Outcome Of Pediatric Oncologic Patients in the Respiratory Intensive Care Unit : Siriraj Hospital

CHAKRAPHAN SUSIVA, M.D.*,
SRIASSANCEE KEERATIRUANGRONG, M.D.*

Abstract

Objectives : To review the characteristics and outcome of patients with childhood malignancy requiring respiratory intensive care treatment and to assess the outcome of these patients.

Design : Retrospective review of 22 oncological patients admitted to the pediatric respiratory intensive care unit between January 1, 1996 and December 31, 1998 (total 3 years.)

Results : The overall survival at discharge from the intensive care unit was 10 out of 22 (45%). The mean age of the patients was 4 years 5 months old (range 1 month to 14 years). Male : Female ratio was 1.2 : 1. 21 patients had fever. All patients with a systemic or respiratory infective illness were neutropenic with a positive hemoculture in 17 out of 21 (81%) and 10 out of 20 (50%), respectively. The most common organisms detected were coagulase negative *Staphylococcal aureus* and *Escherichia Coli*. Sputum culture in the respiratory failure group was positive in 3 out of 7 patients, all of them grew *Pseudomonas aeruginosa*. Antibiotics were given to all oncological patients presenting with fever. The most common antibiotics administered were Ceftazidime, Amikacin and Imipenem. Fourteen patients needed mechanical ventilation. 11 of these 14 patients had respiratory tract infections, 1 patient had acute respiratory distress syndrome and the remainder were in a coma as a result of brain metastasis. Only 2 of them survived. The mean duration of stay in the respiratory intensive care unit was 10.9 days.

Conclusions : There has been an improvement in the survival of oncology patients admitted to the intensive care unit especially for those with either a systemic or respiratory infection. Early and full intensive care treatment should be provided for these patients in order to improve the outcome.

Key word : Intensive Care, Oncology, Infection, Survival

SUSIVA C & KEERATIRUANGRONG S
J Med Assoc Thai 2002; 85 (Suppl 2): S564-S568

* Department of Pediatrics, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700,Thailand.

Recent developments, using intensive chemotherapeutic treatment regimens, have led to an increase in survival of children with malignancies (1-4). However, after such treatment, patients have a greatly increased susceptibility to infection, especially septicemia, and may require admission to a pediatric intensive care unit (PICU) for supportive treatment. Other indications for admission to the PICU include the direct effect of the malignant disease on organ function, drug toxicity, metabolic complications such as the tumor lysis syndrome(5) and life threatening hemorrhage associated with severe thrombocytopenia. Admission to an intensive care unit with all the necessary support infrastructure is usually considered essential for good outcome. But mortality among pediatric oncology patients with acute illness remains high especially in those with systemic or respiratory infection.

In 1988 a study reported a mortality of more than 84 per cent in children with either respiratory failure requiring ventilation, or those who had circulatory failure needing inotropic support(6). They suggested that either treatment should be improved significantly or that intensive care doctors should be realistic and advise parents and physicians accordingly of the high risk involved. In 1992 Heney et al reported a mortality of 100 per cent in children with systemic infection requiring ventilation and advised against ventilation for such patients(7).

The aim of our study was to review the characteristics and outcome of patients with childhood malignancy requiring intensive care treatment in the pediatric respiratory intensive care unit (PRCU) and to report on the recent survival trends of patients with childhood malignancies in Thailand who were admitted to our PRCU.

PATIENTS AND METHOD

This was a retrospective review of pediatric oncology patients who were admitted to the PRCU at Siriraj Hospital between January 1, 1996 and December 31,1998. Patients were admitted to the PRCU for neurological, cardiovascular and/or respiratory support but occasionally for invasive monitoring. The oncologists ensured uniformity in the treatment provided by having standard policies for the management of all oncologic malignancies and their complications. The list of oncology patients admitted to the PRCU was obtained from the PRCU admissions book. Data were collected from the hospital records, which detailed each patient's personal details, diagnosis, previous treatment, reason for admission to the PRCU, treatment received in the PRCU, and outcome. Patients were categorised as non-survivors and survivors depending on the outcome at the time of leaving the intensive care unit.

RESULTS

There were 22 oncological patients admitted to the PRCU during the study period, comprising 12 boys and 10 girls, with a mean age of 4.5 years (range, 1 month to 14 years). Male : Female ratio was 1.2 : 1. The underlying oncologic diagnoses are shown in Table 1. There were 21 patients with fever and only one without. The overall survival at discharge from the PRCU was 10 out of 22 (45%). 21 patients were admitted with an infective illness (systemic or respiratory) and 17 of them had neutropenia. There was a positive hemoculture in 10 out of 20 patients. The most common organisms detected were coagulase negative *Staphylococcal aureus* and *Escherichia Coli*. Sputum Cultures in the respiratory failure groups was positive in 3 out of 7 patients, all of them grew *Pseudomonas aeruginosa*. Survival in relation to febrile neutropenia and respiratory failure patients is shown in Table 2 and 3. Out of 21 patients who had systemic infection, 10 survived, whereas only 2 of the 12 patients admitted with respiratory failure survived. The quantity of antibiotics used ranged from 2 to 12 items. The majority of the antibiotics prescribed were Ceftazidime, Amikacin and Imipenem. The average cost of the antibiotics used was 40,420 baht/person. Fourteen patients needed mechanical ventilation. 11 of these 14 patients had respiratory tract infections, 1 patient had acute respiratory distress syndrome and the remainder were in a coma as a result of tumor metastases and intracranial hemorrhage and only 2 of them survived. The length of stays in the PRCU was between 2-104 days (average 10.9 days).

DISCUSSION

Over the past three decades the outlook for children with malignancy has improved dramatically so that 60-70 per cent are now expected to become long term survivors(1-4). Such improvement has resulted from increasingly intensive and sustained chemotherapy. One of the most serious consequences of this is an increase in myelosuppression and immunosuppression, with a risk of life threatening infection. Over the past 15 years several groups have reported the outcome of patients with malig-

Table 1. The underlying oncologic diagnoses.

Diseases	Number		
	Male	Female	Total
Acute lymphoblastic leukemia	3	6	9
Acute non-lymphoblastic leukemia	3	1	4
Lymphoma	4	2	6
Neuroblastoma	1	1	2
Malignant histiocytosis	1	-	1
Total	12	10	22

Table 2. Survival in relation to febrile neutropenia.

Conditons	Survival	Non-survival	Total
Febrile with neutropenia	7	10	17
Febrile without neutropenia	3	1	4
Total	10	11	21

Table 3. The survival in relation to respiratory failure.

Conditions	Survival	Non-survival	Total
With respiratory failure	2	10	12
Without respiratory failure	8	2	10
Total	10	12	22

nant disease admitted to intensive care units for treatment. Unfortunately, most of these studies were on adults[8-10] and only a few have reported the outcome in children[6,7,11,12].

The present study shows the use of the PRCU service over the past 3 years and highlights the pattern of the patients. The overall survival in the present series was 45 per cent which is lower than the 52 per cent and 51 per cent reported by Butt et al and Heney et al, respectively[6,7]. In addition, the survival rate for ventilated patients in the present study was only 2 of 12 patients (16%) compared with Keengwe et al[11] who found an overall survival for ventilated patients of 41 per cent. Patients with an infective illness requiring ventilation had the lowest survival rate but this is an improvement compared to the results of Heney et al [7] who reported no survival for a similar category of patients. He advocated treatments other than ventilation for these children because of the very poor outcome. The present study is similar to that of Butt et al[6] who reported a low survival (< 16%) in patients with respiratory failure requiring ventilation. Therefore, the survival of oncology patients with an infective illness who need ventilation in our unit is very low.

Most of the patients in the present study were very sick. 21 patients had a fever and only one was afebrile. 17 out of 21 patients with a systemic or respiratory infective illness were neutropenic in and 10 out of 20 had a positive hemoculture. The most common organisms detected were coagulase negative *Staphylococcal aureus* and *Escherichia Coli*. Sputum culture in the respiratory failure group was positive in 3 out of 7 patients, all of them grew *Pseudomonas aeruginosa*. Antibiotic treatment was

given to all oncologic patients with fever. The most commonly prescribed antibiotics were Ceftazidime, Amikacin and Imipenem. These children required many drugs and intensive support. This was expensive and time consuming and even with this intensive support, the survival rate for patients with respiratory failure and infection was still low.

Several factors may be responsible for improved survival, including the development of pediatric intensive care units and an awareness by physicians of the improved long term survival of children with cancer, and the consequent need for acute early and urgent support of these patients. Early management of sepsis using an aggressive antimicrobial, fluid, and inotropic agent, coupled with the use of granulocyte colony stimulating factor, might have contributed to the improvement in outcome(11).

Restrictions have to be placed on the use of the pediatric intensive care unit, not just for logistical and financial reasons(13), but because a realistic and compassionate approach is needed to avoid causing unnecessary suffering and anguish for the patient and family when the outcome is likely to be unfavorable(14). Close cooperation between the oncology and the intensive care teams will allow the care that is most appropriate for the child in close cooperation with the family. Early and full intensive care treatment should be provided for those patients who have a chance of survival. A holistic and cost effectiveness approach should be taken by all doctors caring for these patients.

SUMMARY

There has been an improvement in the survival of oncology patients receiving intensive care treatment. The authors recommend early and aggressive intensive care management for such patients who have a reasonable chance of survival in order to maximise the outcome. Information and counselling should always be given to their parents. Whether new experimental treatments will improve the outcome of such patients remains to be seen.

(Received for publication on February 1, 2002)

REFERENCES

1. Birch JM, Marsden HB, Morris Jones PH, et al. Improvements in survival from childhood cancer: Results of a population based survey over 30 years. BMJ 1988; 296: 1372-6.
2. Stiller CA. Population based survival rates for childhood cancer in Britain, 1980-91. BMJ 1994; 309: 1612-6.
3. Blair V, Birch JM. Trends in survival from childhood cancer in the North West of England, 1954-1989 Med Pediatr Oncol 1994; 23: 174.
4. Pui CH. Childhood leukemias. N Engl J Med 1995; 332: 1618-30.
5. Stokes DN. The tumour lysis syndrome: Intensive care aspects of paediatric oncology. Anaesthesia 1989; 44: 133-6.
6. Butt W, Barker G, Walker C, et al. Outcome of children with haematologic malignancy who are admitted to an intensive care unit. Crit Care Med 1988; 16: 761-4.
7. Heney D, Lewis IJ, Lockwood L, et al. The intensive care unit in paediatric oncology. Arch Dis Child 1992; 67: 294-8.
8. Hauser MJ, Tabak J, Baier H. Survival of patients with cancer in a medical critical care unit. Arch Int Med 1982; 142: 527-9.
9. Lloyd-Thomas AR, Dhaliwal HS, Lister TA, et al. Intensive therapy for life-threatening complications of haematological malignancy. Intensive Care Med 1986; 12: 317-24.
10. Lloyd-Thomas R, Wright I, Lister TA, et al. Prognosis of patients receiving intensive care for life-threatening complications of haematological malignancy. BMJ 1988; 296: 1025-9.
11. Keengwe IN, Stansfield F, Eden OB, et al. Paediatric oncology and intensive care treatments: Changing trends Arch Dis Child 1999; 80: 553-5.
12. Siven Y, Schwartz PH, Schonfeld T. et al. Outcome of oncology patients in the Pediatric Intensive Care Unit. Intensive Care Med 1991; 17: 11-5.

13. Turnbull AD, Graziano C, Baron R, et al. The inverse relationship between cost and survival in the critically ill cancer patient. Crit Care Med 1979; 7: 20-3.

14. Hays DM, Hoffman KI, Williams KO, et al. Effects of intensive clinical exposure on attitudes of medical students toward cancer related problems. Cancer 1985; 55: 636-42.

ผลการรักษาผู้ป่วยเด็กโรคมะเร็งในหออภิบาลโรคระบบการหายใจ : โรงพยาบาลศิริราช

จักรพันธ์ สุศิวะ, พ.บ., ศรีอัศนีย์ กีรติเรืองรอง, พ.บ.**

เป็นการศึกษาเพื่อรวบรวมข้อมูลและผลการรักษาผู้ป่วยเด็กกลุ่มโรคมะเร็งที่ได้รับการรักษาในหออภิบาล RCU ภาควิชากุมารเวชศาสตร์ คณะแพทยศาสตร์ ศิริราชพยาบาล เพื่อเป็นแนวทางการรักษาผู้ป่วยอาการหนักกลุ่มนี้ โดยเป็นการศึกษาย้อนหลัง ผู้ป่วยทั้งหมด 22 ราย ที่รับไว้รักษาในหออภิบาล RCU ตั้งแต่วันที่ 1 มกราคม พ.ศ. 2539 ถึง วันที่ 31 ธันวาคม พ.ศ. 2541 รวมเวลา 3 ปี พบว่ามีผู้ป่วยจำนวน 10 รายในจำนวน 22 ราย (ร้อยละ 45) สามารถจำหน่ายจากหออภิบาล RCU นี้ได้ ผู้ป่วยมีอายุเฉลี่ย 4 ปี 5 เดือน (อายุตั้งแต่ 1 เดือน ถึง 14 ปี) มีอัตราส่วนเพศชายต่อเพศหญิง 1.2 : 1 ผู้ป่วยมี ไข้ จำนวน 21 ราย ไม่มีไข้ จำนวน 1 ราย ผู้ป่วยที่มีไข้ จำนวน 21 รายมีภาวะ febrile neutropenia 17 ราย (ร้อยละ 81) และได้ทำการเพาะเชื้อในเลือด 20 ราย พบว่ามีเชื้อขึ้น 10 ราย (ร้อยละ 50) โดยเชื้อที่พบบ่อยที่สุด คือ *Staphylococcal aureus* coagulase negative และเชื้อ *Escherichia Coli* การเพาะเชื้อในเสมหะจำนวน 7 ราย พบเชื้อ 3 รายพบว่าเป็นเชื้อ *Pseudomonas aeruginosa* ทั้งหมด ได้ให้ยาปฏิชีวนะในการรักษาผู้ป่วยทุกรายที่มีไข้ยาที่นำมาใช้บ่อย คือ Ceftazidime, Amikacin และ Imipenem มีผู้ป่วยที่ต้องใช้เครื่องช่วยหายใจในการรักษาจำนวน 14 ราย ซึ่งมีสาเหตุจากการติดเชื้อทางการหายใจ 11 ราย ภาวะ acute respiratory distress syndrome 1 ราย ภาวะ coma 2 ราย มีผู้ป่วยเพียง 2 รายในจำนวนนี้ที่รอดชีวิต ระยะเวลาในการรับการรักษาในหออภิบาล RCU เฉลี่ย 10.9 วัน กล่าวได้ว่าการรักษาผู้ป่วยโรคมะเร็งในเด็กที่มีอาการหนักในอภิบาล มีผลการรักษาค่อนข้างดีเมื่อเปรียบเทียบกับการรักษาในอดีต ผู้ป่วยกลุ่มนี้จึงควรได้รับการรักษาอย่างเต็มที่ต่อเนื่องในหออภิบาล

คำสำคัญ : การรักษาในหออภิบาล, โรคมะเร็ง, ภาวะติดเชื้อ, การรอดชีพ

จักรพันธ์ สุศิวะ, ศรีอัศนีย์ กีรติเรืองรอง
จดหมายเหตุทางแพทย์ ฯ 2545; 85 (ฉบับพิเศษ 2): S564–S568

* ภาควิชากุมารเวชศาสตร์, คณะแพทยศาสตร์ศิริราชพยาบาล, มหาวิทยาลัยมหิดล, กรุงเทพ ฯ 10700