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Major Article

Collaboration with an infection control team for patients with infection after spine surgery

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Key Words:
Surgical site infection
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Background: The risk of infection, including surgical site infection (SSI), after spine surgery has increased due to aging and more immunocompromised hosts. An infection control team (ICT) is responsible for management of health care-associated infections at our institution.
Methods: The study subjects were 40 patients (18 men and 22 women with an average age of 54 years) referred to the ICT after spine surgery since 2010. Pathogenic bacteria and treatment in these cases were reviewed.
Results: Collaboration with the ICT involved guidance on use of antibiotics for infection in 30 patients (16 SSI and 14 non-SSI) and a search for the infection focus for fever of unknown origin in 10 patients (7 patients were found to have urinary tract infections and 2 patients were found to have pneumonia). The detection rate of causative bacteria in ICT consultation was 88% (35 out of 40 patients). SSI patients with instrumentation involved had a significantly higher rate of methicillin-resistant *Staphylococcus aureus* infection compared with those without instrumentation (42% vs 13%; $P < .05$).
Discussion: All cases of SSI with instrumentation involved were cured by ICT support without removal of instrumentation. Early assistance from the ICT was important for prevention of worsening of methicillin-resistant *S aureus* infection.
Conclusions: Collaboration with the ICT was helpful for detection of pathogenic bacteria and allowed appropriate use of antibiotics at an early stage.

Risk management in hospitals has been become important for prevention of accidents to medical staff and patients.[1] Surgical site infection (SSI) is an adverse event related to surgery that places a major burden on patients and staff. Therefore, reduction of the incidence and increased awareness of SSI are important in medical institutions. The risk of infection after spine surgery has increased during recent years due to aging of society and a higher number of immunocompromised hosts, and treatment of this infection can be difficult. To address this problem, formation of an infection control team (ICT) may be useful for prevention of infection and for therapeutic collaboration.

In our hospital, SSI prevention has been performed by an ICT since 2003. The team includes 9 doctors, 3 nurses, 2 pharmacists, 1 clinical microbiologist, 1 radiologist, 1 medical engineering technician, 2 physical therapists, and 3 clerks. The ICT is responsible for infection prevention and control (IPC) and support for treatment of health care-associated infections. In addition to a direct request from an orthopedic surgeon, the ICT responds autonomously if bacteria are detected in blood culture or if drug resistant-bacteria are detected. The purpose of this study was to examine SSI occurrence and patients referred to the ICT after spine surgery, and to describe the practical implementation of IPC measures.

METHODS

Among all patients who have undergone spine surgery at our hospital since 2010, 40 received therapeutic support from the ICT.

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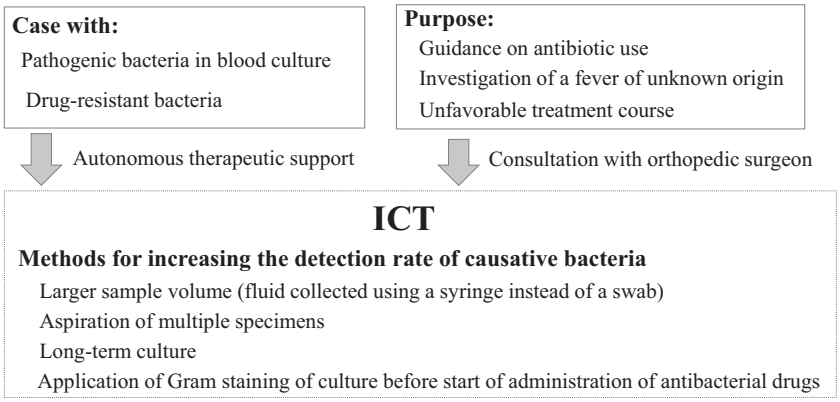

Fig 1. Collaborative activities with the infection control team (ICT) and promotion of appropriate use of antimicrobial therapy.

The patients were 18 men and 22 women, whose average age was 54 years (range, 10-82 years). Pathogenic bacteria and treatment in these patients were examined retrospectively. The incidence of SSI in these patients was also examined. The protocol was approved by the ethical committee of Nagoya University Graduate School of Medicine (institutional review board No. 354-3).

ICT collaboration

In our hospital, therapeutic support (Fig 1) is autonomously implemented by the ICT in all patients with a positive blood culture or in patients in whom drug-resistant bacteria are detected. ICT assistance can also be requested by a spine surgeon directly for advice on use of antibiotics, for newly suspected infections or infections with initial unsuccessful treatment, and for investigation of fever of unknown origin. To increase the rate of detection of causative bacteria and perform appropriate infection treatment, the following routine ICT collaborations for appropriate antimicrobial therapy are performed: culture before the start of administration of antibacterial drugs, collection of a larger sample volume of fluid using a syringe instead of a swab, aspiration of multiple specimens, and long-term culture.

In all cases, surgical prophylaxis was performed using evidence-based standards and guidelines, such as injection of a first-generation cephalosporin within 1 hour before incision and discontinuation of prophylaxis within 48 hours after surgery. Antibiotics as proposed by the ICT were used in all patients indicated to be treated with ICT assistance, and selection of antibiotics was performed at the discretion of the ICT until bacteria were no longer detected. In the case of surgery with instrumentation, vancomycin or linezolid was selected as initial treatment if gram-positive cocci were found in a wound smear test. De-escalation to narrow-spectrum antimicrobial agents with relatively few side effects was used if causative bacteria were identified and drug susceptibility was revealed, depending on the clinical symptoms. In patients with methicillin-resistant (MR) staphylococci, long-term sulfamethoxazole-trimethoprim and rifampicin were used to reduce infection until bacteria were no longer detected.

The effectiveness of SSI control by the ICT was evaluated by examining the origins of infection found in ICT collaboration, causative bacteria, and detection rates of MR bacteria in all cases with SSI and in those with SSI after surgery using instrumentation. Significance was assessed by Student *t* test or Fisher exact test at a level of $P < .05$. Data analysis was performed with SPSS version 22 for Windows (IBM-SPSS Inc, Armonk, NY).

Table 1
Cases with infection control team (ICT) collaboration since 2010 (N = 40)

ICT involvement	n
Guidance on use of antibiotics for infection (n = 30)	
Surgical site infection	16
Nonsurgical site infection*	14
Focused search for an unknown fever with high C-reactive protein (n = 10)	
Confirmed by ICT†	9
Not confirmed by ICT	1
Total	40

*Urinary infection (n = 10), pneumonia (n = 2), and sepsis (n = 2).
†Urinary infection (n = 7) and pneumonia (n = 2).

RESULTS

In the 40 patients in the study, ICT collaboration involved guidance on use of antibiotics for infection in 30 patients, and a focused search for an unknown fever with high C-reactive protein in 10 patients. Guidance on use of antibiotics was provided in 16 patients with SSI and 14 patients with non-SSI. The focused search for an unknown fever resulted in confirmation of urinary tract infection in 7 patients and pneumonia in 2 patients. In 1 patient, the origin of fever with high C-reactive protein could not be determined (Table 1).

MR bacteria such as methicillin-resistant *Staphylococcus aureus* (MRSA), methicillin-resistant coagulase negative *Staphylococcus*, and methicillin-resistant *Staphylococcus epidermidis* were detected in 12 of 40 patients (30%). Details are shown in Table 2. In the 16 patients with SSI, MR bacteria were detected in 8 patients (50%). In the 24 patients with non-SSI, bacteria were detected in urinary culture in 17 patients and in blood culture in 7 patients.

The bacterial detection rate after ICT collaboration was 88% (35 out of 40 patients), whereas that before ICT collaboration was 60% (24 out of 40 patients). These results show the efficacy of ICT consultation and are likely to be due to the methods recommended by the ICT for increasing the detection rate of causative bacteria (Fig 1).

Patients with instrumentation had a significantly higher rate of MR bacteria compared with those without instrumentation (42% vs 13%; $P < .05$). All patients with SSI after surgery with instrumentation involved underwent reoperation for debridement, and all were cured without the need for removal of the instrumentation (Table 3).

DISCUSSION

The ICT in our hospital has the following responsibilities: creation of an infection prevention manual, creation and guidance on