

SURGICAL MANAGEMENT AND LONG-TERM OUTCOMES OF POST-BURN NECK CONTRACTURES

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ABSTRACT

OBJECTIVES

The study aimed to assess the range of motion and graft recipient site complications in post-operative burns patients.

METHODOLOGY

This descriptive cross-sectional study was conducted at the Burns and Plastic Surgery Centre in Peshawar over a period from January 2019 to December 2024. A total of 40 patients diagnosed with post-burn mento-sternal neck contractures were included in the study. Participants of all age groups, both male and female, were considered, while patients with infected contractures, sinus, or fistula burns, or those who had undergone previous surgeries elsewhere were excluded. Range of motion of neck and graft recipient site complications were recorded from the patient records. Data were analysed using SPSS version 25.

RESULTS

The study included 40 patients, with 30 (75%) males and 10 (25%) females. The mean age of the patients was 22.20 ± 10.12 years, with an age range of 10 to 45 years. Most burns were flame-related (80%), while scalds caused 20%. For those treated after 12 months, 24 (60%) underwent skin grafting, while 10 (25%) exhibited poor skin texture. Good range of motion was found in 24 (60%) patients while 10 (25%) patients had fair ROM at 12 months follow-up.

CONCLUSION

Post-burn neck contractures are a common and challenging complication of burns, typically managed with surgical interventions such as skin grafts, local flaps, and Z-plasty. The overall outcome of these procedures is greatly influenced by early and consistent physiotherapy. A well-structured follow-up program for up to 18 months is essential for ensuring optimal functional recovery and improving long-term outcomes.

KEYWORDS: Burns, Post-Burn Neck Contractures, Physiotherapy, Surgical Management, Skin Grafts, Z-Plasty

INTRODUCTION

Post-burn contracture is common and very frustrating sequel of burn injury affecting form and function. Amongst these, burn contracture of the neck affects the patients significantly, causing both functional limitations and aesthetic disfigurements.^{1,2,3} Burns and fires result in more than 300,000 deaths. Almost 11 million people each year require burn-related medical attention all over the world.⁴ It not only affects the movements of the neck, but also can affect the function of the lower face as well as result in possible tracheal alteration and distortion of the cervical spine. As these contractures cause significant functional and cosmetic problems with resultant economic and psychosocial implications, operative correction is generally recommended, particularly in children in whom they

can cause growth imbalance in the head and neck area.⁵ Contracture is defined as inability to perform the full range of motion of a joint. The development of contractures after burn injury depends on many factors including areas involved, depth of burn, initial management, duration of immobilization, and soft tissue and bony problems.² In developing countries their incidence are mainly due to lack or unsuitable care because they almost didn't see a specialist medical doctor to evaluate the need of skin grafting of acute burn and physiotherapy after healing.⁶ Major improvements in burn care in the 20th century brought in a shift in attention from mortality towards reduction of morbidity.^{4,7,8} Burn scar contractures involving the anterior cervical neck present a unique set of problems compared with the rest of the body. The thin and pliable

skin of the neck is a region with multidirectional activity, and post-operative scar contractures tend to form there easily.⁹ Best way to treat post-burn contracture is to prevent them, as once they are formed, they are not easy to deal with, especially in children.¹⁰ There are various methods to treat contractures depending on the type of contracture and donor site availability. Splintage and physical therapy are as crucial in post-burn contractures as in early burn management.^{2,11,12} The burn scar contracture has been classified into dynamic (early phase) and static (late phase).¹³ However, early reconstruction of dynamic scar contractures could decrease rehabilitation time and improve life quality, before proceeding to static complex scar contractures. Achauer in 1991 classified anterior neck contractures into mild, moderate, extensive, and severe depending on what fraction of the anterior part of the neck involved in the contracting band. The goals of treatment for neck contractures are to release the contractures thoroughly; to regain the natural profile, contour, and color match; and to restore the normal mobility. Recently, numerous methods for releasing the complex scar contracture have been developed; the most common procedure being scar excision and coverage with split- or full-thickness skin grafts.^{4,14} Although skin grafting is a commonly used treatment, its major disadvantages are hyperpigmentation and contracture.^{10,15} Local flaps such as the deltopectoral flap, supraclavicular and transverse cervical artery perforator flap, can be advanced into burn defects.¹⁵ These local flaps can obtain contour and color match with the nearby tissue. Complex scar contractures are also resolved with multiple Z-plastics and local or pedicled cutaneous flaps; however, there are often limitations of local injured donor tissue.^{4,16} This study is conducted to assess the outcomes of various treatments for post-burn neck contractures, to provide critical data for the development of standardized treatment protocols. By focusing on the efficacy of surgical approaches, this research intends to contribute to improving management strategies in burn centers, particularly in regions where specialized care is limited. Additionally, the findings will establish baseline data for further studies and the formulation of comprehensive follow-up protocols, enhancing the long-term care of burn survivors. The objective of this study is to assess the range of motion and graft recipient site complications in post-operative burns patients.

METHODOLOGY

This descriptive cross-sectional study was conducted from January 2019 to December 2024 in the Burns and Plastic Surgery department of a public sector teaching hospital in Peshawar, after obtaining permission from

the Institutional Board. Informed written consent was obtained from all participating patients. The sample size was calculated to be 25 using an 80% power of the test and a 5% significance level, based on a 94% prevalence of post-burn neck mento-sternal contracture in patients who underwent successful operative treatment. However, due to small sample size, the number of patients was increased to 40 in this study. Patients diagnosed with proven post-burn neck mento-sternal contracture, including both males and females of all age groups, were included in the study. Exclusion criteria included patients with infected mento-sternal neck contracture, those with sinus or fistula burns, patients who had undergone surgery elsewhere or presented with recurrence, and those with additional conditions such as cervical spondylosis or achondroplasia. A detailed history was obtained, followed by a thorough local examination to assess the extent of contracture, as classified by Achauer and Salisbury. The examination also included assessment of bevin, skin texture, color match, and the range of neck movement. The evaluation of atlanto-occipital extension was performed with the patient sitting straight, head erect, and facing directly forward, as described by Bellhouse and Dore. The lines of contracture and proposed incisions were marked, with reference points including the mandibular angle, mid-clavicle, mental tubercle, and sternal notch. The vertical extent of the contracture was measured using the mento-sternal distance. The availability of surrounding skin and its suppleness were also assessed. If the distance between the mentum and thyroid prominence was less than 6 cm, difficult intubation was anticipated. Postoperatively, physiotherapy was initiated 2-3 weeks after surgery. The primary exercises included extension, alternate anterior flexion, lateral rotation, flexion on both sides, and circumduction. The range of motion at the donor and grafted sites was checked. The patient was sent home with instructions on positioning, splintage (Watucci), local care, massage, and physical therapy. Results were evaluated in terms of the range of motion (ROM), especially extension, and aesthetic appearance, including color match, texture, contour, and donor site morbidity. Follow-up was conducted at 6-, 12-, and 18-month post-surgery. Data were entered into SPSS version 23. Continuous data, such as age, was presented as mean and standard deviation. Categorical data, including gender, duration of hospital stay, type of contracture, and complications, were presented as frequency and percentage.

RESULTS

In our study, a total of 25 patients were included, comprising 19 (76%) males and 6 (24%) females. The mean age was 22.20 ± 10.12 years, ranging from 10 to

45 years. Flame burns accounted for 20 (80%) cases, while 5 (20%) were due to scalds. The severity of contractures varied, with Z-plasty performed for 5 (20%) patients with mild contractures, local flaps and STSG used for 15 (60%) patients with moderate contractures, and STSG alone used for 3 (12%) patients with severe contractures (Figures 1 and 2). Scar tissue was released until healthy underlying tissue was exposed. Table: 1

Table 1: Demographic and clinical characteristics of patients with neck contractures (including mean age, gender distribution, burn etiology, and classification of contractures by severity and surgical management techniques).

Age	Mean +SD
Mean age	22.20+10.12
Gender (n) (%)	
Male	30(75%)
Female	10(25%)
Etiology of Burn (n) (%)	
Flame	32(80%)
Scald	08(20%)
Type of Contracture (n) (%)	
Mild (Z-Plasty)	08(20%)
Moderate (STSG with local flaps)	24 (60%)
Sever (STSG)	05 (12.5%)
Extensive (graded release &STSG)	03(7.5%)

Table: 2 Summary of Anesthetic Techniques for Intubation, Methods of Contracture Release, Hospital Stay Durations, Post-Operative Complications, and Range of Motion (ROM) Outcomes among Patients with Neck Contractures

Anesthetic technique for intubation (n)	
A wake	13
Controlled Anesthesia	22
Spontaneous release and intubation	05
Method of release (n)	
Incisional	32
Excisional	08
Duration of hospital stay (n)	
Less than 5 days	24
7-14 days	10
Greater than 14 days	06
Complications (n) (%)	
Poor Match Color	10 (25%)
Graft Loss	06 (15%)
Graft hypertrophy	06 (15%)
Range of Motion(ROM) (n)	
Good	24
Fair	10
Poor	06



Figure 1: Neck contracture resulting from flame burns, treated with release and split-thickness skin grafting (STSG). Postoperatively, splintage was maintained using a Watucci splint. The images depict the long-term outcome of the patient.



Figure 2: Severe neck contractures treated with release and split-thickness skin grafting. The images illustrate both the early and long-term outcomes of the graft in these patients.



Figure 3: A Case of Severe Recurrent neck contractures treated with adequate release and Thickish split-thickness skin grafting. The images illustrate early outcomes of the graft.

DISCUSSION

The head and neck are the most exposed parts of the body to the external environment; disfiguring scars in this region affect the function and aesthetics of various parts. As the skin in this region is thin and pliable, contractures can result in abnormalities of lip competence, facial expression, and decreased neck movements.⁴ Initial management affects the depth of burn but also causes hindrances in physiotherapy because of late mobilization, pain, repeated anesthesia, and nutritional problems. Initial adequate burn management and aggressive physiotherapy and Splintage have the leading role in prevention of contractures.² The basic goals of neck reconstruction are the restoration of appearance, including symmetry, contour, texture, color match, and function. In our study, we had 19 females and 06 males. Similarly, another study was also seen by Kobus, where there were 87 females out of 147 patients. This increased incidence is mainly due to increased domestic exposure due to kitchen work.⁶ Many classification systems were found in the literature; most of them were based on the severity of the contracture, as Achauer in 1991, who classified anterior neck contractures into mild, moderate, extensive, and severe depending on what fraction of the anterior part of the neck is involved in the contracting band.¹⁷ There are various options of reconstruction for post-burn neck contractures. But each option has its advantages and disadvantages. It includes plasties, STSG alone or with local flaps, regional flaps, and expanded local flaps. In our study, we only included release n z-plasties, STSG with or without local flaps, excision, and STSG. In our study, five patients (20%) had z-plasties. Comparing this to a study by Fehmina, 21.1% of pts underwent z-plasties. Z plasties has the advantage of using local pliable skin, good color and texture match, and is mainly for linear bands. Disadvantage is that it needs non-scarred skin to be available for transposition of flaps.⁴ Out of a total of 25 patients, 15 (60%) were treated with STSG+ z plasties. And 02 patients (12%) with STSG alone. According to KOBUS, 74 patients out of 147 were treated with STSG, and 182 operations included both local plasties and staged excisions.¹⁸ Similarly, in another study by Fehmina, 39.4% patients were treated with STSG.² Treatment outcomes were assessed based on the duration of stay in hospital. In our study, mostly patients stayed in less than 5 days in the hospital, and only four patients stayed more than 14 days in the hospital due to graft scar. In the 2013 India study, complication was seen in only 4 cases; as compared to our study, complication was seen in 14 cases.¹ Scar hypertrophy was the common complications seen in 4

patients. Range of motion or function good results were seen in 15 patients, fair in 6 n poor in 4 patients. Expanded neck skin has a better color match and pliability their disadvantage is donor site morbidity and availability of donor flap, options are free tissue transfer that brings a well vascularized tissue but it's a prolonged surgery with risk of failure.^{19,20} Other Need of long pedicle, donor site morbidity but usually kept as last option, which ever technique used the main outcome depends on post op splintage and physiotherapy early initial management had better post op outcomes and post op physiotherapy and splintage had a role in reducing recurrence.^{6,21,22} As essential as early intervention is in the treatment of burns, standard precautions among healthcare workers are also just as important. Just as prompt physiotherapy can prevent contractures, proper precautionary practice prevents healthcare-associated infections. Enhancing knowledge and compliance through ongoing training and audits will lead to improvements in patient outcomes and general safety.^{23,24}

LIMITATIONS

The strengths of this study include explicit inclusion and exclusion criteria, thus ensuring a homogeneous patient group and a well-defined study protocol for examination, treatment, and post-operative care. Moreover, the study had a long follow-up period that enabled the assessment of short- and long-term outcomes. However, it had some limitations, as the sample size was small with only 25 patients. Because this is a descriptive cross-sectional study, causal relationships could not be established. The lack of control and subjective nature of aesthetic and ROM evaluations may also introduce bias in this study. Lastly, it limits generalizability since this study was conducted only at a single center.

CONCLUSIONS

Post-burn neck contractures are a common complication of burns. They are managed primarily surgically by skin grafts, local flaps, and z-plasty. Local and loco-regional flaps give better results because of the use of similar skin quality and color and induce low risk of recurrences. Overall outcome of any procedure used for release depends on early and prolonged physiotherapy for better functional results. A follow-up program for a reasonable period is highly desired up to 18 months.

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AUTHORS CONTRIBUTION

Muhammad Mudassir Mahboob - Concept & Design; Data Acquisition; Drafting Manuscript; Critical Revision; Final Approval

Adeeba Ahmad - Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval

Muhammad Shadman - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Supervision; Final Approval

Fahimullah Khan - Concept & Design; Data Acquisition; Drafting Manuscript; Critical Revision; Final Approval

Shahzad - Concept & Design; Data Acquisition; Drafting Manuscript; Critical Revision; Final Approval

Adil Rehman - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Final Approval

The authors accept responsibility for all aspects of the work and will ensure that any concerns regarding the accuracy or integrity of any part are properly investigated and resolved.



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