ELEVATED LEAD LEVELS WITH RETAINED BULLETS IN PEDIATRIC PATIENTS

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BACKGROUND

The majority of patients who sustain low-velocity gunshot wounds (GSW) are treated non-operatively and the retained projectiles are not typically removed unless involving intra-articular fragments. Lead toxicity from extra-articular retained bullets is uncommon but the potential does exist.1,2 The risk of toxicity is based on multiple factors1-4.

In children, the possibility of elevated lead levels should be considered as health effects from the elevated levels can lead to permanent disability (Figure 5)2. The two following cases are of children who sustained GSWs with retained extra-articular bullets that resulted in elevated lead levels.

Table 1: Factors impacting risk of lead toxicity from retained bullets1-4

<table>
<thead>
<tr>
<th>Factors Impacting Risk of Lead Toxicity</th>
<th>Site of impact</th>
<th>Degree of fragmentation</th>
<th>Type of bullet</th>
<th>Final resting place (i.e. intra-articular)</th>
<th>Physiologic state of the individual</th>
</tr>
</thead>
</table>

CASE REPORT 1

A 7-year-old boy sustained a shotgun wound to his left upper thigh. The x-ray (Figure 1) demonstrated numerous pellets in the soft tissues of his left thigh without an underlying fracture. His wounds were cleaned and superficial pellets removed. A lead level was drawn at his 2 week follow-up visit and was elevated at 31μg/dL. Lead levels were monitored based on the CDC schedule for lead testing (Table 3), with plans to treat if levels exceeded 45μg/dL. His levels continued to trend downward (Figure 2). Some pellets came to the surface and were removed, however the majority of the pellets remain in the soft tissues and are likely encapsulated. His lead level will continue to be monitored until a value of less than 5 μg/dL is reached.

CASE REPORT 2

A 6-year-old girl sustained a GSW to her right pelvis. She had a single, retained bullet in her right pelvis with fracture of the right ileum (Figure 3). Orthopedic surgery determined the risk of removal was higher than the benefit. Her lead level on the day of injury was 7.5 μg/dL. This increased to 17 μg/dL at her 3 week follow-up visit and continues to rise (Figure 4). She was lost to follow-up for a period of time, however recently at 68 weeks post injury had a lead level of 21. Due to this elevation, she has been referred for neurodevelopmental assessment.

Table 2: CDC recommended follow-up of elevated blood lead levels7

<table>
<thead>
<tr>
<th>Venous Blood Lead Levels (μg/dL)</th>
<th>Early follow up testing (2-4 tests after identification)</th>
<th>Later follow up testing after BLL declining</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤5 μg/dL</td>
<td>As soon as possible</td>
<td>≥70 μg/dL</td>
</tr>
<tr>
<td>5-9 μg/dL</td>
<td>≥45 μg/dL (3 months)</td>
<td>≥45 μg/dL (3 months)</td>
</tr>
<tr>
<td>10-19 μg/dL</td>
<td>≥45 μg/dL (1-3 months)</td>
<td>≥45 μg/dL (1-3 months)</td>
</tr>
<tr>
<td>20-24 μg/dL</td>
<td>≥45 μg/dL (2 weeks-1 month)</td>
<td>≥45 μg/dL (1 month)</td>
</tr>
<tr>
<td>≥25 μg/dL</td>
<td>As soon as possible</td>
<td>As soon as possible</td>
</tr>
</tbody>
</table>

CONCLUSIONS

Lead exposure is associated with toxicity to every organ system. Neurological effects are especially concerning and can lead to life-long impacts on neurological function and decreased IQs3,5,6. Additionally, lead toxicity can delay puberty and can decrease fertility3,6. The half-life of lead in blood ranges from 1 week to 2 years and can be 1-2 decades in bones2-3. Treatment and monitoring is based on blood lead levels as seen in Tables 2 and 3. In these cases the threshold of 45 μg/dL was not reached and chelation treatment has not been needed. These cases do however demonstrate that some extra-articular projectiles can cause increased blood lead levels and patients would benefit from monitoring. Not all bullets contain lead. Shotgun rounds are more likely to contain uncoated lead. Many single bullets have a lead core coated with copper or steel, therefore if they fragment, the patients are at a higher risk of lead toxicity2. If the lead levels reach toxicity, or remain elevated, projectiles may need to be removed. Case two is at risk of needing intervention.

REFERENCES