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Amputations in the burn unit: A retrospective analysis of 82 patients across 12 years

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ABSTRACT

Background: The aim of this study is to analyze the data of amputees in the burn center of the Inner Mongolia region and to provide instructive suggestions for a preventative reduction of the amputation rate.

Methods: Between 2004 and 2016, all patient medical profiles were reviewed to extract data of patients with major amputation. Demographic data, mechanism of injury, location and level of amputation were recorded. The healing condition of the residual limb was noted. In addition, we performed comparisons of amputees whose injuries were caused by electricity and those whose injuries were related to other mechanisms.

Results: Among the 82 amputees in our study, about 89% of amputees were male patients and the predominant age-group was 20-29 years (26.8%). The injuries occurred most commonly at the work place (62.2%) with laborers (40.2%) being the most commonly affected. The most common mechanisms of injury were electricity (51.2%) and hot crush (14.6%), followed by frostbite (13.4%). The most common level of amputation was the right wrist joint (n=16). About 60.4% of the amputation sites were by primary healing. The rate of escharotomy in electrical burn amputees (n=27, 62.3%) was significantly higher than the other groups (n=16, 40.0%, $p<0.05$). The first amputation in electrical burn group (7.2±5.6) was significantly earlier than the other etiology group (17.9±13.7, $p<0.05$).

Conclusions: Electrical burns were the major mechanism of injury among amputees. Effective safety measures, factory modifications, and adequate instructions should be implemented to protect laborers. Urgent interdisciplinary communication should be taken into account for the prevention reduction of the amputation rate in our region.

1. Introduction

The number of amputations in the civilian population are low in proportion but represent a significantly large economic cost [1]. Patients with severe burns are common in Inner Mongolia due to a rapid increase in our manufacturing sector combined with a lack of effective safety measures to protect laborers. Besides burns, frostbites are also frequently seen in the cold winter, especially prevalent among individuals who inadvertently find themselves without appropriate shelter such as inebriated individuals and the elderly who suffer from dementia. Severe skin damage caused by acute burns and frostbite are life threatening and various types of surgical

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interventions are indicated [2]. In addition, due to insufficient soft tissue for graft support in cases with extremity destruction, high rates of amputation, functional impairment, and repeat operations are inevitable during the treatment of full thickness extremity injury [3].

The aim of this study is to analyze the data of 82 amputee inpatients in the burn center of the Inner Mongolia region across 12 years, to provide instructive suggestions for the prevention reduction of the amputation rate in our region in the future.

2. Methods

In a retrospective study at the third affiliated hospital of the Inner Mongolia medical university burn unit, the medical profile of all the patients admitted between November 2004 and October 2016 were reviewed to extract data of patients with major amputation. All reviews and analyses were performed with the express approval of the third affiliated hospital of the Inner Mongolia medical university and Inner Mongolia Institute of Burn Research.

Patients admitted to the burn unit and underwent major amputation were included in this study. Patients who died during in-hospital treatment and those who lacked medical records were excluded from the study. Upper limb proximal to the wrist joint and lower limb proximal to the ankle joint were defined as being major amputations, while partial hand or foot and all digital amputations were excluded from this study [4]. All the data were obtained from the medical records of the third affiliated hospital of Inner Mongolia medical university.

Demographic data, the occupation of the patients, mechanism of injury, burn and frostbite degrees, overall total body surface area (TBSA), full thickness TBSA, location and level of amputation were recorded. Additionally, the healing condition of the residual limb after the first amputation, total length of the hospital stay (LOS), total days in burn intensive care unit (BICU), inhalation injury and escharotomy were noted. The number of operations, defined here as procedures involving excision, grafting, flap and amputation, were also counted and recorded. Hospital mortality was recorded. The abbreviated burn severity index (ABSI) was noted to assess the injury severity for each patient [5]. In order to preserve as much viable tissue to facilitate the use of prosthetics in the future, the amputation level was considered in terms of rehabilitation prospects and tissue viability [6].

Hospital mortality and ABSI score were compared between amputees and patients that did not undergo amputation. In addition, we performed comparisons of amputees whose injuries were caused by electricity versus those whose injuries were related to other mechanisms with respect to age, overall TBSA, full thickness TBSA, first amputation after admission, inhalation injury, escharotomy, total days in BICU, total LOS and number of operations. Flash burn caused by lightning was associated with other etiology, in which there was no electrical current flow through the body of the patient.

Data are presented as rate and frequency values or mean ±standard deviation when appropriate. Independent sample t-test for quantitative continuous variables was applied. Chi-square or Fisher's exact tests were used for the categorical variables when appropriate. Differences were regarded statistically significant at the level of a p value <0.05. All statistical calculations were performed using the statistical package for social science (SPSS, version 19.0, Chicago, USA).

3. Results

During the study period, between November 2004 and October 2016, a total of 7362 patients were admitted in the burn unit of the third affiliated hospital of Inner Mongolia medical university. From this list, 82 patients complied with the inclusion criteria and were included in the study, representing an incidence of 1.1%. The study included 73 (89%) male and 9 (11%) female patients. The predominant age group of the amputee patients was 20–29 years old (n=22, 26.8%), followed by 30–39 years old (n=19, 23.2%) and 40–49 years old (n=17, 20.7%). The injuries occurred most commonly at the work place (n=51, 62.2%) and laborers (n=33, 40.2%) were the most commonly affected (Table 1).

Among these 82 patients, the most common mechanism of injury was electricity (n=42, 51.2%), followed by hot crush (n=12, 14.6%). In about 13.4% (n=11) of the amputee patients, the injury was caused by frostbite (Fig. 1). About 74.4% (n=61) of the patients had one limb amputated. However, in some cases amputation was performed at more than one site, specifically, 23.2% (n=19) had two limbs amputated, 1.2% (n=1) had three limbs amputated and 1.2% (n=1) of amputees had four limbs amputated (Fig. 2). In total, there were 82 cases included in this study, and amputation was performed at 106 sites. The most

Table 1 – General demographics of amputees.

	Frequency (n=82)	Percent (%)
Gender		
Male	73	89.0
Female	9	11.0
Age		
0-19	4	4.9
20-29	22	26.8
30-39	19	23.2
40-49	17	20.7
50-59	8	9.8
≥60	12	14.6
Occupation		
Farmer	15	18.3
Laborer	33	40.2
Housewife	1	1.2
Student	2	2.4
Employee	8	9.8
Unemployed	8	9.8
Freelance	12	14.6
Others	3	3.7
Place		
Public place	11	13.4
Home	15	18.3
Work place	51	62.2
Wilderness	5	6.1