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Investigation of Common Catheter Infections in Bone Marrow Transplant Patients in Baqaei 2 Hospital, Ahvaz

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Abstract

Background: Bone marrow transplant patients often rely on catheters for various medical procedures, including administering medications and taking blood. However, catheters can sometimes lead to complications and infections that can significantly affect a patient's overall health and recovery.

Objective: The purpose of this article is to investigate the common catheter-related infections in bone marrow transplant patients at Bagai 2 Ahvaz Hospital. This study seeks to increase our understanding of catheter-related issues and improve patient outcomes in the field of bone marrow transplantation by examining diagnostic methods, treatment strategies, and preventive measures.

Material and methods: This research is retrospective, the study population includes all patients who had a bone marrow transplant in the period of 2021-2022 and were hospitalized in Beqai 2 Hospital. By referring to the microbiology department of Bagai 2 Hospital, the result of the catheter culture of all patients who received bone marrow transplants and the isolation of bacteria according to standard microbiological culture (cultivation in BA medium and nutrient agar medium, (Cetrimide agar base)) It was completed in the checklist created by the researcher. Finally, the data was analyzed using SPSS software and the rate of catheter infection and other factors related to it were analyzed using *Chi-square* statistical test.

Findings: In the period of 2021-2022, the number of transplanted patients (children/adults) was 138. The age range of the patients was from 4 to 69 years. The average hospitalization during two years was equal to 23.04. Hodgkin's patients were 23.08%, AML and neuroblastoma were 15.38%, multiple myeloma was equal (23.08%), ALL and PCSNSL and thalassemia major were 7.7% each. The prevalence of positive cultures in 2021, was zero and in 2022, it was 8.30% (38.47-0.002%) which was seen in a 52-year-old patient with diabetes.

Conclusion: Underlying diseases such as diabetes in patients who receive bone marrow transplants can play an important role in catheter infections.

Keywords: Human; Bone marrow transplants; Catheters; Risk factor; Neuroblastoma

Introduction

Catheters play an important role in the treatment and care of bone marrow transplant patients. These patients often require long-term intravenous access for chemotherapy, blood transfusions, and drug administration. Catheters are a convenient and efficient way to deliver these treatments directly to the bloodstream and eliminate the need for frequent needle placement [1].

Although catheters have many advantages, they can also be associated with certain complications. Common catheter-related problems in bone marrow transplant patients include infection, obstruction, and thrombosis, which significantly affect patient treatment, prolong hospital stay, and increase healthcare costs. Therefore, taking care of the catheterization of patients is necessary to ensure the improvement of the treatment procedures of these vulnerable patients [2].

Catheter-related infections are a significant concern in bone marrow transplant recipients. These patients are more susceptible to infection due to their weak immune system and long-term hospitalization [3]. Bacterial and fungal organisms can cause infections and can even spread to the bloodstream. Early diagnosis and proper management of these infections are very important to prevent serious complications [4]. Catheter occlusion

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occurs when blood clots, debris, or other drug substances block the catheter channel, which can disrupt the flow of medications and fluids and cause delays in treatment and the need to remove or replace the catheter. Preventive measures, such as regular flushing and the use of anti-coagulants, can reduce the incidence of blockages. Catheter-related thrombosis refers to the formation of blood clots in or around the catheter. This condition can disrupt blood flow, increase the risk of infection, and lead to potentially life threatening events, such as pulmonary embolism. Therefore, patients with catheters should be carefully examined for signs and symptoms of infection, obstruction or thrombosis [5,6]. Laboratory cultures play an important role in the investigation of catheter-related infections. Using a catheter blood sample and its culture in environments such as BA, a possible infection is investigated. Some of the most common catheter-related infections are: Bloodstream infections, urinary tract infections, and skin infections around the catheter site [7,8].

Materials and Methods

This study is retrospective and has been approved by the research code: Th-0207, and ethical code IR.AJUMS.MEDICINE.REC.1402.053, at Jundishapur University of Ahvaz the studied population includes all patients who had bone marrow transplant in the period of 2021-2022, and were hospitalized in Beqai 2 hospital. By referring to the microbiology department of Beqai 2 hospital, the result of catheter culture of all patients who received bone marrow transplant and the isolation of bacteria according to standard microbiological methods (cultivation in BA medium and nutrient agar medium, (Cetrimide agar base)) is in the Czech Republic. The check list made by the researcher, including: Age, gender, type of malignancy, length of hospitalization and the result of culture was completed. In this study, the data were reported using descriptive statistics including mean, standard deviation, frequency and frequency percentage. To check the relationship between the variables, two independent sample t-test and *Chi-square* as well as logistic regression were used. Kolmogorov-Amirnov test was used to check the hypothesis of normality of the data. The descriptive coefficient test and data analysis were done using SPSS version 23 software.

Results

In the period of 2021-2022, the number of transplanted patients (children/adults) was 138. The age range of the patients was from 4 to 69 years. All patients were alive during this study. The average stay of patients during two years was equal to 23.045. This average was 24.69 days in 1400 and 20.7 days in 2022. The average for adults in 2021, was 29.3 days and for children 23.3 days. The average for adults in 2021, was both 20.7. The average age of adults was 45.7 years and the average age of children was 6.3 years, and the total average age was 36.15 years in 2021. The average age of adults was 45.7 and the average age of children was 10.7 years, and the average age of the total was 43.7 in 2022. Hodgkin's patients were 23.08%, AML and neuroblastoma were 15.38%, multiple myeloma was 23.08%, ALL and PCSNSL and thalassemia major were 7.7% each. The prevalence of positive culture in 1400 was zero and in 2022, it was (0.002-38.47) percent.

The average length of hospitalization of the patients is 23.045 days with a standard deviation of 4.942. The minimum hospitalization period of patients is 16 days and the maximum hospitalization period is 32 days.

Descriptive indicators of the length of hospitalization of bone marrow transplant patients referred to Baqaei 2 Ahvaz Hospital based on the type of cancer, according to the results of the type of cancer, the minimum length of hospitalization in ALL patients is 19 days, in AML patients it is 24 days, in Hodgkin patients it is 25.6 days in multiple myeloma patients was equal to 19.6 days and in PCNSL patients the hospitalization period was equal to 18 days (Table 1).

Table 1: Descriptive indicators of the length of hospitalization in patients based on the type of cancer.

Maximum amount	Minimum amount	Standard deviation	Average	Type of cancer	Variable
19	19	-	19	ALL	Length of hospitalization
25	23	1.414	24	AML	
31	20	4.844	25.667	Hodgkin	
25	17	3.445	19.667	MM	
18	18	-	18	PCNSL	

In the two-year review, only one case, catheter culture, was positive. The presence of Staphylococcus epidermidis bacteria was confirmed. Bacterial coagulase test was negative. The patient was a 52-year-old man with Hodgkin's lymphoma [9].

Discussion

Bone Marrow Transplant (BMT) recipients are susceptible to bacterial, viral, and fungal infections. Bacterial infection is considered as one of the common and serious side effects in bone marrow transplant recipients [10]. This study was conducted

with the aim of investigating common catheter infections in bone marrow transplant patients referred to Ahvaz Begai 2 hospital.

The minimum hospitalization period of the patients was 16 days and the maximum hospitalization period was 32 days. The highest frequency of cancer type was in Hodgkin and multiple myeloma patients, and the length of hospitalization in these patients was 25.6 and 19.6 days, respectively. The lowest length of hospitalization was seen in PCNSL and the highest length of hospitalization was seen in Hodgkin type. According to the Godara study conducted in 2021 to investigate the length of stay and hospital costs for patients undergoing allogeneic stem cell transplantation, between 2002 and 2015, 68,296 hospitalizations for allo-HSCT were identified. The average stay was 25.8 days, and the overall mortality rate of hospitalized patients was 8%. The source of prognostic stem cells plays a significant role in patient length of stay, for example for cord blood (median, 36.9 days) compared to bone marrow (median, 27.2 days) and for peripheral blood (median, 25.4 days). Other Predictive factors for longer hospitalization were patient characteristics such as age and race, transplant/post-transplant characteristics, and complications such as the use of total body radiation therapy, acute graft versus host disease, and infections [11].

In this study, in only one case, from the catheter culture, the positive result and the presence of Staphylococcus epidermidis bacteria was confirmed, but the bacterial coagulase test was negative. The patient was a 52-year-old person with Hodgkin's lymphoma and diabetes. According to the research of Afsharian et al., in 2021, in a systematic review study titled frequency of infectious agents after bone marrow transplantation in different regions of Iran (1380-1396), in total, 11 studies on infectious agents after bone marrow transplantation were identified became six studies in Tehran, three studies in Shiraz and Mashhad and Semnan provinces were the location of two separate studies. The majority of case studies identified viral agents (54.5%; 6n=), followed by fungal infectious agents (27.3%; 3n=) and bacterial agents (18.2%; 2n=). Gram-positive bacteria (bacterial agents), cytomegalovirus (viral agents), and Candida and Aspergillus (fungus) were the most frequent after bone marrow transplantation [12].

In venous catheters, most of the organisms that cause bacteremia are usually present in the skin as normal flora, such as coagulase-negative staphylococci [13]. It is usually difficult to determine the clinical significance of a positive blood culture for Quag-Lase-negative staphylococci in a non-neutropenic patient population. Many physicians have traditionally considered growth in blood cultures only as a risk factor and refrained from empiric treatment in the absence of other signs of infection. Attempts have been made to correlate this theory with the onset of clinical symptoms but with little success [14].

Conclusion

Bone marrow transplant can have many risks. Some people experience minimal problems after this procedure. While others have serious complications and need to be hospitalized for treatment. Sometimes the complications of bone marrow transplantation threaten the recipient's life. These risks and complications depend on many factors, including the disease or condition for which the transplant was performed. Also, the type of transplant, age and general health of the patient are effective in causing complications.

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