

Management of Post Burn Contracture of Neck

M AFZAL J IQBAL M SAJID M R GULZAR M BASHIR

Department of Surgery, Punjab Medical College/Allied Hospital, Faisalabad

Correspondence to Dr. Muhammad Afzal, Senior Registrar Surgery drafzal@cityonline.net.pk

Study Design: It is a prospective analytical study. **Place and durations:** Subjects + methods: 43 patients admitted during JAN 2001 to DEC 2002 who presented with severe functional (25 patients) of cosmetic impairment (27 patients). We selected 4 different options to manage the patients. (1) Release of/or excision + thigh grafts (2) Release of/or excision + wolfm (3) Thick therish + local flap (4) Musculocutaneous flap. **Results:** Out of 43 patients 27 were females and 16 were male and the age varies from 4-45 years. Out of 28 patients \bar{e} (1) 25 given satisfactory and excellent results, and 5 out of Six patients \bar{e} (2) and 4 out of 5 with (3) gave excellent results. To evaluate the outcome of different options for the management of PBNC we are presenting our 2 years experience of PBNC Neck in 43 patients from January 2001 to December 2002 who were admitted through surgical outdoor of Teaching Hospitals of PMC, Faisalabad. In our set up most of the patients presented with severe functional (25 patients) and cosmetic impairments (27 patients out of 43) because of late presentation, delayed treatment, poverty and lack of proper medical facilities. We selected 4 different options to manage these patients accordingly i.e. (1) release or and excision of contracture and thick split skin graft, (2) release or and excision of contracture and full thickness skin graft, (3) thick split skin graft and local flap, (4) musculocutaneous flap, giving satisfactory to excellent results in 25 out of 28 patients, 5 out of 6 patients and 4 out of 5 patients respectively. Thick split skin grafting after release or/and excision of contracture with strict advice of wearing cervical neck collar remained our mainstay of treatment because it was one of the best practical options to deal with severe PBC Neck while other options being reserved for difficult and recurrent cases. **Conclusion:** Thick split skin grafting is an easy, cost effective, reliable and compliant to the patient. Furthermore thick split skin grafting is a simple procedure which may be carried out by any general surgeon with reserve for referred for the difficult cases.

Key words: Burn, contractures, neck, surgery, plastic, skin grafting, skin flaps.

Contracture neck is one of the social problems all over the world. In addition to disfigurement, it may lead to permanent changes in the musculoskeletal system and neurovascular bundles.

Severe Contracture of the neck limits the range of rotation and extension of head and can cause disorders of mastication. In younger age group, burns of head and neck can cause distortion in growth of facial skeleton. Maltreated or untreated patients of younger age may develop facial skeletal deformities due to Contracture formation. Therefore, it results not only in developmental deformities but also affects the function of eyes.

Healing of deep burn wounds of neck leads to hypertrophic scar formation which results in development of Contracture, the commonest long term complication of deep burns. The Contractures of the neck may lead to severe problems during endotracheal intubation in general anesthesia. The Contracture may also induce psychological disorders in patients with face and neck burns that need early treatment and psychotherapy that continues until the patient returns to the work. Long standing burn scars in head and neck region, may undergo neoplastic changes, therefore, early use of skin graft might decrease the development of the serious complications.

Neglected wound especially after deep burns can lead to severe Contracture which results in increased morbidity in appearance and function. In a developing country like Pakistan due to non-existence of purpose built burn units, complicated burns can not be dealt with properly, therefore, the general surgeon interested to treat these

patients must be knowing the basics of proper management.

The highly mobile anterior neck with its thin skin cover is liable to develop flexion contractures that can range from a minor contracted band to a severe mentosternal Contracture. Neck Contracture following burn injury is one of the challenging problems for the surgeon in obtaining good cosmetic and functional results. Therefore, many procedures have been adopted for the management of neck contractures which are meant to release Contracture, to restore contour and to prevent recurrence with special reference to age, sex and particularly the organ involvement in severe burns.

In this study we have compared four different options for treatment of PBC neck which are as follows:

1. Release or/and excision of Contracture and thick split skin graft.
2. Release or/and excision of Contracture and full thickness skin graft.
3. Thick split skin graft and local flap.
4. Musculocutaneous flap.

In No. 1 and 3 options we used thick split thickness skin graft to prevent the recurrence. In all these options we treated the patients of PBC neck by selecting specific procedure on certain criterias. And at the end of 2 years of our study done prospectively, we are auditing our experience that which one method would be suitable for our patients to have satisfactory functional and cosmetic results with decreased morbidity.

Subjects and methods:

In this study we included 43 patients, 27 females, 16 males with post burn neck Contracture who had been admitted through surgical outdoors of D.H.Q. and Allied Hospitals, Punjab Medical College, Faisalabad from January 2001 to December 2002. The range of age of the patients varied from four years to forty-five years and total duration of study was 2 years.

All these patients were registered for study, their detailed history and physical examinations was endorsed on study protocol Performa and were treated according to the protocol.

We selected 4 different options to manage the patients.

1. Release of contracture and split thickness skin graft.
2. Release of contracture and full thickness skin graft.
3. Split thickness skin graft and local flap.
4. Musculocutaneous flap.

Follow up: All these patients have been followed up after two weeks, three months and six months intervals; prolonged immobilization with cervical collar is advised in the follow up period. In this follow up period wound appearance, hypertrophic scar formation, neck movements, reappearance of the contracture and others are noted.

Methods: The patients were admitted in General Surgical Wards of D.H.Q. and Allied Hospitals, Punjab Medical College Faisalabad. The detailed history was taken and physical examination done. In the history, chief presenting complaints, mode of burn injury, duration of burn, primary management of burn (how, when and where) and any previous operation done (previous release of contracture and others). The physical examination is divided into two parts:

1. Local Examination
2. Systemic Review

In local examination extent of contracture (Severe, Moderate, Mild), functional disability, (Severe, Moderate, Mild) and cosmetic impairment (Severe, Moderate, Mild) noted. In systemic review, other head and neck examination, chest and abdominal examinations have been done to role out any associated disease for the fitness of anesthesia and operation.

Preoperative routine investigations; HB, TLC, DLC, Blood Sugar and Blood Urea were carried out mainly at Pathology Laboratories of D.H.Q. and Allied Hospitals, P.M.C. Faisalabad.

The patients have been selected for the following operative procedure accordingly:

1. Release or/and excision of contracture and thick split thickness skin graft.
2. Release or/and excision of contracture and full thickness skin graft.
3. Combination of thick split thickness and local flap.
4. Musculocutaneous flap.

Anaesthesia: In 36 patients, mainly GENERAL ANESTHESIA was used. In certain difficult cases i.e. in 7 cases severe neck contracture, extension of the neck was

not possible, a combination of anesthesia was used in which first of all ketamine was given then contracture was released by the surgeon to make the neck extension possible for endotracheal intubation by the anesthetist. Then again after aseptic measures and proper draping, surgery was carried out.

Perioperative antibiotic: Perioperative antibiotics (first generation cephalosporins) was given in all patients at induction of anaesthesia.

Position: Extended neck with supine position of the patient.

Operative procedure: After aseptic measures and proper draping of head and neck and donor areas was done. Marking of the incision with GENTION VIOLET was done accordingly. Release of contracture and excision of hypertrophic scar tissue was carried out. After release full extension of the neck was made possible and meticulous homeostasis was assured. The raw area was covered accordingly i.e. with graft or flap or combination of both graft and flap. In cases of thick split skin graft we have taken the graft mainly from thigh and less frequently from upper arm and flexure aspect of forearm. In cases of full thickness skin graft, the graft has been taken from upper arm, groin, thigh and rarely from abdomen. Deltopectoral flaps are included in the local flaps and latissimus dorsi flap was used as a myocutaneous flap.

In cases of skin grafting, first of all wet sterilized cotton pads soaked with normal saline were placed directly over the graft, dry sterilized dressing pads were placed over the wet pads then tie over bolus dressing was done in extension of the neck extension of neck was maintained in all stages of treatment with bulky dressing over anterior neck, small pillow or rolled cloth on the back of the patient between the two scapulae / shoulders.

On 7th day, the dressing was opened and stitches were removed at the same time. In uncomplicated cases we advised wearing of neck collar on 10th day in cases of thick split skin grafting. We have advocated strict advice of wearing the neck collar to the patient at the time of discharge from the ward, at all times except during bathing, eating and physiotherapy.

Results:

We studied 43 patients in DHQ and Allied Teaching Hospitals, Punjab Medical College Faisalabad from January 2001 to December 2002 (i.e. total period of study is two years). The age range varied from 4 years to 45 years and the maximum age group which was included in the study is from 21 to 30 years.

In sex distribution 16 (i.e. 37.20%) were males and 27 (i.e. 62.80%) were females.

Amongst the presenting complaints patients had mainly functional, cosmetic, mastication and eye problems. Out of the total 43 patients, 33 (76.74%) had limited neck movements, 10 (23.25%) were unable to move the neck in any direction i.e. either in vertical or

horizontal axis. all patients had cosmetic problems to some degree, 3 (6.97%) patients had difficulty in mastication and drooling of saliva, 2 (4.65%) patients had eye problems i.e. were unable to close the lower eyelids properly, in 10 (23.25%) patients there was hypertrophic scar information. (Table 3)

In plan of management, 4 different options have been applied for these 43 cases of PBC neck i.e. 1. Release and excision of contracture and thick split skin graft in 30 patients. 2. Release or/and excision of contracture and full thickness skin graft in 6 patients. 3. Thick split skin graft and local flap including deltopectoral skin flap in 6 patients. 4. Musculocutaneous flap in one patient. (Table 3)

In post operative complications in case of release and excision of contracture and thick split skin graft, out of the total 30 patients, 3(10%) patients developed seroma formation, 4 (10.33%) patients had haematoma formation, 2(20%) had infection of the recipient site, 7(23.33%) had loss / displacement of the graft, 10 (33.33%) had pain at the donor site, 6(20%) had itching at the donor site, 3 (10%) had infection at the donor site, 6 (20%) had fever, while 3 (10%) had chest infection in the post operative period. (Table 8)

In post operative complications in case of release or excision of contracture and full thickness skin graft, out of the total 6 patients, 1 (16.66%) patient had seroma formation, 2 (33.33%) patients had haematoma formation, 2 (33.33%) had infection of the recipient site, 2 (33.33%) had loss / displacement of the graft, 2 (33.33%) had pain at the donor site, 2 (33.33%) had itching at the donor site, 1 (16.66%) had fever in the post operative period. (Table 8)

In case of postoperative complications of thick split skin graft and local flaps, out of 6 patients, 1 (16.66%) had seroma formation, 1 (16.66%) patient had haematoma formation, 1 (16.66%) patient had loss / displacement of graft, 1 (16.66%) patient had marginal flap necrosis, 2 (33.33%) patients developed pain at the donor site and 1 (16.66%) patient developed itching at the donor site and 1 (16.66%) patient had fever in the post operative period.

The hospital stay varied in different options. In uncomplicated cases of thick split skin graft, it varied from 10 to 12 days while in complicated cases it varied from 22 to 34 days. In uncomplicated cases of full thickness, it varied from 9 to 14 days while in complicated cases 14 to 21 days. In uncomplicated cases of thick split skin graft and local flap, it varied from 8 to 12 days while in complicated cases 17 to 24 days. In case of musculocutaneous flap the hospital stay was 10 days. (Table 9)

All these patients were advised to come for the follow up at 2 weeks, 3 months and 6 months intervals, 3 patients ran away, out of these 3, 2 patients of thick split skin graft did not come after 2 weeks and one patient of thick split skin graft and local flap did not come after 3

months intervals. In the follow up periods we noted wound appearance (excellent, good, satisfactory, poor), neck movements (free, limited but satisfactory, limited but unsatisfactory), others (hypertrophic scar formation, hyperpigmentation and recurrence).

Table 1: Age distribution (n=43)

Range of age (Years)	=n	%age
1-10	4	09.30
11-20	8	16.60
21-30	14	32.55
31-40	11	25.58
41-50	6	13.95
51-60	0	00.00

Table 3: Sex distribution (n=43)

Sex	=n	%age
Male	16	37.20%
Female	27	62.80%

Table 3: Presenting complaints

Presenting complaints	=n	%age
Limited neck movements	33	76.74
Inability to move the neck in any direction	10	33.25
Cosmetic impairment	43	100.00
Drooling of saliva	3	6.97
Unable to close the lower eyes	2	4.65
Hypertrophic scar formation	20	46.51

Table 4: Previous history of operation

Type of operation	=n	Surgeon
Simple debridements	5	General Practitioner
Release and split thickness skin graft	3	General Surgeon
Release and split thickness skin graft	2	Plastic Surgeon

Table 5: Preoperative assessment of the postburn neck contracture

Local examination	=n	%age
Extent of contracture		
Severe	25	58.13
Moderate	12	27.90
Mild	6	13.95
Functional disability		
Severe	25	58.13
Moderate	12	27.90
Mild	6	13.95
Cosmetic impairment		
Severe	27	62.79
Moderate	8	18.60
Mild	8	18.60

Table 6: Plan of management

Option	=n	%age
Release or/and excision of contracture and thick split skin graft	30	69.76
Release or/and excision of contracture and full thickness skin graft	6	13.95
Thick split skin graft and local flap	6	13.95
Musculocutaneous flap	1	2.32

Table 7: Release or/and excision of scar tissue

Release or/and excision of scar	=n	%age
Simple release of contracture	33	76.77
Release and excision of scar tissue	10	23.25

Management of Post Burn Contracture of Neck

Table 8: Postoperative complication

Complications	Thick Split Skin Grafting		Full Thickness Skin Grafting		Thick Split Skin Graft & Local Flap	
	=n	%age	=n	%age	=n	%age
Seroma Formation	3	6.97	1	2.32	1	2.32
Hematoma Formation	4	9.30	2	4.65	1	2.32
Infection	6	13.95	1	2.32	Nil	Nil
Loss Of Graft/ Displacement Of Graft	7	16.27	2	4.65	1	2.32
Donor Site Complications						
◇ Pain	10	23.25	2	4.65	2	4.65
◇ Itching	6	13.95	2	4.65	1	2.32
◇ Infection	3	6.97	Nil	Nil	Nil	Nil
Systematic Complications						
Fever	6	13.95%	2	4.65	1	2.32
Chest Infection	3	6.97%	Nil	Nil	Nil	Nil
Flap Necrosis *						
◇ Marginal	Not Applicable				1	2.32
◇ Partial					Nil	Nil
◇ Total					Nil	Nil

* Flap Necrosis means Flap Ischemia.

Table 9: Hospital stay in uncomplicated and complicated cases

Option	Hospital stay in uncomplicated cases	Hospital stay in complicated cases
Release or/and excision of conacture and thick split skin graft	10-12 day	22-34 days
Release or/and excision of contracture and full thickness skin graft	9-14 day	14-21 days
Thick split skin graft and local flap	8-12 days	17-24 days
Musculocutaneous flap	10 days	NIL

Table 10: Follow up:

Criteria of follow up	Thick split skin Graft			Full Thickness skin Graft			Split Thickness Skin Graft And Local Flap			Musculocutaneous Flap		
	02 Weeks	03 months	06 months	02 weeks	03 months	06 months	02 weeks	03 months	06 months	02 weeks	03 months	06 months
Wound appearance												
Excellent	10	10	9	1	1	2	3	3	2	Nil	Nil	Nil
Good	12	12	12	3	3	2	2	2	2	Nil	Nil	Nil
Satisfactory	5	2	2	2	1	1	1	1	1	1	1	1
Poor	3	4	5	-	1	1	Nil	Nil	Nil	Nil	Nil	Nil
NECK												
Free	21	19	22	2	3	3	3	3	3	1	1	1
Limited but Satisfactory	5	5	3	3	2	2	3	3	2	Nil	Nil	Nil
Limited but unsatisfactory	4	4	3	1	1	1	Nil	Nil	1	Nil	Nil	Nil
OTHERS												
Hypertrophic scar	Nil	2	3	Nil	Nil	Nil	Nil	1	1	Nil	Nil	Nil
Hyper pigmentation	Nil	5	2	Nil	Nil	1	Nil	Nil	Nil	Nil	Nil	Nil
Recurrence	4	3	3	1	1	1	Nil	1	1	Nil	Nil	Nil

Table 11: Final outcome

Option	Results	=n	%age
Release or/and excision of contracture and thick split skin graft	<input type="checkbox"/> Excellent	8	28.57
	<input type="checkbox"/> Good	12	42.85
	<input type="checkbox"/> Satisfactory	5	17.85
	<input type="checkbox"/> Poor	3	10.71
Release or/and excision of contracture and full thickness skin graft	<input type="checkbox"/> Excellent	2	33.33
	<input type="checkbox"/> Good	2	33.33
	<input type="checkbox"/> Satisfactory	1	16.66
Thick split skin graft and local flap	<input type="checkbox"/> Poor	1	16.66
	<input type="checkbox"/> Excellent	2	33.33
	<input type="checkbox"/> Good	1	16.66
	<input type="checkbox"/> Satisfactory	1	16.66
Musculocutaneous flap	<input type="checkbox"/> Poor	1	16.66
	<input type="checkbox"/> Excellent	Nil	Nil
	<input type="checkbox"/> Good	1	100%
	<input type="checkbox"/> Satisfactory	Nil	Nil
	<input type="checkbox"/> Poor	Nil	Nil



Fig. 11: Pre & Post operative photographs of a Child with PBC Neck (Different views)



Fig. 12: Preoperative photograph of a patient with PBC Neck (front view) with Hypertrophic scar and keloid formation



Fig. 16: Post operative photograph of a child with PBC Neck after thick split skin grafting with Necrosis on the edges of the graft

Discussion:

Post burn neck contracture is one of the complications which occur usually after thermal burns. When the scarring is located anteriorly, there is frequently severe contracture formation with a resultant flexion of the neck, while scarring of neck posteriorly is quite uncommon. Contracture of the neck is an extremely disabling condition resulting in flexion deformity of the neck. In our set up, poverty, ignorance, non availability of health personnel nearby lead to complicated wounds resulting in tremendous morbidity as regards function and appearance. Most of the patients in our study were young females. Most of them has had bad contractures with marked cosmetic impairment and limitation of neck movements. One major cause of this advanced deformity is lack of or inadequate treatment of the initial burn.

The anesthesia for PBC Neck in severe cases is very difficult and in our set up severe contracture can be released after giving local anesthesia or ketamine followed by endotracheal intubation for maintenance of general anesthesia.¹ In modern centers, laryngeal mask airway² and fiber optic laryngoscope can be used for the anesthesia.

Progress in reconstructive surgery for PBC Neck has been related to increased use of skin grafts. Padgett and Stephenson and May favoured the use of thicker skin grafts over the thin variety. Cronin advocated the necessity of excision of scar tissue at least down to the plane of subcutaneous fat. Once the deformity develops despite our best efforts, then the patient becomes a candidate for surgical treatment. In fresh cases free grafts are preferable over flaps and the flaps should be reserved for later cosmetic revision.³

In the world literature a study has been conducted which has favoured the use of thick split skin graft along with other modalities like Z plasty in selective cases and in this study recurrence was noted in 19% cases, hyper pigmentation noted in 80% cases and wrinkles noted in 23% without any contracture.⁴

In another study it has been suggested that split thickness skin graft has a good take, provide good contour but requires long term regular physiotherapy, massage and splintage with cervical collar while in full thickness skin graft there is good contour, good colour match and texture but there is always a threat of haematoma formation⁵. In another study in children split thickness skin graft and full thickness skin graft have been advocated in 12 and 8 patients respectively along with other modalities in other patients. In these patients polyvinyl chloride neck extension brace has been advised to wear one to two weeks after surgery at all time except when eating and bathing for a minimum of 1 year following surgery. In 9 of these patients it was determined that they did not wear their braces following discharge from the hospital. 8 of these patients subsequently developed a recurrence of there contracture (89%). 12 patients were found to have been compliant in wearing their braces after surgery and only 2

of these patients (17%) developed a recurrence of the neck contracture. One of the 8 patients suffered necrosis of the full thickness skin graft and underwent a split skin grafting to cover the resulting defect who eventually developed the recurrence of the contracture. 12 split thickness skin grafts were used to cover the release site in this group of patients. None of them had any significant graft loss; however six did develop a contracture recurrence. There was a contracture recurrence rate of 62% in those patients treated with split thickness skin grafts; this was not affected by meshing or increasing the thickness of the graft but not to the extent of the full thickness skin graft. Although full thickness graft is associated with less recurrence but it increases the morbidity of the patients as it needs split thickness skin graft to cover raw area of the donor site. Therefore, it should be reserved for those patients who refuse to wear neck brace. If the patient complies with the strict advice to wear the neck brace regularly the recurrence rate will fall from 89 to 17%⁶. S. Nath and others have conducted a study on the management of PBC Neck on 37 patients with age range from 5 to 43 years, 24 were females. Release of contracture and excision of scar tissue followed by skin grafting was the mainstay of treatment. In most patients a medium to thick split graft was used. On 5th day dressing was opened and first soft cervical collar was advised a few days later and then after physiotherapy a hard cervical collar was advised. In patients who underwent skin grafting alone, very good to satisfactory results were achieved in 80% of the patients. Skin graft take was 70 to 100 percent and hospital stay varied from 1 to 3 weeks, the length of follow up was 3 months to 3 years. During the follow up period shrinkage of the grafted skin was noted in 6 patients, who were readmitted for 2 to 3 days for minor corrective operations.

By observing all these above-mentioned results in the world literature our results are also comparable to them with certain differences. Neck collar not only prevents the recurrence of the contracture but also provides a safe measure towards the prevention of hypertrophic scar formation.⁸

In case of local flaps different studies have been conducted to repair the soft tissue defect after release of contracture and scar excision. It was suggested that local flaps like pedicled deltothoracic skin flaps, cervico-thoracic skin flaps, cervico-shoulder flaps and pedicled vascularized extra long deltothoracic skin flaps were used to treat cicatricial deformity of the neck with good results⁹. In another study clinical importance of the bilateral cervico-thoracic skin flap has been proposed according to the site of involvement and specific size along with skin grafting to the donor area¹⁰. It has been found that supraclavicular artery island flap with specific geometry is a reliable and safe method to treat contractures along with secondary healing in one out of eight patients¹¹.

In a study conducted in department of plastic surgery, Mayo Hospital Lahore, reconstruction with local flap was done in four out of seventy five patients with post burn neck contractures and in two cases local flap was applied after tissue expansion. Though the expansion is a useful reconstructive option to increase the amount of adjacent tissue but it is not a single stage procedure. It is costly, rare and has limitations like embarrassing the patient's social life along with more recurrence rate.

In musculocutaneous flaps, latissimus dorsi, pectoralis major and trapezius were used in the history. In a study conducted in plastic surgery at Jinnah Postgraduate Medical Center, Karachi cervico-thoracic flap has been raised including skin subcutaneous tissue, fascia and a portion of trapezius muscle in the upper part of the flap and the base at the level of vertebra prominens. The flap gives more mobility to be required and the donor area can be closed after undermining the skin at the same time. This flap has given the excellent result especially in recurrent cases¹³. In our study latissimus dorsi flap has been used. This flap has more advantages over pectoralis major flap as far as versatility, vascularity and quality of the secondary defect, mobility and to reach the defects high in the head and neck area, are concerned. Furthermore, it comes from an area normally hairless in the male and aesthetically more acceptable in females¹⁴. Myocutaneous flap gives a bulky appearance to the neck, which is not aesthetically acceptable to the patients.

Local flaps have their own limitations e.g. limited size of the flap, fixed geometry, increase donor site morbidity and require more expertise. As far as musculocutaneous flap are concerned, they have limitations like fixed geometry increase donor site morbidity (especially pectoralis major myocutaneous flap leaves behind ugly appearance to the donor area with more blood loss) and requires qualified reconstructive surgeon.

In our set up poor patients with inadequate primary management of wounds present with severe neck contracture and a little normal skin is available around the neck along with its vicinity areas, therefore, it has been concluded that release or/and excision of the contracture with thick split skin graft is one of the best practical options to treat PBC Neck keeping other modalities as in reserve to deal with difficult and recurrent cases. Comparing the functional and aesthetic results of different options of management in terms of cosmesis, neck mobility, skin elasticity, skin sensitivity, colour matching and scar recurrence, thick split skin grafting seems to be the most satisfactory option in severe contracture of the neck burns. The option of thick split skin grafting comes in domain of many practicing general surgeons and before the basic training of plastic surgery should be included in the training of general surgeons while on the other hand the difficult selective cases should be referred to plastic surgery.

Conclusion:

In this study of 2 years, most of the patients have presented with severe neck contractures as far as the cosmetic and the functional problems are concerned due to delayed treatment, ignorance and poverty. Out of 4 different options which we have applied, thick split skin grafting remains the mainstay of treatment in majority of cases. Analyzing the final results in terms of morbidity, neck mobility, colour matching, scar recurrence, simplicity, economy and reliability, thick split skin grafting seems to be one of the best practical modalities of treatment.

Skin grafting is within the competency of most of the general surgeons because burn contractures are common in the developing world like Pakistan, therefore plastic surgery training should be included in general surgery and the more complicated cases should be referred to plastic surgeons.

References:

1. Jandova-J; Konigova-R; Kapounkova-Z; Broz-I combined technique of anesthesia in early and late neck reconstruction. *Acta-Chir-Plast.* 1997; 39(2): 56-9
2. Lee-CM; Yang-HS. Case of difficult intubation overcome by the laryngeal mask airway. *J-Korean-Med-Sci.* 1993 Aug; 8(4): 290-2
3. Remensnyder J.P. Burn Contractures of the Neck : Natural History and Surgical Treatment. Department of Surgery, Massachusetts General Hospital, Boston, Massachusetts and the Department of Plastic Surgery, Shriners Burns Institute, Boston, Massachusetts, 1973
4. Moustafa M F, Borhan A A. Burn contractures of the neck. *Plastic & Reconstructive Surgery*, 1978
5. Konigova R; Tvrdok M. Consideration on classic methods and free flaps in face and neck reconstruction. *Acta Chir Plast*, 38(1): 14-20 1996
6. Waymack J.P. Release of burn scar contractures of the neck in paediatric patients. *Burns* (1986) 12, 422-426
7. Nath S. Erzingastian K, Simonde S. Management of post burn contracture of the neck. *Burn* (1994) 20(5): 438-441
8. Basse. P, Alsbj. B and Lohmann. M. The Neck Collar – A Treatment Of Hypertrophic Burn Scars of the Neck Region. *Acta Chirurgiae Plasticae* 34, 3, 1992
9. Wang X; Lang KJ; Wang Y. Treatment of cicatricial deformity of neck with local skin flap. *Chung Kuo Hsiu Fu Chung Chien Wai Ko Tsa Chih*, 11(4):213-5 1997 Jul.
10. Zhu-S; Liu ZM; Qiu C. Clinical use of bilateral cervicothoracic skin flaps. *Chung Kuo Hsiu Fu Chung Chien Wai Ko Tsa Chih*, 11(2): 86-8 1997 Mar
11. Pallua N; Machens HG; Rennekampff O; Becker M; Berger A. The fasciocutaneous supraclavicular artery island flap for releasing postburn mentosternal contractures. *Plast Reconstr Surg*, 99(7):1878-84; Discussion 1885-6 1997 Jun
12. Babar A. H., Cheema S.A. and Ikram M.S. Postburn Mentosternal Contractures – Split Skin Graft Remains The Most Workable Option. *Annals of K.E.M.C. Lhr.* 5, (Issue 2), April – June, 1999.
13. Hussain A.A. Siddique. H. U. and Ibran. E.A. Modified Cervicodorsal Flap: A New Approach To Post-Burn Contracture of Neck. *Pakistan Journal of Surgery*, Oct-Dec. 1997, Vol. 13, No.4
14. Loenard A.G. Musculocutaneous flap in head and neck reconstruction. *Annals of the Royal College of Surgeons of England* (1989) vol. 71.