Iron Deficiency Anemia in Patients Undergoing Extracorporeal Photopheresis for Cutaneous T-Cell Lymphoma

Jennifer Anderson, Kimberly Sanford, Susan Roseff, Richard McPherson
Virginia Commonwealth University
Extracorporeal Photopheresis (ECP) 
Background

- Used for treatment
  - Cutaneous T-cell lymphoma (CTCL)
  - Graft versus host disease (GVHD)
- Generally considered safe; mild side effects
  - Syncope, fever, chills, headache, hematoma or infection
    at site of venous access
Rationale for Study

- We observed significant iron-deficiency anemia (IDA) in some patients after months of ECP for CTCL.
- Goal of study: to describe the incidence and severity of IDA in patients treated with ECP for CTCL.
- Study approved by the VCU Cancer Center Protocol Review and Monitoring Committee and by the VCU IRB.
Methods: Design

- Retrospective study of hematologic results in adult patients with CTCL treated with ECP from January 2005 through June 2014
- Patients identified from our apheresis clinical data base
- Photopheresis instruments
  - Discontinuous flow UVAR XTS (throughout study)
  - Continuous flow Cellex (after March 2011)
Methods: Laboratory Results

- Laboratory results retrieved from hospital electronic medical record
- Criteria for Iron Deficiency Anemia (IDA)
  - Decrease in hemoglobin
  - Decrease in mean cell volume (MCV)
  - Increase in Red Cell Distribution Width (RDW)
  - Low values of serum ferritin
Index Case: 59 YO Man with IDA in ECP

- 202 procedures over 5 years
- Hemoglobin fell to 9.4 then 7.1 (Ref Range 13.3-17.2) g/dL
- MCV fell to 64.6 (81.2-94) fL
- RDW rose to 18.1% (mixture of cell sizes)
- Ferritin 23 (30-330) ng/mL
- RBC transfusions for orthopedic surgery
- 10 iron infusions reversed IDA
Index Care: Iron Deficiency Anemia with 202 ECP in 5 years

**Hemoglobin**

- Initial IDA
- Severe IDA
- Recovery with Fe infusions

**MCV**

- Initial IDA
- Severe IDA
- Recovery with Fe infusions

**RDW**

- Initial IDA
- Severe IDA
- Recovery with Fe infusions
Results: Demographics

- Total of 35 patients
  - 22 men; 13 women
  - 20 white; 15 black
  - Ages 32 to 85
- Initial Hemoglobin
  - 9.8 to 15.9 g/dL (mean $\pm SD = 12.8 \pm 1.73$)
- Number of treatments
  - 4 to 327 (median 29; IQR 14-56)
- Frequency of treatment
  - 2 days every 2 weeks or every month
Results: Anemia

- 28 (80%) of 35 patients showed progressive decreases in hemoglobin of 0.8 to 6.9 g/dL (mean ± SD = 3.12 ± 1.46 g/dL)
- 18 of those 28 patients had decreased MCV and elevated RDW, meeting criteria for IDA
Results: Other 10 Patients with Anemia

- 3 had decreased MCV with stable RDW
- 3 had stable MCV with increased RDW
- Possible early IDA in these 6 patients
- 4 had stable MCV and RDW but decreases in Hgb
- 5 of those 10 patients were early in the course of treatment
  (10 or less ECPs)
Other Factors

- No association of developing IDA with
  - Age
  - Gender
  - Race
  - Body Weight
  - Initial Hemoglobin
Iron Studies in 13 Patients

<table>
<thead>
<tr>
<th></th>
<th>Median</th>
<th>Range</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron (µg/dL)</td>
<td>58</td>
<td>13 - 284</td>
<td>30 - 165</td>
</tr>
<tr>
<td>Transferrin Saturation (%)</td>
<td>14</td>
<td>3 - 41</td>
<td>16 - 60</td>
</tr>
<tr>
<td>Ferritin (ng/mL)</td>
<td>23</td>
<td>3 - 309</td>
<td>30 - 330</td>
</tr>
</tbody>
</table>

Results generally showed iron deficiency.

Two patients had possible acute phase reactions with elevated ferritin.
Distribution of ferritin in 13 ECP patients
# ECP to Development of IDA

- Range: 2 to 60 procedures before onset of IDA
- Median 11.5 procedures
- Interquartile range 3.25 to 23 procedures
- No relationship between # ECP to develop IDA and
  - Age, gender, race, body weight, initial hemoglobin
ECP Treatments before Onset of IDA
Treatments for Iron Deficiency in 6 Patients

- Dietary increase (red meat) 1
- Oral Fe, transfusion 1
- Fe infusions x 5 3
  x 10 1
Conclusions

- ECP performed over extended periods led to clear IDA in 18 of 35 patients with CTCL
- An additional 10 patients showed probable early IDA
- The IDA was most likely due to blood loss from ECP equipment that does not fully return blood
- Development of IDA was not predicted by age, gender, race, initial hemoglobin, or body weight
- Patients undergoing ECP for long-term management of CTCL should be evaluated periodically for iron status