

## Breast Burns Are Characteristic Burns And They Require A Very Meticulous Treatment

Nihan Turhan MD<sup>1</sup>, Percin Karakol MD<sup>2</sup>

<sup>1</sup>Martyr Prof. Dr. İlhan Varank Sancaktepe Training and Research Hospital, Department of General Surgery, Istanbul, Turkey.

<sup>2</sup>Health Science University Bağcılar Education and Training Hospital, Department of Plastic, Reconstructive and Aesthetic Surgery, Istanbul, Turkey.

Corresponding Author: Percin KARAKOL, MD

Health Science University Bağcılar Education and Training Hospital, Department of Plastic, Reconstructive and Aesthetic Surgery, Istanbul, Turkey

### Abstract

**Introduction:** Burn is a form of injury with high mortality and morbidity, and the treatment of special area burns is even more difficult. There is no proven treatment method recommended for anterior chest wall and breast burns that are cannulated as special areas.

**Materials and Method:** We retrospectively scanned 39 anterior chest wall burn and breast burn cases between January, 2018 and January, 2020. We determined that gender, age, etiological factors, deepening of the burn after 48 hours, type of accident and the treatments applied, are screening parameters.

**Results:** It was observed that the burns of male patients were mostly due to occupational accidents and that breast burns occurred more in both genders after scalding, but deepening was frequent after 48 hours in women and the response to topical treatments was less for them.

**Discussion:** The first thing to do in approaching breast burns is to decide the treatment method considering the risk of deepening of the burn.

**Keywords:** Breast, Burn, Breast bud, Contracture.

Date of Submission: 24-02-2021

Date of Acceptance: 08-03-2021

### I. Introduction

Burn, one of the most common forms of injury, continues to be a burden both socially and economically. Thanks to innovative applications in burn treatment and the development of human conditions of burn centers, the chance of life has increased even in patients with a high burn percentages. As mortality rates decrease, coping with morbidity becomes more difficult for the surgeon. Among these all burn types, private site burns continue to be a problem. Apart from the face, hand, genital area and joint areas, we believe that breast burns are characteristic burns and their treatment should be applied specifically. Although the breast is an endocrine organ in both men and women, it is also an important part of sexual identity for women. Therefore, there are different treatment modalities for body burns compared to surrounding tissues to reduce morbidity. Treatment of burns in both genders, especially in children, is difficult due to anatomical and histological differences arising from the structure of the breast tissue. The aim of our study is to share our observations over 39 patients in this difficult process, and to create a stepwise treatment scheme.

### II. Material And Method

In our study, we retrospectively evaluated adult patients with anterior chest wall burn, who were hospitalized in our burn unit between January, 2018 and January, 2020. The age distribution of the patients was between 19-64, and a total of 12 men and 27 women were included in the study. The average ages were calculated as 37.9 years for men and 38.2 years for women (Table 1).

**Table 1: Subject demographics, mechanisms and treatments of burn injury.**

	Gender	Age	Burn agent	Burn Depth	Deepening	Burn Area	Treatment
1	F	25	contact	deep	no	home	grafted
2	F	19	scalding	deep	no	home	grafted
3	F	22	scalding	superficial	yes	home	topical

*Breast Burns Are Characteristic Burns And They Require A Very Meticulous Treatment*

4	F	49	scalding	deep	no	work	topical
5	F	64	flame	deep	no	home	segmental mastectomy
6	F	58	contact	deep	no	work	grafted
7	F	27	scalding	deep	no	home	grafted
8	F	36	chemical	deep	no	home	grafted
9	F	33	scalding	superficial	no	home	topical
10	F	59	chemical	superficial	yes	home	topical
11	F	49	scalding	deep	no	home	topical
12	F	60	scalding	superficial	yes	home	grafted
13	F	31	scalding	deep	no	home	grafted
14	F	28	scalding	deep	no	home	grafted
15	F	27	contact	deep	no	work	grafted
16	F	36	scalding	superficial	yes	home	grafted
17	F	44	scalding	deep	no	home	grafted
18	F	47	scalding	deep	no	home	grafted
19	F	23	flame	deep	no	home	grafted
20	F	18	scalding	superficial	yes	work	topical
21	F	54	flame	superficial	no	home	topical
22	F	37	scalding	superficial	no	home	topical
23	F	21	scalding	deep	no	home	grafted
24	F	35	scalding	deep	no	home	grafted
25	F	26	scalding	superficial	no	home	topical
26	F	43	flame	deep	no	home	grafted
27	F	60	scalding	superficial	yes	home	topical
28	M	25	flame	deep	no	home	grafted
29	M	42	scalding	deep	no	home	topical
30	M	40	flame	superficial	yes	home	topical
31	M	37	flame	deep	no	work	topical
32	M	26	scalding	superficial	no	work	topical
33	M	18	flame	superficial	no	work	grafted
34	M	60	scalding	deep	no	home	grafted
35	M	37	scalding	superficial	no	home	topical
36	M	48	chemical	deep	no	work	topical
37	M	19	scalding	deep	no	work	topical
38	M	58	contact	superficial	yes	work	topical
39	M	45	scalding	deep	no	work	topical

F: female, M: male

Patients in need of intensive care, patients with a total burn area of more than 40%, patients with more than two additional systemic diseases despite being young, patients over 65 years of age and pediatric patients and patients with extra comorbidity factors were excluded from the study.

When the factor of burn was investigated, breast burns were observed most frequently due to scalding and flame. Electricity burns were excluded from the study because they cause other hidden systemic problems and frequently requiring intensive care.

In our study, we evaluated patients with torso and breast burns treated in our burn clinics in terms of gender, age, the etiological factor causing the burn, deepening in the degree of burns after 48 hours, the result of a home or work accident and the treatments applied.

### III. Results

Table 2 indicates the distribution of agents causing burns by gender. When the etiological factors were evaluated, scalding burns were the most common in both genders such as 6 (50%) in men and 18 (66.7%) in women. However, due to the small number of patients with burns, no statistically significant difference was detected in the distribution of etiological factors (p:0.607).

**Table 2: Etiological Factors Causing Burn Formation**

	Scalding	Flame	Chemical Matter	Contact
Male	6 (50%)	4 (33.3%)	1 (8.3%)	1 (8.3%)
Female	18 (66.7%)	4 (14.8%)	2 (7.4%)	3 (11.1%)

(p:0.607)

When the depth of scalding burns, which is the most common cause of burns in terms of percentage, was evaluated, it was observed that the distribution between genders was similar (p:0.633) (Table 3).

**Table 3. Depths of Scalding Burns According to Gender**

	Scalding	
	2 <sup>nd</sup> Degree Superficial Burn	2 <sup>nd</sup> and 3 <sup>rd</sup> Degree
Male	4 (66.7%)	2 (33.3%)
Female	8 (44.4%)	10 (55.6%)

(p:0.633)

When all etiological factors were evaluated, it was observed that the probability of deepening of the burn (mi for viscous) was higher in women as a percentage of the deepening rates after 48 hours of follow-up (p:0.464) (Table 4).

**Table 4. Patients whose Burns Deepen During Their Follow-up Process**

	1 <sup>st</sup> degree and superficial 2 <sup>nd</sup> degree burn at the time of application	Patients having deep burn after 48 hours of follow-up
Male	5	2 (40.0%)
Female	10	6 (60.0%)

(p:0.464)

When the burn areas were evaluated, it was ascertained that home accidents were more common in female patients, and work accidents were more common in male patients (p:0.005) (Table 5).

**Table 5. Formation Mechanisms of Burn Trauma**

	Home accident	Work accident
Male	5 (41.7%)	7 (58.3%)
Female	23 (85.2%)	4 (14.8%)

(p:0.005)

When the first treatments for breast burns of the patients were evaluated, topical wound care was sufficient in most of the male patients (75%) whereas the majority of female patients (59.3%) required escarectomy and grafting with partial thickness skin grafts (Table 6). For the treatment of a 64-year-old female patient with comorbidities and deep breast burn, segmental mastectomy followed by equalization reduction mammoplasty operation was required (p:0.086).

**Table 6. Burn Treatment for the Acute Period**

	Topical wound care-dressing	Escarectomy and Grafting	Other treatments
Male	9 (75.0%)	3 (25.0%)	0 (0%)
Female	10 (37.0%)	16 (59.3%)	1 (3.7%)

(p:0.086)

### IV. Discussion

The breast is an apocrine gland of ectoderm origin that begins to develop in the 6<sup>th</sup> week of embryonic life. Stage 2 development of the breast is observed in women in puberty. During this period, bud formation in the breast, followed by papilla development and areola enlargement occurs (1). Fat and support tissue increase in the breast, and the ductal structures of the breast develop, with the release of estrogen. Also, lobular structures

are formed with the release of progesterone. Breast burns are likely to cause asymmetries in both genders, even if they are superficial (Figure 1).



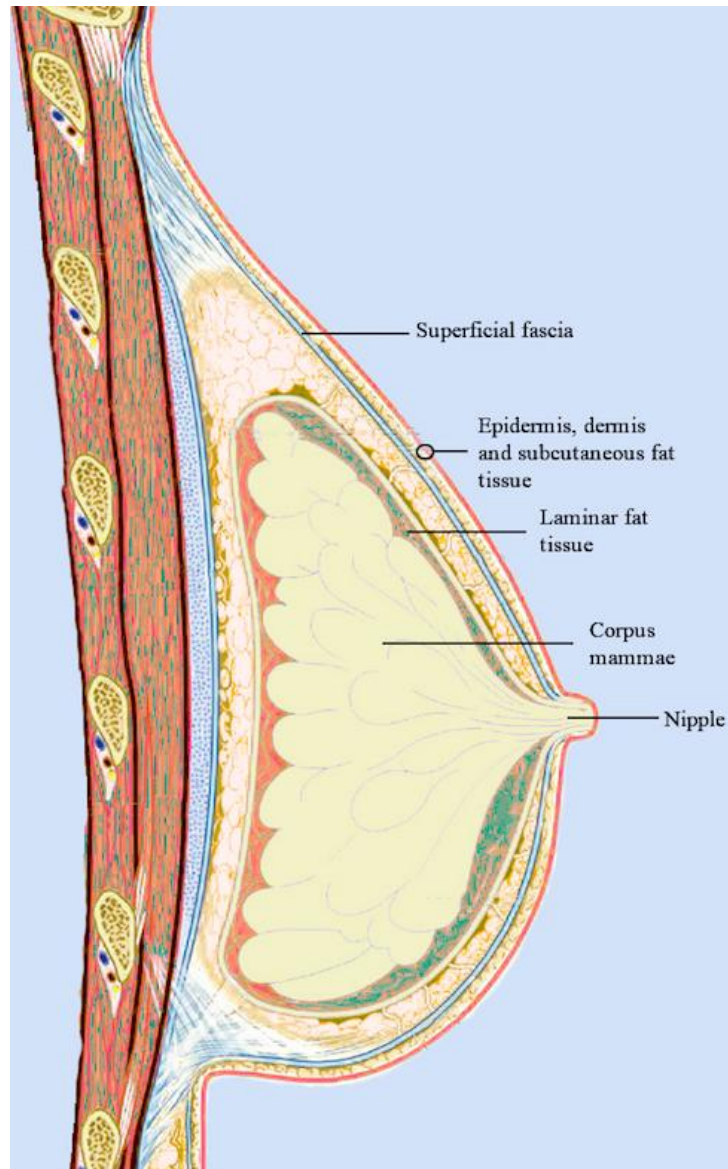
**Figure 1:** Young female patient who developed breast asymmetry after chest anterior wall burn.

It sometimes does this by causing contractures, sometimes by affecting the nipple or bud and preventing it from growing (Figure 2).



**Figure 2:** Young girl patient with burned entire breast bud and nipple areolar complex.

As a result of these developments, adult breast tissue consisting of skin, subcutaneous adipose tissue, breast parenchyma and stromal tissue occurs (2, 3). The figure below demonstrates the adult female breast structure in a sagittal section. At this point, the superficial fascial system that gives the shape of the breast and provides support, nipple areola structure, epidermis, dermis, subcutaneous adipose tissue, lamellar adipose tissue, and core structure of the breast are demonstrated (Figure 3).



**Figure 3:** Schematic representation of the variability of breast glandular tissue and adipose tissue composition.

Protein denaturation that starts due to thermal energy, chemicals, electrical energy or radioactive rays in the burn is followed by the activation of toxic inflammatory mediators. In addition, continued tissue destruction results in ischemic tissue necrosis in deep burns (4).

Breast and chest burns can disrupt the posture of the patients and can be clinically asymmetrical (Figure 4).



**Figure 4:** Male child with chest anterior wall burn, whose left breast nipple areolar complex was destroyed, and posture disorder.

If the body burns include the breast, it definitely requires special treatment. While epidermal or superficial second-degree breast burns often heal in a short time without causing significant functional and cosmetic problems through topical treatments, it is difficult to overcome functional and cosmetic problems in the treatment of deep burns both in the first wound healing phase and in later reconstruction stages (5, 6).

As a result of breast burns, there exists some patient presentations about psycho-social problems related to delay in wound healing, limitation of movement, contractures in the trunk and abdominal surrounding tissue and arms, breast pain, loss of breastfeeding potential, breast deformity and aesthetic deformities (7).

In order to prevent deepening of burns, adequate perfusion should be provided by keeping fluid resuscitation at optimum level, tissue edema should be tried to be reduced, adequate nutritional support should be provided, wound care should be performed with topical antibiotic dressings or, if necessary, use of biological, synthetic wound care products and bacteria contamination to the wound should be prevented (8). Every effort should be made to protect the nipple areolar complex (NAC). At this stage, SPY analysis of breast tissue with Indocyanine in developed clinics is important in terms of depth determination and perfusion control (9).

Breast tissue is rich in fat, especially in female patients. The increase in adipose tissue causes a relative decrease in vascularity. There is a risk of female breast burns to progress to deeper burns due to the decrease in blood flow, which is one of the factors affecting the deepening of the burn (2).

Care should be taken to protect the parenchymal tissues and the nipple areola complex while gentle debridement is performed early for the burned areas on the breast skin in order to reduce the risk of infection by removing necrotic tissue (10, 11).

In local wound care, topically effective agents should be selected considering the patient's pregnancy or breastfeeding status, and agents that can cause systemic absorption and pass into milk, should be avoided for this group of patients (12). The dermis layer plays an important role in the healing of the skin in burn cases. Leaving the reticular dermis for secondary healing in 2<sup>nd</sup> degree deep burns and 3<sup>rd</sup> degree burns increases the possibility of hypertrophic scar and contracture development. When pathophysiology of the burn was investigated, it was determined that the burn was a dynamic process, and the burn could transform from a superficial burn to a deep burn within the first 3-5 days, including the subacute stage after the burn event. It is important to prevent the progression of the burn wound, and to prevent possible morbidity and functional losses.

Infection in the tissue, decrease in blood flow that cause blood flow of the wound to be blocked and edema of the surrounding tissue are the leading local factors that affect the progression of the burn (8, 13).

For women, the breast, which is an important part of sexual identity, is a very important endocrine organ physically, spiritually and socially. The priority order in the treatment of breast burns should be as follows: 1) preventing the deepening of breast burns, 2) trying to reduce the risk of hypertrophic scar formation, 3) by considering the breastfeeding potential of the patient, trying to preserve the lobular and ductal structures of the breast and area of the nipple and areola functionally, 4) informing the patient about the aesthetic results and providing an adequate support to her/him (7, 11).

In order to prevent breast distortions and contractures that may occur during the reconstruction phase, following sensitive debridements in deep burns, the method of repair with grafts or flaps in the early period is determined. However, it should not be forgotten that tissue expanding applications, free tissue transplants, fat injections for functional symptoms in the late period, and fat injection, laser applications and tattooing for cosmetic symptoms should be considered (14).

Cosmetic protection of the inframammary folds, which is characteristic in breast reconstruction, is the reconstruction of the functional nipple areolar complex (NAC) as early as possible. NAC is also an erectile tissue and it is important that the neural network is not exposed to late burn damage. The place of lasers affecting collagen remodeling should not be underestimated in the late period of scar modulation (15, 16).

Due to its semispheric and 3-dimensional structure, the female breast first comes into contact with the agent, especially in liquid and viscous burns. The exposure time to the burn agent increases because of its large size. The glandular tissue is more susceptible to burns, and the high fluid content of it makes the breast more conductive. The transition from the stasis zone to the coagulation zone may occur within couple of hours due to the lack of water in the adipose tissue in the breast (4, 8).

After the burn occurs, providing tissue from the surrounding skin through expansion or its reconstruction with abdominal skin and muscle tissue never provides replacement of glandular tissue (Figure 5). Breast tissue is a special tissue and deserves a meticulous treatment from the first moment of the burn.



**Figure 5:** Young girl patient who is planned to have a breast contracture with tissue expander application.

## V. Conclusion

The type of treatment to be applied in patients with breast burns should be evaluated specifically for the patient at every stage, and it should be determined depending on the age of the patient, the history and expectation of breastfeeding in female patients, and depth and extent of the burn. Also, the shape of the breast should be shaped according to the size of the other breast in the reconstruction phase. Starting from the stage of 2<sup>nd</sup> degree deep burn, the patient should be informed that she will never regain her normal cosmetic form, and that she will need some interventions in the late period. Since the breast is rich in adipose tissue, continuing with careful gentle debridement application and then grafting, reduces reconstruction need for the late period. Considering the local factors affecting the progression of the burn, we think that the risk of burns to turn into deep burns increases in female breast with rich adipose tissue.

**References:**

- [1]. Pandya S, Moore RG. Breast development and anatomy. *Clin Obstet Gynecol.* 2011;54(1):91-5.
- [2]. Gaskin KM, Peoples GE, McGhee DE. The fibro-adipose structure of the female breast: A dissection study. *Clin Anat.* 2020;33(1):146-55.
- [3]. Rehnke RD, Groening RM, Van Buskirk ER, Clarke JM. Anatomy of the Superficial Fascia System of the Breast: A Comprehensive Theory of Breast Fascial Anatomy. *Plast Reconstr Surg.* 2018;142(5):1135-44.
- [4]. Nielson CB, Duethman NC, Howard JM, Moncure M, Wood JG. Burns: Pathophysiology of Systemic Complications and Current Management. *Journal of burn care & research : official publication of the American Burn Association.* 2017;38(1):e469-e81.
- [5]. Loss M, Infanger M, Künzi W, Meyer VE. The burned female breast: a report on four cases. *Burns : journal of the International Society for Burn Injuries.* 2002;28(6):601-5.
- [6]. Mueller M, Boorman JG. Post-burn breast resurfacing using an abdominal full-thickness skin graft. *Br J Plast Surg.* 2002;55(2):148-50.
- [7]. Cahners SS. Young women with breast burns: a self-help "group by mail". *J Burn Care Rehabil.* 1992;13(1):44-7.
- [8]. Singh V, Devgan L, Bhat S, Milner SM. The pathogenesis of burn wound conversion. *Ann Plast Surg.* 2007;59(1):109-15.
- [9]. Fourman MS, Phillips BT, Crawford L, McClain SA, Lin F, Thode HC, Jr., et al. Indocyanine green dye angiography accurately predicts survival in the zone of ischemia in a burn comb model. *Burns : journal of the International Society for Burn Injuries.* 2014;40(5):940-6.
- [10]. Grishkevich VM. Restoration of the shape, location and skin of the severe burn-damaged breast. *Burns : journal of the International Society for Burn Injuries.* 2009;35(7):1026-35.
- [11]. Foley P, Jeeves A, Davey RB, Sparnon AL. Breast burns are not benign: long-term outcomes of burns to the breast in pre-pubertal girls. *Burns : journal of the International Society for Burn Injuries.* 2008;34(3):412-7.
- [12]. Honari S. Topical therapies and antimicrobials in the management of burn wounds. *Crit Care Nurs Clin North Am.* 2004;16(1):1-11.
- [13]. Mosier MJ, Gibran NS. Surgical excision of the burn wound. *Clin Plast Surg.* 2009;36(4):617-25.
- [14]. Sadeq F, Cauley R, Depamphilis MA, Driscoll DN, Ehrlichman R. Reconstruction of Severe Burns to the Breast in Pediatric Patients: A 10-Year Experience. *Journal of burn care & research : official publication of the American Burn Association.* 2020;41(3):568-75.
- [15]. Jarjis RD, Matzen SH. Release and Reconstruction of a Postburn Deformed Breast in a Young Woman. *Plast Reconstr Surg Glob Open.* 2016;4(3):e643.
- [16]. Ogilvie MP, Panthaki ZJ. Burns of the developing breast. *J Craniofac Surg.* 2008;19(4):1030-3.

Percin KARAKOL, MD, et. al. "Breast Burns Are Characteristic Burns And They Require A Very Meticulous Treatment." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(03), 2021, pp. 25-32.