Late complications in PNH

- Bone Marrow
- Thrombosis
  - Liver
  - Kidney
- Fertility / Pregnancy

Late Complication in PNH
Bone Marrow

- Worsening of Bone Marrow Function (Recurrence of Aplastic Anemia)
- Transformation to Myelodysplastic Syndrome (MDS)
- Transformation to Acute Myeloid Leukemia (AML)

Possible Relationship between PNH, Aplastic Anemia, Myelodysplastic Syndrome, and Acute Myeloid Leukemia
The Rate of Transformation to MDS and AML in Patients with PNH

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>% of patients with PNH</td>
<td>80</td>
<td>220</td>
<td>10</td>
<td>49</td>
<td>209</td>
<td>176</td>
<td>49</td>
</tr>
<tr>
<td>% of PNH patients with MDS</td>
<td>0</td>
<td>1 (5)</td>
<td>0</td>
<td>6</td>
<td>8</td>
<td>16</td>
<td>2</td>
</tr>
</tbody>
</table>

The Rate of Transformation to MDS and AML in PNH is Rare
Late Complication of PNH Thrombosis

- Skin thrombosis pyoderma gangrenosum
- Portal Hypertension, Esophageal varices, Abdominal wall varices
- Arterial thrombosis, stroke

Thrombosis in Patients with PNH

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cause of death n=60</td>
<td>Incidence n=204</td>
<td>Incidence n=183</td>
<td>Incidence n=176</td>
<td>Incidence n=135</td>
<td></td>
</tr>
<tr>
<td>Venous Thrombosis</td>
<td>~40%</td>
<td>14%</td>
<td>23%</td>
<td>32%</td>
<td>4%</td>
<td>32%</td>
</tr>
<tr>
<td>Abdominal</td>
<td>18</td>
<td>26</td>
<td>18</td>
<td>28</td>
<td>2</td>
<td>35</td>
</tr>
<tr>
<td>Cerebral</td>
<td>4</td>
<td>17</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Pulmonary Embolus/DVT</td>
<td>18</td>
<td>17</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>6/33</td>
</tr>
<tr>
<td>Other Venous Sites</td>
<td>-</td>
<td>5</td>
<td>1</td>
<td>34</td>
<td>4</td>
<td>26</td>
</tr>
<tr>
<td>Arterial</td>
<td>6%</td>
<td>-</td>
<td>-</td>
<td>1%</td>
<td>3%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Incidence of Thrombosis is Highest in Patients with a Large PNH Clone

Skin Vein Thrombosis in PNH (Pyoderma Gangrenosum)

Cerebral Venous Sinus Thrombosis in PNH
- Sagittal Sinus
- Cortical Vein Thrombosis Hemorrhagic Infarction

Hepatic Vein Thrombosis in PNH (Budd-Chiari Syndrome)
Late Complications in PNH
Liver

- Liver fibrosis
- Portal Hypertension, Esophageal varices, Varices in the abdominal wall
  - Gallstones (Cholelithiasis)!
    (Due to extravascular hemolysis!)

Late Complications in PNH
Liver Portal Hypertension

Late Complications in PNH
Kidney

- Kidney Failure
  - Acute:
    - Tubulo Necrosis Renal
    - Renal Vein Thrombosis
  - Chronic:
    - Pigment Nephropathy (Blue Kidney)
Late Complications in PNH Kidney

Hemoglobinuria

Hemosiderinuria
Iron in urine

Iron Kidneys

Iron Kidneys
“Blue Kidney”

Late Complication in PNH Pregnancy

Sunday: 2:45 pm - 3:45 pm

Pregnancy and Bone Marrow Failure Diseases

Monica Bessler, MD, PhD
Children's Hospital of Philadelphia & Hospital of the University of Pennsylvania