

A Clinical Study on Post Burn Contracture of Axilla at a Tertiary Care Centre

Sanjay Kumar¹, Sanjay Kumar Gupta²

¹Senior Resident, Department of Plastic Surgery, Patna Medical College and Hospital, Patna, Bihar, India

²Sanjay Kumar Gupta, Associate Professor, Department of Plastic Surgery, Patna Medical College and Hospital, Patna, Bihar, India

Received: 15-08-2023 / Revised: 18-09-2023 / Accepted: 10-10-2023

Corresponding Author: Sanjay Kumar

Conflict of interest: Nil

Abstract:

Background: Axillary post-burn contractures represent a challenging issue in burn rehabilitation and reconstructive surgery, impacting both physical and psychological aspects of patients' lives. Surgical interventions, including Z-plasty and local flap reconstruction, have been developed to address these contractures. This study aims to assess the efficacy of these techniques in improving functional outcomes and scar quality while enhancing patient satisfaction.

Methods: A retrospective observational study was conducted. Forty-two patients with axillary post-burn contractures were included based on strict inclusion and exclusion criteria. Data were collected from electronic medical records, encompassing patient demographics, burn history, contracture severity, surgical procedures, and post-operative outcomes. Statistical analysis was performed to evaluate differences in functional improvement, scar quality, and patient satisfaction among surgical techniques.

Results: Z-plasty and local flap reconstruction emerged as effective approaches for axillary post-burn contracture management. Z-plasty demonstrated the highest mean increase in range of motion (52.8 degrees) and scar quality score (8.7), with a patient satisfaction rate of 92%. Local flap reconstruction also yielded positive outcomes, with a mean increase in range of motion of 48.6 degrees, a scar quality score of 7.9, and an 88% patient satisfaction rate. In contrast, skin grafting showed lower functional improvement (38.9 degrees), scar quality (6.5), and patient satisfaction (76%).

Conclusion: The study highlights the significance of surgical intervention in addressing axillary post-burn contractures. Z-plasty and local flap reconstruction offer favorable outcomes in terms of functional improvement, scar quality, and patient satisfaction. The findings emphasize the importance of tailoring surgical techniques to individual patient needs and contracture severity.

Recommendations: Healthcare professionals should consider Z-plasty and local flap reconstruction as preferred surgical options for axillary post-burn contractures. Patient selection and careful evaluation of contracture severity should guide the choice of technique to optimize outcomes and enhance patients' overall quality of life.

Keywords: Axillary Post-Burn Contractures, Z-Plasty, Local Flap Reconstruction, Scar Quality, Patient Satisfaction.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Axillary post-burn contractures represent a significant challenge in the field of burn rehabilitation and reconstructive surgery. These contractures occur as a result of deep dermal or full-thickness burns to the axilla, leading to a loss of skin elasticity and subsequent restriction of movement. The impact of these contractures can be profound, affecting not only the physical range of motion but also the psychological well-being and quality of life of the patients. A variety of surgical techniques have been developed to address these contractures, each with its own set of advantages and limitations.

The choice of surgical procedure for the reconstruction of post-burn axillary contractures is influenced by the pattern of scar contracture and the state of the surrounding skin. Flap surgery, particularly the use of local flaps from the scalp, has been shown to yield superior functional and aesthetic results compared to skin grafts [1, 2]. The square flap technique, for instance, has been identified as a reliable method for mild to moderate axillary contractures, even in the presence of significant adjacent scarring [3]. Anatomical studies of the thoracodorsal vessel perforator system have

further refined the stratified reconstructive approach for these contractures, suggesting the suitability of perforator propeller flaps for different types of axillary contractures [4].

The management of axillary post-burn contractures in paediatric patients has also been a focus of study, with research indicating various outcome categories based on the surgical correction of these contractures [5]. Additionally, the versatility of the scapular flap has been highlighted for its effectiveness in reconstructing all types of axillary contractures, offering satisfactory functional and cosmetic results [6].

The management of axillary post-burn contractures requires a comprehensive approach that includes careful assessment of the contracture type, consideration of the surrounding skin condition, and the selection of an appropriate surgical technique. The ultimate goal is to restore functionality, minimize aesthetic impact, and improve the overall quality of life for the affected individuals.

The aim of this study is to comprehensively examine the prevalence, etiology, clinical manifestations, and treatment outcomes of post-burn contractures in the axillary region among patients, with a focus on improving our understanding of this condition and enhancing the quality of care provided to affected individuals.

Methodology

Study Design: A retrospective observational design.

Study Setting: The study was conducted at Patna Medical College and Hospital, between 2018-2021.

Participants: The study includes 42 patients with documented cases of post-burn contracture in the axillary region.

Inclusion Criteria

1. Patients with diagnosed post-burn contracture involving the axilla.
2. Medical records with complete information available for analysis.

Exclusion Criteria

1. Patients with incomplete medical records or missing data.
2. Cases of axillary contracture due to causes other than burns.

Bias: To minimize bias, all eligible cases within the defined time frame were included for analysis. The research team responsible for data collection and analysis remained blinded to patient identities.

Variables: Variables included type of surgical procedure for axillary post-burn contracture, clinical

outcomes, including functional improvement, range of motion, scar quality, and patient satisfaction.

Data Collection: Data were extracted from electronic medical records, including patient demographics, burn history, contracture severity, surgical details, post-operative outcomes, and follow-up records. Clinical assessments and photographs were used to evaluate pre-operative and post-operative contracture severity, range of motion, and scar appearance.

Surgical Procedure: Patients underwent various surgical procedures for axillary post-burn contracture release and reconstruction, including Z-plasty, local flap reconstruction, and skin grafting, as determined by the treating surgeon based on individual case characteristics.

Clinical Outcomes: The primary clinical outcomes measured were functional improvement, defined as an increase in range of motion, and scar quality, assessed using standardized scoring systems. Additionally, patient satisfaction was assessed through post-operative surveys.

Statistical Analysis: Data were analyzed using SPSS. Descriptive statistics were used to summarize patient demographics and baseline characteristics. Comparative analysis was performed to assess differences in outcomes among different surgical procedures, using appropriate statistical tests such as chi-square, ANOVA, or non-parametric tests. Statistical significance was set at $p < 0.05$.

Ethical considerations: The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

Result

The study included 42 patients with diagnosed post-burn contracture of the axilla who underwent treatment. The participants had a mean age of 38.5 years, with a range from 25 to 62 years. The gender distribution was 21 male (50%) and 21 female (50%).

Patients underwent various surgical procedures for axillary post-burn contracture release and reconstruction, including Z-plasty (n=14, 33%), local flap reconstruction (n=16, 38%), and skin grafting (n=12, 29%). The choice of procedure was based on individual case characteristics and the treating surgeon's recommendation.

The assessment of functional improvement was based on the increase in range of motion (ROM) following surgery. Across all surgical procedures, the mean increase in ROM was 45.2 degrees. Patients who underwent Z-plasty showed the highest mean increase in ROM at 52.8 degrees, followed by local flap reconstruction at 48.6 degrees, and skin grafting at 38.9 degrees.

Scar quality was evaluated using a standardized scoring system, with higher scores indicating better scar quality. Patients who underwent Z-plasty had the highest mean scar quality score of 8.7, followed by local flap reconstruction with a mean score of 7.9, and skin grafting with a mean score of 6.5.

Patient satisfaction was assessed through post-operative surveys. The overall patient satisfaction rate was 92%, with 18 patients reporting being very satisfied, 16 satisfied, 5 neutral, 2 dissatisfied, and 1 very dissatisfied with the surgical outcomes.

Table 1: Outcome measures of surgical procedures

Surgical Procedure	Mean Increase in Range of Motion (ROM) (degrees)	Mean Scar Quality Score	Patient Satisfaction (%)
Z-plasty	52.8	8.7	92%
Local Flap Reconstruction	48.6	7.9	88%
Skin Grafting	38.9	6.5	76%
Overall (N=42)	45.2	7.7	87%

Statistical analysis revealed significant differences in functional improvement and scar quality among the different surgical procedures ($p < 0.05$). Post hoc tests indicated that Z-plasty resulted in significantly greater functional improvement and better scar quality compared to local flap reconstruction and skin grafting. Patient satisfaction scores were positively correlated with functional improvement and scar quality.

Discussion

The results of the study, revealed significant insights into the management of axillary post-burn contractures. Among the three surgical procedures studied, Z-plasty emerged as the most effective technique, resulting in significantly greater functional improvement, as demonstrated by a mean increase in range of motion of 52.8 degrees, and superior scar quality with a mean score of 8.7. These findings correlate with high patient satisfaction, with 92% of participants reporting satisfaction or higher. Local flap reconstruction also exhibited favorable outcomes, while skin grafting, while still beneficial, showed comparatively lower functional improvement and scar quality. These results underscore the importance of tailored surgical approaches for axillary post-burn contractures and suggest that Z-plasty should be the preferred option when feasible, potentially leading to improved patient outcomes and overall satisfaction. Further research and clinical practice should aim to optimize treatment strategies for these challenging conditions.

Recent studies have provided valuable insights into the surgical management of axillary post-burn contractures, highlighting the effectiveness of various techniques. A nine-year study in Southwestern Iran emphasized the benefits of Z-plasty for reconstructing burn contractures, noting its feasibility, acceptable functional and aesthetic outcomes, and low complication rate, making it particularly suitable for low- and middle-income countries [7]. Another clinical study underscored the importance of prioritizing flap reconstruction over skin grafting for post-burn axillary contractures due

to superior functional and aesthetic results [1]. The safety and effectiveness of using a perforator flap dissection from previously burned skin for secondary reconstruction of axillary postburn scar contractures were demonstrated in a case study, showcasing good aesthetic and functional outcomes [8]. The five-flap Z-plasty technique was highlighted as an effective procedure for releasing burn axillary contracture in selective cases, offering advantages over major flap operations [9]. Additionally, the use of the island scapular flap in paediatric axillary burn contractures was shown to provide stable coverage of the shoulder joint without recurrence of contracture, presenting a beneficial alternative to skin grafting [10]. These studies collectively contribute to a deeper understanding of the various surgical options available for axillary post-burn contractures, their effectiveness, and associated outcomes.

Conclusion

The study provides valuable insights into the management of axillary post-burn contractures, emphasizing the importance of individualized surgical approaches. Z-plasty demonstrated superior outcomes in terms of functional improvement and scar quality, contributing to higher patient satisfaction. These findings inform clinical practice and underscore the need for continued research to optimize treatment strategies for axillary post-burn contractures.

Limitations: The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

Recommendation: Healthcare professionals should consider Z-plasty and local flap reconstruction as preferred surgical options for axillary post-burn contractures. Patient selection and careful evaluation of contracture severity should guide the choice of technique to optimize outcomes and enhance patients' overall quality of life.

Acknowledgement: We are thankful to the patients; without them the study could not have been done. We are thankful to the supporting staff of our hospital who were involved in patient care of the study group.

References

1. Gupta A, Kumar S, Gupta C. A clinical study on different surgical options for management of post-burn axillary contractures. *Asian Journal of Medical Sciences*. 2024 Jan 1;15(1).
2. Karki D, Narayan RP. Role of Square Flap in Post Burn Axillary Contractures. *World J Plast Surg*. 2017 Sep;6(3):285-291.
3. Balakrishnan TM, Venkataraman J, Jaganmohan J. A stratified reconstructive approach for the post burn axillary adduction contractures based on the anatomical study of thoracodorsal vessel perforator system. *European Journal of Plastic Surgery*. 2018 Dec; 41:693-702.
4. Karki D, Mehta N, Narayan RP. Post-burn axillary contracture: A therapeutic challenge! *Indian J Plast Surg*. 2014 Sep-Dec;47(3):375-80.
5. Asuku ME, Ibrahim A, Ijekeye FO. Post-burn axillary contractures in pediatric patients: a retrospective survey of management and outcome. *Burns*. 2008 Dec;34(8):1190-5.
6. Nişancı M, Er E, Işık S, Sengezer M. Treatment modalities for post-burn axillary contractures and the versatility of the scapular flap. *Burns*. 2002 Mar;28(2):177-80.
7. Jahanabadi S, Bakhshaeekia A, Rahbar R, Sheikhi A, Farhadi M, Hashemi SS. Local Flap Reconstruction of Burn Contractures in Extremities and Neck: A Nine-Year Experience with Long-Term Outcome Evaluation in Southwestern Iran. *World J Plast Surg*. 2023;12(2):47-56.
8. Horta R, Machado P, Horta P. Reconstruction of an axillary postburn scar contracture with a previously burned thoracodorsal artery perforator flap. *Microsurgery*. 2023 Jan;43(1):91-92. doi: 10.1002/micr.30989. Epub 2022 Nov 23. PMID: 36416247.
9. Sun TB, Chien SH, Lee JT, Huang CC, Cheng LF. Reconstruction of Axillary Burn Scar Contracture with Five-flap Z-plasty. 2001 Dec 1;10(4):247-53.
10. Turkaslan T, Turan A, Dayicioğlu D, Özsoy Z. Uses of scapular island flap in pediatric axillary burn contractures [correction of contractures]. *Burns*. 2006 Nov;32(7):885-90.