: (–) cytotoxin assay BCx: no growth SCx: (+) MRSA	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 SCx: (+) SA LGIS: normal	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 SCx: (+) MRSA	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 Autopsy (+) SA	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 SCx: (+) MSSA (85%) or MRSA (15%)	NS	121 of 2727 (4%) (+) for CD 198 of 2727 (7%) (+) for SA, of which 29 (15%) were MRSA Outcome: NS

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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	PS	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, cefepime, 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

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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 LGIS: PM colitis	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	IDB	CD test: (–) cytotoxin assay SCx: (+) MRSA	Vancomycin	Outcome: Survival
Speare [67]	1954	USA	8	NT	AA, PS	CD test: NT SCx: (+) SA	Aureomycin, magnamycin, sulfadiazine	Outcome: Survival in 3, death in 5

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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 Iwata 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.

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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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Department and Institution where work was done

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Conflict of interest

None.

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