ELSEVIER

Burns 31 (2005) 765–767

BURNS

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Patterns of grease burn injury: Development of a classification system

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Abstract

Grease burns occur commonly in the home during food preparation. It has been our observation that grease burns follow a particular pattern of injury. The purpose of this study was to review our institutional experience in the management of these burns to develop a classification scheme.

We performed a retrospective review of patients admitted to our burn center with grease burns. Subjects were identified through our database and their charts were reviewed with particular attention to burn distribution, TBSA and need for grafting. We excluded workplace burns and children under the age of six.

A total of 249 patients who fit the above criteria were admitted with grease burns to our burn center from 1993 to 2003. The sequence of events leading to burn and its distribution followed a consistent pattern. The majority of patients (86%) had an isolated upper extremity burn or upper extremity burn in combination with a face, trunk or lower extremity burn. Forty percent of patients required at least one excision and grafting procedure.

Grease burns associated with cooking at home follow predictable patterns of injury. Based on these patterns we proposed a classification system for domestic grease burns.

Keywords: Grease burns; Burn injury; Classification scheme

1. Introduction

Grease burns or (cooking oil burns) are a common cause of injury in both the home and workplace. Due to the special heat and viscosity of grease, patients who sustain grease burns are at risk for developing deep burns requiring excision and grafting. Previous studies have found that nearly half of the patients who sustain grease burns require excision and grafting [1], a much higher rate than other types of scalds.

The frequency of grease burns in children and in the workplace has led to several studies that focused on the specifics of the etiology of these burns in order to develop effective prevention programs [2–7]. The majority of grease burn patients admitted to our burn center are adults who were injured while cooking at home. These grease burns typically occur as a result of an ill-fated attempt to extinguish a frying pan fire. Given this common etiology, it was our observation that these grease burns follow a particular pattern of injury. The purposes of this study were to review our institutional experience in the management of grease burns, develop a classification scheme for these injuries and determine whether the classification correlates with need for surgery or severity of injury.

2. Methods

We performed a retrospective review of all patients admitted to the University of Washington Burn Center with grease burn injuries from 1993 to 2003 in accordance with HIPAA guidelines. Study approval was obtained by our institutional Human Subjects Committee. Patients admitted with grease burns were identified through our clinical patient database and their charts were reviewed with particular

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0305-4179/$30.00
doi:10.1016/j.burns.2005.04.005

attention to etiology and distribution of burns, total body surface area burned (TBSA), need for excision and grafting, and location of injury (work or home). (We excluded all patients who were burned at work and all patients under the age of 6 since the purpose of this study was to examine patterns of grease burn injuries while cooking at home.) In addition, patients treated only as outpatients are not tracked in our burn center database and, therefore, were not included in our review.

3. Results

A total of 322 patients were admitted to our burn center with grease burns from 1993 to 2003. Of these, 249 patients fit the above criteria—6 years of age and older and injured at home (while cooking). Average patient age of this group was 34.6 (range 6–88) and average TBSA was 4.8% (range 1–49). The majority of patients were male (59%).

The sequence of events leading to burn and its distribution of burns followed a consistent pattern. Typically, the grease burns occurred when the patient lifted a pan of burning grease in an effort to place it in the sink or outdoors to extinguish the fire; this resulted in a burn to the hand and forearm (from the hot grease and/or the flame). Due to the pain of the hand burn, patients often spilled or splashed the grease onto their trunk, lower extremities and/or face.

The majority of patients (86%) had an isolated upper extremity burn or upper extremity burn in combination with a face, trunk or lower extremity burn (Table 1). Forty percent of patients required at least one excision and grafting procedure and 4.4% required two operations to achieve complete excision and closure. The upper extremity was the site most commonly grafted.

After spilling the grease, 13 patients slipped and fell into it. Of these 13 patients, six (46.2%) required excision and grafting. The distribution of the burns in this group varied (Table 2). Four patients' homes burned down from the grease fire but these patients had small burns (average 7% TBSA) and none sustained an inhalation injury.

Table 1
Distribution of grease burns

Anatomic location	Patients (%)
Hands/upper extremity	35.1
Bilateral hands/upper extremities	5.2
Lower extremities	14.3
Trunk (anterior and posterior)	1.0
Face	2.4
Upper and lower extremity	12.7
Upper extremity and trunk	6.0
Upper extremity and face	4.4
Lower extremity and trunk	2.0
Upper extremity, lower extremity, trunk	6.8
Upper extremity, trunk, face	3.6
Upper extremity, lower extremity, face	2.8
Other	3.7

Table 2
Burn distribution of patients who fell in grease

Burn distribution	Patients (#)	Patients requiring surgery
Upper and lower extremity	4	4
Upper extremity only	3	0
Upper extremity, trunk	2	1
Upper extremity, trunk, face	2	0
Upper extremity, lower extremity, trunk	1	1
Lower extremity, trunk	1	0
Total	13	6

4. Discussion

Despite prevention efforts, grease burns remain a common cause of injury in both the home and workplace. We admit an average of 25 patients with grease burns each year to our burn center, the majority of which occur in the home. We have informally classified these patients' injuries in accordance with the burn distribution and whether or not patients fell in spilled grease. The purpose of this study was to determine if grease burn injuries that occur at home fit this pattern and whether the classification correlates with need for surgery or severity of injury.

The most striking feature of the grease burn patients in this series was their consistent patterns of injury. Nearly all patients were burned while trying to extinguish a grease fire by transporting the pan to the sink or outside of the house. The anatomic burn distribution also followed a similar pattern. Based on these findings, we propose the Heimbach classification scheme (Table 3) for grease burn injuries.

Class I injuries occur from the lifting of the pan leading to a flame burn, spill or splash of hot grease to the radial aspect of one or both hands and forearms or to the face or chest. As a result of the hand burns, people may drop the pan or spill/splash the contents resulting in a Class II injury. Class III

Table 3
Heimbach classification of grease burns

Class I – Burns associated with lifting a pan with hot or burning grease (upper extremities only, face only, trunk only)
Class II – Burn associated with spilling/splashing grease while carrying the pan (lower extremities only, upper and lower extremities, upper extremity and chest, lower extremity and chest, upper extremity and face)
Class III – Patient slips and falls in grease
Class IV – House fire from burning grease

Table 4
Operations based on classification

Classification level	Patients requiring excision and grafting (%)
Class I	36.7
Class II	48.1
Class III	46.2
Class IV	25.0

injuries result from slipping on the spilled grease and falling and, on rare occasions, the house may catch fire and that is a Class IV injury.

We also examined the correlation between burn class and need for operation (Table 4) (to determine if injury class impacts patient treatment). Interestingly, patients who sustained burns to their lower extremities or more than one body part (Class II) were more likely to require an operation than those who burned their upper extremities alone (Class I). In addition, a higher percentage of patients who fell in the spilled grease (Class III) required an operation, which is not surprising due to the potentially longer contact with hot grease.

This series confirmed several of the other distinguishing characteristics of grease burns as well. Grease burns are typically deeper than other types of scald burns and more commonly require operation. This is due the viscosity, high boiling point and lower specific heat of oil. Schubert et al. [1] previously reported that more than half of their grease burn patients (58%) require excision and grafting [1]. In our series, almost 40% of patients required excision and grafting, which exceeds operative rates for other types of scald burns. During the same time period of this study 16.8% of patients admitted to our burn center with scald burns required an operation. In addition, the proportion of female patients who sustain grease burns is higher than for other types of burn injuries. In this series, over 40% of the patients were female, whereas only 30% of the patients admitted to our burn center are female.

The common cause of domestic grease burns calls attention to the need for prevention programs directed at the simplicity of extinguishing grease pan fires—quite simply place a lid on the pan and turn off the stove. Prevention programs for children have focused on the risks of grease burns—particularly related to the risks of grabbing pots and pans off of the stove and workplace regulations designed to decrease the risks of industrial grease burns [4,5]. (In addition, prevention campaigns in the United Kingdom have sought to raise awareness of the risks of chip-pan fires [7]). The addition of prevention tips for handling grease pan fires (or the use of closed deep fat fryers) may be similarly beneficial.

Acknowledgement

This work was supported in part by funds from the National Institute on Disability and Rehabilitative Research in the Office of Special Education and Rehabilitative Services in the U.S. Department of Education.

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