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Bone marrow harvest procedure: Is age really, just a number?

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Abstract

We report a case of a 15-month-old male donor who underwent bone marrow harvest procedure under general anesthesia. He had a complete HLA matched elder sibling with Aplastic Anemia. Approximately 800cc of bone marrow was harvested and transfused to the recipient. The procedure was uneventful with the donor recovering completely after this iatrogenic blood loss. The patient engrafted on day+20. Both patient and donor were discharged from the hospital without any complications.

Keywords

donor; age; bone marrow

Introduction

The first pediatric stem cell transplant was performed in 1968 at the Leiden University Medical Center, following which; more than 300 children donated bone marrow as the source of stem cells [1]. A recent EBMT estimate states that in Europe, approximately 600-700 children are recruited as HLA matched sibling donors each year (unpublished data). The ethical predicament of pediatric donation is the exposure of a healthy child to a procedure that provides no clinical benefit. It is undertaken to save a seriously ill sibling. In Pakistan, pediatric haematopoietic stem cell transplants (HSCT) are mainly being performed for non-malignant disorders i.e. β Thalassemia Major and Aplastic Anemia [2,3]. An HLA (human leucocyte antigen) matched sibling donor is available in 70% of the cases due to large family size.

Considering the body surface area and the amount of bone marrow to be aspirated (15-20ml/kg/procedure), the acceptable age of donation is approximately 2 years. However, the youngest donor reported by Campkin et al in 1992 [4], was a 13-week-old baby who donated bone marrow stem cells to his four-year-old sibling with metachromatic leukodystrophy. We report a case of a 15-month-old male donor, in whom bone marrow harvest procedure was performed to rescue, his seven-year-old sibling suffering from severe aplastic anemia.

Case Report

A 15-month-old male child was recruited from bone marrow transplant clinic as a complete HLA matched donor for his sibling with aplastic anemia. Pretransplant workup included baseline laboratory and radiological investigations, all of which were under acceptable limits. This was a sex matched,

similar blood group, allogeneic stem cell transplant. He was started on G-CSF (granulocyte colony stimulating factor) mobilization as per institutional protocol. The donor was admitted 24 hours prior to the procedure. Bone marrow harvest was planned on day 5 under general anesthesia. At the time of procedure, his hemoglobin was 10.2gm/dl, WBC: 40 x 10^9/L and platelets: 423 x 10^9/L. Irradiated packed cell transfusion was started simultaneously with the procedure through blood warmer. Bilateral posterior iliac crests were sterilized and draped. One operator technique was used, with site being changed after every 20 -25cc of harvest.

After collecting 400cc of the required product, a mononuclear cell count (MNC) was performed, the value of which was 2.5 x 10^8/kg. Based on this calculated value, another 400cc of harvest volume was collected to achieve the desired yield.

The entire harvest procedure (180 minutes) remained uneventful. The donor received 600cc of irradiated packed red cells during the procedure and was successfully weaned off from the ventilator. MNC count of the total harvest volume (800cc) was 4.2 x 10^8/kg and $CD34^+$ count was 3.5 x 10^6/kg. These stem cells were transfused to the recipient immediately post procedure.

The donor was discharged the following day with no adverse sequelae. The main complaint was pain at the aspiration site. The patient's neutrophil engraftment occurred on day+12 and platelet engraftment occurred on day+20. He was discharged on day+ 22 with no infectious complications or graft versus host disease. At the time of discharge the patient's complete blood count showed hemoglobin of 11.2 gm/dl, WBC: 4.2 x 10^9/L and platelets: 70 x 10^9/L.Till last follow up (day+35), both the donor and the patient were stable and healthy.

Discussion

Bone marrow is still the primary stem cell source in pediatric patients as compared to peripheral blood or umbilical cord blood [5]. HLA matched sibling donors are still considered to be the best available option for medical, biological, economic and logistical reasons. Pediatric donors represent a unique and underreported group. Since an age limit with respect to fitness and stem cell collection volume has not been defined in literature, this population may be vulnerable when high volumes of harvest collection are required.

Our donor was a 15-month-old male child who underwent bone marrow stem cell collection. Currently, he is the youngest bone marrow donor in our hospital records. His main complaint was pain at the site of procedure. Styczynski J et al [6] have also reported pain as the most frequent complication (occurred in 50.2% of donors) requiring the administration of analgesics. Our patient required oral non-narcotic analgesia for 24 hours as well. Multiple marrow aspirations result in trauma to the iliac bone. Our donor showed no signs of iliac injury. Morbidity resulting from damage to the bone or adjacent structures was not seen either [7]. Other complications including lumbar stiffness and sore throat related to general anesthesia were not present.

SM van Walraven et al in 2013 [8], concluded that bone marrow donation in childhood does not lead to physical impairment. There are lack of child donor care guidelines which lead to inconsistencies in management. Appropriate pre-transplant assessment, pre-emptive packed red cell transfusions, apt anesthesia protocol and post procedure care have made it possible for young donors to undergo the

harvest procedure with ease, making age just an arbitrary figure, as seen in our youngest donor.

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