Cardio-Pulmonary Assessment Before and After Hematopoietic Stem Cell Transplantation

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Introduction

Hematopoietic stem cell transplantation (HSCT) is a crucial treatment for various malignant and non-malignant hematologic diseases[1] With ongoing advancements in both curative and supportive care for cancer patients, the number of individuals eligible for HSCT continues to rise[2]. Although early post-transplant mortality rates are gradually decreasing, recipients of bone marrow transplants (BMT) still face risks associated with early and late post-transplant complications[3].

Aim

we assessed the cardiovascular and pulmonary status of patients prior to and following HSCT, as well as to identify associated risk factors.

Patients &Methods

The study involved 103 patients who underwent an electrocardiogram, echocardiogram, and spirometry prior to transplantation, as well as at 6 months and 12 months after HSCT. The average age of the patients was 39.6 years (±13.10 years). Of the participants, 89.3% received autologous HSCT, while 10.7% underwent allogeneic HSCT. Hypertension was the most common pre-transplant comorbidity, affecting 11.7% of the patients, followed closely by diabetes mellitus, which affected 6.5%. The mean body mass index (BMI) before HSCT was 28.95 kg/m² (±6.45). Additionally, 29.13% of patients received a cumulative dose of < 250 mg/m², while 35.92% were administered a cumulative dose o ≥ 250 mg/m². Finally, 7.8% of the patients had previously undergone mediastinal radiotherapy.

results

The mean ejection fraction percentage (EF%) following HSCT was 65.08% at 6 months and 64.65% at 12 months, a decrease from 67.48% before the procedure. Cardiac events occurred in approximately 9.7% of patients, primarily due to arrhythmias (6.8%). Additionally, 1.9% experienced heart failure, and 1% had ischemic heart disease. Pre-transplant anthracyclines treatment significantly impacted overall survival (OS), particularly in patients receiving doses of ≥ 250 mg/m² (p=0.007). In terms of pulmonary function, mean values for forced expiratory volume in one second (FEV1) and forced vital capacity (FVC) were lowest at 6 months post-transplant, but showed improvement by one year. Reductions in FVC and the FEV1/FVC ratio correlated with OS outcomes. Pulmonary complications were reported in 42.71% of patients, with infectious complications making up 86.4% of these cases, and 57% occurring within the first 6 months. Pre-transplant mediastinal radiotherapy did not significantly affect pulmonary function test results, but early post-transplant respiratory infections negatively impacted FEV1 and FVC at 6 months. Thirteen patients died, with septic shock being the leading cause of mortality (61.53%), followed by pulmonary complications (30.71%).

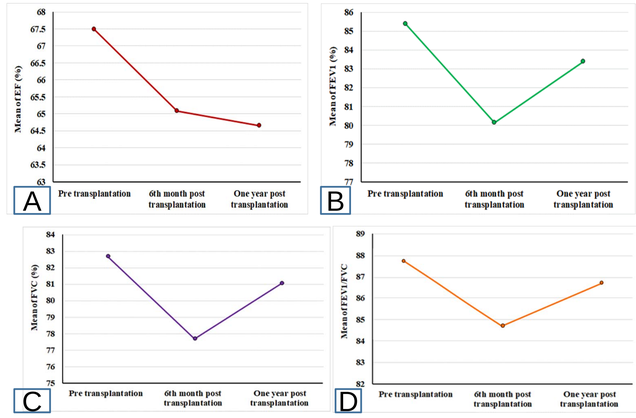


Figure A:Line chart comparing EF before and after transplantation.
Figure B:Line chart comparing FEV1 before and after transplantation.
Figure C:Line chart comparing FVC before and after transplantation.
Figure D: Line chart comparing the ratio of FEV1 to FVC before and after transplantation.

Discussion

This study aimed to identify risk factors contributing to complications following HSCT and their implications for patient survival. An increased prevalence of hypertension post-HSCT necessitates vigilant follow-up and management. Arrhythmia was the most frequently reported cardiovascular event within the first 100 days post-transplant. Higher doses of anthracyclines (≥ 250 mg/m²) significantly impacted OS. Pulmonary function tests (PFTs) showed a notable decline at six months after transplantation, followed by improvement after one year. The reduction in FVC and the FEV1/FVC ratio significantly influenced survival outcomes. Post-transplant pulmonary complications were observed in 42.71% of participants, primarily due to infections (86.4%), with 57% occurring within the first 6 months. Early respiratory infections adversely affected PFTs, while later infections did not lead to significant changes. The one-year follow-up indicated improved pulmonary functions.

Summary

Extended follow-up after transplantation is essential for identifying long-term complications and monitoring recovery from various challenges. We must be vigilant about respiratory infections during the first 6 months after HSCT, as these infections can significantly impact lung function and were the second most common cause of mortality in our study. Addressing non-infectious pulmonary complications is crucial, as they have a significant influence on overall survival.

References

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