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ORIGINAL ARTICLE

Comparative Study of Early Clinical Outcomes of Full Thickness Skin Graft and Local Flap in Post-Burn Inframammary Contracture Reconstruction

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ABSTRACT

Introduction: *Post-burn inframammary contracture presents a significant reconstructive challenge, often affecting breast contour, function, and overall aesthetics. Various surgical techniques, including full-thickness skin grafts (FTSG) and local flaps, are commonly employed to restore symmetry and achieve optimal healing, yet their comparative outcomes remain insufficiently explored. This study aims to compare the early clinical outcomes of full-thickness skin grafts (FTSG) and local flaps in the reconstruction of post-burn inframammary contracture.* ***Methods and materials:*** *This observational prospective study was conducted from August 2017 to June 2019 in the Department of Burn and Plastic Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh. 50 female patients with post-burn inframammary contracture requiring reconstruction were selected using random sampling. Data analysis was carried out by using SPSS version 26.* ***Result:*** *At 30 days postoperatively, 76% of all patients had no complications. Infections occurred in 8% of cases, all within the FTSG group (14.28%), while local flap cases showed no infections but had small rates of marginal (9.09%), tip (9.09%), and partial flap loss (4.54%). Breast symmetry was seen in 78.6% of FTSG and 77.3% of local flap cases, and color match in 57.1% and 59.1%, respectively (both p>0.05). Reconstruction results were rated very good in 42.9% of FTSG versus 36.4% of local flap cases, and healing was excellent in 71.4% of FTSG compared to 50% of local flap patients (p>0.05), indicating better, but not statistically significant-outcomes in the FTSG group.* ***Conclusion:*** *It can be concluded that the inflammatory fold is better reconstructed with FTSG in younger patients but with local flaps in adult patients. Early clinical outcome and rate of complications were statistically similar across both groups who underwent FTSG and local flap alone.*

Keywords: *Skin Graft, Local Flap, Post-Burn Contracture*

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INTRODUCTION

Burn injuries remain a significant global health concern and are among the most devastating forms of trauma, often resulting in functional impairment, aesthetic deformity, and long-term psychological consequences. The trunk is commonly involved in burn patients, and within it, the breast is particularly vulnerable. The high prevalence of breast involvement in childhood trunk burns has a substantial impact on long-term development [1]. When burns occur during childhood or adolescence, normal breast growth may be permanently disrupted, resulting in deformities that persist into adulthood [2]. Breast burns in prepubertal girls can cause major developmental distortion and asymmetry, often due to domestic scald injuries [3]. Among the various post-burn breast deformities, inframammary contracture is particularly challenging because it distorts the inframammary fold (IMF), a key aesthetic and anatomical landmark defining the lower boundary of the breast mound. When the IMF is obliterated or displaced superiorly due to scarring, the breast assumes an unnatural shape with reduced lower pole fullness, nipple–areola malposition, and noticeable asymmetry [4]. The restoration of the IMF thus becomes a central objective in the reconstruction of post-burn breast deformities. Multiple surgical techniques have been described for correcting post-burn breast deformities, including Z-plasty, split-thickness skin grafts (STSG), full-thickness skin grafts (FTSG), local flaps, distant pedicled flaps, free flaps, and tissue expansion [5]. STSG and simple scar-release techniques, despite being technically uncomplicated, are associated with high recurrence rates and poor long-term aesthetic results due to pronounced secondary contraction. More advanced options, such as distant pedicled flaps and free flaps, offer durable results but require

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microsurgical expertise, prolonged operative time, and may involve greater donor-site morbidity. FTSG and local flaps remain two of the most widely used reconstructive options, owing to their balance between technical simplicity, reliable outcomes, and acceptable donor-site morbidity. Full-thickness skin grafts offer advantages such as reduced long-term contraction, improved texture and color match, and better stability of the reconstructed IMF [6,7]. Local flaps-including thoracodorsal artery perforator (TDAP) flaps, lateral intercostal artery perforator (LICAP) flaps, and axillary flaps—offer well-vascularized tissue with superior color and texture match. These flaps allow for reliable contracture release and IMF restoration while minimizing donor-site morbidity [8,9]. Despite the extensive use of both full-thickness skin grafts and local flaps, comparative studies focusing specifically on early clinical outcomes in post-burn inframammary contracture reconstruction remain scarce. Existing publications often address breast burn reconstruction broadly without evaluating which technique offers superior early postoperative results in terms of aesthetics, recurrence, complication rates, and donor-site morbidity. This lack of focused comparative data limits evidence-based decision-making [10]. This study aims to compare the early clinical outcomes of full-thickness skin grafts (FTSG) and local flaps in the reconstruction of post-burn inframammary contracture.

METHODS & MATERIALS

This observational prospective study was conducted from August 2017 to June 2019 in the Department of Burn and Plastic Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh. 50 female patients with post-burn inframammary contracture requiring reconstruction were selected using random sampling. Data were collected from the selected patients using a pre-designed structured questionnaire. Odd-numbered patients underwent full-thickness skin grafting (FTSG), while even-numbered patients received local flap reconstruction. Patients aged 13–40 years with perforators identified by a handheld Doppler probe were included. Those with gross deformity of the breast, chest wall, or trunk, major comorbidities, psychiatric disorders, or who did not consent were excluded. Demographics and clinical characteristics, including age, socio-economic status, burn cause, type, previous surgery, and contracture extent, were collected. Data analysis was carried out by using SPSS version 26. To determine associations, chi-square tests were used. Differences were considered significant at the $P < 0.05$ level for all these tests. Ethical approval was obtained from the Ethical Review Committee of Dhaka Medical College.

RESULTS

The above table shows that, among 50 patients, 32 (64%) were in the 13-20 years age group, 14 (28%) were in the 21-30 years age group, and the remaining 4 (8%) were in the 31-40 years age group. The mean age shows 20.26±6.30years with a range of 13 to 38 years. [Table I]

Table – I: Distribution of patients according to age at the time of reconstruction (*n*=50)

Age Group (years)	Frequency (n)	Percentage (%)	Mean ± SD Age	Age Range (years)
13–20 years	32	64%	20.26 ±6.3	13 – 38
21–30 years	14	28%		
31–40 years	4	8%		
Total	50	100%		

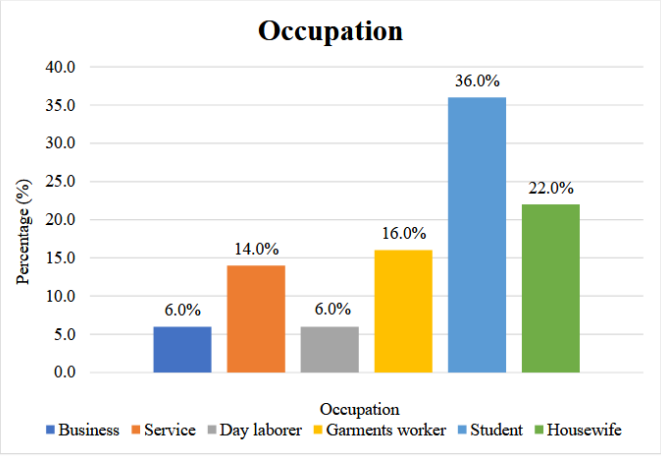

Figure – 1: Occupation of study population (*n*=50)

According to the above figure, it's obvious that, majority of our study population were students (36%), followed by housewives (22%), garment workers (16%), and 14% were service holders. [Figure 1]

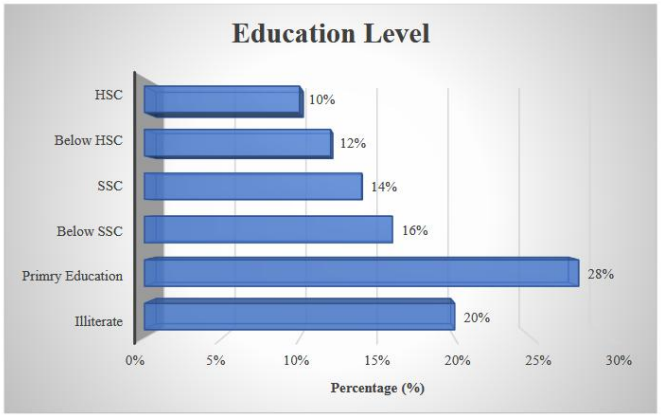

Figure – 2: Distribution of study population according to education level (*n*=50)

Among 50 patients, 28% had completed their primary education, 20% were illiterate, and 16% had studied below SSC. Only 36% subjects were studied above or equal to SSC. [Figure 2]

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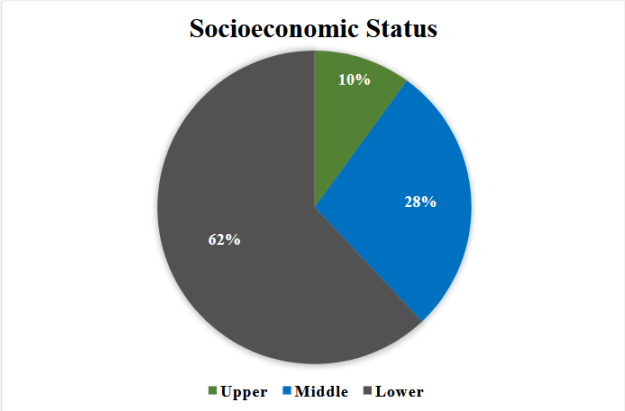

Figure – 3: Socio-economic status of study population (n=50)

Socioeconomic status of the study population reveals that, majority were from low socioeconomic conditions (62%), followed by 28% middle class, and 10% from upper-class families. [Figure 3]

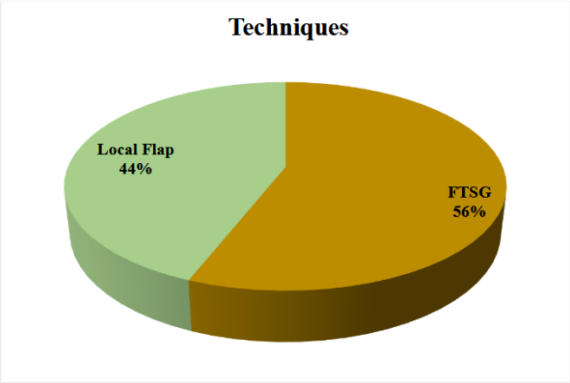

Figure – 4: Distribution of the study population according to coverage technique (*n*=50)

The above figure shows the graft technique used in our study population. Full-thickness skin graft (FTSG) was used in 28 patients (56%) while local flap was used in 22 patients (44%). [Figure 4]

Other characteristics of our study population show that the mean duration of scar was 6.31±3.97 years. At the time of burn, the majority of injuries (56%) took >6 weeks to heal, and the maximum patient (60%) received their treatment in hospital, and it was surgical management. [Table II]

Table – II: Characteristic features of the burn of the study population (*n*=50)

Variables	Frequency	(%)	Mean duration of scar (year)
Duration of healing			
Within 3 weeks	3	6	6.31 ± 3.97
Within 4–6 weeks	19	38	
>6 weeks	28	56	
Treatment at the time of burn			
Conservative at home	6	12	
Conservative at the hospital	14	28	
Surgical treatment	30	60	

36% of total study subjects had left-sided breast deformity following burn. In 34% cases, there was a whole length extension of scar after healing, and 68% had a broad scar in their breast. The majority (40%) of cases have hyperpigmented surrounding skin. [Table III]

Table – III: Pattern of deformity of study subjects following burn (*n*=50)

Variables	Frequency	(%)
Site of deformity		
Right	15	30
Left	18	36
Both	17	34
Extension of deformity		
Medial	8	16
Lateral	10	20
Central	15	30
Whole length	17	34
Type of scar		
Linear	16	32
Broad	34	68
Surrounding skin condition		
Normal	16	32
Hypopigmented	14	28
Hyperpigmented	20	40

The above table shows, length and width of the scar and flap. The mean length of the wound was 14.15±4.09 cm, and the width was 6.77±1.61 cm. The mean length of flap was 17.01±5.04 cm, and the mean width was 7.80±1.44 cm. [Table IV]

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Table – IV: Length and width of scar and flap (*n*=50)

Variable	Mean (cm)	Minimum (cm)	Maximum (cm)
Scar			
Length	14.15 ±4.09	6	22.1
Width	6.77 ± 1.61	4	10.5
Flap			
Length	17.01 ± 5.04	7.7	29.7
Width	7.80 ± 1.44	5.5	11.5

The mean dimension of the scar was 102.12 ± 52.28 cm^2, with a maximum dimension of 232.05 cm^2 and a minimum dimension of 24 cm^2. The mean dimension of the flap was 139.58 ± 67.29 cm^2, with a maximum dimension of 341.55 cm^2 and a minimum dimension of 42.35 cm^2. [Table V]

Table – V: Dimensions of the scar and flap among the study population (*n*=50)

Variable	Mean Dimension (cm^2)	Minimum Dimension (cm^2)	Maximum Dimension (cm^2)
Scar (n =50)	102.12 ± 52.28	24	232.05
Flap (n =50)	139.58 ± 67.29	42.35	341.55

The above table shows the morbidity of the flap donor site. Out of 50 patients, 34 (68.0%) patients had no donor site morbidity, 7 (14.0%) patients had infection of the donor site, 2 (4.0%) patients had skin graft loss on the donor site, and wound dehiscence in 7 (14.0%) cases. Infections occurred in 10.7 of % FTSG group, while it was 18.2% in the case of the local flap technique. [Table VI]

Table – VI: Distribution of morbidity of flap donor site between groups (*n*=50)

Complications	FTSG (n=28)	Local Flap (n=22)	Total (n=50)
	n (%)	n (%)	n (%)
Infections	3 (10.7%)	4 (18.2%)	7 (14.0%)
Skin graft loss on the donor site		2 (9.1%)	2 (4.0%)
Wound dehiscence	5 (17.9%)	2 (9.1%)	7 (14.0%)
None	20 (71.4%)	14 (63.6%)	34 (68.0%)
Total	28 (100%)	22 (100%)	50 (100%)

Among 50 patients, flap morbidity at the recipient site is shown in the above table. 76% cases had no complication, while 8% had infection at the site of graft. Among FTSG cases, 14.28% had infection and 3.57% had a history of graft loss, while in the local flap, no infection occurred. Marginal Flap Loss occurs in 9.09%, Flap Tip Loss occurs in 9.09% &Partial Flap Loss occurs in 4.54% cases, and wound dehiscence occurs in 4.54%. [Table VII]

Table – VII: Postoperative outcome of the study subjects on the 30th POD (*n*=50)

Complications	FTSG (n=28)	Local Flap (n=22)	Total (n=50)
	n (%)	n (%)	n (%)
Infections	4 (14.28)	0 (0)	4 (8)
Graft loss	1 (3.57)		6 (12)
Marginal flap loss		2 (9.09)	2 (4)
Flap tip loss		2 (9.09)	2 (4)
Partial flap loss		1 (4.54)	1 (2)
Wound dehiscence	1 (3.57)	1 (4.54)	2 (4)
None	22 (78.57)	16 (72.72)	38 (76)
Total	28 (100)	22 (100)	50 (100)

The aesthetic outcome of the study population was shown in the above table. Symmetry of both breasts after grafting was present in in78.6% cases in FTSG and 77.3% cases of local flap. Color match of both breasts in 57.1% cases of FTSG and 59.1% cases of local flap. Chi-square test was done as a test of significance. $P<0.05$ is considered significant. Both the statistics were non-significant ($P>0.05$). [Table VIII]

Table – VIII: Aesthetic outcome of study population at 30th POD among two techniques (*n*=50)

VARIABLES	FTSG (n=28) (%)	Local Flap (n=22) (%)	P-value
0.59			
Yes	22 (78.6%)	17 (77.3%)	
No	6 (21.4%)	5 (22.7%)	
0.56			
Yes	16 (57.1%)	13 (59.1%)	
No	12 (42.9%)	9 (40.9%)	

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In 42.9% cases of FTSG, there was a very good reconstruction result, while it was 36.4% in the case of local flap. The bad reconstruction result in the case of FTSG was 7.1% while it was 18.2% in the case of local flap. That is, the reconstruction outcome is much better in FTSG, though the study shows no significance (p>0.05). It is done on the basis of criteria (Flap adhesion or graft take, infection, wound dehiscence, or flap loss) set in the questionnaire. [Table IX]

Table – IX: Distribution of study population according to the result of reconstruction at 30th POD (*n*=50)

Reconstruction Outcome	FTSG (n=28)	Local Flap (n=22)	P-value
Very good	12 (42.9%)	8 (36.4%)	0.37
Good	8 (28.6%)	3 (13.6%)	
Average	6 (21.4%)	7 (31.8%)	
Bad	2 (7.1%)	4 (18.2%)	

Among 28 cases of FTSG, 71.4% had an excellent outcome in terms of healing, while it was 50% in the case of 22 local flap cases. The study shows no significance (p>0.05), though the outcome is much better in FTSG than in local flaps. [Table X]

Table – X: Distribution of study population according to outcome at 30th day of healing (n=50)

Healing Outcome	FTSG (n=28)	Local Flap (n=22)	P-value
Excellent	20 (71.4%)	11 (50.0%)	0.26
Satisfactory	6 (21.4%)	7 (31.8%)	
Poor	2 (7.1%)	4 (18.2%)	

DISCUSSION

Among 50 patients of our study, 28 (56%) had FTSG and 22 (44%) had the local flap technique. In the present study, the mean age of the patient was 20.26±6.3 years. The majority of patients (64%) were between 13-20 years of age, followed by 28% from 21 to 30 years. Beck et al. showed similarly that the majority of patients who came for reconstruction of burned breast were in the 10-20 years group [11]. Regarding occupation, 36% of our subjects were students and 22% were housewives. 28% of total study subjects had only completed their primary education, and 20% were illiterate. Overall socioeconomic status reveals that, majority (62%) were from a lower socio-economic background. The most common burn agent in this study was thermal burn 45 (90%), where 29 (58%) were flame burn type and 16 (32%) were scald. These data may lead to the possibility that suitable legislation and education will reduce the incidence of burns [11]. 28% patients with burned breast had a history of burn in the chest & back, 22% had anterior chest wall burn, and 14% in the anterior trunk. Burns of the anterior chest can cause significant distortion to the developing breast [12]. In our analysis, 17(34%) cases came with bilateral involvement, 15 (30%) cases had right side involvement, and 18 (36%) cases had left side involvement. 34% patients had a whole length extension of deformity, followed by 30% had central. In the majority of cases, there was a broad scar (68%). Surrounding skin is hyperpigmented in 40% cases [13]. The mean length of scar and flap in our study was 14.15±4.09 cm and 17.01±5.04 cm, respectively. Mean width was6.77±1.61 cm and 7.80±1.44 cm. Mean scar dimension was 102.123±52.28 cm^3, and flap dimension was 139.58±67.29 cm^3 [11]. Morbidity of flap donor site reveals that 64.3% patients with FTSG have no complication, while it is 63.6% in the case of local flaps. Infection at the donor site was observed 10.7% in FTSG and 18.2% of the local flap. Graft loss on the donor site was found to be 9.1% in the case of local flaps. Wound dehiscence in local flaps was noted in 2 cases, while in the study of Kim et al, minor wound dehiscence was noted in 2 patients and severe wound dehiscence in 1 case total of 3cases (6%) [14]. Regarding complications on the recipient site,76% cases had no complication, while 8% had infection at the site of graft. Among FTSG cases, 14.28% had infection and 3.57% had a history of graft loss, while in the local flap, no infection occurred. Marginal Flap Loss occurs in 9.09%, Flap Tip Loss occurs in 9.09% &Partial Flap Loss occurs in 4.54% cases, and wound dehiscence occurs in 4.54%. The possibility of graft loss is higher in FTSG compared to the local flap [15]. Aesthetic outcome of study population reveals that symmetry of both breasts after grafting was present in78.6% cases in FTSG and 77.3% cases of local flap. Color match of both breasts in 57.1% cases of FTSG and 59.1% cases of local flap. The full-thickness skin graft is preferable because of better aesthetic results and less secondary contracture of the skin [16]. The correction of asymmetry plays an important part in post-burn breast reconstruction. Asymmetry following burn injury to the breast can be due to pre-existing asymmetry, scar contracture, or impaired maturation of the breast gland [17]. Comparison of reconstruction of the burned breast and redefinition of inframammary fold by FTSG and local flap showed that 42.9% with the FTSG technique had a very good outcome, while it was 36.4% in the local flap. The bad outcome was 7.1% in FTSG and 18.2% in the local flap. That means, FTSG was found to be effective in the case of post-burn inframammary contracture. The reconstruction and redefinition of the inframammary fold as a major landmark in successful breast reconstruction can be performed by simple scar release and grafting of the area [17]. But in the case of early age patients whose breast was not fully developed, their inframammary fold was better developed by FTSG than the local flap in our study. On the other hand, in adult patients with fully developed breasts, the inframammary fold was well developed by the local flap. Because flap has given excellent results and offers two advantages: first, it builds up the inframammary line if this is lost as a consequence of the burn, and the second advantage is the gradual stretching of the overlying skin over the fixed inframammary fold, resulting in improvement of the fold [18].

Limitations of The Study

The study had a relatively small sample size, which limits the generalizability of its findings to the wider population. All data were obtained from a single tertiary care center, which may introduce institutional bias. In addition, the study could not include long-term follow-up, preventing evaluation of outcomes beyond the immediate study period.

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CONCLUSION

It can be concluded that the inflammatory fold is better reconstructed with FTSG in younger patients, but with local flaps in adult patients. Early clinical outcome and rate of complications were statistically similar across both groups who underwent FTSG and local flap alone.

RECOMMENDATION

A larger sample size should be included in future research to improve the robustness and generalizability of the findings. Conducting a multicentre study would also help minimize institutional bias and provide a more representative understanding of the study population. Additionally, incorporating long-term follow-up would be beneficial for assessing the durability and progression of outcomes over time.

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