Introduction

Over the last few years, we have noticed an increasing number of admissions to our burn unit for high-voltage electrical burns from copper wire theft. The market value of copper and the difficult economic situation are making this a common criminal activity in our country. The economic costs to society are high, and include treatment and rehabilitation of these individuals as well as repair or replacement of the stolen property.

Burns caused by an electric current are very serious, with a risk of death from cardiac arrhythmias and dramatic functional sequelae, including a very high risk of amputation. We report the cases of burns admitted to our institution due to this new burn risk factor, namely copper theft.

Case Series

Six patients were admitted to our Burn Unit between January 2012 and December 2014 due to electrical burns caused by copper wire theft (Table I). The patients were male, between 28 and 37 years old. A known history of drug abuse was present in four of the cases. They presented with severe third-degree burns in the upper limbs (likely the point of entry of the electric current – Fig. 1) and facial, cervical and trunk flash burns, with the exception of two patients who sustained more generalized and deeper burns. One patient also had severe burns in the right lower limb with knee joint destruction (Fig. 2). Other traumatic lesions were excluded in all cases.
All of them had markedly increased levels of creatine kinase and myoglobin on admission and received intravenous fluid therapy and calcium bicarbonate. They were monitored for cardiac arrhythmias, and serial measurements of cardiac enzymes were taken, with no pathological findings except for one case of sinus bradycardia. Fasciotomies had to be performed in every patient due to compartment syndrome. They were subjected to serial debridement and split thickness skin grafting of their burns. In one case, there was extensive damage to the volar aspect of the left wrist with irreversible destruction of the median and ulnar nerves, ulnar artery and superficial and deep flexor tendons (Fig. 3). A pedicled groin flap was performed for wrist coverage (Fig. 4). Four patients had to undergo limb amputation at the electric current’s point of entry and/or exit due to extensive tissue necrosis and joint involvement.

Long-term follow-up was not possible since all the patients abandoned their clinical appointments, including two of them who were arrested for crimes committed after their discharge from our institution.

Discussion

High-voltage electrical injuries cause extensive deep tissue damage, often more severe than TBSA might predict. Vascular, nerve and muscle structures are usually affected due to their low electrical resistance. In the acute setting, these patients need cardiac monitoring due to the possibility of acute life-threatening arrhythmias. The need for fasciotomies and amputations is higher than for any other type of burn, our series being no exception. The hands and upper extremity are generally affected, and it has been reported that only 5.4% of patients retain full function. Associated injuries include fractures, renal injury and abdominal and head trauma, among others.

This phenomenon is increasing worldwide, possibly because of the economic crisis and the significant increase in the value of copper in the last decade. Stolen copper is a valuable scrap metal, in great demand due to the fact that it is widely used in fiber optics, electricity and plumbing.

The costs of these injuries are very high, and include the acute and long-term treatment and rehabilitation of the patients as well as repair or replacement of the damaged materials.

This paper shows the severe consequences of this new criminal tendency and the need to avoid it. Measures to counteract this increasing trend should be implemented, such as better surveillance, regulation of scrap metal transactions, replacing copper wires with copper weld and public awareness campaigns.

<table>
<thead>
<tr>
<th>Patient no.</th>
<th>Age</th>
<th>Past medical history</th>
<th>TBSA</th>
<th>Myoglobin (ng/mL)</th>
<th>Creatinine kinase (U/L)</th>
<th>Acute cardiac arrhythmias</th>
<th>Fasciotomies</th>
<th>Amputation</th>
<th>Hospital length of stay (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>37</td>
<td>-</td>
<td>50</td>
<td>&gt;12000</td>
<td>31896</td>
<td>-</td>
<td>Upper right limb</td>
<td>Right arm</td>
<td>64</td>
</tr>
<tr>
<td>2</td>
<td>31</td>
<td>Drug abuse, HCV</td>
<td>5</td>
<td>&gt;12000</td>
<td>36432</td>
<td>-</td>
<td>Upper right limb</td>
<td>Right forearm</td>
<td>70</td>
</tr>
<tr>
<td>3</td>
<td>34</td>
<td>Drug abuse, HCV, HIV</td>
<td>10</td>
<td>&gt;12000</td>
<td>25486</td>
<td>-</td>
<td>Upper left limb</td>
<td>Left forearm</td>
<td>58</td>
</tr>
<tr>
<td>4</td>
<td>29</td>
<td>Drug abuse</td>
<td>16</td>
<td>&gt;12000</td>
<td>32357</td>
<td>-</td>
<td>Right forearm</td>
<td>-</td>
<td>63</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>Drug abuse</td>
<td>25</td>
<td>&gt;24000</td>
<td>38223</td>
<td>-</td>
<td>Right hand</td>
<td>Right thigh</td>
<td>38</td>
</tr>
<tr>
<td>6</td>
<td>28</td>
<td>-</td>
<td>70</td>
<td>&gt;12000</td>
<td>21109</td>
<td>Bradycardia</td>
<td>Upper limbs and left thigh</td>
<td>-</td>
<td>95</td>
</tr>
</tbody>
</table>

Fig. 3 - Destruction of the volar aspect of the left wrist with nerve, vascular and tendon lesion.

Fig. 4 - Coverage with a pedicle groin flap.

BIBLIOGRAPHY