Signalment & History

- 7-year-old, female/spayed, Australian Shepherd dog
- Right CCL ligament tear
- All other physical exam findings WNL
- Reported to be completely healthy at home (other than lameness)
Pre-anesthetic blood work

Serum Biochemistry

• All WNL except mild hyperglycemia (145 mg/dL; reference interval 73-113 mg/dL)
<table>
<thead>
<tr>
<th>CBC results</th>
<th>Result</th>
<th>Units</th>
<th>Reference Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leukocyte count</td>
<td>4.7 L</td>
<td>k/uL</td>
<td>6-17</td>
</tr>
<tr>
<td>Erythrocyte concentration</td>
<td>6.47</td>
<td>M/uL</td>
<td>5.5-8.5</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>16.6</td>
<td>g/dL</td>
<td>12-18</td>
</tr>
<tr>
<td>Mean Cell Volume</td>
<td>76</td>
<td>fl</td>
<td>60-77</td>
</tr>
<tr>
<td>Mean Cell Hemoglobin</td>
<td>26 H</td>
<td>pg</td>
<td>19-24</td>
</tr>
<tr>
<td>MCHC</td>
<td>34</td>
<td>g/dL</td>
<td>32-36</td>
</tr>
<tr>
<td>Platelet Concentration</td>
<td>255</td>
<td>K/uL</td>
<td>164-510</td>
</tr>
<tr>
<td>Segmented Neutrophil</td>
<td>0.9 L</td>
<td>K/uL</td>
<td>3-11.5</td>
</tr>
<tr>
<td>Band Neutrophil</td>
<td>2.3 H</td>
<td>K/uL</td>
<td>0-0.3</td>
</tr>
<tr>
<td>Lymphocyte</td>
<td>0.5 L</td>
<td>K/uL</td>
<td>1.5-5</td>
</tr>
<tr>
<td>Monocyte</td>
<td>0.3</td>
<td>K/uL</td>
<td>0.1-0.8</td>
</tr>
<tr>
<td>Eosinophil</td>
<td>0.7</td>
<td>K/uL</td>
<td>0-0.75</td>
</tr>
</tbody>
</table>
Blood smear
Blood smear
Blood smear
Further diagnostics

- A CBC was repeated one day after initial CBC (Patient spent night in hospital kennel)
  - The hyposegmentation of the granulocytes persisted
  - Leukocyte count increased from 4.7 K/uL to 11.5 K/uL (RI: 6-17 K/uL)
  - Total neutrophil count went from 3.2 K/uL to 10.1 K/uL (RI: 3-11.5 K/uL)
Interpretation

- On initial evaluation this appears to be a severe, acute inflammatory leukogram
  - Does not fit with clinical picture
Interpretation: Pelger-Huet Anomaly

- Characterized by failure of mature granulocyte and monocyte nuclei to lobulate. Megakaryocytes may also be affected.

- Inherited condition in dogs, cats, horses, rabbits, mice, and humans.

- The increase in neutrophils seen on Day 2 was interpreted as a stress leukogram.
  - This is supported by the lymphopenia.
Interpretation: Pelger-Huet Anomaly

• In humans and mice, the defect is due to a mutation in the *lamin B receptor (LBR)* gene
  – The same defect is suspected in dogs and other species, however this has not been proven

• LBR is an inner nuclear membrane protein

• The LBR protein is involved in trafficking of heterochromatin and lamins to the nuclear membrane

• Disruption of LBR protein causes abnormalities in nuclear heterochromatin, thereby causing abnormalities in nuclear morphology
Pelger-Huet Anomaly

- Reported in many dog breeds including:
  - Australian shepherds
  - Australian cattle dogs
  - Basenjis
  - Border collies
  - Cocker spaniels
  - Coonhounds
  - Foxhounds
  - German shepherds
  - Mixed breeds

- Leukocyte function has been demonstrated to be normal in affected dogs

- Anecdotal evidence suggests leukocyte function is normal in other animals
Pelger-Huet Anomaly

- In Australian shepherds
  - ~10% of Australian shepherds are affected. There is no sex predilection
  - Autosomal dominant trait with incomplete penetrance
  - Heterozygotes express the leukocyte morphologic abnormality
  - Homozygotes die in utero or have marked skeletal abnormalities
Pelger-Huet Anomaly: Diagnosis

• Genetic testing is not yet available in dogs

• Serial CBCs and documentation of persistence of the condition in a healthy animal

• Evaluating relatives for presence of the anomaly

• Animal Genetics is currently calling for cases of Australian Shepherds and other breeds that have been diagnosed with (P-H) anomaly in order to identify the genetic defects and develop a cheek-swab DNA test.
Pelger-Huet Anomaly: Importance of recognition

- Can be mistaken for a marked inflammatory leukogram or a preleukemic condition

- Must be differentiated from **pseudo Pelger-Huet anomaly**
  - Acquired hypossegmentation of granulocytes secondary to infections, myelodysplastic syndromes or drug treatments
  - The chromatin is more clumped in true Pelger-Huett anomaly
Blood smear
Case outcome

• Patient developed local infection at surgery site ~3 months post-op
  – CBC performed-almost identical to CBC done on initial presentation
• Hypossegmentation of granulocyte nuclei persisted
• Bone plate was removed and patient recovered uneventfully

• No signs of systemic illness/inflammation
References

Acknowledgments

• Clinical Pathology lab
  – Jill Newland
• Histopathology lab
  – Jodee Webster
• Faculty Mentors
  – Melinda Wilkerson
  – Lisa Pohlman