**INTRODUCTION**

- Neuromyelitis optica (NMO) is characterized by:
  - Longitudinally extensive inflammatory spinal cord lesions
  - Optic neuritis
  - 70% of individuals with NMO test positive for an autoantibody to aquaporin 4
  - First-line therapy for NMO is often a combination of azathioprine and prednisone.
  - When azathioprine + prednisone fails to control NMO, other treatment strategies include:
    - Mycophenolate mofetil + prednisone
    - Mitoxantrone
    - Plasma exchange
    - Intravenous Immunoglobulin (IVlg)
    - Rituximab (anti-CD20 monoclonal antibody)
- Here we present a patient with NMO in which multiple agents, including Rituximab, failed to control relapses.
- We propose a role for HDIT+HSCT in such instances.

**METHODS**

- **Case Report**
- **Stem Cell Transplantation Protocol**
  - Pre-transplant treatment to reduce risk of relapse during peripheral blood stem cell (PBSC) mobilization:
    - Rituxan
    - Cyclophosphamide
    - Dexamethasone
  - PBSCs mobilized with granulocyte colony stimulating factor (GCSF):
    - Concomitant dexamethasone
    - CD34 selection
  - Conditioning 4 weeks post stem cell mobilization:
    - Carmustine, etoposide, cytarabine, melphalan
    - Anti-thymocyte globulin
    - CD34-selected hematopoietic stem cells infused one week post-conditioning

**RESULTS**

**Box 1. Initial history and physical**

- 54 year old social worker with a history of thyroid cancer and NMO presents to clinic for management of recalcitrant NMO relapses. Many years ago, while carrying a diagnosis of MS, she received interferon beta and then glatiramer acetate. For NMO, she was previously treated with mitoxantrone and mycophenolate mofetil. A few weeks prior to this presentation, while admitted for transient paraparesis, she was started on azathioprine + prednisone. She notes residual lower extremity weakness with an associated increase in wheelchair use and chronic left visual impairment. No difficulty with cognition. Physical examination is significant for lower extremity (LE) weakness, brisk LE reflexes, impaired proprioception, and moderate spasticity.

**Figure 2. Treatment Timeline**

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>Diagnosed with MS</td>
</tr>
<tr>
<td>2063</td>
<td>Relapse with partial paraparesis</td>
</tr>
<tr>
<td>2065</td>
<td>Tested NMO antibody positive</td>
</tr>
<tr>
<td>2068</td>
<td>Admitted for relapse with paraparesis</td>
</tr>
<tr>
<td>9/2008</td>
<td>Rituximab 1000mg x 2</td>
</tr>
<tr>
<td>12/2008</td>
<td>Relapse with lower extremity weakness</td>
</tr>
<tr>
<td>2/2009</td>
<td>Relapse with near complete paraparesis</td>
</tr>
<tr>
<td>3/2009</td>
<td>Relapse with optic neuritis and inability to support her weight standing</td>
</tr>
<tr>
<td>5/2009</td>
<td>Transplantation</td>
</tr>
<tr>
<td>6/2009</td>
<td>Relapse with LL weakness</td>
</tr>
<tr>
<td>7/2009</td>
<td>Transplantation</td>
</tr>
</tbody>
</table>

**Box 2. The post transplant period**

- Early post-transplant period
- Good engraftment
- Transplant associated complications:
  - 1 month post-transplant: Mucositis and neutropenic fever
  - CMV reactivation: treated with ganciclovir
- Recurrent urinary tract infections
- On two year follow up:
  - Sustained stabilization of NMO
  - No relapses post-transplant
  - No new lesions on MRI
  - Reduced disability
  - Expanded disability status scale (EDSS):
    - Immediate pre-transplant EDSS: 8.0
    - Two year post-transplant EDSS: 8.5

**DISCUSSION**

- Two years following high dose immunosuppressive therapy with autologous hematopoietic stem cell transplantation, our patient is relapse-free with an improved disability score (Box 2).
- This suggests that HDIT + HSCT may used successfully in individuals with multi-agent refractory NMO.

- Limitations:
  - n = 1
- Through the frequency of relapses was increasing in the months preceding transplantation, we cannot ascertain what the disease course would have been in the absence of transplantation.

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