Carpal tunnel syndrome (CTS) is often caused by entrapment of the median nerve and tendons in the carpal tunnel, but is rarely due to a problem of the nerve itself.\textsuperscript{1} The commonest cause of CTS is a congenital predisposition - the carpal tunnel is simply narrower in some people than in others.\textsuperscript{1} Many middle-aged people develop CTS because of this deformity. Other contributing factors include stressful work, trauma, injury, endocrine disorders, joint deformities, fluid retention, and the development of any space occupying lesions in the tunnel.\textsuperscript{1-3} In burn cases the reported causes of CTS are increased volume of carpal tunnel content due to oedema and synovitis, wrist hyperextension, tight dressing, fibrosis, and direct burn injury to the nerve.\textsuperscript{4-7} The median nerve is more affected than the ulnar nerve among patients with wrist burn.\textsuperscript{5}

Although the involvement of peripheral nerves in electrical burn injuries is frequently observed in clinical practice, there are few reports of CTS following electrical burns.\textsuperscript{4} A Medline search through May 2007 failed to identify studies on CTS developing from burns and its relationship with different burn aetiologies. This study describes some selective features of reported CTS cases following different types of burns treated in our burns centre.

Materials and methods

A retrospective case study was carried out at our burns centre in order to identify CTS following different burn aetiologies. The data were collected by reviewing the treatment charts of patients with CTS admitted to the burns centre between January 2001 and January 2006. All the patients had surgical release of their CTS immediately after diagnosis, when these data were collected in a data collection sheet and compiled in a spreadsheet. A descriptive data analysis was carried out, using Epilinfo software, to observe CTS following hand burns. All the CTS cases were primarily diagnosed clinically and, if needed, either electromyography or magnetic resonance imaging was performed for confirmation.

Results

We considered 36 cases of CTS in 28 patients treated for CTS following different kinds of burns in the upper extremities. Of these 28 patients, eight had bilateral CTS, 12 in the right hand, and the rest in the left hand. In our study group 79% of the patients were male, 75% were white, and 22% were African American. The mean age of the CTS patients was 52 yr (SD = 10.51 yr) and 79% were male. Of these, 57% had sustained thermal burns, 32% electrical burns, and the remainder had scalds or chemical burns. More patients (56%) had second-degree burns than third-degree burns and all but one of the patients with electrical burns had second-degree burns. This observation demonstrates that there were a considerable number of CTS cases following thermal burn injury compared to previous reporting. This study also suggests the need of a prospective study to examine the association between burns in the upper extremities and the likelihood of their progression to CTS and whether any specific type of burn is more likely to result in CTS.
Table I - Carpal tunnel syndrome in relation to burn aetiological factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>Number of patients (n = 28)</th>
<th>Number of CTS (n = 36)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal</td>
<td>11 - 5 = 16</td>
<td>20</td>
<td>56</td>
</tr>
<tr>
<td>Electrical</td>
<td>8 - 1 = 9</td>
<td>12</td>
<td>33</td>
</tr>
<tr>
<td>Chemical</td>
<td>2 - 0 = 2</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Scalds</td>
<td>1 - 0 = 1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>22 - 6 = 28</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion

The lifetime prevalence of CTS in the general population is less than 10%. The occurrence of CTS following burns has been cited in a number of articles in past years, but very few stress the aetiological aspect of burns progressing to CTS. In our observation, the development of CTS follows burns is common and there may be some specific kind of aetiological factor predisposed to CTS.

In our study, we observed 36 cases of CTS following burns, in most of which CTS developed within five months of the burn injury. The commonest aetiological factor in burns among the CTS patients was thermal burns, with an incidence of about 56% in the study group. We also observed that apart from the direct effects of trauma, there was a greater chance of entrapment of nerves of the hand, especially of the median nerve in the carpal tunnel, owing to excessive oedema in circumferential burns.

Extensive metabolic and inflammatory changes occur in response to burns. Some studies have documented that metabolic disorders such as acromegaly, amyloidosis, diabetes, hypothyroidism, and hyperthyroidism can cause or exacerbate the CTS syndrome. However, CTS due to metabolic changes caused by burns has not been previously documented and therefore, in this retrospective data analysis, it was not possible to examine this aspect in the present study.

One previous observation reported that burn patients may take 4-14 months after discharge before developing the symptoms of CTS. In our study, this took an average time of 143 days - nearly five months between the day of injury and the day of surgical intervention. The data in the charts were not sufficient to estimate the time in days between the burn injury and the exact day the patient started experiencing symptoms due to CTS.

With regard to sex distribution, in the general population women are twice as likely to develop CTS as men. In our observation group of CTS patients, there were four times as many men as women, while the number of male admissions to our burns centre was only twice that of female admissions. Therefore, the sex distribution of CTS cases in the study did not confirm the sex distribution of CTS cases reported in population-based studies. The most likely explanation for this variation is that a disproportionate number of males had sustained hand burns during this period of time.

Previous studies have shown that CTS is mainly an observable fact in the adult population aged over 25 years of age. Although half of the patients admitted to our burns centre were 30 years of age and under, surprisingly none of our particular patients was aged less than 30. This raises an interesting question, because if burns are a predisposing factor for CTS, we should have seen at least some CTS patients under the age of 30.

Conclusions

This observation demonstrates that there was a considerably higher number of CTS cases following thermal burn injury than other kind of burn. We would therefore suggest that during the follow-up of hand burn cases, the burns team should consider the possibility of CTS developing after burns, and especially thermal burns. This study is limited by the size of the patient sample and the retrospective method of data collection. However, it leaves us with questions as to why there was no case of CTS in burn patients aged less than 30 years and why CTS is more prevalent among male burn patients. A prospective study needs to be designed to examine these issues and to examine in greater detail the association between burns in the upper extremities and their progression towards CTS and whether any specific type of burn is more likely to result in CTS.

RÉSUMÉ. La cause la plus commune du syndrome du canal carpien (SCC) est une prédisposition congénitale - tout simplement, le canal carpien est plus étroit chez certaines personnes. Le développement du CTS à cause de divers types de brûlure n’a jamais été décrit dans la littérature. Notre étude décrit certains aspects caractéristiques démographiques observés parmi tous les cas de SCC observés à la suite de divers types différents de brûlure chez les patients traités dans notre Centre des Brûlés aux États-Unis. Une analyse descriptive des données a été effectuée pour observer le SCC à la suite des brûlures de la main. Nous avons étudié 36 cas de SCC chez 28 patients qui présentaient divers types de brûlure aux extrémités supérieures. L’âge moyen des pa-

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tients atteints de SCC était de 52 ans (déviation standard, 10,51 ans); 79% étaient mâles. De ceux-ci, 56% avaient subi des brûlures thermiques, 32% des brûlures électriques et le reste, des ébouillantements ou des brûlures chimiques. Le nombre des patients atteints de brûlures de deuxième degré (équivalent à 56%) était supérieur au nombre qui présentait des brûlures de troisième degré et tous les patients sauf un atteint de brûlures électriques avaient des brûlures de deuxième degré. Cette observation indique, par rapport aux résultats des études précédentes, une fréquence élevée de cas de SCC à la suite des lésions dues aux brûlures thermiques. Cette étude souligne en outre la nécessité d’une étude prospective pour considérer l’association entre les brûlures aux extrémités supérieures et la possibilité que celles-ci se transforment en SCC; il faudrait aussi étudier s’il existe un type spécifique de brûlure plus exposé au risque de CTS.


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