Preleukapheresis peripheral blood CD34+ cells predict progenitor cell collection yield and the necessary number of procedures to undergo

Sir,

We evaluated the peripheral blood (PB) CD34+ cell content as a predictive parameter of the leukapheresis CD34+ cell yield. Regression analysis showed that a preleukapheresis CD34+ cell concentration of ≥40/µL predicted a yield of ≥2×10^6 CD34+ cells/kg by a single leukapheresis (r = 0.83, p = 0.0001). In addition, CD34+ cell concentrations in preleukapheresis PB ≤30/µL and ≤15/µL were associated with the need for at least two (p = 0.0028) or at least three (p = 0.02) procedures respectively in order to obtain ≥2×10^6 CD34+ cells/kg.

We studied CD34+ cell concentration in preleukapheresis PB samples and CD34+ cell yield in a number of apheresis to investigate whether these parameters are related. The aim of our work was: a) to establish a statistical relationship between both parameters which would allow us to calculate the threshold concentration of immediate preleukapheresis PB CD34+ cells necessary to obtain ≥2×10^6/kg CD34+ cells; b) to determine the number of procedures necessary to obtain ≥2×10^6 CD34+ cells/kg.

CD34+ cells were analyzed in PB samples in patients mobilized either with rhG-CSF or following chemotherapy plus rhG-CSF. Underlying diseases were: breast carcinoma (n=56), Hodgkin’s disease (n=5), non-Hodgkin’s lymphoma (n=12), multiple myeloma (n=13), acute leukemia (n=4) and CML (n=1).

Ten liter leukaphereses were performed until more than ≥2×10^6 CD34+ cells/kg had been collected. A total of 218 aphereses were evaluable for CD34+ counts. Evaluated paired data (PB-apheresis) corresponding to the first, second or subsequent apheresis procedures involved 87, 80 and 51 samples respectively.

Processing of samples was performed as reported elsewhere1 with FITC-conjugated CD34 (anti-HPCA-2; Becton Dickinson, Mountain View, CA, USA). Fifty thousand mononuclear cells were analyzed in each sample.

The median concentration of CD34+ cells in preleukapheresis PB samples was 11.96/µL (range: 0.9-1035). The median CD34+ cell count per leukapheresis was 0.61×10^6/kg (range 0.03-22.51). The results obtained for these parameters are summarized in Table 1.

<table>
<thead>
<tr>
<th>PB CD34+ (Cell/mL)</th>
<th>Apheresis CD34+ (Cell x10^6/kg)</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>All aphereses</td>
<td>11.96 (0.9-1035)</td>
<td>0.61 (0.03-22.51)</td>
</tr>
<tr>
<td>Apheresis 1</td>
<td>9.35 (1.42-1035)</td>
<td>0.71 (0.03-22.51)</td>
</tr>
<tr>
<td>Apheresis 2</td>
<td>13.93 (0.9-162.13)</td>
<td>0.76 (0.03-12.68)</td>
</tr>
</tbody>
</table>

The same analysis showed that target yields of ≥1.5, ≥1 and ≥0.75×10^6 CD34+ cells/kg could be predicted with preleukapheresis PB CD34+ cells/µL of ≥30, ≥16 and ≥11, respectively.

We applied Student’s t test to compare PB CD34+ cell counts in patients who had undergone one, two or more and three or more procedures. In this analysis, we found that mean PB CD34+ cell concentrations ≤30/µL and ≤15/µL were associated with the need to perform at least two (p=0.0028) or at least three (p=0.02) apheresis procedures, respectively, to obtain ≥2×10^6 CD34+ cells/kg.

In PBSCA, the estimation of CD34+ cell yield prior to initiating apheresis procedures,2-8 has both clinical and economic implications. In the present study, patients with a variety of underlying diseases, mobilization treatments and mobilization schedules...
were evaluated. Regardless of the previous variables, a preleukapheresis PB CD34+ cell concentration ≥ 40/µL was significantly related to the collection of at least 2 × 106 CD34+ cells/kg in a single apheresis, as previously reported.9,10 In addition to the above data, we found that to obtain a target number of 2 × 106 CD34+ cells/kg, PB CD34+ cell concentrations ≤ 30/µL are associated with the need for at least two leukapheresis procedures and PB concentrations ≤ 15/µL are associated with the need for at least three procedures. In conclusion, our study shows that preleukapheresis PB CD34+ cell concentration can be used to guide PBPC harvest by predicting both the total CD34+ cell yield and the number of aphereses needed to be undergone.

M. Mar Osma, Francisco Ortuño, Felipe de Arriba, Inmaculada Heras, Jose María Moraleda, Vicente Vicente
Unit of Hematology and Hemotherapy, School of Medicine, Hospital General Universitario, Murcia, Spain

Key words
CD34, mobilization, autologous peripheral blood transplantation

Correspondence
Prof. V. Vicente Garcia, Centro Regional de Hemodonación, C/ Ronda de Garay sn, 30003 Murcia, Spain. Phone: international +34-68-341990 – Fax: international +34-68-261914.

References

Phenotypic changes in neutrophils after rhG-CSF administration in non-Hodgkin’s lymphoma patients undergoing PBSC transplantation or conventional chemotherapy

Sir,
rhG-CSF induces several phenotypic changes in neutrophils. Increased HLA-DR expression and decreased CD10 expression have recently been described in neutrophils from some patients after rhG-CSF therapy. We evaluated these parameters in 12 non-Hodgkin’s lymphoma patients undergoing either PBSC transplantation after high-dose chemotherapy or conventional chemotherapy. The appearance of an HLA-DR-positive neutrophil subpopulation, along with a marked decrease in CD10 expression, was confirmed. However, despite this immature phenotype, rhG-CSF-induced neutrophils displayed enhanced phagocytosis and chemiluminescence.

Recombinant human granulocyte colony-stimulating factor (rhG-CSF) induces several changes in neutrophils.1,2 Recently, Zarco et al.3 described new phenotypic findings in rhG-CSF-induced neutrophils in six ALL patients undergoing chemotherapy. The appearance of an HLA-DR-positive neutrophil subpopulation, along with a decrease in the percentage of CD10+ neutrophils, appeared of particular interest.

We reviewed the clinical files of patients recently treated with rhG-CSF (Filgrastim) for whom analysis of HLA-DR and CD10 expression on circulating neutrophils before and after rhG-CSF administration was available. Twelve patients (4 females, 8 males), with intermediate and high grade non-Hodgkin’s lymphoma (NHL) were evaluated. Six patients had been treated with autologous peripheral blood stem cells (PBSC) transplantation after high-dose chemotherapy,4 and neutrophils had been studied before the conditioning regimen and after engraftment (i.e. neutrophils >0.5 × 109/L, and platelets >20 × 109/L), stimulated by rhG-CSF (5 mg/kg/d). The other 6 patients had been studied before the first course of chemotherapy (Promice-Cytabom)5 and after a five-day course of rhG-CSF (5 µg/kg/d), administered to