

Axilla Reconstruction Post Burn Contracture: Thoracodorsal Artery Flap Versus Local Flap and Skin Grafts

SOBIA RASHID, FAISAL AKHLAQ ALI KHAN, SADAF GULZAR, WAQAS SAMI, HYDER ALI, SABA KIRAN

Department of Plastic Surgery, Civil Hospital Karachi

Correspondence to Dr. Sobia Rashid Email: sobiarashid22@gmail.com, Telephone #: 0333-1522703

ABSTRACT

Background: Burns are a prevalent worldwide morbidity that frequently results in contractures that impede function and appearance, especially in the axilla, which has a major impact on upper limb mobility.

Aim: To compare the functional results of local flaps with skin transplants versus Thoracodorsal artery flaps for axilla repair following burn contracture.

Methods: A prospective comparative study was conducted. In the Department of Plastic and Reconstructive Surgery, thirty patients were split into two groups for a prospective comparative study. Group B underwent local flaps utilizing skin grafts, whereas Group A underwent thoracodorsal artery flaps. An analysis was conducted on pre- and post-operative shoulder joint abduction, complications, and demographic factors.

Result: The two groups' post-operative shoulder abduction did not significantly differ, according to the results; however, younger patients and those with concomitant conditions including diabetes and hypertension were more likely to benefit from thoracodorsal artery flaps because of increased vascularization. The study discovered that middle-aged individuals typically had local flaps, but younger patients frequently had thoracodorsal artery flaps. Though not statistically significant, the gender distribution revealed a trend with more males obtaining local flaps and more females receiving thoracodorsal artery flaps. Thoracic dorsal artery flaps were substantially more common in patients with diabetes and hypertension.

Practical Implication: The higher prevalence of thoracodorsal artery flaps in patients with diabetes and hypertension underscores importance of choosing flaps that provide better vascular support for patients with compromised vascular health.

Conclusion: The findings highlight the significance of considering patient-specific criteria when choosing a flap, as thoracodorsal artery flaps provide better vascular support and are advantageous for patients with compromised vascular health. These results emphasize the need for customized surgical planning to improve results in post-burn contracture axilla repair. To enhance patient care and further improve surgical protocols, future research should concentrate on long-term results.

Keywords: Thoracic dorsal artery flap, burns, contracture, axilla

INTRODUCTION

Burns are one of the most common morbidities in the globe. Even though the prognosis and recovery after burns have significantly improved because of new methods, contractures still result in certain cosmetic and functional issues. Deep partial-thickness burns or full-thickness burns are common causes of contracture formation, particularly if the injured tissue is not removed by skin grafting and excision, but occasionally even after surgery. Most often, burn wounds will result in tight, aberrant scar tissue if they are not initially correctly handled or if there is no functional rehabilitation. According to recent research, contractures occur in roughly twenty-three (23%) to fifty-four (54%) of patients who are hospitalized in hospitals with burn injuries that require auto grafting^{1,2}. Although it typically affects shoulder joints, burns can occur in any joint. The most problematic complication of contractures is reduced mobility^{3,4}.

Because it joins the upper limb to the chest, the axilla is significant. Ampit scarring is frequently caused by large-area burns in the axilla, radiation therapy for breast cancer, or surgery. The axilla contracture is one of the most intricate conditions affecting hand movements. They restrict hand movements to a specific position and cause hand stiffness, which limits hand function. These contractures adversely impede normal living⁵.

Early and reasonable treatment is essential to reducing scar contracture and improving the prognosis for patients. When axillary scar contracture is severe and limits shoulder joint movement, surgery is necessary. Currently, the primary goal of treatment for axillary scar contracture deformity is scar release. Autologous skin and neighboring skin flaps, scapular or Para scapular skin flaps, and free flaps are typically used to correct axillary abnormalities. Because the flap is elastic and flexible, it doesn't need to be fixed right away. It is widely regarded as the best technique for healing scars from mild to severe axillary contracture⁶.

Restoration of function and appearance is significantly hampered by post-burn axillary contractures. The question of whether to use a local flap with skin grafts or a thoracodorsal artery flap is one of the most controversial reconstructive choices. The purpose of this paper is to present a thorough analysis of these two methods, assessing how well they work to restore function, achieve cosmetic, reduce problems, and guarantee patient happiness. Determining the benefits and drawbacks of each strategy is essential for making well-informed decisions in cases involving axilla repair following burn contracture.

This study is conducted to evaluate the functional results, such as strength and range of motion, between patients receiving local flap and skin grafts for post-burn contracture and patients having axilla restoration using the thoracodorsal artery flap.

Hypothesis: There is a significant difference in the outcomes of axilla reconstruction between the thoracodorsal artery flap technique and the local flap and skin graft technique for post-burn contracture.

MATERIALS AND METHODS

This prospective comparative study was conducted in the Department of Plastic and Reconstructive Surgery during a period of 6 months after the approval of synopsis by IRB.

Sampling Technique: Nonprobability consecutive sampling

Sample Size: The sample size is calculated by using the standard deviation difference by the formula of Lane et al [8] and using a previous study by Walsh et al⁷ Sample size will be 30 patients, with 15 patients in each group.

Inclusion Criteria: Patients of both gender aged 20 to 50 years having post-burn contracture in the axilla for at least 6 months and not responding to physiotherapy

Exclusion Criteria: Patients with chronic illness will not be included due to poor healing of wounds.

Data collection procedure: After approval from the hospital's ethical board, patients fulfilling the inclusion criteria and admitted to our ward will be included in our study. A written informed consent will be taken. Demographic data regarding age, gender, diabetes,

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hypertension, and obesity will be noted. All patients will be subjected to a general and local examination with emphasis on the detection of contracture degree, site of contracture (whether anterior or posterior axillary folds, or both), axillary dome affection, and surrounding skin of the adjacent areas (chest, shoulder, and back). Patients will be divided into two groups using the lottery method. Patients in Group A will undergo reconstruction using thoracodorsal artery flap while patients in Group B will undergo reconstruction using local flap and skin grafts.

The thoracodorsal artery flap will be marked. Its marking is initiated from the posterior axillary fold up to the posterior superior iliac spine which separates the latissimus muscle at its lateral border. Handheld Doppler is used for the marking of the thoracodorsal artery with its cutaneous perforators on the back preoperatively. The thoracodorsal artery perforator flap is marked fasciocutaneously, from the point of cutaneous perforators that lies perpendicular to the latissimus dorsi muscles. The proximal perforator is present at about two to three cm behind the lateral border of the latissimus and eight to ten centimeters below the axilla. The lateral decubitus position is used to raise the flap under GA in which the arm is rotated and abducted at ninety degrees above the head. The size of the wound is used as a reference for the size of the flap to be elevated. To enhance the mobility of the pedicle flap, transfer of the point of the perforator artery is also included in the flap design.

Patients in group B will undergo local flap using landmarking and skin grafting if needed. As a routine of each technique, post-operative physiotherapy will be done under a specialist. Patients will be examined periodically for complications of wound healing (infection, ulceration, necrosis, wound dehiscence, hypertrophic scar, and contracture) and maximum degree of axillary joint abduction. Data will be entered in specially designed proforma.

Data analysis procedure: Data will be entered and analyzed by using SPSS version 22.0. Mean and standard deviation will be calculated for quantitative variables like age, pretreatment abduction at the shoulder joint, post-treatment abduction at the shoulder joint, and duration of symptoms. Frequency and percentage will be calculated for categorical variables like gender and complications. Both groups will be compared for an increase in joint abduction using a paired t-test, and a p-value ≤ 0.05 will be taken significantly. Effect modifiers like age, type of injury, and gender, will be addressed through the stratification of data. Post-stratification t-test will be applied and p-value ≤ 0.05 will be taken as statistically significant.

RESULT

Figure1: Demographic information with Hypertension and Diabetes

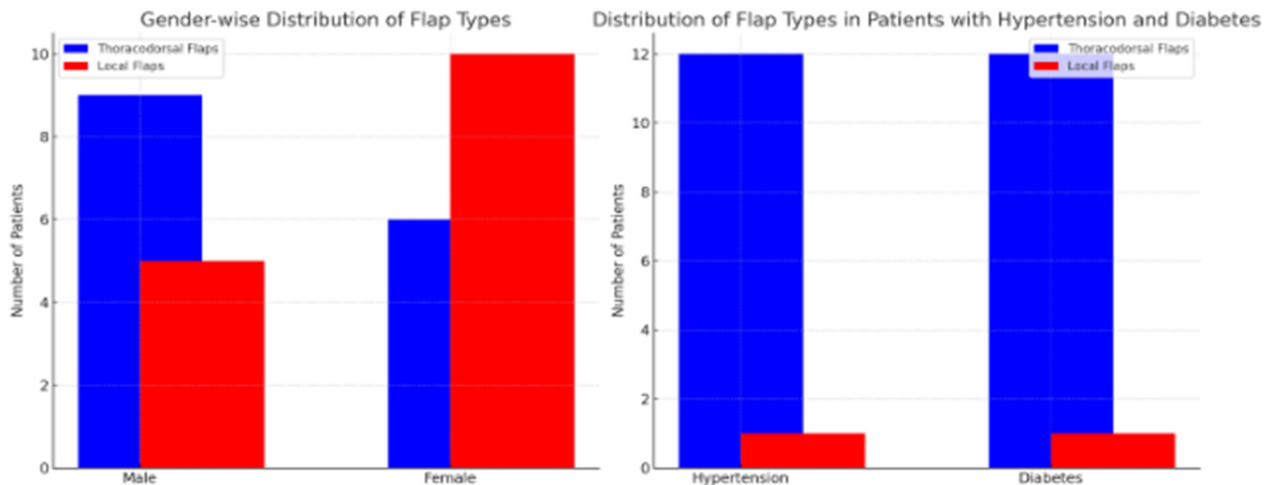


Table 1: Comparison of variables with demographics

		Thoracodorsal artery flap	Local flap	P-value
Age in years	Less than 18 years	6	2	0.096
	18-30 years	5	3	
	30-50 years	2	9	
	More than 50 years	2	1	
Gender	Male	9	5	0.136
	Female	6	10	
Diabetes	Yes	12	1	0.00
	No	3	14	
Hypertension	Yes	12	1	0.00
	No	3	14	

Several clinically important findings were obtained when thoracodorsal artery flaps and local flaps were compared. Patients under the age of eighteen had a higher likelihood of receiving thoracodorsal artery flaps—6(40%) patients as opposed to 2(13.3%) patients for local flaps; patients between the ages of thirty and fifty-nine had a higher likelihood of receiving local flaps—60% (9 patients) as opposed to 2(13.3%) patients. There is a discernible trend indicating younger patients are more likely to have thoracodorsal artery flaps, even if the age distribution did not achieve statistical significance (P = 0.096).

Table 2: Comparison between thoracodorsal artery flaps and local flaps

Type of injury	1A: Injury involved the anterior axillary fold	0	3	0.254
	1B: Injury involved the posterior axillary fold	7	4	
	2: Injury involved the anterior and posterior axillary fold	5	4	
	3: Injury type 2 also involves the axillary dome	3	4	
Duration of injury	Less than 6 months	8	2	0.102
	6-12 months	6	9	
	12-36 months	1	3	
	More than 36 months	0	1	

Gender-wise, more male patients 9(60%) patients had thoracodorsal artery flaps done than local flaps (33.3%), whereas more female patients 10(66.6%) patients had local flaps done than thoracodorsal artery flaps (6 patients). There is no compelling evidence of a preference for one flap type over the other based on gender, as this gender difference was not statistically significant (P = 0.136).

A noteworthy observation was made regarding patients who had both hypertension and diabetes. Thoracic artery flaps were performed on a notably greater number of patients (80%; 12 patients) with diabetes and 80% (12 patients) with hypertension than on local flaps (6.66%; 1 patient) for either disease, with a P-value of 0.00 for both. This implies that thoracodorsal artery flaps are the preferred procedure for individuals with hypertension and diabetes, most likely because of their superior vascularization qualities, which promote recovery.

There were no statistically significant variations in the injury kinds and durations between the two flap groups. Only three patients in the local flap group (20%) had injuries affecting the anterior axillary fold (type 1A); other injury types were distributed equally between the two groups ($P = 0.254$). To the length of the injury, thoracodorsal artery flaps were more frequently utilized for injuries that were less than six months old ($P = 0.102$; 53.3%, 8 patients) as opposed to 13.3%, 2 patients, in the local flap group.

To compare the two groups post-operative abduction at the shoulder joint, an independent samples t-test was used. The Thoracodorsal Artery Flap group and the Local Flap group did not significantly differ in post-operative abduction, according to the results. In comparison to the Local Flap group, the Thoracodorsal Artery Flap group had a slightly higher mean post-operative abduction; however, this difference was not statistically significant.

DISCUSSION

Critical insights into the use and efficacy of local and thoracodorsal artery flaps in reconstructive surgery can be gained from comparing them. This study adds to the continuing discussion on flap selection in clinical practice by highlighting several significant factors about patient demographics, comorbidities, and injury features.

Though not statistically significant, younger patients' preference for thoracodorsal artery flaps may indicate that these flaps provide advantages that are consistent with the physiological traits of a younger population. Younger patients can benefit from the use of more complex flaps, such as the thoracodorsal artery flap because they frequently have superior general health and vascular integrity. On the other hand, those in the 30–50 age range tended to employ local flaps more often. This could be an indication of a therapeutic decision-making process wherein middle-aged patients with potentially differing risk profiles and healing capacities are given preference for local flaps due to their relative simplicity and little invasiveness and results are similar to prior studies⁹⁻¹⁰.

The study's gender distribution did not reveal any statistically significant differences, however, it did demonstrate a tendency wherein more males underwent local flaps and more females underwent thoracodorsal artery flaps. This may be connected to anatomical factors particular to gender or variations in the patterns of injuries; however, more study is required to completely comprehend these tendencies.

The results about comorbidities, including diabetes and hypertension, were the most startling and statistically significant. Thoracodorsal artery flaps were significantly more common in patients with these disorders. This preference can be explained by the fact that thoracodorsal artery flaps improve vascularization, which is important for patients who have poor vascular health. Patients with diabetes and hypertension are more likely to experience delayed wound healing and an elevated risk of infection; therefore, the strong vascular support provided by thoracodorsal artery flaps is especially advantageous. These results are consistent with other worldwide research highlighting the significance of flap selection in patients presenting with substantial comorbidities. For instance, a study by Wu¹¹ discovered that diabetes patients had comparable preferences for well-vascularized flaps to enhance healing and lower problems¹²⁻¹³.

There were no statistically significant differences between the two flap groups according to the study of damage kinds and duration. The adaptability of the thoracodorsal artery and local flaps was demonstrated by their application in a range of injury types and durations. Nonetheless, a pattern was noted wherein injuries less than six months old were more commonly treated with thoracodorsal artery flaps. This may point to a therapeutic preference to optimize healing potential by using these flaps in acute circumstances. This result aligns with other research findings, including a studies by¹⁴⁻¹⁵, which demonstrated that thoracodorsal artery flaps' superior blood supply makes them useful in managing early-stage wounds.

All things considered, this study emphasizes how crucial it is to take patient-specific variables like age, comorbidities, and injury features into account when choosing a flap. Thoracodorsal artery flaps are significantly more common in patients with diabetes and hypertension, which emphasizes the importance of meticulous surgical planning in these high-risk populations. These results emphasize the value of customized patient care in reconstructive surgery and add to a more comprehensive understanding of flap selection¹⁶⁻¹⁷. Subsequent investigations have to persist in examining these patterns and assessing extended consequences to enhance surgical protocols and elevate patient results worldwide.

CONCLUSION

In reconstructive surgery, this study compares thoracodorsal artery flaps with local flaps. It emphasizes how important it is to consider patient-specific parameters including age, gender, comorbidities, and damage features when choosing a flap. Patients with diabetes and hypertension had a considerable preference for thoracodorsal artery flaps because of their superior vascularization, which improves healing and lowers complications in these high-risk groups. The study's conclusions, which emphasize the necessity of customized surgical planning to maximize results, are consistent with current worldwide research trends. Long-term outcomes should be the main focus of future studies to further improve surgical guidelines and patient care.

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1. Conception and design of or acquisition of data or analysis and interpretation of data.
2. Drafting the manuscript or revising it critically for important intellectual content.
3. Final approval of the version for publication.

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