

Danger in the kitchen: pressure cooker burns

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ABSTRACT

BACKGROUND: Burns resulting from pressure cooker explosions are preventable domestic injuries that occur during routine kitchen use; however, they are underrepresented in the medical literature despite their potential severity. This study aimed to evaluate the clinical and demographic characteristics, treatment approaches, and outcomes of patients with pressure cooker-related burns.

METHODS: In this retrospective study, medical records of patients who presented to a tertiary burn center with pressure cooker-related burns between 2016 and 2024 were reviewed. Collected data included demographic characteristics, burn location and depth, total body surface area (TBSA), time to hospital admission, treatment modalities, and clinical outcomes.

RESULTS: A total of 41 patients were included in the study. The vast majority were female (97.6%), with a mean age of 36.2 ± 13.5 years. Most injuries were second-degree burns (92.7%). The most commonly affected anatomical regions were the head and neck (65.9%) and the anterior chest (61%). Escharotomy was performed in 29.3% of patients, and 2.4% required skin grafting. Delayed hospital presentation was significantly associated with an increased need for surgical intervention ($p=0.001$).

CONCLUSION: Pressure cooker-related burns predominantly affect women and frequently involve cosmetically and functionally important anatomical regions. Although the total burn surface area is often limited, the depth and location of these injuries may lead to significant complications. These findings highlight the importance of increasing public awareness regarding the safe use of pressure cookers and emphasize the need for prompt medical evaluation to reduce morbidity. Overall, the results underscore the seriousness of domestic burn injuries and the importance of preventive public health measures.

Keywords: Burn injury; domestic accident; scalds; escharotomy; pressure cooker.

INTRODUCTION

Burn injuries represent a major global health problem with substantial medical, psychological, and economic consequences. With the advancement of industry and technology, both the incidence and diversity of burn injuries have increased.^[1] In recent years, pressure cookers have become increasingly popular in domestic kitchens because they are widely promoted as a faster, healthier, and more efficient method of cooking. However, the growing use of pressure cookers has also been associated with an increase in reports of scald injuries resulting from sudden release of hot contents.^[2] Although pressure cooker use is primarily associated with burn

injuries,^[3] rare traumatic injuries such as mandibular fractures^[4] and ocular perforations^[5] have also been reported.

In the United States, pressure cookers are used as a household cooking appliance in approximately 20% of homes.^[6] These devices utilize steam pressure to cook food rapidly. The operating principle of pressure cookers is based on the relationship between pressure and the boiling point of water. Equipped with a valve calibrated to a specific pressure threshold, these cookers function under elevated pressure conditions. The valve, which can be adjusted according to the desired cooking intensity, releases steam once a critical pressure threshold is reached, thereby functioning as a safety

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mechanism to prevent explosions.^[7] These airtight vessels are designed to raise the boiling temperature of water from 100°C to approximately 121–125°C at a standard pressure of about 15 pounds per square inch. Despite their widespread use, severe burn injuries associated with pressure cookers are rarely reported in the literature.^[6,7]

This study aims to investigate burn injuries associated with pressure cookers, which are widely used in household kitchens, and to contribute to the limited literature on this topic. To the best of our knowledge, this study presents the largest case series to date specifically addressing burns resulting from pressure cooker incidents.

MATERIALS AND METHODS

Study Design and Setting

This retrospective chart review was conducted at a tertiary-level burn center. Between January 2016 and December 2024, a total of 3,410 patients were hospitalized for burn treatment at our institution, of whom 41 patients (1.2%) were included in the study due to burns caused by pressure cooker incidents.

Patient Selection and Inclusion Criteria

Patients were identified through electronic medical records using diagnosis codes related to pressure cooker burns. The inclusion criteria were defined prior to data collection and included all patients presenting with burn injuries resulting from pressure cooker accidents. No exclusion criteria were applied based on age or sex.

Data Collection

Demographic data (age, sex, and date of admission) and clinical burn characteristics (burn location, burn depth, and total body surface area [TBSA] involved) were collected. Information on major complications and treatment outcomes (complete recovery, treatment abandonment, or death) were also recorded using a standardized data collection form.

Data Extraction and Quality Control

Two independent researchers, blinded to the study objectives, extracted the data. Any discrepancies between reviewers were resolved through discussion. Inter-rater reliability was assessed using a randomly selected sample of patient charts, and discrepancies identified during the process were reviewed and corrected accordingly.

Ethical Approval

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was obtained from the Health Sciences University Diyarbakır Gazi Yaşargil Health Practice and Research Hospital Local Ethics Committee (Decision No. 435, April 25, 2025). Patient confidentiality was maintained throughout the study, and all data were anonymized prior to analysis. Written informed consent was obtained from the patient featured in the image (Fig.

1) for the scientific publication of the photograph.

Statistical Analysis

Continuous variables were presented as mean±standard deviation (range: minimum–maximum), while categorical variables were expressed as numbers and percentages (%). For comparisons between groups (patients who underwent escharotomy versus those who did not), the Mann-Whitney U test was used to analyze continuous variables with non-parametric distributions. A p-value of <0.05 was considered statistically significant. All statistical analyses were performed using IBM SPSS Statistics for Windows, version 22.0 (Armonk, NY, USA).

RESULTS

A total of 41 patients were included in the study. Most patients were female (n=40; 97.6%). The mean age of the patients was 36.2±13.5 years (range: 10–69 years). Based on burn depth, 92.7% (n=38) of the cases were classified as second-degree burns. The most frequently affected body regions were the head and neck (65.9%), anterior chest (61%), left upper extremity (61%), and right upper extremity (56.1%). Figure 1 shows a patient with extensive burns involving the head and neck, anterior chest, and both upper extremities caused by a pressure cooker injury.

Wound cultures were positive in three patients (7.3%), all of whom had *Staphylococcus epidermidis*. Regarding treatment, 28 patients (68.3%) received dressing care, 12 patients (29.3%) underwent escharotomy, and one patient (2.4%) required grafting following escharotomy.

The mean time to hospital admission was 26.9±57.7 hours (range: 1–240 hours), the mean length of hospital stay was 4.2±3.6 days (range: 0–15 days), and the mean follow-up period was 19.4±18.0 days (range: 1–94 days). The average total body surface area affected was 8.2±3.7% (range: 1–15%). Analysis of seasonal distribution indicated that cases most commonly occurred in fall (41.5%) and spring (31.7%) (Table 1). When patients were grouped according to whether escharotomy was performed, the time to hospital admission was



Figure 1. Extensive pressure cooker burn involving the head and neck, anterior chest, and bilateral upper extremities.

Table 1. Demographic, clinical, and treatment characteristics of patients with pressure cooker burns

Characteristic	Mean±SD (Min-Max), n (%)
Age	36.2±13.5 (10-69)
Sex	
Male	1 (2.4%)
Female	40 (97.6%)
Wound culture result	
Negative	38 (92.7%)
Positive	3 (7.3%)
Burn depth	
Second-degree	38 (92.7%)
Third-degree	3 (7.3%)
Treatment modality	
Escharotomy	12 (29.3%)
Escharotomy + grafting	1 (2.4%)
Dressing	28 (68.3%)
Affected body region	
Head and neck	27 (65.9%)
Eye	4 (9.8%)
Chest	25 (61%)
Back	2 (4.9%)
Left upper extremity	25 (61%)
Right upper extremity	23 (56.1%)
Left lower extremity	2 (4.9%)
Right lower extremity	4 (9.8%)
Burn percentage	8.2±3.7 (1-15)
Time to hospital admission (hours)	26.9±57.7 (1-240)
Length of hospital stay (days)	4.2±3.6 (0-15)
Follow-up duration (days)	19.4±18.0 (1-94)
Season of injury	
Fall	17 (41.5%)
Spring	13 (31.7%)
Winter	8 (19.5)
Summer	3 (7.3%)

significantly shorter in the non-escharotomy group ($p=0.001$) (Table 2).

DISCUSSION

In this retrospective study, we found that pressure cooker-related burns predominantly occurred in middle-aged women. The injuries were mainly concentrated in the upper body, particularly the face and upper extremities. Additionally, deeper burns and a greater need for escharotomy were significantly associated with delayed hospital presentation.

Previous studies have reported that burns caused by pressure cooker explosions account for approximately 1.8–2.75% of all burn injuries.^[1,8-10] In our series, this rate was 1.2%. The mean age of patients in our study fell within the middle-aged group, and women constituted the vast majority of cases. These findings are consistent with reports in the literature indicating that pressure cooker injuries most commonly affect housewives involved in meal preparation. In the case series by Meriç et al.,^[7] which included 32 patients, more than 90% were women, with a mean age of 42.3 years. Similarly, in a study by Perera et al.,^[11] five of the seven patients were female. We believe that the cultural tendency for women to spend more time in the kitchen and assume primary cooking responsibilities is the main reason for this gender disparity. In contrast, our series included very few pediatric cases, likely because pressure cookers are typically operated by adults. Nevertheless, children may still be indirectly exposed to these injuries. One study reported that nearly all steam burns in infants were associated with pressure cooker accidents, although most injuries were superficial in nature.^[12] Therefore, while children are less commonly affected, they remain vulnerable to significant burn injuries when exposed to such incidents. Domestic cooking-related burns represent an important cause of morbidity and mortality among women and children worldwide.^[13] Pressure cooker accidents constitute a specific subset of these injuries and particularly affect housewives. Recent epidemiological data emphasize that domestic cooking burns remain a major public health concern, accounting for up to 25% of all household injuries, many of which are preventable through improved safety awareness, user education, and safer appliance design.^[14]

In our study, the most frequently affected anatomical regions were the head, neck, and upper torso with facial involvement being particularly common. This finding is consistent with previous case reports and small case series.^[2,7] Perera et al.^[11] reported superficial facial burns in all seven patients in their cases. Similarly, facial burns were observed in most patients

Table 2. Comparison of admission time between patients with and without escharotomy

Group	n	Mean rank	Sum of ranks	p value
Escharotomy	13	29.73	386.5	0.001
Non-escharotomy	28	16.95	474.5	

Mann-Whitney U Test.

in our cohort. This pattern likely reflects the close proximity of the individual to the device at the time of the explosion, often while attempting to open the lid. Burns involving the face and upper extremities not only result in significant aesthetic disfigurement but may also lead to long-term functional impairment and psychological distress, highlighting the importance of multidisciplinary management.^[15] Another typical injury pattern involves scald burns to the upper extremities. During an explosion, individuals may instinctively attempt to grasp or push away the pressure cooker, resulting in direct exposure to hot liquids and steam. For example, in the case report by Kulahcı et al.,^[16] a 44-year-old male sustained deep second- and third-degree burns to the arms, shoulders, neck, and face after boiling food was forcefully discharged during lid removal. Similarly, in our study, many patients presented with scald burns affecting the arms and anterior chest. In another report, a patient sustained a mandibular fracture caused by the pressure wave generated during a pressure cooker explosion,^[4] demonstrating that these incidents may produce not only thermal injuries but also blunt trauma and fractures from flying metallic fragments. Atreya et al.^[3] further suggested that the mechanism of pressure cooker explosions may resemble that of a “homemade explosive,” with pressure waves and shrapnel potentially causing penetrating trauma. Although no orthopedic or penetrating injuries were identified in our series, these reports highlight the potential for multisystem trauma in such accidents. Therefore, the clinical evaluation of patients injured in pressure cooker incidents should not be limited to burn wounds; clinicians should also consider possible ocular injuries, fractures, and internal organ damage.

An important characteristic of pressure cooker-related burns is that the total body surface area involved is often limited. In our study, most patients had burns affecting less than 10% TBSA, typically presenting as localized scald injuries. This observation is consistent with previous reports. Perera et al.^[11] documented TBSA involvement ranging from 1% to 4% in all cases in their series. In a case reported by Schukow and Nordyke, a pressure cooker explosion caused approximately 10% TBSA second-degree burns requiring multidisciplinary management.^[6] In one of the largest case series on this topic, Meriç et al.^[7] reported that only one patient required grafting for deep burns, while most patients were treated conservatively due to the predominance of superficial injuries.^[7] Similarly, in our study, only one patient required surgical excision and grafting for a third-degree burn. However, even when the affected surface area is limited, burns involving critical anatomical regions (such as the face or eyes) or deeper burn injuries may still require intensive management and surgical intervention.^[17] Several studies have demonstrated that burns involving less than 10% TBSA, particularly when located in functionally important areas, are associated with prolonged hospital stays and higher complication rates.^[18] Most pressure cooker burns present as superficial to deep dermal injuries; early fluid resuscitation, adherence to appropriate wound care protocols, and timely surgical intervention when indi-

cated can significantly improve clinical outcomes.^[7]

Our findings also indicated a seasonal variation in the incidence of pressure cooker-related burns. Presentations were more frequent during the fall and spring months, whereas a relative decline was observed during the summer. Although data on seasonal distribution are limited, Çıkman et al.^[19] reported that over a four-year period the highest frequency of burn injuries occurred in spring (31%), with a notable peak in March, while the lowest number of cases was observed during the summer. Conversely, some studies have reported higher burn incidence during the summer months.^[20,21] In another study conducted at our center that included all burn cases, we also observed higher frequencies during spring and fall.^[22] The present series demonstrated a similar pattern, with most cases occurring in October and November. We believe that the decreased number of cases during the summer may be related to the preference for lighter meals and the reduced use of pressure cookers during this period. Additionally, sociocultural factors, including seasonal dietary patterns and variations in household activity levels, may influence the temporal distribution of domestic burn injuries.^[23]

One of the most significant findings of our study was the relationship between time to hospital admission and treatment requirements. Time to burn center admission emerged as a critical determinant of treatment modality in pressure cooker-related injuries. Patients who presented shortly after injury were typically managed conservatively, whereas those with delayed presentation had a significantly greater need for surgical escharotomy. This observation is consistent with the established literature on burn care, which indicates that delayed hospital admission is associated with poorer wound outcomes. Ozbek et al.^[24] demonstrated significantly higher rates of wound contamination and infection among patients with delayed hospital admission following burn injuries. The prolonged presence of necrotic tissue increases the risk of infection and predisposes patients to septic complications, underscoring the importance of early surgical excision for deep burns. Previous studies have also shown that delays in escharotomy may increase both morbidity and mortality.^[25] Although no mortality was observed in our study, some patients with delayed presentation developed wound infections and experienced prolonged hospital stays. The most effective strategy to reduce the need for surgical interventions such as escharotomy is prompt and appropriate burn management. Early specialized burn care within the first 24 hours has been associated with a 35–50% reduction in surgical intervention rates and significantly improved functional outcomes.^[26]

CONCLUSION

Burn injuries caused by pressure cooker explosions, similar to other thermal injuries, are largely preventable forms of trauma. Although these injuries typically present as scald burns involving a limited total body surface area, they frequently

affect anatomically and functionally critical regions such as the face and hands, potentially resulting in significant functional impairment and aesthetic complications. Early medical evaluation and timely intervention improve treatment effectiveness and substantially reduce the risk of complications. We believe that increasing public awareness regarding the safe use of pressure cookers and promoting proper handling practices are essential for preventing these injuries, thereby enhancing individual safety and reducing the burden on healthcare systems.

Ethics Committee Approval: This study was approved by the Health Sciences University Diyarbakır Gazi Yaşargil Health Practice and Research Hospital Ethics Committee (Date: 25.04.2025, Decision No: 435).

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ORİJİNAL ÇALIŞMA - ÖZ

Mutfaktaki tehlike: Düdüklü tencere yanıkları

AMAÇ: Düdüklü tencere patlamalarına bağlı yanıklar, ev içi kullanım sırasında meydana gelen, önlenemez nitelikte fakat tıbbi literatürde yeterince yer almayan ciddi yaralanmalardır. Bu çalışma, bu tür yaralanmaların klinik ve demografik özelliklerini, tedavi süreçlerini ve sonuçlarını incelemeyi amaçlamaktadır.

GEREÇ VE YÖNTEM: Bu retrospektif çalışmada, 2016 ile 2024 yılları arasında üçüncü basamak bir yanık merkezine düdüklü tencere kaynaklı yanık nedeniyle başvuran hastaların tıbbi kayıtları incelendi. Veriler arasında demografik özellikler, yanık yeri ve derinliği, toplam vücut yüzey alanı (TBSA), hastaneye başvuru süresi, tedavi yöntemleri ve klinik sonuçlar yer aldı.

BULGULAR: Çalışmaya toplam 41 hasta dahil edildi. Hastaların büyük çoğunluğu kadındı (%97.6) ve yaş ortalaması 36.2 ± 13.5 yılı. Yanıkların çoğu ikinci derecedeydi (%92.7). En sık etkilenen bölgeler baş-boyun (%65.9) ve ön göğüs bölgesiydi (%61). Hastaların %29,3'üne eskarektomi uygulandı, %2.4'üne deri grefti yapıldı. Gecikmeli başvuru, cerrahi müdahale gereksiniminde anlamlı artışla ilişkiliydi ($p=0.001$).

SONUÇ: Düdüklü tencere yanıkları ağırlıklı olarak kadınları etkilemekte ve çoğunlukla kozmetik ve fonksiyonel açıdan önemli anatomik bölgelerde meydana gelmektedir. Yanıkların yüzey alanı genellikle sınırlı olsa da, derinlikleri ve yerleşimleri ciddi sonuçlara neden olabilmektedir. Bu durum, halkın düdüklü tencere kullanımı konusunda bilinçlendirilmesi gerektiğini ve olası komplikasyonları azaltmak adına erken medikal müdahalenin önemi ortaya koymaktadır. Bu bulgular, ev içi kazaların ciddiyetine dikkat çekmekte ve koruyucu halk sağlığı önlemlerinin gerekliliğini vurgulamaktadır.

Anahtar sözcükler: Düdüklü tencere; eskarektomi; ev kazası, haşlanma; yanık yaralanması.

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