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Little negligence leading to irreparable harm: Thinner burns

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Abstract

The aim of the present study is to evaluate the epidemiology and outcome of paint thinner induced burn injuries at a local burn center. A retrospective analysis of 55 patient paint thinner thermal burn cases was conducted. Relevant patients' data such as age, sex, etiologic factors, burn extent and localization, employed methods of treatment, hospitalization period, and results were evaluated in retrospect from patients' records. 50 male and five female patients with a mean age of 26,78 (14-47) years participated in the presented study. Kindling fire with paint thinner was the most frequent etiologic factor. Total body surface burn area was 22,5 % (5-90). The mean hospitalization period of the survivors was 24 (5-64) days. Early excision and split-thickness sking grafting was applied in 22 patients. The remaining 26 patients were treated with topical agents. Total mortality was only 7 (12.7%). These patients had paint thinner induced burned body surfaces of 60 % with accompanying inhalation injuries. Paint thinner may cause catastrophic thermal injuries even with terminal outcomes and should therefore never used to kindle a fire.

Keywords: Bone tumor, soft tissue tumor, demography

Introduction

Burns continue to constitute a medical, psychological, economic, and a social problem in all societies throughout the world. Likewise, in Turkey too, burns comprise a major problem for the health care system and afflicted people and their relatives. Compared to western countries, burns afflict the Turkish population more [1-2].

Particularly, paint thinner induced burns result in higher morbidity and mortality rates compared to accidental burns because the total body surface area [TBSA] affected is significantly larger. Moreover, paint thinner induced burns are relatively deeper and result with higher overall mo1tality rates because of coexisting injuries of the respiratory system [3-5]. The most frequent etiologic factor is using paint thinner to kindle a fire, accidents at work, suicidal and homicidal assaults, and flame burns occurring during sniffing paint thinner.

Workplace paint thinner induced burns can be prevented if the workers and staff are educated about accidents and methods of prevention.

The present study aims to evaluate the epidemiology and outcome of paint thinner induced burn injuries in a local burn center.

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Throughout a 3-year period, 55 patients were admitted to our Burn Unit for paint thinner induced burns. Patients' medical records were reviewed for age, sex, etiologic factors, extent and localization of burn, treatment methods, length of hospitalization, and treatment results.

Material and Methods

Medical records of 55 paint thinner induced burn patients admitted to the Burn Unit of Konya Training and Research Hospital Turkey, between February 2010 and September 2013 were reviewed retrospectively. Out of all burn patients admitted to our Burn Unit only paint thinner induced burn patients were included in the present study.

Relevant data such as patients' age, gender, place of bum, and method of burn, burn percentage area, and total body surface social and family status, treatment methods, length of hospitalization period, and mortality rate were collected retrospectively from the clinical records.

Statistical analysis was done with windows compatible SPSS 16. Since the data do not correspond to the normal range, the descriptive data are shown as median (min-max) values. Man whitney U test was used for comparison of nonparametric continuous data. The ratios were compared with the Fisher's Exact test. A P value of 0.05 was considered significant.

Results

The majority of the patients were male 50 (90.9) %9 and only 5 (9.1%9) were female. The number of male patients was statistically

significant (p<0.001). Upper extremities constitute the areas burned most 19 (34, 5%). 36 patients (65, 5%) had second-degree bums. TBSA involved was 22.5 % (5-90%). Seven (12.7 %) out of the 55 patients had also inhalation bums and 5(9.1%) had accompanying trauma. 16 patients (29.1%) were treated earlier in intensive care units and in total 22 patients had surgical intervention (40.0%). Seven patients (12.7%) whose ages ranged from 14 to 47 years (mean age 26, 7) died. The analysis of patients' ages revealed that the majority of the cases were adults (53 cases) aged 18-47. Most of the burn incidents 44 (80%) occurred at the work place. Only eleven burn incidents occurred at home. In the three different workplace thinner burn incidents, 13 people were injured due to explosions (Table 1). Abbreviated Burn Scala Index(ABSI), scores of thinner burn patients (Table 2). When regression analysis was performed, over 21% of TBSA was found to be risc factors that affect mortality in patients suffering from inhalation injury and intensive care (Table 3). These were statistically significant (p<0.001).

Table 1. Thinner Burns

Gender	**Male %90,9 (50)**	**Female %9.1 (5)**
Burn occured	Work place 44(%80)	Home place 11(%20)
Age (years)	26,78 (14-47)	
Most Affected burn region	19(%34,5) arm fore arm trunk	
Burn Degree	%65 (36) secomddegree	
Total Body Surface Area	%22.5(5-90)	
Inhalation burns	%12.7 (7)	
Associated trauma	%9.1 (5)	
Patientsreated in intensivecareunit	%29.1 (16)	
Surgical treatement (number)	%40 (22)	
Hospital stay duration	24 day (5-64)	
Exitus	%12.7 (7)	

Table 2. ABSI scores of thinner burn patients

Total Burn score	Mortality (+)		Mortality (-)	
	N=7	%	N=48	%
2-3	0	0	18	32,7
4-5	0	0	23	41,8
6-7	3	5,5	7	12,7
8-9	3	5,5	0	0
12-13	1	1,8	0	0

Table 3. Risk factors that affect mortality

	P value	Odds ratio (95 % CI min-max)
Burned arca over 21%	0,016	7,890 (1.720-34.223)
Inhalation burn	0,000	15.613 (4.154-42.485)
Intensive care treatment	0,08	7.920 (3.057-20.520)

When the time of burn injuries were compared throughout the year, there was a peak in the winter months. The great majority of the burn incidents were unintentional with kindling fire with paint thinner as the leading cause. In four cases burn incidents occurred during suicide attempts and in l case burn injury occurred during lightning a cigarette while inhaling paint thinner. In the cases with attempted suicide paint thinner was used to accelerate fire ignition. Out of the four attempted suicide cases, two had split intentionally paint thinner to their head and neck region, anterior chest wall, and limbs leading to burns at 70-90% of TBSA with accompanying injuries in the respiratory system. These two patients died in an early period of the treatment. One patient in the same group had 10% deep paint thinner induced burns at the same sites of the head, neck, and anterior chest. Wound coverage required skin grafting. The last patient of the suicidal group had 5% TBSA burns involving the neck and face and was treated conservatively.

The one remaining patient had 5% TBSA intermediate paint thinner induced burn thatwas managed medically. The underlying cause in this patient was an attempt to light a cigarette using paint thinner sustaining thus 10% TBSA flame burn. TBSA percentages ranged from 5% to 90 %, with a mean of 22.5%. The anatomical sites most frequently involved were upper limbs and face. Seven patients (12.7 %) had also severe inhalation injuries and were intubated. Patients with burns around the face, mouth, nose, mouth, mucous membranes, voice changes, and hyperemia edema on laryngeal examination were accepted as inhalation damage. Bronchoscopy was not done. Whereas six died, one survived. Out of the six, two patients died within the first 24 hours. Five patients (9.1 %) had additional trauma. 22 patients were treated with early excision and split-thickness skin grafting without postoperative complications.

Hospitalization period was in most of the cases ≥7 days. In the treatment of burns, the hospitalization period ranged from 5 to 65 days with a mean of 24 days.

Discussion

Paint thinner associated burns in the adult population constitute a significant number of burn unit admissions with serious consequences for the patients as well as their families such as treatment costs, prolonged hospitalization periods, surgical intervention, and long outpatient care a return to regular daily and work life. Moreover, it is also a massive burden for the health care system. Paint thinner induced thermal injuries were treated conventionally like other burns. The general demographic profile of the cases enrolled in the present study has shown that the cases were mostly teenagers, male, and of lower economic status. Most of the patients caught fire while flaring up the fire using paint thinner. The second most common cause in the present series was use of paint thinner for self-destruction. A single case had burns as he lit a cigarette during inhaling paint thinner as a substance abuser.

Inhaling paint thinner, potentially fatal, causes vital damage to and has a poisonous effect on inner body organs such as liver, nervous system, lung, and kidneys [6]. Moreover, there are several reports of ventricular fibrillation and cardiac arrest, rhabdomyolysis, polyneuropathy and chemical pneumonia induced by paint thinner intoxication [7,8]. Containing hazardous aromatic hydrocarbons like xylene, toulene and N-hexane, this solvents' vapor can intoxicate industrial laborers when inhaled [9]. Continuing intoxication can seriously corrupt and diminish mylinated nerve

fibers, diffuse cerebral and cerebellar cortex atrophy and giant axonopathy leading to neurological and behavioral disorders disturbances [10, 11].

Homeless teenagers use commonly paint thinner to change their mood since these solvents are cheap, readily available, and fast in mood alteration onset. Paint thinners are abundantly available wherever paint and hardware are sold [12]. As mentioned earlier, due the quick onset of mood change, it is preferred by substance abusers leading to severe accidents. Ho et. al. reported about four juveniles burned due to lighting a cigarette during inhaling thinner with 3% to 25% TBSA flame burns [3].

Despite the variations preferred by the citizens of various countries homicidal bums is globally on the rise worldwide. However, in western civilizations, burning is not a preferred method of homicide [13, 14]. In Turkey, homicidal burns induced with paint thinner are after sharp/blunt trauma and firearms the third most frequent cause [2]. Increase in homicidal burns might be attributed to rapid increase in population, wars, immigration, and misery accompanying all these.

Burns self-inflicted may be either a self-immolation attempt or a part of self-harm process. Either way, there are factors facilitating the process such as alcoholism, substance abuse, relationship discords, unemployment, and emotional trauma [15]. According to the study made by Ambade et.al. 19,3 % of the cases committed burn suicides and in the Hilal et.al study, like in the present one, 3,6% of the cases [2,16].

Contrary to the findings of the present study, Ambade et.al reported that burning was the most preferred method of homicide among females [17]. 14 - 44, 4% TBSA [l8] of self-inflicted burn injuries were reported from countries in Western Europe. Another report from England has shown that the severity of bums varied in different areas with the lowest TBSA of 22% in Essex [19]. In the present study self inflicted burn injuries varied between 5- 90% TBSA.

Retrospective studies made in China, Hong Kong, South Africa, and USA have shown an assault burn injury incidence from 1,9 -20,9% of the total acute burn admissions [l6]. Paint thinner burn assaults result with higher morbidity and mortality rated compared to accidental burns as the TBSA is significantly larger. Moreover, paint thinner induced burns are relatively deeper and result with higher overall morbidity and mortality rated because of coexisting inhalation injuries [3-5]. In the present study; however, there were no paint thinner assault burns. Tobiasen et al. First classified patients with mortality risk with ABSI [20]. In our study, the score was 6 and above in patients who were dying according to this scoring.

Like other flammable liquids such as gasoline and liquefied petroleum gases, paint thinner ignition occurs explosively and causes extensive burns even with minimal exposure. Unfortunately, paint thinner is frequently used for kindling fire. In the present study, there were three different work related accidents causing paint thinner burn injuries 23% (13/55). Unlike other studies in the relevant literature, accidents that have occurred over a three year period, is the underlying reason for large number of patients affected. Suicide attempts, igniting a stove, kindling fire, inhalation of paint thinner as a mood changing substance are among the reasons of paint thinner induced burns in developing countries. Hence, paint thinner marketing and sales must be controlled even restricted. The body parts mostly affected were hands, face, forearm, arm, and trunk in the present study. Therefore protective gear especially for the face, trunk, and upper extremities should be used by the related personnel while using/operating with paint thinner. Mortality rate in the present study was increased if there were accompanying inhalation burns.

Conclusion

Paint thinner induced burns are to be managed by a professional team while considering inhalation bums. Education of the personnel working with paint thinner and other flammable liquids, making them wear masks protecting the respiratory system, regular vocational training, and strict controls applied at the workplace may decrease the incidence of accidents in general but paint thinner induced burns in particular.

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