Red Blood Cells Morphological Changes as a Prognostic Tool for Organophosphorus Toxicity Patients

Authors
Dr. O.P. Moorjani¹, Dr. Amar Gangwani²
¹Asso. Prof, Bhundelkhand Medical College Sagar M.P
Email- omprakashmoorjani@gmail.com, +919713606060
²Assit. Prof, Bhundelkhand Medical college Sagar M.P.
Email: drgangwaniamar79@gmail.com

ABSTRACT
Aims & Objectives- Identify and exclude the misinterpretation of peripheral blood smears examination. Identify organophosphorus induced RBC & WBC morphological changes used as a prognostic tool. Identify the organophosphorus induced peripheral blood cells changes.

Material & Methods: Blood was collected in a sterile EDTA containing tube and processed following our established laboratory protocol. A complete blood counting including HB%, PCV, Red cell indices, platelet count and total white cell count and differential was done by Automated blood cell counter with peripheral blood smear examination and further confirmed by manual oil immersion smear study method. Peripheral smears study was done with field A and B stain and leishman stain.

Conclusion- organophosphorus can cause changes on peripheral blood cell due to lipid peroxydation and oxidative stress of cell membrane. RBC shows various types changes theses may be used as a prognostic tool for severity of toxicity, monitoring of patients and follow-up and exclude the various misinterpretation of peripheral blood smear examination like hemolytic anemia and liver disease.

Keyword- Creanated RBC, Organophosphorus

MATERIAL & METHODS
Study area and design- The present study was conducted at the Department of Pathology Bhundelkhand Medical college associated Hospital Sagar, M.P. The study was designed as a observational hospital based study over a period of time from 2012 to 2015 years.

Ethical consideration- Blood was collected in a sterile EDTA containing tube and processed following our established laboratory protocol then generate the report of each patient. Take informed consent was obtained from all study participant for use of your blood sample for medical research after doing physician request investigating and generate the report.

Patient’s selection criteria- The study target all organophosphorus toxicity patients on the basis of clinical signs, symptoms history of exposure, history by attainer and smell with residual element on cloth of patients. We include both emergency and IPD patients with all age groups male and female both gender for study. Sample size is 50 patients.

Laboratory investigations Blood was collected in a sterile EDTA containing tube and processed following our established laboratory protocol. A
complete blood counting including HB%, PCV, Red cell indices, platelet count and total white cell count and differential was done by automated blood cell counter and peripheral blood smear examination. The all cell count indices including RBC, WBC count with differential along with morphological changes further confirmed by manual oil immersion smear study method. Peripheral smears study was done with field A and B stain and leishman stain.

**COMPLETE BLOOD COUNT (CBC) AND PERIPHERAL SMEAR.**

**Materials**
1. Purple vacutainer tube or capillary collector (EDTA) ethylenediaminetetraacetate
2. Slides and blue capillary tube
3. Needle or lancet
4. Vacutainer holder
5. Alcohol swab
6. Cotton balls
7. Absorbent materials
8. Slide case

**Procedure**
1. Specimen is collected into EDTA (purple) vacutainer. (5 or 7ml volume)
   - Step 1. A small drop of venous blood is placed on a glass microscope slide, using a glass capillary pipette.
   - Step 2. A spreader slide is positioned at 45° angle and slowly drawn toward the drop of blood.
   - Step 3. The spreader slide is brought in contact with the drop of blood and is being drawn away.
   - Step 4. The spreader slide is further pulled out, leaving a thin layer of blood behind.
   - Step 5. The blood smear is nearly complete.
   - Step 6. End result will be a glass slide with a well-formed blood film. After drying for about 10 minutes, the slide is fixed in methanol & stained with field A and B stain.

A well-made peripheral smear is thick at the frosted end and becomes progressively thinner toward the opposite end. The “zone of morphology” (area of optimal thickness for light microscopic examination) should be at least 2 cm in length. The smear should occupy the central area of the slide and be margin-free at the edges.

**Hematological examination** - Hematological examination including HB%, PCV, Red cell indices, platelet count and total white cell count with differential count should be done on peripheral smears stained with field A and B stains.

**OBERVATION & DISCUSSION**
**Organophosphorus toxicity induced RBC changes.**

<table>
<thead>
<tr>
<th>RBC changes</th>
<th>Misinterpretation on peripheral blood smears examination</th>
<th>Total (n=50)</th>
<th>Cases</th>
<th>Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acanthocytes, Spherocytes with central pallor, Polychromatophilic cells</td>
<td>RBC crenations , Heredity Sherocytosis, Hemolytic evidence</td>
<td>31</td>
<td>62.00%</td>
<td>Mild toxicity</td>
</tr>
<tr>
<td>Dacrocytes / Boat sheped rbc, Shistocytes, Target cells</td>
<td>Hbsc Disease , Hemolytic Anemia Liver disease</td>
<td>10</td>
<td>20.00%</td>
<td>Moderate Toxicity</td>
</tr>
<tr>
<td>Echinocytes / Burr cell Rouleaux formation</td>
<td>Ueaemia, High plasma protein concentration</td>
<td>05</td>
<td>10.00%</td>
<td>Mild Toxicity</td>
</tr>
<tr>
<td>Degenerated erythrocytes</td>
<td>Poor smear / store sample</td>
<td>04</td>
<td>8.00%</td>
<td>Sever Toxicity</td>
</tr>
</tbody>
</table>
WBC changes

<table>
<thead>
<tr>
<th>WBC cells</th>
<th>WBC Changes</th>
<th>% (n=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutrophils</td>
<td>Degeneration</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28.00 %</td>
</tr>
<tr>
<td>Lymphocyte</td>
<td>Degeneration</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.00 %</td>
</tr>
<tr>
<td>Monocytes</td>
<td>Nuclear under goes disintegration.</td>
<td>04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.00 %</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>Degeneration</td>
<td>04%</td>
</tr>
</tbody>
</table>

Platelets

<table>
<thead>
<tr>
<th>platelets</th>
<th>% (n=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platelets aggregation ( Pseudo thrombocytopenia )</td>
<td>02(2.00%)</td>
</tr>
</tbody>
</table>

CONCLUSION
In this study, we found that patients with more severe organophosphate poisoning shows degeneration of all peripheral blood cells due to lipid per oxidation and oxidative stress of cell membrane and these have worst prognosis with very poor or delay recovery. Those patients shows various type RBC morphological changes on peripheral blood smear have mild to moderate type toxicity with slow recovery from illness. RBC shows various types changes theses may be used as a prognostic tool for severity of toxicity monitoring of patients and follow-up and exclude the various misinterpretation of peripheral blood smear examination like hemolytic anemia and liver disease. RBC cell morphological changes also indicate to involvement of various other system CVS, GIT and CNS etc.

REFERENCES


