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ORIGINAL ARTICLE

Significance of anaerobic bacteria in postoperative infection after radical cystectomy and urinary diversion or reconstruction

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Abstract Radical cystectomy followed by urinary diversion or reconstruction (RC) is a standard treatment for patients with muscle-invasive bladder cancer. In these operations, a high frequency of complications, especially postoperative infection, has been reported. However, there have only been a few studies about postoperative anaerobic bacterial infection. To clarify the significance and role of anaerobic bacteria in postoperative infection, we retrospectively analyzed cases in which postoperative infection by these organisms developed. A total of 126 patients who underwent RC from 2006 to 2010 were included in this study. Various types of postoperative infection occurred in 66 patients. Anaerobic bacterial infections were detected with cultures for urine and blood in one case, for blood in two cases, and for surgical wound pus in four. The frequency of postoperative anaerobic bacterial infection in RC was less than that of colon surgery. However, this study revealed the possible development of a nonnegligible number of postoperative anaerobic bacterial infections. Therefore, we should consider anaerobic bacteria as possible pathogens in postoperative infection after RC.

Keywords Anaerobic bacteria · Surgical site infection · Postoperative infection · Radical cystectomy · Urinary diversion

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Introduction

Radical cystectomy followed by urinary diversion or reconstruction (RC) is a standard treatment for patients with muscle-invasive bladder cancer. However, the frequency of postoperative complications, including postoperative infection, is relatively high compared with other types of urologic surgery [1]. Surgical-site infection (SSI) is one of the major complications in RC, and SSI and urinary tract infection (UTI) have been reported to occur in 0.14–46 % and 7.4–18 % of patients with such surgery, respectively [2–9]. Previous reports revealed that methicillin-resistant *Staphylococcus aureus* (MRSA) and *Enterococcus faecalis* as Gram-positive cocci, and *Escherichia coli* as a Gram-negative rod, were responsible for SSI [2, 3, 8, 9]. Although anaerobic bacteria are possible pathogens for postoperative infection [8], the frequency of isolation of those pathogens and the clinical backgrounds of patients with SSI remain unclear. Therefore, to determine the significance of anaerobic bacteria in postoperative infection in patients with RC, we retrospectively analyzed their clinical and bacteriological features.

Patients and methods

We retrospectively reviewed the medical charts of 126 patients with bladder cancer who received RC from 2006 to 2010. Ileal conduit was done in 109 patients and ileal neobladder reconstruction in 17. The protocol for perioperative antimicrobial prophylaxis and preoperative bowel preparation were described in our previous reports [2, 3]. Antimicrobial prophylaxis was also done when the ureteral stent was removed at 7–14 days postoperatively [10]. SSI was defined according to a previous report [11]. If the preoperative urinary culture was positive, an antimicrobial agent effective for pathogens was preoperatively administered for therapeutic purposes [2, 3, 10].

We evaluated the frequencies of SSI, UTI, sepsis, and other conditions of postoperative infections. In the study period, when postoperative infection was suspected or observed, cultures for urine and wound pus were done before starting antimicrobial chemotherapy. Two sets of blood culture were also done if patients became febrile with a body temperature >38 °C. Isolation and identification of bacterial cultures were done using a MicroScan Walk Away 96 plus (Siemens AG, Munich, Germany). Backgrounds and clinical courses were examined in patients with postoperative infections caused by anaerobic bacteria.

Results

Postoperative infections

Postoperative infection occurred in 66 patients. There were 73 infectious events, including 28 of SSI, 29 of UTI, and 16 others. In these 66 patients, anaerobic bacterial strains were isolated from seven (10.6 %), consisting of four with SSI, two with sepsis, and one with urosepsis (Tables 1, 2). Intra-abdominal abscess developed in case 1, and case 3 had been treated due to diabetes mellitus; however, other patients had no risk factors of anaerobic infection.

Bacteriological findings

Prevotella spp. and members of the *Bacteroides fragilis* group were isolated from wound-pus cultures of four patients with SSI. *Bacteroides* spp. were also isolated from blood cultures of the two patients with sepsis. *Prevotella* spp. were detected in urine and blood cultures from the patient with urosepsis. Those anaerobic bacterial strains were isolated simultaneously with some aerobic bacterial strains in patients who developed SSI (Table 2). Anaerobic strains were detected in cultures for wound pus, irrespective of the extent of SSI (Table 2). In case 7, who was diagnosed as having urosepsis, the isolated anaerobic bacterial strains were *Prevotella* spp. both in urine and blood. Although blood culture produced *P. melaninogenica*, further analysis for urine culture resulted in identification of *Prevotella* spp. only. However, the two pathogens were highly likely to be the same strain, because they had extremely similar patterns of antimicrobial susceptibility.

Treatments

All four patients having only SSI that was positive for anaerobic bacteria were successfully treated by open drainage without antimicrobial chemotherapy. The three patients with positive blood cultures were successfully treated by appropriate antimicrobial chemotherapies. Case 5 was treated with meropenem and clindamycin, and cases 6 and 7 were treated using tazobactam/piperacillin (TAZ/PIPC) (Table 2). In case 7, superficial SSI and urosepsis occurred 7 days after operation. Open drainage of the surgical site and antimicrobial chemotherapy using TAZ/PIPC, to which the pathogen was susceptible, led to a successful clinical course. Minimum inhibitory concentration (MIC) of antimicrobial prophylaxis using cefotiam is unclear because it was not applied for anaerobic bacteria.

Table 1 Number of strains isolated from wound-pus, urine, and/or blood culture in cases with postoperative infection

Wound pus		Urine		Blood	
Aerobic bacteria	No. of strains (%)	Aerobic bacteria	No. of strains (%)	Aerobic bacteria	No. of strains (%)
MRSA	10 (28)	MRSA	9 (21)	MRSA	5 (42)
E. faecalis	4 (11)	*E. faecalis*	8 (19)	MRS	3 (25)
MRS	3 (8)	MRS	5 (12)	*E. faecalis*	1 (8)
MSSA	2 (6)	*E. faecium*	4 (9)	Others	1 (8)
E. coli	2 (6)	MRSE	3 (7)		
Others	11 (31)	Others	13 (30)		
Wound pus		**Urine**		**Blood**	
Anaerobic bacteria	No. of strains (%)	Anaerobic bacteria	No. of strains (%)	Anaerobic bacteria	No. of strains (%)
Prevotella sp.	2 (6)	*Prevotella* sp.	1 (3)	*Prevotella* sp.	1 (8)
Bacteroides fragilis group	2 (6)			*Bacteroides* sp.	2 (17)
Total	36 (100)		43 (100)		12 (100)

MRSA methicillin-resistant *Staphylococcus aureus*, *MSSA* methicillin-sensitive *Staphylococcus aureus*, *MRS* methicillin-resistant *Staphylococcus*, *MRSE* methicillin-resistant *Staphylococcus epidermidis*, *E. faecalis Enterococcus faecalis*