Comparison of Split Thickness Skin Graft vs. Muscle Sparing Latissmus Dorsi Flap for Lower Pole Reconstruction in Post Burn Breast Deformity

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Abstract

Objective: To compare the outcomes of split thickness skin grafting with muscle sparing Latissimus Dorsi flap for post burn lower pole breast reconstruction.

Material and Methods: A prospective comparative study. It is conducted within a period of March 2024 to March 2025 .In females with inframammary fold contracture were divided in two groups, 20 patients in group A (STSG) and 20 in group B (MSLD) group. All patients were evaluated in terms of patient's satisfaction, aesthetic outcome, and re-contracture rates. Objective (NAC: SN & NAC: IMF distance) and subjective assessment of aesthetic outcome between groups was assessed with Mann Whitney U test and within groups pre and post operatively was assessed with the Wilcoxon test. Patient satisfaction measures were compared between groups with the help of Chi Square test. P-value ≤ 0.05 was considered statistically significant.

Results: The mean age in group A and B is 25 and 26 years respectively. The mean duration of burn in group A is 19 months and in group B was 17.8 months. There is significant improvement in MSLD group in terms of shape, volume, projection, symmetry with less re-contracture rate as compared to STSG group. Most of the patients were well satisfied in MSLD group.

Conclusion: MSLD flap is a valuable option in post burn breast deformities. This technique proved to be considerable alternative to split thickness skin grafting depicting improved patient's satisfaction and aspiring breast aesthetics with minimal donor site morbidity.

Keyword: split thickness skin graft, post-burn breast deformity. muscle sparing latissimus dorsi, inframammary fold contracture.

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Introduction

Breasts are a potent symbol of feminity. Thermal injuries to anterior chest wall results in grave consequence of disruption of development of breast due to tight scar envelop.[1] Scarring prevents expansion of the inferior pole of breast especially resulting lack of projection of breast in addition to unpleasant shape of breast. Post burn breast deformity leads to esthetic concerns and psychological trauma. Reconstructive options for post bun breast deformity range from simple split thickness skin grafting to flaps.[2,3] The purpose of reconstruction is to project the breast as well as to restore its normal appearance and development with minimal donor site morbidity.[4] Commonly used techniques for augmentation of breasts includes split thickness skin grafting and latissimus Dorsi flap. Release of post burn contracture and re-surfacing of the resultant defect with split thickness skin graft is a

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standard procedure that has acceptable results. It is simple, quick with minimal donor side mobility.[5] However, cosmetic results are suboptimal as compared to a flap. A flap would provide more projection as compared to split thickness skin graft.[6] Latissimus dorsi flap is accredited as a work horse flap for breast reconstruction which have been used for many years due to its better color match, pliable skin, concealed scar, greater bulk and wide arc of rotation but at expense of shoulder adduction.[7] Muscle Sparing latissimus dorsi flap is a variant that prevents unnecessary donor muscle morbidity as well as preserve its motor function, making it an excellent choice when a bulky flap is not required.[8,9]

The aim of this study is to provide strong evidence regarding comparison of these two different modalities in terms of improvement in appearance of breast. This research will establish evidence for preferable approach for management of lower pole post burn breast deformity along with impact of reconstruction on patient's psychological distress.

Material and Methods

This comparative study was carried out in Plastic Surgery Department from March 2024 to March 2025. IRB No: IRB/2022/1028/SIMS. 40 patients of age range between 16 to 45 years, having postburn constriction of lower pole of breast were enrolled in the study. The sample size of 20 subjects in each group is calculated using 80% power of the study, 5% level of significance and considering the satisfaction rate with latissimus dorsi flap is equal to 100% and 75 % with split thickness skin graft. Consecutive sampling was done. Patients were assigned in equal two groups randomly i.e. STSG group and MSLD group. All the demographic details, educational status type and duration of injury were noted. Patients with history of previous axillary dissection, scarring of the back and co morbidities were excluded from the study. After complete history, detailed examination was done. Pre op photographs in standard views were taken. In bilateral cases, normal breast aesthetic distances were taken as reference values. The skin laxity on back was used to mark the horizontal skin pedicle that can be taken so that closure of donor can be done primarily. Distances from suprasternal notch to Inframammary fold and IMF to nipple areola complex were taken on both of the breasts preoperatively .Under general anesthesia release of IMF was performed to release constricting forces on the breast.STSG group defect was re-surfaced with intermediate thickness split thickness skin graft and in MSLD group, muscle sparing LD flap (II) with 4cm muscle cuff based on descending branch of thoracodorsal artery was performed. Thick split thickness skin graft was harvested with dermatome (Zimmer) with caliber of 0.16 cm. Skin graft was anchored to defect after release of IMF. Quilting sutures were applied, and foam dressing was done. The donor site dressing was done with antimicrobial interactive dressing. In MSLD group, standard marking and Doppler for perforator was performed. In lateral position, after incising skin paddle, anterior border of latissimus dorsi muscle was visualized and dissected from serratus anterior muscle. The descending branch of thoracodorsal artery was dissected out and traced up to proximal bifurcation of thoracodorsal main artery. Skin paddle was elevated off the latissimus dorsi muscle thorough posterior approach. Visualization of tiny musculocutaneous perforators limits the portion of muscle harvested along with skin paddle. A small cuff of muscle up to 4 cm was harvested with bovie cautery. Care was taken to preserve thoracodorsal nerve and transverse branch[10]. Flap was inset in to the defect created after the release of IMF using 4/0 vicryl and 4/0 prolene. Closure of the donor area was done primarily. Drains was placed at both donor and recipient sites. Sutures were removed after 10 days. Recipient drain was removed after 48 hours and donor drain at 5thday. Follow up done at one month and six months. Massage of the breast was advised. Supporting bra with conformer was advised for 6 months.

Primary outcomes were aesthetic outcome of breast and patient's satisfaction noted after 6 months. Secondary outcomes were complication rate and re-contracture rate. Subjective assessment of appearance of breast was performed on 5 -point Likert scale in terms of breast shape, projection, volume, symmetry and IMF definition. This was done by consultant Plastic Surgeon who was not involved in surgery. Analysis was performed both preoperatively and post operatively. Objective assessment was performed by comparing pre-operative and post-operative measurements of distance between suprasternal notch to NAC (SN: NAC) and NAC to inframammary fold (NAC: IMF).Inter-group analysis was performed for

objective analysis. Patient satisfaction was assessed using 5- point Likert scale breast shape, volume, projection, symmetry and softness[11]. Complications for both groups were noted. Seroma rate was noted among MLSD group. Re-contracture was noted after 6 months. All the outcomes were compared in both groups. Data entry and analysis was done with SPSS version 25. Normality assessment was done with Kolmogorov Smirnov test. Objective (NAC: SN & NAC: IMF distance) and subjective assessment of aesthetic outcome between groups was assessed with Mann Whitney U test and within groups pre and post operatively was assessed with the Wilcoxon test. Patient satisfaction measures were compared between groups with the help of Chi Square test. P-value.

Results

Mean duration of burn was 19.20±7.12 in Group-A and 17.80±4.51 in Group-B. In Group-A 11(55%) patients were married and 9(45%) were unmarried while in Group-B 10(50%) were married and 10(50%) patients were unmarried. In Group-A and B 4(20%) patients each were illiterate. In Group-A 12(60%) belong to lower and 8(40%) belong to middle class while in Group-B 11(55%) patients belong to lower and 9(45%) belong to middle class. In Group-A and B 15(75%) patients each presented with scald burn while 5 (25%) patients each in Group-A and B presented with flame burn. **Table-I** represents the objective assessment for improvement in aesthetic outcome between two groups. Before surgery, there was no noticeable difference between the STSG (skin graft) and MLSD (flap) groups in terms of nipple position (NAC) or sternal notch measurements (SN). However, after surgery, the MLSD group showed significantly better results. The nipple position in the MLSD group was closer to the ideal measurement, and the sternal notch measurement was also more favorable. These differences were statistically significant, indicating that the MLSD technique provided better anatomical correction compared to skin grafts. **Table-2** demonstrates the subjective assessment of outcomes between two groups. Both treatment groups showed major improvements in all subjective measures including breast shape, projection, volume, symmetry, and fold definition—after surgery. However, when comparing the two techniques, the MLSD group scored significantly higher than the STSG group in post-operative shape, projection, volume, and fold definition. **Table-3** represents comparison of patient's satisfaction between group A and B. Before treatment patient satisfaction showed no significant difference between groups for shape, volume, projection, symmetry and for softness respectively. However, post treatment significant difference was seen in all parameters between groups.

Rate of re-contracture was significantly higher for STSG group as compared to MSLD group.

Table 1: *Objective assessment for improvement in aesthetic outcome between STSG and MLSD groups.*

	Pre-operative Median(IQR)		Post-Operative Median(IQR)	
	STSG	**MSLD**	**STSG**	**MSLD**
NAC: IMF (cm)	9(4)	7.50(3)	10(4)	10(1.88)
p-value [(a)]	**0.369**		**0.04**	
SN: NAC (cm)	22.50(3)	23.50(1.3)	21(3.50)	20(2)
p-value[(a)]	**0.096**		**0.035**	

Note: (a) *Mann Whitney U test*

Table 2: *Subjective assessment of aesthetic outcome between STSG and MLSD groups.*

	STSG Median(IQR)			MLSD Median(IQR)			Between Groups p-value[(c,d)]	
	Pre-Op	**Post-Op**	**p-value[(a,b)]**	**Pre-Op**	**Post-Op**	**p-value[(a)]**	**Pre-Op**	**Post-Op**
Shape	1(1)	2(1)	**<0.001**	2(1)	4(1)	**<0.001**	**0.142**	**<0.001**
Projection	1(1)	2(1)	**<0.001**	2(0)	4(0)	**<0.001**	**0.043**	**<0.001**
Volume	1.50(1)	2(1)	**<0.001**	2(0.75)	4(0)	**<0.001**	**0.142**	**<0.001**
Symmetry	1.50(1)	3(0)	**<0.001**	2(1)	3(1)	**<0.001**	**0.565**	**0.314**
IMF definition	1.50(1)	2(0)	**<0.001**	2(1)	4(0.75)	**<0.001**	**0.602**	**<0.001**

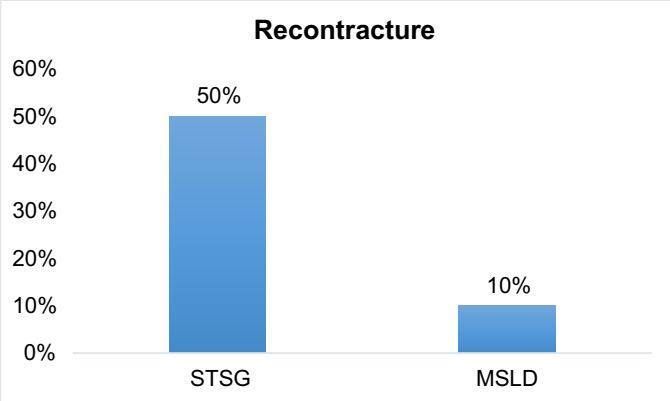
Note: (a): *Wilcoxon test,* ***(b):*** *Within Groups* ***(c):*** *Mann Whitney U test,* ***(d):*** *Between Groups*

Table 3: *Comparison of Patients satisfaction between STSG and MSLD.*

	Shape				Volume				Projection			
	Pre-Operative		Post-Operative		Pre-Operative		Post-Operative		Pre-Operative		Post-Operative	
	STSG	MSLD	STSG	MSLD	STSG	MSLD	STSG	MSLD	STSG	MSLD	STSG	MSLD
Very-Unsatisfied	60%	40%	-	-	45%	25%	-	-	65%	55%	-	-
Unsatisfied	40%	55%	25%	-	55%	70%	20%	-	35%	45%	10%	5%
Neutral	-	5%	55%	20%	-	5%	65%	-	-	-	40%	5%
Satisfied	-	-	20%	60%	-	-	15%	65%	-	-	50%	45%
Extremely Satisfied			0%	20%			-	35%			-	45%
p-value[(a)]	**0.343**		**<0.001**		**0.32**		**<0.001**		**0.748**		**<0.001**	

STSG= Split thickness skin graft, **MLSD=** Muscle sparing latissimus dorsi flap

Re-contracture rate in Study Groups



Discussion

The aesthetic breasts are of remarkable importance in woman's personal life. It is also related to sense of physical and emotional well-being of woman.[12] Thermal burn of the chest affects breast development. The reason for this impact is not due to glandular damage but the cause is thickened, tight cutaneous envelop.[13] This phenomenon causes displacement of nipple areola complex, scarring, breast mound deficiency and infra-mammary fold obliteration. IMF and lower quadrants are core areas for breast beauty. A natural attractive breast should be of proportion 45:55 from upper to lower pole with upward angulation of nipple from nipple meridian and convex lower pole.[14] Constriction at lower pole not only makes the breast flatter but also hinders the expansion of lower pole that is required for natural convexity.

Timely release allows the normal breast growth ensuring normal breast contour.[15] For aesthetic reconstruction, nipple to IMF distance has a pivotal role which is usually kept 8-10 cm. Beauty of breast resides in convexity of lower pole. That is why expansion of lower pole with release and reconstruction is essential.[17]

Conventionally breast contracture is dealt by release and skin grafting. El-Otiefy in his analysis concludes that skin graft has better prognosis in upper half of breast rather than IMF.[3] A case report by Jarjis et al advocates that incision of breast scar at IMF and skin graft provide elasticity for expansion, though associated with hypertrophy.[5] Sadeq etal in 2020 published a retrospective cohort study for correction

	Symmetry				Softness			
	Pre-Operative		Post-Operative		Pre-Operative		Post-Operative	
	STSG	MSLD	STSG	MSLD	STSG	MSLD	STSG	MSLD
Very-Unsatisfied	30%	55%	-	-	75%	55%	-	-
Unsatisfied	60%	45%	15%	-	25%	45%	30%	-
Neutral	10%	0%	65%	10%	-	-	60%	5%
Satisfied	-	-	20%	65%	-	-	10%	70%
Extremely Satisfied			-	25%			-	25%
p-value[(a)]	**0.127**		**<0.001**		**0.32**		**<0.001**	

of burn breasts.Our comparative study concludes re-contracture rate higher in STSG group (50%) as compared to MSLD group (10%).



Figure – 1: Spilt thickness skin graft group (STSG), case 1- (a) Right breast having post burn contracture of a (b) late follow up after contracture release and split thickness skin case_2(c) Pre op post burn contracture involving lower poles of both breasts of a 25 years old female (d) late follow up after bilateral post burn contracture release and STSG.

Though, it provides bulk, supple soft tissue and skin paddle, actual problem of breast mound deficiency in burn breast is not due to glandular volume loss but its compression due to tight scar.[7] Release and resurfacing with TDAP flap or muscle sparing LD flap precludes the morbidity of myocutaneous LD flap harvest.[23] Many studies have documented that harvest of LD myocutaneous flap leads to reduced shoulder strength and stiffness.[24]

Thoracodorsal artery perforator flap (TDAP) has been initially introduced for preservation muscle function of latissimus dorsi but Schwabegger etal introduced the idea of muscle sparing latissimus dorsi flap to reduce partial flap loss and tedious dissection of TDAP flap.[9] Diminutive muscle strip protects the tiny perforators from shearing forces and improves vascular supply without any donor site morbidity. Hamdi et al graded this flap in three categories; MS-LD I, MS-LD II and MS-LD III.According to him, if perforators are pulsating and of good caliber, it is safe to proceed with TDAP flap. If perforators are tiny but pulsating, a small piece of mucle is included (MS-LD I). If the perforators are not pulsating, a larger portion upto 5 cm is included (MS-LD II). If most of the muscle is incorporated, it is MS-LD III.[15] In our study, MS-LD II has been utilized as thermal injury to anterior chest also has impact of skin of lateral chest and status of perforators. Moreover, this prevents the higher partial necrosis rate associated with TDAP. Only 1 patient has partial tip necrosis is our analysis.

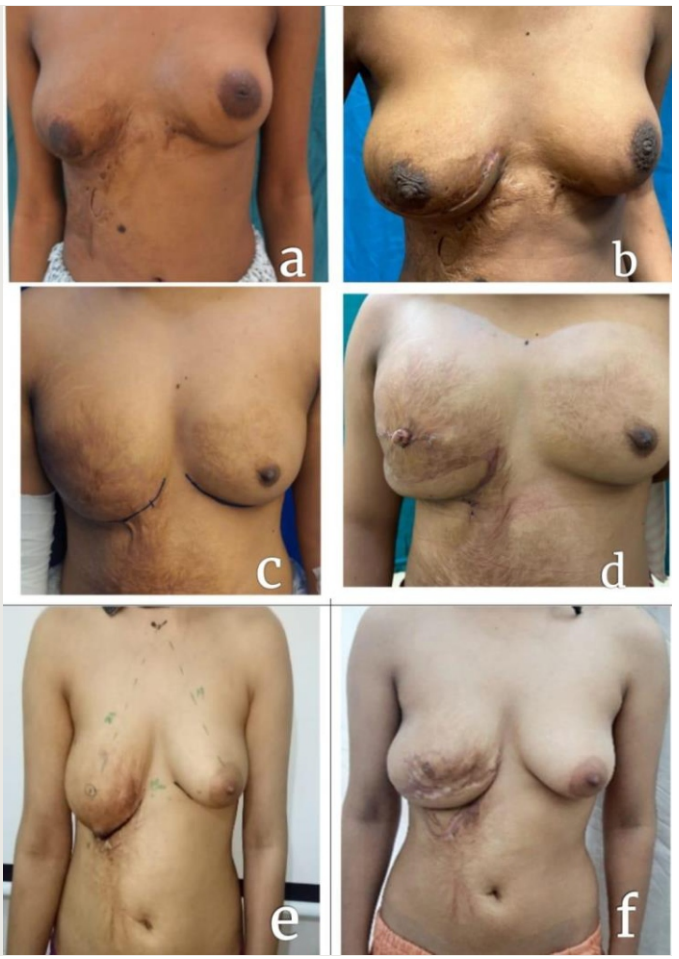


Figure – 2: Three representative cases of coverage with muscle sparing latissimus dorsi flap after release of post burn breast deformity obliterating the IMF.

In this study, seroma rate was 5% which is comparable to literature. A study by Saint-Cyr suggested range of motion of shoulder joint for muscle –sparing latissimus dorsi patients was not reduced significantly when comparing operated side with non-operated side.[15]

So muscle-sparing latissimus dorsi flap is regarded superior than latissimus dorsi in terms of reduced

donor-site morbidity, seroma rate, operative time preserving muscle function and back contour. An edge over pure thoracodorsal artery flap, MSLD prevents undue tension over tiny perforators especially in post burn patients improving vascularity and provides supple skin paddle with minor bulk according to requirement of recipient defect in post burn deformity of IMF ,So without no doubt, MSLD flap is a resolution bordering between harvesting whole LD and pure TDAP flap.

Though release and resurfacing with STSG also improves the outcomes but women undergone IMF reconstruction with MSLD were more satisfied with shape, volume, projection, symmetry and softness. This can markedly boost patient's confidence and self-esteem. This is a unique study reporting objective improvement in NAC: IMF and SN: NAC distance near normal after reconstruction which is significantly higher in MSLD group as skin graft contracts during scar maturation resulting in reduction of NAC:IMF distance. Though MSLD provides pliable coverage for expansion of lower pole, but still secondary procedures are required to correct bilateral asymmetry. Subjective assessment in this analysis also showed non- significant results for symmetry. NAC reconstruction is performed in second stage when breast mound is developed**.**

Conclusion

Muscle-sparing latissimus dorsi flap is considered to be valuable alternative to skin graft as regard to IMF re-creation with lower re-contracture rate. For post burn distorted breast having effaced IMF combined with inferior breast pole deficiency and displaced nipple areola complex, this modality is a better safe choice preserving muscle function and body contour.

Conflict of Interest None

Funding Source None

References:

1. Kunert P, Schneider W, Flory J. Principles and procedures in female breast reconstruction in the young child's burn injury. Aesthetic Plast Surg. 1988; 12(2):101-6. Doi: 10.1007/BF01576922.
2. Gus E, Zhu J, Brooks SG. Postburn breast reconstruction: a scoping review. Scars Burn Heal. 2023; 9:20595131231202100. Doi: 10.1177/-20595131231202100.
3. Hussein MA, Abdelkader R, and El-Henawy AN, Makarem K. Lower pole breast reconstruction using muscle-sparing latissimus dorsi flap in postburn breast deformity. Plast Reconstr Surg Glob Open. 2021; 9(9):e3835. doi:10.1097/-GOX.0000000000003835.
4. Jarjis RD, Matzen SH. Release and reconstruction of a postburn deformed breast in a young woman. Plast Reconstr Surg Glob Open. 2016; 4:e643. doi:10.1097/GOX.0000000000000626.
5. Mousavizadeh SM, Motamed S, Hosseini SN, et al. Re-creation of the inframammary fold, breast mound, and projection by the latissimus dorsi musculocutaneous flap in burned breasts. Eplasty. 2011; 11:e11.
6. Saint-Cyr M, Graham D, Wong C, Donfrancesco A, Colohan S, Rohrich R. The free descending branch muscle-sparing latissimus dorsi flap: vascular anatomy, clinical results and comparison with the transverse branch. Plast Reconstr Surg. 2011; 127:73.
7. Schwabegger AH, Harpf C, Rainer C. Muscle-sparing latissimus dorsi myocutaneous flap with maintenance of muscle innervation, function, and aesthetic appearance of the donor site. Plast Reconstr Surg. 2003; 111(4):1407-11. doi:10.1097/-01.PRS.0000049448.56511.23.
8. Colohan S, Wong C, Lakhiani C, Cheng A, Maia M, Arbique G, et al. The free descending branch muscle-sparing latissimus dorsi flap: vascular anatomy and clinical applications. Plast Reconstr Surg. 2012; 130(6):776e-87e. doi:10.1097/-PRS.0b013e31826d9c5e.
9. Dikmans REG, Nene LEH, Bouman MB, de Vet HCW, Mureau MAM, Buncamper ME, et al. The Aesthetic Items Scale: a tool for the evaluation of aesthetic outcome after breast reconstruction. Plast Reconstr Surg Glob Open. 2017; 5(3):e1254. doi:10.1097/GOX.0000000000001254.
10. 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. 2008; 34(3):412-7. doi:10.1016/j.burns.2007.05.001.
11. Kunert P, Schneider W, Flory J. Principles and procedures in female breast reconstruction in the young child's burn injury. Aesthetic Plast Surg. 1988; 12(2):101-6. Doi: 10.1007/BF01576922.

12. Mallucci P, Branford OA. Concepts in aesthetic breast dimensions: analysis of the ideal breast. J Plast Reconstr Aesthet Surg. 2012; 65(1):8-16. doi:10.1016/j.bjps.2011.08.006.
13. Sadove AM, van Aalst JA. Congenital and acquired pediatric breast anomalies: a review of 20 years' experience. Plast Reconstr Surg. 2005; 115(4):1039-50. doi:10.1097/01.prs.0000154214.99641.72.
14. MacLennan SE, Wells MD, Neale HW. Reconstruction of the burned breast. Clin Plast Surg. 2000; 27(1):113-9.
15. Sadove AM, van Aalst JA. Congenital and acquired pediatric breast anomalies: a review of 20 years' experience. Plast Reconstr Surg. 2005; 115(4):1039-50. doi:10.1097/01.prs.0000154214.99641.72.

Author's Contribution:

BB: Conceptualization of Project
SS: Data Collection
AR: Literature Search
HRA: Statistical Analysis
SA: Drafting, Revision
SAN: Writing of Manuscript