

# Physiological problems in patients undergoing autologous and allogeneic hematopoietic stem cell transplantation

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## ABSTRACT

**Objective:** Stem cell transplantation is usually performed in an effort to extend the patient's life span and to improve their quality of life. This study was conducted to determine the postoperative physiological effects experienced by patients who had undergone autologous and allogeneic stem cell transplantation. **Methods:** The research is a descriptive study conducted with a sample of 60 patients at Stem Cell Transplantation Units in Ankara. Percentile calculation and chi-square tests were used to evaluate the data. **Results:** When a comparison was made between patients who had undergone allogeneic Hematopoietic stem cell transplantation (HSCT) and those who had undergone autologous HSCT, results indicated that problems occurred more often for the allogeneic HSCT patients. The problems included: Digestion (94.3%),

dermatological (76.7%), cardiac and respiratory (66.7%), neurological (66.7%), eye (56.7%), infections (26.7%) and Graft Versus Host Disease (5 patients). Furthermore, the problems with pain (50%), numbness and tingling (40%), and speech disorders (3 patients) were observed more often in autologous BMT patients. **Conclusion:** Autologous and allogeneic patients experienced most of physical problems due to they receive high doses of chemotherapy. Therefore, it is recommended that an interdisciplinary support team approach should be used to help reduce and manage the problems that may arise during patient care.

**Key words:** Autologous, allogeneic, hematopoietic stem cell, transplantation, physiological problems

## Introduction

Hematopoietic stem cell transplantation (HSCT) is the transplantation of multipotent hematopoietic stem cells, peripheral blood, or umbilical cord blood. The two main types of stem cell transplants are autologous and allogeneic. The stem cells are taken either from the patient or from a donor whose tissues are compatible with the patient and these

are then transplanted into the patient. Hematopoietic stem cells collected from a healthy donor and transplanted into a recipient is called an allogeneic stem cell transplantation. Autologous stem cell transplantation refers to stem cells that are collected from a patient and given back to that same individual.<sup>[1,2]</sup> Stem cell transplantation is usually performed in an effort to extend the patient's life span and to improve their quality of life. However, complications experienced after the treatment of stem cell transplantation may result in severe physiological, psychological, social and economic problems for the patient.<sup>[3,4]</sup>

The protocol of peripheral stem cell transplantation is a therapeutic approach whose side effects can negatively affect human life. So the patient undergoing HSCT experienced some life-threatening physical problems, such as leukopenia,

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thrombocytopenia, anemia, fatigue, infection, mucositis, and gastrointestinal changes, etc. may occur early during therapy due to bone marrow suppression. These side effects are negative impact on the recovery and treatment success. These side effects can result in patient death.<sup>[3,5,6]</sup>

Watson, *et al.* who evaluated three groups receiving chemotherapy and undergoing autologous and allogeneic stem cell transplantation, found that 75% of the patients had emotional problems, 41% had physical problems, 56% had social difficulties, and 35% had lost confidence and had become uncertain of their role in life, such as that of mother or father.<sup>[5]</sup> The same study reported that the patients undergoing allogeneic transplantation experienced more of these problems when compared with those receiving chemotherapy and the autologous transplantation.

This study was conducted to identify physiological problems which can develop in the post-transplantation period in patients undergoing autologous and allogeneic HSCT. We also wanted to compare the differences between the autologous and allogeneic HSCT patient groups regarding any problems or complications after their transplants.

## Material and methods

### Clinical data

The study population consisted of all the centers in which stem cell transplantations are performed within the provincial borders of Ankara. The study was cross-sectionally designed, and the patients undergoing stem cell transplantation between 30 December 2004 and 30 July 2005 and complying with the sample characteristics were included in the study. Sixty-nine patients were accepted into the study, and nine patients were excluded from the sample. Those excluded were two patients who could not speak Turkish, two patients who were intubated, and five patients who had died (because of complications of treatment). Thus, 60 patient samples were generated for two groups. Based on the relevant literature,<sup>[2,3,5]</sup> the researchers prepared a questionnaire covering definitive patient characteristics. The research data were collected using this questionnaire and another related to patients' problems with SCT on 30th day after BMT. The research data were collected by face-to-face interviews with the patients. The SPSS Release 11.5 (Statistical Package for Social Sciences) program was used to analyze the data. Percentile calculation and chi-square tests were used in the statistical evaluation of data.

### Ethical considerations

Participants were informed about the study in writing and verbally by the primary researcher and given the opportunity to ask any questions concerning participation. Participants were guaranteed anonymity and assured that the findings would be used solely for research purposes.

### Limitations of the study

It was determine the postoperative physiological effects experienced by patients who had undergone autologous and allogeneic stem cell transplantation on 30 days after HSCT in this study.

## Results

Forty percent of the patients included in the autologous group were between 44 and 67 years of age; 66.7% were male; 73% were married; 26.7% were university graduates [Table 1]. The autologous group had 76.7% of patients who had been diagnosed with lymphoma, and 36.7% of those in the autologous group had been coping with their disease for between 0 and 11 months. Most of patients received information about their disease and the transplantation process at the time of transplantation and 86.7% received information after the transplantation. During the post-transplantation period nurses were the source of information for 50% of the patients. All patients were given pre-transplantation therapy and 83.3% were discharged from hospital before the 30th day (because their symptoms did reduce and they feel well enough to be discharged).

Fifty percent of the patients in the allogeneic group were between 18 and 30 years of age; 63.3% were male; 63.3%

**Table 1: The demographic characteristics of the patients according to the type of transplantation**

Characteristics	Autologous No. (%)	Allogeneic No. (%)
Age, yrs		
18-30	7 (23.3)	15 (50.0)
31-43	11 (36.7)	8 (26.7)
44-67	12 (40.0)	7 (23.3)
Gender		
Female	10 (33.3)	11 (36.7)
Male	20 (66.7)	19 (63.3)
Marital status		
Married	22 (73.3)	19 (63.3)
Single	8 (26.7)	11 (36.7)
Education level		
Primary School	4 (13.3)	6 (20.0)
Secondary School	5 (16.7)	3 (10.0)
High school	13 (43.3)	10 (33.3)
University	8 (26.7)	11 (36.7)

were married; 3.7% were university graduates [Table 1]. Acute leukemia had been diagnosed in 36.7% of patients in the allogeneic group, and 46.7% of these patients had been coping with their diagnosis for between 0 and 11 months. All patients received pre-transplantation therapy and 66.7% were discharged from hospital before the 30th day (33.3% were discharged from hospital after the 30th day because of GNHD and other complications).

Most of patients were informed about their disease and the transplantation process before the transplantation. During the post-transplantation period nurses were the source of information for 51.2% of the patients. Most of patients received pre-transplantation therapy and 66.7% were discharged from the hospital before the 30th day. Table 2 shows problems which can develop in the post-transplantation period in autologous and allogeneic patients. Alopecia occurred in all patients belonging to the autologous group. Gastrointestinal tract problems were found in 86.7% of the patients (such as problems mouth and throat dryness, hypergeusia, nausea and vomiting).

Dermatological problems were encountered by 63.3% of the patients (such as skin dehydration, skin color variations, itching, edema and pustules). Cardiac and respiratory problems were also found in 60% of the patients (fatigued, palpitations, dyspnea, cough and patients needed to rest with two pillows). Changes in weight were noticed by 56.7% of the patients, and 36.7% felt these changes were associated with anorexia. Half of the patients had problems with the nervous system and pain which of them felt was bone pain related to the growth factor [Table 2]. Our study revealed that alopecia occurred in the entire allogeneic group. Most of the patients had gastrointestinal (such as mouth and throat dryness, hypergeusia, nausea and vomiting). Dermatological problems were found in 76.7% of the patients (such as skin dehydration, skin color variations,

itching, edema and pustules). Cardiac and respiratory problems were also monitored and noted in 66.7% of the patients (fatigue, dyspnea, cough and patients needed to rest with two pillows). Half of the patients noted changes in their weight; and 40% felt that the weight changes were associated with anorexia. In the groups, the infection rate was approximately 30%; mostly fungal pneumonia due to aspergillus developed in both of the groups [Table 2].

## Discussion

It has been noted that alopecia and digestion problems occur more commonly among allogeneic and autologous transplantation patients [Table 2]. Such as abnormal taste sensation, nausea, vomiting and stomach pain are observed at higher rates among allogeneic transplant patients when compared to autologous transplantation patients. The preparation regimen is the main reason for the development of these complications. The immunosuppressive medications that are used for Graft Versus Host Disease (GVHD) prophylaxis in the preparation regimen negatively affect the mucosal regeneration and cause mucositis.<sup>[7,8]</sup> Cutler, *et al.* determined that 75% of the patients who have undergone allogeneic stem cell transplantation developed mucositis due to the high doses of chemotherapy.<sup>[8]</sup> The study of Fallows, *et al.* determined that among patients who undergo stem cell transplantation 70% had vomiting and 58.8% had diarrhea.<sup>[9]</sup> Other studies showed same results.<sup>[10-12]</sup> Our study also showed similar to other studies.

Our study indicated a higher rate of dermatological problems among allogeneic transplantation patients compared to autologous transplantation patients [Table 2]. These problems were mostly skin dryness, skin pigmentation changes, pruritus, edema and acne. As the effects of GVHD on skin are dryness, pruritus and erythema, the patients who undergo allogeneic transplantation are believed to have a higher risk of developing complications. The two groups together have a 50% chance of developing skin dryness, which corresponds with the complications of high dose chemotherapy.<sup>[13,14]</sup> The allogeneic group displayed higher rates of cardiac and respiratory problems than autologous transplantation patients [Table 2]. These problems included palpitations, dyspnea, use of double pillows, rapid onset of fatigue, and cough. Watson, *et al.* determined that 32% of the autologous and 55% of the allogeneic transplantation patients had a cough.<sup>[8]</sup> Our study showed similar results to that of Watson, *et al.* in that the rate of cough was higher among the allogeneic transplantation patients. Since the preparation regimen causes inflammatory reaction and

**Table 2: Physiological problems of the patients undergoing autologous and allogeneic HSCT (30th day after HSCT)**

Problems	Autologous No. (%)	Allogeneic No. (%)
Alopecia	30 (100.0)	30 (100.0)
Menstrual Irregularity* (Autologous:10, Allogeneic:11)	9 (90.0)	8 (72.8)
Gastrointestinal problems	26 (86.7)	28 (94.3)
Dermatological problems	19 (63.3)	23 (76.7)
Cardiac and respiratory problems	18 (60.0)	20 (66.7)
Weight changes	17 (56.7)	16 (53.3)
Pain	15 (50.0)	12 (40.0)
Eye problems	14 (46.7)	17 (56.7)
Infection	7 (30.4)	8 (26.7)

\*Percent is for females

interstitial thickening, patients develop hacking cough and dyspnea; in fact, these problems can progress to pulmonary insufficiency. Dyspnea, and cough in both groups can be due to the harsh effects of the preparation regimen on the respiratory system.<sup>[15]</sup> Literature determined that stem cell transplantation patients experienced weakness.<sup>[10,16]</sup> The rate of weakness and fatigue observed in our study are similar to other studies. Both patient groups had similar weight change rates. Patients reported a loss of appetite as the reason for changes in their weight. Preparation regimens cause mucosal damage and initiate problems as nausea and vomiting, mucositis and enteritis.<sup>[9,17]</sup>

Half of the patients in the autologous group had pain after the transplantation [Table 2]. Bone pain was determined as more prevalent in the autologous group and abdominal pain in the allogeneic group. It has been suggested that bone pain might develop due to growth factor complications; stomach pain may be due to diarrhea and GVHD, and back ache may arise from a continuous prone position due to weakness. Lymphoma patients might develop pain because of the tumor compression.<sup>[18]</sup> Headache, back pain and lymph node pain were other sources of pain.<sup>[10]</sup> The allogeneic group also had a higher rate of eye problems [Table 2]. These were mostly light sensitivity, vision problems and watering of eyes. The higher rate of eye problems in the allogeneic group is considered to be related to the risk of developing cataract due to GVHD and TBI.<sup>[4,19]</sup> In the groups, the infection rate was similar; mostly fungal pneumonia due to aspergillus developed in both of the groups [Table 2]. Fungal pneumonia often develops in the early phases after the stem cell transplantation, especially in the allogeneic group. This is due to the administration of immunosuppressive agents that are used in the preparation regimen.<sup>[16]</sup> The similar rate of infections in both groups indicates that adverse effects of chemotherapy also persist in the autologous group. Our study showed that the problems which appeared during the autologous and allogeneic post-transplantation periods were similar to those seen in other relevant studies. The rate of physiological problems observed in the patient group with allogeneic stem cell transplantation was greater to some extent. This is a consequence of the differences in the preparation regimens and the side effects of the agents administered. It may also be due to the usage of immunosuppressive agents or the development of GVHD after stem cell transplantation. Based on our study results, it is clear that nurses may contribute to improving patients' quality of life by determining the physiological problems in the patients with autologous and allogeneic stem cell transplantation and by showing them constructive ways in which to cope with their health issues.<sup>[6,20-23]</sup>

## Conclusion

Most patients who undergo autologous and allogeneic transplantation suffer many side effects. These include dyspepsia (abnormal sense of taste, nausea, vomiting, stomach pain, oral aphtha, diarrhea, constipation); skin problems (dryness, color changes, pruritus, edema and acne); cardiac and respiratory problems (palpitation, shortness of breath, using double pillows, rapid onset of fatigue, coughing); problems associated with the nervous system (amnesia, attention deficit, nervousness, sleep disorders); weight changes; pain (bone pain) and infection (catheter infection and fungal pneumonitis such as aspergillus); and the female patients suffered from menstrual irregularities.

Based on the study results, the following suggestions are offered:

Standards of care should be developed to assist patients undergoing autologous and allogeneic transplantation in dealing with the numerous problems associated with post-transplantation [Table 2].

- Physiological problems post-transplantation are increasingly being seen in both patient groups. In order to effectively cope with these problems, regular education programs should be offered during the preparation period prior to the transplant to both the patients and their caregivers [Table 2].
- Additional studies should be carried out to learn more about patients' long-term post-transplantation period, such as patients' status at the 100th day, end of 6 months and end of the first year.

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