SELF-INFLICTED BURNS IN A NATIONAL SWEDISH BURN CENTRE: AN OVERVIEW

BRÛLURES VOLONTAIRES DANS UN CTB SUÉDOIS: REVUE D’UNE SÉRIE

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SUMMARY. In the Western world, self-inflicted burns are often associated with mental health disorders, and the management, particularly the pain treatment, can often be complicated by the psycho-social background of the patients. The aim was to describe a group of patients with self-inflicted burns by analysing their in-hospital mortality and the use of sedation during procedures. All patients with self-inflicted burns admitted to the Linköping Burn Centre during 2000-2017 were included. The control group consisted of adults (≥17 years) with accidental burns, admitted during the same period. Multivariable logistic and linear regression was used for analysis. Three percent of all patients (47/1601) had self-inflicted burns: most of them were men (60%, 28/47), none was younger than 17 years, and flame was the major cause of injury. Self-inflicted burn patients were younger and had larger burns: mean age (SD) was 42 (16) and 49 (20) years, respectively; mean TBSA (SD) was 29% (26) and 14% (17), respectively. The crude rate of procedures done under sedation was higher (mean (SD) 0.37 (0.23) compared with 0.24 (0.25)) as was crude in-hospital mortality (8/47, 17% compared with 72/1018, 7%). Multivariable analyses showed no difference in the use of sedation for procedures or in-hospital mortality after adjustment for TBSA%, full thickness burns, age and sex. Age and TBSA% were associated with in-hospital mortality, whereas the intentionality of the burn was not. TBSA% and female sex were associated with increased use of sedation for wound care procedures, whereas self-inflicted burns were not.

Keywords: self-inflicted burns, sedation, wound procedures, mortality

RÉSUMÉ. Dans les pays développés, les brûlures volontaires entrent souvent dans le cadre d’une pathologie psychiatrique, qui peut interférer avec leur traitement, en particulier l’analgésie. Le but de cette étude était de décire un groupe de patients brûlés par tentative de suicide hospitalisés dans le CTB de Linköping entre 2000 et 2017, en analysant la mortalité et le recours à la sédation, comparativement à une population d’adultes (≥17 ans) hospitalisés durant la même période après une brûlure accidentelle. Nous avons utilisé une analyse logistique linéaire multivariée. Les suicidants représentaient 3% des patients (47/1601), 60% (28/47) étaient des hommes, aucun n’avait moins de 17 ans et une flamme était le plus souvent cause de la brûlure. Les suicidants étaient plus jeunes (42 +/- 16 VS 49 +/- 20 ans) et plus extensivement brûlés (29 +/- 26% VS 14 +/- 17%). Les pansement étaient plus fréquemment réalisés sous sédation (37 +/- 23% des cas VS 24 +/- 25%) et la mortalité était plus élevée (17% - 8/47 VS 7% - 72/1018). En analyse multivariée et après ajustement sur la surface brûlée, on ne trouve pas de différence de mortalité, de recours à la sédation, de brûlures profondes, d’âge ni de sexe, la surface brûlée et l’âge étant associées à la mortalité mais pas le caractère intentionnel. Les femmes avaient plus souvent besoin de sédation que les hommes, le recours à la sédation tant en outre associé à la surface brûlée mais pas l’intentionnalité.

Mots-clés: brûlure volontaire, sédation, pansement, mortalité
Introduction

Self-inflicted burns represent a small proportion of burns worldwide.\textsuperscript{1,2} In the Western world it is a relatively rare phenomenon, often related to individuals with mental or psychological disorders or substance abuse.\textsuperscript{3-5} Risk behaviours causing recurrent injuries among this group have been described\textsuperscript{6} and the in-hospital mortality risk has been reported to be no higher than that among accidental burns\textsuperscript{2,7} although there are studies that have shown the opposite.\textsuperscript{8}

In South-East Asia, on the contrary, self-immolation is a frequent cause of death among young women who commit suicide.\textsuperscript{9,10} The treatment of patients with self-inflicted burns is a challenge for caregivers because of the potential complexity of their psycho-social background.\textsuperscript{11,12} A recent review has concluded that the treatment can be improved if the psycho-social element is considered together with the physical care.\textsuperscript{3}

The estimation of care provided to patients with self-inflicted burns is feasible regarding the physical aspects\textsuperscript{13} as the burn care is relatively standardized. However, psycho-social factors are more complicated to study. Moreover, a recent study has shown divergent attitudes among burn surgeons regarding self-harm injuries, which could influence treatment decisions, sometimes to the disadvantage of these patients.\textsuperscript{14} Also the management of pain and sedation during procedures of dressing change gives rise to large, individual variations.\textsuperscript{15,16}

The question remains if there is a tendency to treat patients with intentional burns differently to those with accidental burns, and whether it is affecting in-hospital mortality. Our hypothesis is that these patients receive more frequent sedations for burn care procedures compared to unintentional burn patients, and that this negatively affects outcome.

The aim was to describe the group of patients with self-inflicted burns admitted to a National Swedish Burn Centre by:

- comparing their characteristics and outcomes with patients admitted for accidental burns;
- determining the effect of self-inflicted burns on in-hospital mortality;
- detecting differences in the use of sedation during wound care procedures with patients admitted for accidental burns.

Material and methods

The study population consists of all the patients admitted to the Linköping Burn Centre for self-inflicted burns (\(n = 47\)), between the 1\textsuperscript{st} January 2000 and the 31\textsuperscript{st} June 2017. As all patients in the study population were 17 years old or over (age range = 17-77 years), we defined the control population as all accidental burns \(\geq 17\) years (age range = 17-97 years, \(n = 1018\)) admitted to the Linköping Burn Centre during the same period. Patients readmitted for care of the same burn injury were considered once in the analysis; in these cases, the date of injury, cause of burns and burn size were the same, and the duration of stay was calculated as the sum of all days at the Burn Centre. Three patients in the study population were readmitted many times for new burns, but we included them once in the analyses and we described them separately.

All variables had been prospectively recorded in the local Burn Unit Database and were analysed retrospectively: age, sex, cause of injury, percentage total body surface area burned (TBSA\%), full thickness burns (FTB), duration of hospital stay and death from any cause during the admission. All medical interventions had been recorded for each patient on a daily basis, using the Burn Scoring System.\textsuperscript{13,17} The rate of dressing procedures under sedation was calculated by dividing the number of procedures with sedation with all procedures for wound care.

Analysis of data and statistics

Data are presented as number (%), mean (SD), or median (10th-90th centile). Normal distribution of the data (tested by the Lilliefors test for normality) could not be assumed. All statistical tests were two-tailed. Probabilities of less than 0.05 were accepted as significant.

Differences between groups were tested for significance using Mann-Whitney U test, and chi square test, as appropriate. The effect of self-inflicted burns on in-hospital mortality adjusted for age, sex, TBSA\% and FTB\% was analysed with logistic mul-
tivariable regression. The effect of self-inflicted burns on the use of sedation during procedures adjusted for age, sex, TBSA% and FTB% was analysed with linear multivariable regression.

Data were analysed with the help of Statistica (v.13.2, StatSoft Inc., USA) or STATA (STATA v.12.0, Stata Corporation LP College Station, TX, USA).

Results

From 2000 to 2017, 1601 individuals (children and adults) were admitted to the Linköping Burn Centre with burns: 3% of them (47/1601) were self-inflicted. Of these, one was caused by electricity, 2 by scalds and 44 (93%) by flame. Sixty percent (28/47) of patients with self-harmed injuries were men, mean (SD) age was 42 years (16), TBSA 29% (26) and full thickness burns (FTB) 17% (25). Four patients with self-inflicted burns (one man and three women) were readmitted during the study period for new self-harm injuries and none of them died during the admissions. Two men with unintended injuries were readmitted for new accidental burns. The crude in-hospital mortality among self-harm injuries was 17% (8/47). One woman and two men died during admission despite a Baux score of less than 100 (Baux score range: 64-85); their injuries were deep and they had severe burns (18-55% TBSA and 10-36% FTB); one of them died from multiple organ failure and two due to cerebral-vascular causes.

Comparison of demographic details and use of sedation for wound care procedures between self-inflicted and accidental burns are shown in Table I. The group with self-inflicted burns was younger, had larger and deeper burns, and the proportion of women was larger than in the control group. More procedures, both with and without sedation, were provided to self-inflicted burns and crude in-hospital mortality was higher.

The results of multivariable regression showed that age and TBSA% were associated with an increased risk of dying during the admission, whereas sex, full thickness burns and self-inflicted injuries were not (Table II). Female sex and TBSA% were associated with increased use of sedation during wound care procedures, whereas intentional injuries were not (Table III).

| Table I - Comparison between self-inflicted and accidental burns ≥17 years |
|-----------------------------|------------------|------------------|-----------|
| | n | Self-inflicted burns | Accidental burns | p |
| Female sex, n (%) | 1065 | 47 | 1018 |  |
| Age, years | 274 (26) | 19 (40) | 255 (25) | 0.01 |
| TBSA% | 48 (32-64) | 19 (9-42) | 7 (2.5-18) | <0.001 |
| FTB% | 7 (2.5-19) | 19 (9-42) | 7 (2.5-18) | <0.001 |
| In hospital mortality, n (%) | 0.25 (0-4) | 3 (0-27) | 0.25 (0-3.5) | 0.001 |
| Procedures without sedation | 80 (8) | 8 (17) | 72 (7) | 0.01 |
| Procedures with sedation | 5 (2-11) | 11 (4-20) | 5 (2-11) | <0.001 |
| Rate of procedures with sedation* | 1 (0-5) | 6 (1-15) | 1 (0-5) | <0.001 |

Data are number (%) or median (10th-90th percentile); TBSA = Total body surface area
*Rate of wound care procedures with sedation = Procedure with sedation / all procedures

| Table II - Logistic regression for the effect of self-inflicted burns on in-hospital mortality in patients ≥ 17 years |
|-------------------|-------------------|-----------------|
| OR | 95% CI | p |
| Age, years | 1.11 | 1.08-1.14 | <0.001 |
| Female sex | 0.77 | 0.40-1.51 | 0.4 |
| TBSA% | 1.08 | 1.06-1.11 | <0.001 |
| FTB% | 1.02 | 1.00-1.05 | 0.09 |
| Self-inflicted burns* | 0.28 | 0.07-1.08 | 0.07 |

All patients = 1065; TBSA = Total body surface area; FTB = Full thickness burn
*Reference is accidental burns
Discussion

In this study we described the group of patients with self-inflicted burns admitted to the National Burn Centre in Linköping (Sweden) from 2000-2017. We compared them with the adults with unintentional burns admitted during the same time period. According to our results, self-harm injured patients were predominantly male, flame burn was the main cause of burn, and they had more extensive and deeper burns than patients with accidental burns. Crude in-hospital mortality was higher, as was the number of wound care procedures and the rate of procedures under sedation; however, after adjustment for TBSA%, full thickness burns, age and sex there was no difference between the groups.

Description of the group

Most burns occur unintentionally: scalds that occur at home are common in children, flame burns occur predominately among adults.18-21 Self-inflicted burns make up a small proportion of admissions to burn centres in high income countries, representing approximately 2-3% of all patients with burns. These reports are similar to the results presented in this study: over the last twenty years 3% of all burns admitted to a Swedish National Burns Centre were self-inflicted, 60% of patients were men, and age was in the range of 17-77 years. There were no children in the self-inflicted group, whereas almost a third of the total number of patients with accidental injuries were younger than 10 years but were not included in this study. The patients with self-inflicted burns were mainly older and had larger and deeper burns than those with unintentional burns.

In our study, the mechanism of injury among the accidental burn patients included flame, scalds, contact burns, explosion, electrical burns and chemical substances, whereas almost all self-inflicted injuries were caused by flame.

Mental disorders and alcoholism are overrepresented in the burn population worldwide,22-25 and the same seems to be true even in cases of self-immolation3,5 and in self-harm injuries.12,26-28 However, pre-existing comorbidities are not recorded in the local Burn Unit Database and therefore we can neither confirm nor deny this observation with the present study.

In-hospital mortality

Whether self-inflicted burns are associated with high in-hospital mortality or not is a source of conflicting results. An Australian group reported higher mortality in patients with self-inflicted injuries admitted to a major tertiary referral hospital in Melbourne (n = 98), compared with those with non-intentional injuries (n = 2251), after adjusting for age, severity of injury and mechanism of injury.29 Contrary to this finding, a multicentre study including more than 30,000 burns showed that in-hospital mortality was not higher among self-inflicted burns. In our study, crude in-hospital mortality was 17% and differed considerably from mortality rate for all admissions to our centre (5%). As expected, age and TBSA% increased the risk of dying during hospital

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Table III - Linear regression for the effect of self-inflicted burns on the use of sedation during wound care procedures in patients ≥ 17 years

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>CI</th>
<th>p value</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.14</td>
<td>0.10 to 0.18</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Female sex</td>
<td>0.04</td>
<td>0.01 to 0.07</td>
<td>0.02</td>
<td>0.06</td>
</tr>
<tr>
<td>Age, years</td>
<td>0.00003</td>
<td>-0.0007 to 0.0007</td>
<td>0.94</td>
<td>0.002</td>
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<tr>
<td>TBSA%</td>
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<td>0.007 to 0.009</td>
<td>&lt;0.001</td>
<td>0.57</td>
</tr>
<tr>
<td>FTB%</td>
<td>-0.002</td>
<td>-0.003 to -0.0002</td>
<td>0.03</td>
<td>-0.10</td>
</tr>
<tr>
<td>Self-inflicted burns*</td>
<td>0.008</td>
<td>-0.06 to 0.07</td>
<td>0.82</td>
<td>0.006</td>
</tr>
</tbody>
</table>

All patients = 1065; Model adjusted R² = 0.25; Dependent variable = rate of wound care procedures under sedation of all wound care procedures; TBSA = Total body surface area; FTB = Full thickness burn

*Reference is accidental burns
tics showed a higher number of procedures with and than patients with accidental burns. Unadjusted statistics showed a higher number of procedures with and without sedation among the patients with self-inflicted burns, however, after adjusting for sex, burn extent and depth, there was no independent effect of self-inflicted burns on the use of sedation during procedures for wound care, which goes against our hypothesis.

Limitations
The first limitation is the relatively small study sample and the single-centre approach, which reduces the generalizability of our conclusions. However, the generalizability of our conclusions. However, the

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Conclusions
Self-inflicted burns were rare among all patients admitted to a National Swedish Burn Centre; these burns were larger and crude in-hospital mortality was higher. Age and TBSA% were associated with in-hospital mortality, whereas the intentionality of the burn was not. TBSA% and female sex were associated with increased use of sedation for wound care procedures, whereas self-inflicted burns were not.
TBSA% and age based model for the prediction of mortality after burns does not increase its predictive power. Burns, 41(8): 1868-1876, 2015.


29 Varley J et al.: Self harm is an independent predictor of mortality in trauma and burns patients admitted to ICU. Injury, 43(9): 1562-5, 2012.


**Ethics approval.** The study was approved by the Regional Ethics Review Board in Linköping (No.2013/341-31).

**Availability of data and material.** The dataset used and/or analysed during the current study is available from the corresponding author on request.

**Competing interests.** There are no conflicts of interest for any of the authors, financial or personal.

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