(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 4, Issue 5, Page No: 74-76
September-October2021

IJMSCR

Neck Contractures: A System of Classification and Management

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Type of Publication: Original Research Paper
Conflicts of Interest: Nil

Abstract

Background: The aim of the study is to facilitate choosing the surgical technique that will be suitable for improving both function and aesthetics of each patient through this suggested algorithm system. Any post burn neck contracture usually causes severe impairment of function and aesthetics, which causes serious psychological and social problems. That's why it is very important to sub-categorize this type of deformity by anatomical location and cause of burn to allow choosing the ideal method of surgical management.

Methods: This study was carried out in the Plastic Surgery Department of GMC Srinagar between from January 2009 to December 2019.Study was done on 50 patients with PBC neck who were treated in our institute. **Results:** Patients with type A and type B contractures were treated by multiple Z-plasties. Patients with type C required release of contracture followed by grafting. Occasional Z-plasties were done to break contracture line. Patients with type D contractures, extensive release of the scar tissue until healthy underlying tissues was done. Release of the scar tissue was done usually supraplatysmal. Resurfacing of the resulting defect after release of the contracture was done using skin graft or flaps (Supraclavicular artery flap). Partial flap dehiscence was noted in only 4.5% of patients (five cases), which healed by daily dressing and did not need any further surgical interventions. Partial skin graft loss was a complication found in four cases (13.33%), two cases needed secondary skin graft, while the other two cases healed with only dressing. Recurrence of contracture was found in nine cases (6.43%), six cases had a skin graft for resurfacing, while only three cases had local flaps for the management of PBC.

Conclusions: Application of patients with post burn neck contractures to this classification system will make it easy to choose the ideal method of management and gain the best surgical results possible when performing surgical correction.

Keywords: Burn, Contractures, Neck, Flap.

INTRODUCTION

Cervical contractures are a major problem in burns involving chest, neck and face. The anterior neck skin is thin, and prone to develop contractures. The anterior neck is a very difficult area to reconstruct because the neck connects the head to the body with multidirectional and complex motility. Therefore, post-burn neck contractures represent a great challenge for plastic and reconstructive surgeons. Anterior cervical contractures are characterized by restrictions in range of neck motion, especially extension[1]. Physical and aesthetic abnormalities resulting from this type of distortion can cause extreme depression. Moreover, patients require reliable local, regional or free flaps to reconstruct both form and function[2]. Local flaps are often of inadequate size, while regional muscle flaps (e.g., pectoralis major, deltopectoral, trapezius, and latissimus flaps) are both bulky and often associated with significant

donor-site morbidity. Microsurgical free flaps (e.g., forearm, anterolateral thigh, parascapular, and abdominal flaps) are ideal but require technical expertise and increased operative time. This article will classify post-burn neck contracture (PBC)according to the degree of deformity and the type of the scar into 4 groups. By organizing our classification, an attempt can then be made to provide guidelines, or more specifically, a plan for reconstruction of PBC according to the available healthy tissues.

MATERIALS AND METHODS

This study was carried out in the Plastic Surgery Department of GMCSrinagar between from January 2009 to December 2019.Study was done on 50 patients with PBCneck who were treated in our institute. Patients between the ages of 10 to 60 years old, complaining of different degrees of post burn neck contracture was included in this study. Patients with ages below 10 years and above 60 years; patients with cervical spine spondylitis; patients with tracheal alteration interfering with general anesthesia; patients with cardiac, liver and kidney diseases; patients with uncontrolled diabetes mellitus; patients taking anti convulsing drugs; patients with high body mass index were excluded. Each of these patients was accurately evaluated taking full history to detect the presence of any chronic diseases as diabetes mellitus, hypertension or any neurological disorders requiring frequent treatment, vital signs assessment and full laboratory investigations to complete blood count, random blood sugar, kidney and liver enzymes and coagulation profile, inspection of the quality of the skin at the neck region and the surrounding areas (back , shoulders and the supraclavicular areas) and inspection of the range of motion to extension, lateral rotation of both sides and flexion; in order to evaluate the degree of sternomastoid muscles affection on each side of the neck. All relevant ethical aspects were considered in conducting the research. The participants were assured that their participation in the study is voluntary and that they can withdraw at any time; confidentiality and privacy of the participants were respected. Also, informed consents were taken from the patients declaring their will to participate in the study. For patients under the age of 18, informed consent was taken from their parents, but the data of the questionnaire was collected from the patient.

We clinically examined the degree of neckcontracture and accordingly devised a classification system for PBC neck into five types according to the severity of contracture and functional impairment.

Type A1- Unilateral incomplete contracture band

A2- Unilateral complete contracture band

Type B1- Bilateral incomplete contracture band

B2- Bilateral complete contracture band

Type C1- Diffuse contracture with areas of normal skin in between, but no chin deformity

C2- Diffuse contracture with areas of normal skin in between, but with mild chin deformity

Type D1- Severe contracture of neck with chin and lower lip deformity

D2- Severe contracture of neck with severe chin deformity (sterno-chin) and severe ectropion of lower lip, with exposed teeth

D3- In additions to D2, there are contracture bands pulling the alae of nose with tight facial skin (unilateral-D3a, bilateral-D3b)

Complete release or excision of the scar tissue was done depending on the thickness and the condition of the scar tissue. Different modalities of reconstruction were used for management of neck contracture such as skin graft, local fasciocutaneous flaps and distant flaps. Anticipating that we would encounter a wide range of the patients and intervention types, we planned to categorize the patients and procedures rather than to make comparisons based on individual patient characteristics. Different modalities of reconstruction were used for management of neck contracture such as skin graft, local fasciocutaneous flaps and distant flaps. Anticipating that we would encounter a wide range of the patients and intervention types, we planned to categorize the patients and procedures rather than to make comparisons based on individual patient characteristics. Post-operative splinting using neck collar was used for atleast 6 months to guard against recurrence of contracture. Post-operative follow-up was done for 1 month, 3 months and 6 months post-operatively by the surgeon

Volume 4, Issue 5; September-October 2021; Page No 74-76
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to assess the post-operative results and the complications and the recurrence of contracture.

RESULTS

By assessing the type of contracture, condition of local and adjacent tissues, a treatment plan was made for every patient. Patients with type A and type B contractures were treated by multiple Z-plasties. Patients with type C required release of contracture followed by grafting. Occasional Z-plasties were done to break contracture line. Patients with type D contractures, extensive release of the scar tissue until healthy underlying tissues was done. Release of the scar tissue was done usually supraplatysmal. Platysmal release was done in one case in which the muscle is included in the scar tissue. Resurfacing of the resulting defect after release of the contracture was done using skin graft or flaps (Supraclavicular artery flap). Partial flap dehiscence was noted in only 4.5% of patients (five cases), which healed by daily dressing and did not need any further surgical interventions. Partial skin graft loss was a complication found in four cases (13.33%), two cases needed secondary skin graft, while the other two cases healed with only dressing. Recurrence of contracture was found in nine cases (6.43%),six cases had a skin graft for resurfacing, while only three cases had local flaps for the management of PBC. We found that the recurrence was of milder degree than the previous contracture.

DISCUSSION

The head and neck area is the most important esthetic and functional region in burn patients. The natural neck position makes the head in the most optimal alignment for daily interactions. Unlike other joints, which are normally in maximal extension (e.g., the knee), the necks in a neutral contracted position during standing. Dueto the wrong position of the head on the neck during burn management and the pillow under the head not the shoulder, the chronic flexion contracture is often seen in deep extensive burns of the neck and this may beat tributed to the flexion position taken by the patient to minimize the tension on the neck and hence decreasing the pain sensation. [4]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. [5]Onah introduced a classification system for PBC included major numeric categories of 1-4, which encompassed position, severity and likely problems. Subgroups within each numeric category were used to designate the width of the contracture, which had implications for the options available for reconstruction.[6]Although there is some similarity of this classification with our work, it was somewhat complicated type of classification in comparison to the simplicity of ours. Tsai *et al*.[4]classified PBC by defining the zones of scar contractures in burn patients with anterior cervical contractures. This classification did not deal with the shape of the scar causing the contracture and the aim of this classification was to use it in microsurgical reconstruction.

According to our classification system, guidelines were framed for the management of PBC depending on the availability of healthy un-scared tissues. In linear contracture, usually there is available healthy tissue, especially in mild and moderate degrees, so local flaps such as Z-plasty,[7] or double-opposing Z-plasty (5-flap)[8] can be used to break and lengthen the linear scar. In severe and sometimes in moderate linear contracture, in spite of the available surrounding healthy tissues, tissues in X-axis more than what is available in Y-axis, hence skin graft or flap may be needed for resurfacing after release of the contracture. In band contracture, skin graft is usually needed for resurfacing after release of the contracture especially immoderate and severe degrees, while in mild degrees local flaps as Z-plasty, double-opposing Z-plasty (5-flap), or double-opposing 5-flap could be used. In broad contracture, skin graft is usually needed for resurfacing after release of the contracture with any degree. The presented classification system for PBC is simple and useful to describe the severity of the contracture and the type of the scar causing the contracture and also helps in choosing the reconstructive options.

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