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Mortality and causes of death of Dutch burn patients during the period 2006–2011

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ARTICLE INFO

Article history:
Accepted 14 October 2014

Keywords:
Burn
Mortality
Multiple organ failure
Withholding treatment
Palliative care

ABSTRACT

Introduction: Mortality of burn patients has decreased in the last decades. Literature indicates that the leading cause of death in late mortality is multiple organ failure (MOF), but literature is not clear about the cause of early mortality. The aim of this study was to determine the mortality and causes of death of burn patients in Dutch burn centers between January 2006 and December 2011.

Methods: A retrospective study was performed in patients who died between January 2006 and December 2011 in the burn centers of Rotterdam and Beverwijk, the Netherlands. In this period 2730 patients were admitted.

Results: Of these 2730 patients, 88 patients died as a result of their burn injury. The overall mortality rate was 3.2%. The palliative care group, defined as patients receiving no curative ('active') care and leading to early death (<48 h), consisted of 28 patients (31.8%, 28 out of 88 patients). The most common cause of late mortality (>48 h, in 60 out of 88 patients, 68.2%) was MOF (38.3%, 23 out of 60 patients). One important significant difference between the early and late mortality groups was a higher Baux score in the palliative care group compared to the withdrawal of and active treatment groups. There were no significant differences when the groups were compared regarding the presence of inhalation trauma.

Conclusions: Mortality in burn patients has decreased. Most deaths occur early, in patients who receive only palliative care. In late mortality, MOF is the most common cause of death.

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[1] Members of The Dutch Burn Repository Group are given in Appendix A.
http://dx.doi.org/10.1016/j.burns.2014.10.009
0305-4179/

1. Introduction

Even though the mortality of burn patients has decreased in the last decades [1–3], patients still die as a result of their burn injuries. The literature indicates that the leading cause of late mortality is multiple organ failure (MOF) [4–7]. The cause of early mortality is not clear, but appears to occur mainly in patients who are not actively treated and receive palliative care [8,9].

Beside the depth and affected total body surface area, the prognosis after burn wounds is influenced by age, co-morbidities and other trauma such as inhalation injury [4,10–15]. Breathing or circulation problems occur mainly in the first 48 h after a burn injury. After this period metabolic and infectious problems occur [16].

Due to changes in burn care, such as early surgery, improved resuscitation, nutritional support and skin replacement techniques, the mortality rate has decreased [5,11]. The aim of this study was to determine the mortality and causes of death of burn patients in two Dutch burn centers between January 2006 and December 2011.

2. Methods

A retrospective study was performed in patients who died between January 2006 and December 2011 in two of the three burn centers in the Netherlands (Rotterdam and Beverwijk). In the Netherlands patients with burns are referred to a burn center if they fulfill the referral criteria presented in Table 1.

Data of the patients admitted to the burn centers in the years 2006–2008 were collected from the (digital) patient files. Data of the patients in the years 2009–2011 were obtained from the joint burn registry of the three burn centers in the Netherlands (Dutch Burn Repository R3) which started in 2009.

Data collection included age, gender, year of admission, burn center, cause of injury, co-morbidities (circulatory, endocrine, locomotor, gastro-intestinal, genitourinary, respiratory, and psychiatric), TBSA, Baux score, inhalation injury, CO-intoxication, survival time, complications and cause and time of death. Co-morbidities were registered by number and not by severity. TBSA was determined by the Lund and Browder charts. The Baux score is defined as the sum of age in years and TBSA and can be used to predict the probability of survival after severe burns [17]. If the score exceeds 100, the patient has a reduced probability of survival (<50%). The revised Baux score is defined as the sum of age in years and TBSA in % and the presence of an inhalation trauma with 17 points [18]. Early mortality was defined as death within 48 h and late mortality as death after 48 h.

Table 1 – Dutch burn center referral criteria.

TBSA > 10% for adults
TBSA > 5% for children
Full thickness burn > 5% TBSA
Burns on children or elderly
Burns on patients with pre-existing conditions, that may affect treatment and healing
Burns associated with another trauma or with inhalation trauma
Burns on functional areas, such as hand, foot, face, genitalia or large joints
Electrical burns
Chemical burns
Circular burns on trunk or limbs

Patients who died during hospital admission were subdivided into three groups [19]. The first group consisted of patients for whom no active ('curative') care was started and who received only palliative care. The decision to withhold treatment was made on admission day by the entire burn team according to the hospital protocol. This decision is based on many objective and subjective factors such as age, TBSA, inhalation trauma, co-morbidities, patient's wishes or likely patient choices as reported by the family. In the second group, active treatment was initially started but was discontinued due to complications. The third group received active treatment until death.

Data were analysed using SPSS version 17.0. One-way ANOVA and the Kruskal–Wallis test were used for continuous variables for group comparisons. The Chi-square test was used to compare categorical variables between the patient groups. Two-tailed p values below 0.05 were considered statistically significant.

3. Results

During the period January 2006–December 2011 2730 patients were admitted to the burn centers of Rotterdam and Beverwijk in the Netherlands. The mean age and TBSA did not change between 2006 and 2011 (ANOVA, $p = 0.865$ and $p = 0.151$, respectively) (Table 2). Of these patients, 91 patients died during hospital admission. Three patients who died as a result of cancer were excluded from further analysis. The overall mortality rate due to burn injury was 3.2%.

Table 2 – Age and TBSA of burn patients between 2006 and 2011.

Year admission	Total group N	Age mean (SD)	TBSA mean (SD)	Died N
2006	420	27.8 (24.6)	9.4 (12.6)	18
2007	384	27.1 (23.5)	7.9 (11.6)	11
2008	427	29.2 (24.0)	7.9 (11.6)	10
2009	458	28.6 (24.5)	7.5 (10.9)	15
2010	477	27.9 (24.8)	7.4 (10.7)	12
2011	564	27.8 (24.1)	7.8 (13.1)	22
Total	2730	28.1 (24.2)	8.0 (11.8)	88