Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/burns

Factors affecting the depth of burns occurring in medical institutions

Young Soon Cho [a], Young Hwan Choi [b,*], Cheonjae Yoon [b], Je Sung You [c]

[a] Department of Emergency Medicine, College of Medicine, Soonchunhyang University, Republic of Korea
[b] Department of Emergency Medicine, Bestian Hospital, Republic of Korea
[c] Department of Emergency Medicine, Yonsei University College of Medicine, Republic of Korea

ARTICLE INFO

Article history:
Accepted 12 September 2014

Keywords:
Contact burn
Patient safety
Depth of burn

ABSTRACT

Introduction: Most cases of burns occurring in medical institutions are associated with activities involving heat. It is very difficult to detect these burns. To date, there are few reports on burns occurring in medical institutions. The purpose of this paper was to analyze the etiology of burns occurring in medical institutions and to elucidate the factors affecting burn depth.

Methods: We conducted a retrospective analysis of the medical records of patients who visited our center from April 2008 to February 2013. This study enrolled all patients with burns occurring in the medical institution during or related to treatment. We excluded burn patients whose burns were not related to treatment (for example, we excluded patients with scalding burns that occurred in the hospital cafeteria and pediatric patients with hot water burns from the water purifier). However, patients with burns that occurred in the recovery room after general anesthesia were included.

Results: A total of 115 patients were enrolled in this study. The average patient age was 41.5 years, with more women than men (M:F = 31:84). There were 29 cases (25.3%) of superficial burns (first-degree and superficial second-degree) and 86 cases (74.7%) of deep burns (deep second-degree and third-degree). Hot packs were the most common cause of burns (27 cases, 23.5%), followed by laser therapy, heating pads, and grounding pads, accounting for 15 cases each. There were 89 cases (77.4%) of contact burns and 26 cases (22.6%) of non-contact burns. The most common site of burns was the lower extremities (41 cases, 35.7%). The burn site and contact burns were both factors affecting burn depth. The rate of deep burns was higher in patients with contact burns than in those with non-contact burns (odds ratio 4.26) and was associated with lower body burns (odds ratio 2.85).

Conclusion: In burns occurring in medical institutions, there is a high probability of a deep burn if it is a contact burn or occurs in the lower body. Therefore, safety guidelines are needed for the use of hot packs, heating pads, and grounding pads to prevent such incidents.

* *Corresponding author at*: Department of Emergency Medicine, Bestian Hospital, Seoul, Republic of Korea. Tel.: +82 2 3287 3529; fax: +82 2 3287 3511.
E-mail addresses: yhchoi113020@gmail.com, gosoo71@hanmail.net (Y.H. Choi).

http://dx.doi.org/10.1016/j.burns.2014.09.008
0305-4179/

1. Introduction

Most burns that occur in medical institutions are associated with activities involving heat. Mun et al. [1] reported factors associated with contact burns from therapeutic physical modalities, and Nicolas et al. [2] analyzed 7 cases of contact burns occurring during surgery. Several other investigators have also reported various burn cases in medical institutions resulting from distinct causes [3–7].

However, there are few reports on burns occurring in medical institutions. According to Aigner et al. [2], it can be difficult to determine the cause of burns during diathermy in the hospital setting owing to 3 reasons. Firstly, burns are not generally detected immediately after surgery in the operating room. Secondly, they are not always recognized as burns; instead, they are wrongly diagnosed as bedsores or toxicity or allergic reactions to the disinfectant solution. Lastly, circumstances are another key factor since many individuals are involved in both the preparatory stages and actual performance of diathermy.

The purpose of this paper was to analyze the etiology of burns occurring in medical institutions and to elucidate the factors affecting burn depth.

2. Materials and methods

2.1. Study design and population

We conducted a retrospective analysis of the medical records of patients who visited our center from April 2008 to February 2013. This study enrolled all patients with burns that occurred in the medical institution during treatment. We excluded the burn patients whose burns were not related to treatment (for example, patients with scalding burns that occurred in the hospital cafeteria, and pediatric patients with hot water burns from the water purifier). However, patients with burns that occurred in the recovery room after general anesthesia were included.

All burn wounds were evaluated by an experienced burn surgeon. In cases of indeterminate second-degree burns, the burn was diagnosed as a deep second-degree burn if it took more than 3 weeks to heal and as a superficial second-degree burn if it took less than 3 weeks. Burn wounds resulting from hot packs, heating pads, physical therapy, grounding pads, ondol, moxibustion, or dental treatments were classified as contact burns, while all other burns were classified as non-contact burns. Burn wounds resulting from dental treatment were classified as contact burns because a hot dental apparatus directly touched the skin. Dermatologic treatment is a radiofrequency skin treatment with a cosmetic purpose (for example, tightening loose skin or reducing wrinkles); these were classified as non-contact burns.

Burns to the face, upper extremities, chest, and abdomen were classified as upper body burns, while those to the buttocks and lower extremities were lower body burns.

2.2. Study protocol

Burn wounds were treated with debridement and application of appropriate dressing material (gauze and Allevyn [Smith & Nephew, Lachine, Quebec, Canada] or Duoderm [Convatec Inc., Bristol-Myers Squibb Co., NY, USA] and ointment [silver sulfadiazine, bactroban, and mafenide acetate]). In our institution, the decision to perform surgical intervention was based on the surgeon's judgment if the wound was expected to heal within 4 weeks after conservative treatment for 2–3 weeks.

2.3. Statistical analysis

All analyses were performed with SPSS for Windows (ver. 14.0 SPSS Inc., IL, USA). Nominal variables are presented as frequencies and percentages (%). Continuous variables are presented as means and standard deviations for normal distribution. Data are presented as medians and interquartile ranges for variables that did not follow a normal distribution. We used the Shapiro–Wilk normality test. For nominal variables, the chi-square test was used to identify differences between groups. If the expected frequencies were <5, we used Fisher's exact test. A multivariate logistic analysis was performed to identify variables that affected the depth of burns occurring in medical institutions. p-values <0.05 were considered statistically significant.

3. Results

A total of 115 patients were enrolled in this study. The general characteristics are shown in Table 1. Fig. 1 shows causes of burns in the hospital and an Oriental medical clinic setting.

The average patient age was 41.5 years, with more women than men (M:F = 31:84). There were 29 cases (25.3%) of superficial burns (first-degree and superficial second-degree) and 86 cases (74.7%) of deep burns (deep second-degree and third-degree). Hot packs were the most common cause of burns (27 cases, 23.5%), followed by laser therapy, heating pads, and grounding pads, with each accounting for 15 cases. There were 4 patients (3.5%) with diabetes mellitus and 4 (3.5%) with paraplegia. Diabetes and paraplegia did not affect burn depth ($p = 0.237$ and $p = 0.237$, respectively).

There were 89 cases (77.4%) of contact burns and 26 cases (22.6%) of non-contact burns. The most common burn site was the lower extremities (41 cases, 35.7%), followed by the trunk (24 cases, 20.9%) and upper extremities (22 cases, 19.1%). A total of 46 cases (40%) were treated with burn surgery.

In both the hospital and Oriental medical clinic setting, contact burns were more frequent than non-contact burns, but this difference was not significant ($p = 0.492$; Table 2).

The results of logistic regression of variables associated with deep burns occurring in medical institutions are shown in Table 3. The burn site and contact burns were both factors affecting burn depth. The rate of deep burns was higher in patients with contact burns than in those with non-contact burns (odds ratio 4.26) and was associated with lower body burns (odds ratio 2.85). The setting in which the burn occurred and sex did not have significant independent effects on the deep burn rate.