Original Study

Outpatient Autologous Stem Cell Transplantation for Patients With Myeloma

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Abstract

High-dose melphalan with autologous stem cell transplantation is a standard component of multiple myeloma treatment typically requiring an extended hospital stay. This study reviews our experience selecting patients for a brief hospitalization followed by outpatient follow-up. Of 301 melphalan transplants for myeloma at our center during the study period, 82 (27%) were done as an outpatient. Our institutional experience indicates that, in selected patients, a strategy of outpatient management does not result in increased complications.
Background: High-dose melphalan with autologous stem cell support improves survival for patients with myeloma. For selected patients, we have been using a protocol of short hospitalization, discharging patients to home with careful outpatient monitoring in the office, which we hypothesized would reduce complications and utilization of inpatient beds. **Methods:** We reviewed 301 initial autologous transplants for myeloma, categorized as brief stay ($\leq$ 4 days, 82 patients) or prolonged stay ($\geq$ 5 days, 219 patients). Selection for a brief stay was determined by clinical characteristics, availability of caregivers at home, distance from our medical center, and patient preference. **Results:** Within the brief stay population, 67% required readmission before day + 100, but this group still had fewer cumulative hospital days (9 vs. 18, $P < .0001$). There were fewer documented infections among brief stay patients (22% vs. 46% $P < .001$) and fewer admissions to intensive care units (0% vs. 5.9%, $P = .02$). The groups had similar rates of bleeding (1.2% vs. 1.4% $P = 1.0$) and thrombosis (3.7% vs. 4.6% $P = 1.0$). No patients in the brief stay group died within 100 days, compared with mortality of 1.8% ($P = .6$) in the prolonged stay group. **Conclusion:** Carefully selected patients receiving an autologous stem cell transplant for treatment of myeloma can be managed with a brief initial hospitalization and outpatient follow-up, with low morbidity and mortality.

Clinical Lymphoma, Myeloma & Leukemia, Vol. 15, No. 9, 536-40 © 2015 Elsevier Inc. All rights reserved.
Keywords: Autologous stem cell transplantation, Clinical research, High-dose melphalan, Multiple myeloma, Outpatient

Introduction

High-dose melphalan with autologous stem cell transplantation (ASCT) is a standard component of multiple myeloma treatment because of its demonstrated survival advantage over standard-dose chemotherapy.[1,2] One barrier to using high-dose melphalan for myeloma is its toxicity profile, including mucositis, cytopenias, and high risk of infection, which many centers manage during a prolonged inpatient hospital stay. These long admissions increase health care costs and can deter patients from pursuing this highly effective therapy.

Previous studies have demonstrated that select patients undergoing ASCT can be safely managed on a semioutpatient basis, allowing for reduced costs and shorter duration of hospitalization.[3-6] This approach typically requires daily travel to an infusion center for monitoring and assessment by a physician. Our institution has used an outpatient protocol of discharging selected patients to home with follow-up in the office and without daily visits to an infusion center. We therefore reviewed our results using this outpatient transplantation approach to determine whether it truly decreased utilization of inpatient hospital beds and whether it had any adverse effects on transplantation-related morbidity or mortality.

Patients and Methods

Patients

We reviewed the records of all patients who underwent ASCT between January 2003 and January 2010 for the treatment of myeloma. Patients were included in the analysis if: (1) diagnostic criteria for multiple myeloma without amyloidosis or plasma cell leukemia were met, (2) they received a single dose of high-dose melphalan, 200 mg/m^2 provided over 1 hour on hospital day 1 or 2 (without total-body irradiation or other chemotherapy agents) followed by an autologous stem cell reinfusion, and (3) they had not received a prior autologous or allogeneic stem cell transplant. Patients were classified on the basis of the length of their initial hospitalization into a brief stay group (4 or fewer days) or a prolonged stay group (discharged on hospital day 5 or later).

Clinical selection for a brief stay depended on a combination of age; cardiac, pulmonary, and renal function; availability of caregivers at home; distance to our transplant center; and patient and physician preference. Although specific criteria were not mandated, in general we selected patients for a brief stay to have a performance status of ≤ 1, absence of major organ dysfunction, at least 1 caregiver available to be in the house with the patient at all times, and less than a 90-minute drive to our transplant center.

Patient Management

Patients in the brief stay group were primarily managed as outpatients. They received high-dose melphalan (generally 200 mg/m^2) on either hospital day 1 or 2, followed by stem cell reinfusion 2 days later. Patients were discharged home on hospital day 3 or 4 and had their first outpatient follow-up visit within 2 weeks after discharge. Home care consisted of: (1) a visiting nurse twice a week, (2) daily intravenous fluids and intravenous antiemetics for 7 to 10 days, (3) oral antibiotics (generally a fluoroquinolone), and (4) twice-weekly blood work. Patient transfusions were given at the transplant center or arranged with the patient's primary oncologist, usually on the day after any platelet count < 20,000/μL. Visiting nurse services were provided through commercial companies operating in the area of the patient's home. For many patients, this was the visiting nurse service affiliated with our hospital, though not directly with our transplantation program. There was no other scheduled daily contact with the patients on other days of the week.

Patients in the prolonged stay group remained hospitalized through their cytopenic nadirs until marrow recovery, generally being discharged home when they no longer needed transfusions and felt well enough to maintain adequate hydration and self-care at home.

Pretransplantation Assessments

Pretransplantation organ function assessment included estimated creatinine clearance (calculated using the Cockcroft Gault equation), cardiac ejection fraction (determined by either transthoracic echocardiography or multiple gated acquisition scan), and diffusional capacity of the lung for carbon monoxide (as determined by pulmonary function testing). Disease stage using the Durie-Salmon criteria was determined using patient characteristics at the time of diagnosis; because the albumin level at diagnosis was frequently not available, we analyzed the β2 microglobulin rather than using the International Staging System.[7,8] Disease status was evaluated before transplantation. Patients' driving distance from their home address to our transplant center was determined using Google maps (http://www.google.com/maps).

Study End Points

Posttransplantation outcomes were chosen before analysis and were used for comparison of the 2 groups. Total duration of hospitalization was defined as the cumulative number of days during initial hospitalization and any subsequent hospitalizations included within the first 100 days following stem cell reinfusion. Additional outcomes consisted of: (1) documented infections (including pneumonia, bacteremia, urinary tract infections, and cellulitis, but excluding positive blood cultures that were thought to be due to contamination during the blood draw and excluding positive urine cultures that were not thought be indicative of active infection), (2) documented thrombotic events (defined as either deep-vein thrombosis or pulmonary embolism), (3) bleeding episodes, (4) admissions to an intensive care unit at any point during the 100-day posttransplantation period, and (5) all-cause mortality.

Statistical Analysis

We compared pretransplantation characteristics among the 2 groups using the Fisher exact test for categorical variables and the Student t test for distance from the transplant center. We compared posttransplantation outcomes by the Fisher exact test for categorical outcomes and a Wilcoxon rank sum test comparing numerical outcomes that were not normally distributed.

Results

Of 301 patients with myeloma who received high-dose melphalan and autologous stem cell reinfusion between January 2003 and January 2010, 82 patients (27%) were classified in the brief stay group and 219 (73%) were classified in the prolonged stay group. The characteristics of these 2 groups reflected our clinical selection criteria for outpatient after transplantation management. Age, gender, and myeloma characteristics were similar between the 2 groups, but the prolonged stay group had more patients with renal insufficiency (5% vs. 0%) and pulmonary dysfunction (6% vs. 1%). The patients in the prolonged stay group also lived further away from our medical center (Table 1).

Of the 82 patients in the brief stay group, 55 (67%) required readmission to a hospital, including 11 patients who required more than 1 readmission (9 patients required 2 readmissions, 1 patient required 3 readmissions, and 1 patient required 4 readmissions). The first posttransplantation readmission generally occurred around day + 7 (range, 3-17 days). Indications for readmission were neutropenic fever in 48 patients (87%), inability to maintain hydration as an outpatient in 4 patients (7%), and 3 patients (5%) each with deep-vein thrombosis, severe colitis, and severe electrolyte abnormalities. The median duration of the initial posttransplantation readmission was 7 days (range, 2-15 days), and the median total number of readmission days for those patients with at least 1 readmission was 8 days (range, 2-27 days). Including the initial transplantation admission, the median number of days spent in the hospital during the first 100 posttransplantation days was 9 days.

No patients in the brief stay group died or required care in the intensive care unit during the first 100 posttransplantation days.