—Short Communication—

A Retrospective Study of Risk Factors for Infection in Cancer Patients Receiving Specialist Palliative Care

Ryo Yajima[1,2], Yuya Ise[1], Tetsuya Wako[1], Shirou Katayama[1] and Junko Kizu[2]

[1]Section of Pharmaceutical Services, Nippon Medical School Hospital
[2]Department of Practical Pharmacy, Keio University Faculty of Pharmacy

Abstract

Preventing infectious diseases in patients with cancer receiving palliative care is extremely important. However, little is known about the factors causing infection in these patients. The aim of this study was to clarify the factors contributing to infection in patients with cancer receiving palliative care. The medical records of each patient were reviewed, and patient characteristics were recorded. Factors that correlated significantly with infection, as revealed by univariate analysis, were performance status, the fall risk assessment score, and venous catheters. Our present study provides further evidence that the fall risk assessment score is a risk factor for infection. Critical infections might be prevented in patients with cancer receiving palliative care by monitoring the above 3 factors.
(J Nippon Med Sch 2013; 80: 481–485)

Key words: infection, factor, the fall risk assessment score, palliative care team, designated cancer hospital

Introduction

Preventing infectious diseases in patients with cancer receiving palliative care is extremely important for a number of reasons: 1) infection decreases quality of life (QOL) and can cause death[1,2], 2) the appropriate treatment of infection can help control symptoms in patients with cancer, and 3) use of ineffective drugs in patients receiving palliative care increases the risk of nosocomial infections[3–6]. However, little is known about factors causing infection in patients with cancer receiving palliative care.

Previously reported risk factors for infection in patients with cancer include: destruction of cellular organization by cancer cells, chemotherapy, radiotherapy, surgery, catheters, steroidal anti-inflammatory drugs use, and abnormalities of mucous membranes[1,7,8]. However, there have been few reports about the risk factors for infection in patients with cancer receiving palliative care[4,9]. By determining the risk factors, it may be possible to reduce these risks or to diagnose infections before they become severe. This may lead to improved QOL in these patients.

Therefore, the aim of this study was to clarify the factors contributing to infection in patients with

Correspondence to Yuya Ise, Ph D, Section of Pharmaceutical Services, Nippon Medical School Hospital, 1–1–5 Sendagi, Bunkyo-ku, Tokyo 113–8603, Japan
E-mail: yuyaise@nms.ac.jp
Journal Website (http://www.nms.ac.jp/jnms/)

cancer receiving palliative care.

Methods

Data Sources and Procedures

The method used in this study was a chart review, which was approved by the Ethical Review Board of the Keio University Faculty of Pharmacy. The subjects were patients with cancer referred from June 2008 through September 2010 to the palliative care team of the 899-bed Cancer Hospital at the Nippon Medical School Hospital in Japan. The inclusion criteria were: a diagnosis of incurable advanced cancer and, to clarify the factors contributing to infection at the end-of-life, patients who died during their hospital stay at Nippon Medical School Hospital.

Demographic and Patient Clinical Data

For each patient, characteristics were recorded and included age, sex, performance status, bedsores, edema, ascites, dysphagia, nausea, fall risk assessment score (**Appendix**) and malnutrition. Treatment history (chemotherapy, radiotherapy, and surgery), devices (central venous catheters, urethral catheters, drain tubes, stomach tubes, and colostomies), medications for symptom management (opioids, antipyretic analgesics, and steroidal anti-inflammatory drugs), and infections were also recorded. The fall risk assessment score was used to calculate the probability of falls by identifying fall-associated items on a scale of I to III. The specific procedures for patients with infection were as follows: the possible indications for the use of antibiotics, such as "treatment of infections" and "suspected infection", were first analyzed, as recorded in the patient's chart by the attending physician. Second, episodes of the use of anti-infective drug were identified, regardless of whether infection was or was not actually present, on the basis of information recorded. In this retrospective study, infection was identified on the basis of information recorded in the patients' charts. This information included site-specific diagnosis, presence of suggestive symptoms/signs, and positive bacteriologic cultures.

Statistical Analyses

To examine the correlation between infection and patient background (characteristics, treatment histories, devices and medical treatments), the Mann-Whitney U-test, the chi-square test, or Fisher's exact methods were used. Furthermore, patient factors with a P value <0.20 were used as independent variables for univariate analysis. The multiple logistic regression analysis was also used to analyze the effects of these factors. If a patient had more than 1 episode of infection, the most recent episode was used in the analysis. All analyses were performed with the Statistical Package for the Social Sciences(version 20.0, MAKER, LOCATION). The significance level was set at $P<0.05$.

Results

We obtained data on 95 patients during the study period (**Table 1**) The subjects were 58 men and 37 women with a mean age of 66±11 years. The most

Table 1 Patient Characteristics (n=95)

Age (mean ± SD)	66 ± 11 years
Sex	
Male	61% (n=58)
Female	39% (n=37)
Duration of hospital stay (mean ± SD)	49 ± 47 days
Cause of death	
Cancer	83% (n=79)
Infection	6% (n=6)
Other	10% (n=10)
Primary sites	
Stomach	23% (n=22)
Pancreas, bile duct	17% (n=16)
Liver	11% (n=10)
Colon, rectum	10% (n=9)
Neck	8.4% (n=8)
Esophagus	7.4% (n=7)
Uterus, ovary	6.3% (n=6)
Breast	5.3% (n=5)
Lymphoma, leukemia	3.2% (n=3)
Lung	2.1% (n=2)
Other	7.4% (n=7)
Medication use	
Opioids	90% (n=85)
Antipyretic analgesics	72% (n=68)
Steroidal anti-inflammatory drugs	41% (n=39)
Infection with patients	66% (n=63)

common cause of death was cancer (83%), whose primary sites were most often the stomach, pancreas, bile duct, and liver. Opioids were administered to 85 patients. Seventy-four (72%) patients received antipyretic analgesics. Steroidal anti-inflammatory drugs were prescribed for 39 patients (41%). Sixty-three patients (66%) had infections (**Table 2**).

Table 2 Sites of infection (n=73)

Respiratory	41% (n=30)
Blood	27% (n=20)
Urinary	14% (n=10)
Gastrointestinal tracts	8.2% (n=6)
Skin	5.5% (n=4)
Others	4.1% (n=3)

Factors that correlated significantly with infection, as shown with univariate analysis, were performance status, the fall risk assessment score, and central venous catheter (**Table 3**) Factors not significantly associated with infection were patient age or sex, bedsores, edema, ascites, dysphagia, nausea, malnutrition, treatment history, urethral catheters, drainage tubes, stomach tubes, colostomies, and medical treatments. Factors significantly correlated with infection, as shown with multiple logistic regression analysis, were the all risk assessment score (P<0.048) and central venous

Table 3 Patients With and Without Infection

	Patients with infection		P value
	Yes	No	
Total patients in group	66% (n=63)	34% (n=32)	
Age mean ± SD (median)	66 ± 11 (68)	64 ± 10 (66)	0.369
Gender			
Male	60% (n=38)	63% (n=20)	0.837
Female	40% (n=25)	38% (n=12)	
Performance Status			
2–3	44% (n=31)	72% (n=23)	0.035
4	45% (n=32)	28% (n=9)	
Bedsores	13% (n=9)	13% (n=4)	0.541
Edemas	42% (n=30)	44% (n=14)	0.721
Ascites	31% (n=22)	31% (n=10)	0.721
Dysphagia	23% (n=16)	9.4% (n=3)	0.065
Nausea	37% (n=26)	18% (n=13)	0.952
The assessment score sheet of falls			
1–2	54% (n=38)	84% (n=27)	0.017
3	35% (n=25)	16% (n=5)	
Malnutrition	56% (n=40)	47% (n=15)	0.121
Treatment histories			
Chemotherapy	24% (n=14)	9.4% (n=3)	0.101
Radiotherapy	14% (n=9)	13% (n=4)	0.541
Surgery	8.5% (n=6)	0.0% (n=0)	0.078
Devices			
Central venous catheters	54% (n=34)	28% (n=9)	0.017
Urethral catheters	48% (n=30)	28% (n=9)	0.068
Drain tubes	38% (n=24)	19% (n=6)	0.055
Stomach tubes	14% (n=9)	9.4% (n=3)	0.372
Colostomies	6.3% (n=4)	6.3% (n=2)	0.677
Medication use			
Opioids	70% (N=44)	72% (n=23)	0.837
Antipyretic analgesics	51% (n=32)	50% (n=16)	0.942
Steroidal anti-inflammatory drugs	18% (n=11)	28% (n=9)	0.228

Age was analyzed by Mann-Whitney U-test. The others were analyzed by Chi square test, or Fisher's exact. In all cases, tests of significance were two-tailed, P<0.05 indicated statistical significance.

Table 4 The factors of Patients With Infection using the multiple logistic regression analysis

	Odds ration	95% Confidence interval	P value
The assessment score sheet of falls	3.046	1.01 to 9.186	0.048
Central venous catheters	0.047	0.151 to 0.988	0.047

Multiple logistic regression analysis model Chi square test P<0.05

catheters (P<0.047) (**Table 4**).

Discussion

This study is, to our knowledge, the first to show that the fall risk assessment score is a risk factor for infection. As a result, we can now identify patients with an increased infection risk by evaluating the fall risk assessment score as well as performance status and the use of central venous catheters. The fall risk assessment score includes patient characteristics, such as age, activity, and excretion. As a result, the fall risk assessment score is extracted the possible risk factors for infection. Furthermore, catheter placement and poor performance status are possible risk factors for infection in hospitalized patients, as has been reported previously[4,10].

This study had several limitations. First, this study involved a chart review; therefore, some data may have been unavailable. Second, our institution is an acute care hospital, and subjects had been referred to the only patients of the palliative care team. Third, because diagnosing infection is difficult in patients receiving palliative care, some patients with infections might not have received anti-infective therapy.

Therefore, our selection of subjects may be biased. However, several studies have reported that 30% to 80% patients receiving palliative care at a hospice or a tertiary palliative care unit have at least 1 infection[2–4,6,9,11] and that the most common sites of infection are the respiratory tract, blood, and urinary tract[2–4]. Our results were similar to those of previous studies; therefore, the above limitations may not have affected our results.

In conclusion, our present study provides further evidence that the fall risk assessment score is a risk factor for infection. By monitoring the fall risk assessment score, performance status, and the use of central venous catheters, severe infections might be prevented in patients with cancer receiving palliative care.

Conflict of Interest: The authors declare no conflict of interest.

References

1. Inagaki J, Rodriguez V, Bodey GP: Causes of death in cancer patients. Am Society of Clin Oncol 1973; 33: 568–573.
2. Pereira J, Watanabe S, Wolch G: A retrospective review of the frequency of infections and patterns of antibiotic utilization on a palliative care unit. J Pain Symptom Manage 1998; 16: 374–381.
3. Vitetta L, Kenner D, Sali A: Bacterial infections in terminally ill hospice patients. J Pain Symptom Manage 2000; 20: 326–334.
4. Nakagawa S, Toya Y, Okamoto Y, et al.: Can anti-infective drugs improve the infection-related symptoms of patients with cancer during the terminal stages of their lives? J Palliat Med 2010; 13: 535–540.
5. Nagy-Agren S, Haley H: Management of infections in palliative care patients with advanced cancer. J Pain Symptom Manage 2002; 24: 64–70.
6. Oneschuk D, Fainsinger R, Demoissac D: Antibiotic use in the last week of life in three different palliative care settings. J Palliat Care 2002; 18: 25–28.
7. Takuma T, Genshu T, Mutsuki M, et al.: Autopsy Cases of Miliary Tuberculosis: Clinicopathologic Features Incliding Background Factors. J Nippon Med Sch 2011; 78: 305–311.
8. Phair JP, Riesing KS, Metzger E: Bacteremic infection and malnutrition in patients with solid tumors. Cancer 1980; 45: 2702–2706.
9. Lam PT, Chan KS, Tse CY, Leung MW: Retrospective analysis of antibiotic use and survival in advanced cancer patients with infections. J Pain Symptom Manage 2005; 30: 536–543.
10. Groeger JS, Lucas AB, Thaler HT, et al.: Infectious morbidity associated with long-term use of venous access devices in patients with cancer. Ann Intern Med 1993; 119: 1168–1174.
11. Homsi J, Walsh D, Panta R, Lagman R, Nelson KA, Longworth DL: Infections complications of advanced cancer. Support Care Cancer 2000; 8: 487–492.

Appendix　Fall Risk Assessment Score Sheet

Classification	Characteristics	Score	Patient's evaluation
A. Age	☐ Over 60 years ☐ Under 7 years	2	
B. Past medical history	☐ Experience of fall	2	
C. Functional disorder	☐ Paralysis or numbness ☐ Bone or join abnormality ☐ Edema or pain of Leg	3	
D. Activity	☐ Leg and muscle weakness ☐ Necessity of assistance for movement ☐ Light headedness ☐ Device placement	4	
E. Neurological function	☐ Cerebrovascular disorder ☐ Parkinson's disease ☐ Transient ischemic attack ☐ Epileptic seizure	2	
F. Sensation	☐ Visual disorder ☐ Hypacousia	1	
G. Cognitive function	☐ Dementia ☐ Restless behavior or clouded consciousness, or confusion ☐ Reduced ability to make a judgment and understand ☐ Reduced memorizing ability and difficulty in learning	4	
H. Drugs	☐ Sleep stabilizer or Analgesic or Tranquilizer ☐ Narcotic ☐ Chemotherapy ☐ Alcohol or Drug dependence ☐ Hypotensive diuretic or laxative	3	
I. Excretion	☐ Urinary or fecal incontinence ☐ Frequent urination ☐ Necessity of toilet assistance ☐ Use of toilet at night	3	
J. General condition	☐ Fever ☐ Anemia ☐ Dizziness	2	
Note		Total	
		Risk level	

*Scores by category are given to A to J.
Risk level and total score
Risk level I (0–6 points): Falls may occur.
Risk level II (7–17 points): Falls are likely to occur.
Risk level III (18 or higher points): Falls frequently occur.

(Received,　October　3, 2013)
(Accepted, November 14, 2013)