



POST BURN CONTRACTURE NECK : METHODS GIVING BEST FUNCTIONAL AND AESTHETIC RESULTS

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ABSTRACT

Introduction: Post burn contractures are one of the most troublesome sequels of burn injuries. Severe contracture of neck not only limits neck movements, it affects functions of muscles of face as well. In this study we aimed to evaluate the functional and aesthetic outcomes after release of post burn neck contracture and resurfacing using skin grafts and local flaps. **Material methods:** This was a non-randomized prospective study conducted on 34 patients operated in 2 years

from January 2011 to December 2012. Onah's classification was used to classify contractures. **Results:** In the 5 patients of type improvement ranged from 12° to 15° (mean 12.8°) and the aesthetic outcome was excellent in terms of surgeon's assessment. The angle of extension in type 2 patients (n=19) ranged from 109° to 118° (mean 114.2°) with improvement of extension averaging 22.4°. In ten patients with type 3 contracture, post-operative angle of extension at 6 months follow up ranged from 105° to 116° (mean 110.9°) with an average improvement of 37.3°. **Conclusion:** Although flaps are considered better than skin grafts in neck reconstruction, we consider that skin grafting is still the most suitable technique if the patient shows good compliance.

KEYWORDS : Post burn contracture , skin grafting, flaps

INTRODUCTION :

Despite increased sophistication in the overall management of acute thermal injuries , post-burn contractures occur frequently and remain one of the most problematic late sequels of burn injury. Neck contractures are often seen in Indian situation following poorly managed burn injuries especially when the burn wound around neck is managed conservatively and allowed to heal by secondary intention.

Severe contracture of the neck limits neck movements especially extension. Activities of daily life are affected due to secondary effects of neck contracture like lower lip ectropion , inability to close the mouth, drooling and difficulty in deglutition. Moreover, if there is a need of intubation as a life saving procedure or before any elective surgery, neck contracture can cause a lot of difficulties. Physical and aesthetic deformities resulting from this type of disfigurement in exposed areas, such as the face and the neck can cause significant psychosocial problems.¹ Management of post burn neck contractures is a major challenge to the reconstructive surgeon. The aim was to remove the entire scar and resurface the area with supple tissue, which allows functional and aesthetic rehabilitation. This study was done to evaluate the functional and aesthetic outcomes after release of post burn neck contracture and resurfacing using skin grafts and local flaps.

Materials and methods

A non-randomized prospective study was conducted on 34 patients operated in 2 years from January 2011 to December 2012. Non-burn patients, patients lost to follow up and those having cervical spine pathology were excluded from study. We took 29 female and 5 male patients. We have used Onah's classification² :

Type 1 (mild anterior): Patient can flex the neck to normal anatomical position of neck but cannot place an object on the ceiling in the centre of visual field. (Fig 1) 1a: less than 2 fingers breadth + sufficient adjacent supple skin

- 1b: more than 2 finger breadth but still having sufficient adjacent supple skin
- 1c: broad band or multiple bands with insufficient supple skin adjacent to contracture

Type 2 (moderate anterior): Patient can flex neck to normal anatomical position but attempts to extend the neck from normal position causes significant deformity of uninvolved lower lip. Subdivided into a, b & c same as above. (Fig 2 & 3)

Type 3 (severe anterior): Neck is contracted in the flexed position. The patient is unable to reach anatomical position of the neck and jaws. In an attempt, the superior limbus is covered & the inferior limbus of the unaffected eye is clearly seen. The attempt also usually pulls on the (uninvolved) lower lip. Sometimes referred as mentosternal synechia. Subdivided into a, b & c same as above. (fig. 4)

Type 4 (posterior): The contracting band at the back of the neck prevents full neck flexion and may hold the neck in some degree of extension. Subdivided into a, b & c same as above.

GRADES OF NECK EXTENSION:

For assessment of functional improvement after surgery, we also measured the cervico-mental angle with the help of goniometer in maximum possible extension of neck (fig 5) and graded anterior neck contractures as follows:

- Normal (N): extension greater than 110°
- E1: extension beyond the horizontal plane, parallel to the ground (95 – 110°)
- E2: extension and vision limited to the horizontal plane only (85–95°)
- E3: mentosternal synechia (<85°) where patients only have a visual range below the horizontal plane

Operative technique

All patients were operated under GA after taking informed consent. Difficult intubation was anticipated in patients having contractures higher than type 2C and in 12 cases they were released partially under local anaesthesia to facilitate intubation. Wherever the contracture was flat, it was released up to the subcutaneous tissue and platysma muscle with fish tailing at the apices to gain full or maximum possible extension of neck pre-operatively (fig 6). In case with hypertrophic scar, excision was done with release of contracture. The created defect was assessed and reconstructive options tailored accordingly. Neck contractures with narrow band in type 1 were treated with Z-plasty . Z-plasty was supplemented with skin grafts if band was broad in type 1 contractures. In type 2A and 2B various local flaps i.e. supraclavicular artery flap (fig 7, 8), trapezius flap (fig 9), and delayed cervico-humeral flap were used. The flaps were supplemented by skin grafts when required. Types 2C, 3A, 3B and 3C were reconstructed with skin grafts only because of large size of defect. The skin grafts were fixed with bolster dressings. No neck splints were given pre-operatively. Expanded skin flaps and free flaps were not used. In post operative period dressings of skin grafts were removed on the 5th post-operative day. Thereafter, cervical moulded collar was given (fig 10). Once the grafts healed completely, chinstraps and daily care of skin graft with moisturizers were advised for 4-6 months. Patients were also told about daily exercises and to sleep without pillows for 4-6 months. Patients with flap reconstruction were advised only neck extension exercises. Follow up was at 1 month, 3 months and 6 months. On follow up visits the cervico-mental angle was measured. The surgeon judged the final outcome as excellent, good, fair and poor, by noting the appearance, colour, texture and 5 criteria of youthful neck.³ These total 7 criteria were given 2 points each and aesthetic results were judged as excellent: 11 to 14 points; good: 8 to 10; fair: 5 to 7; poor: ≤ 4.

RESULTS :

In this study, out of 34 patients, 5 were type 1 (2 type 1a and 3 type 1b). All type 1a patients were reconstructed by Z-plasty . Type 1b patients were treated by Z-plasty with skin grafts. In this group of patients, the maximum neck extension measured pre-operatively ranged from 88° to 105° (mean 97°). On follow up at 6 months the angle of extension ranged from 117° to 110° (mean 113°). Thus improvement ranged from 12° to 15° (mean 12.8°). In all the 5 patients

aesthetic outcome was excellent in terms of surgeon's assessment using 7 criteria mentioned earlier. Nineteen patients belonged to the group of type 2 contractures. Out of these, 2 patients had type 2a contracture, which were reconstructed with supraclavicular artery flap. Type 2b contracture was present in 8 patients. Out of them, 2 were reconstructed with trapezius flap, 1 with delayed cervico-humeral flap, 1 with supraclavicular flap and skin grafting and 4 were resurfaced with skin grafts only. One of the trapezius flaps was lost to necrosis so it had to be resurfaced with skin graft later on. In skin grafting, no meshing was done in any type 2b patient. Nine patients were of type 2c contracture and all were resurfaced with moderately thick skin grafts. Meshed skin graft was used in 2 of these patients because of scarcity of skin graft donor site. The angle of extension in type 2 patients ranged from 85° to 98° (mean 91.2°). At 6 months follow up, it ranged from 109° to 118° (mean 114.2°) with improvement of extension averaging 22.4°. Functionally, skin grafts (mean improvement of angle of extension 22.4°) and flaps (mean improvement of angle of extension 22.8°) did not differ much. The flaps had poorer aesthetic results mainly due to the bulge they produced while skin grafts had average score due to poor colour and texture. Ten patients had type 3 contracture. All of these patients were resurfaced with moderately thick skin grafts only. 4 patients had meshed graft due to scarcity of donor site. The preoperative angle of extension ranged from 65° to 80° (mean 73.6). The post-operative angle of extension at 6 months follow up ranged from 105° to 116° (mean 110.9°) with an average improvement of 37.3°. Shows angles of extension in different types of contractures. The unmeshed grafts looked aesthetically good (fig 11) while the meshed grafts yielded poorer aesthetic results (fig 12).

DISCUSSION:

Post burn neck contracture has been a difficult area of burn reconstruction. It is both functionally and aesthetically important area of body and is thus given precedence over other parts of body in the reconstruction algorithm. Although good primary management of neck burns can decrease the severity of neck contracture, post burn neck contractures still do occur due to the character of neck skin and complexity of neck anatomy. Moreover, in a country like India, where good primary burn care centres are lacking, especially for low socioeconomic status people, severe neck contracture patients are found in abundance. The first and foremost important aspect of post burn neck contracture reconstruction is adequate contracture release. For this purpose, release of platysma and its attachment to underlying muscles is a must. Many authors have classified post burn neck contracture⁴⁴. Onah classified post burn neck contracture into type 1 to 4 as discussed above, and this classification is the most simplified and practical one². For good functional results complete release of contracture is necessary but for good aesthetic results the contour of neck is important, which is judged by the maintenance of cervico-mental angle. In addition to a cervicomenal angle of 95°-105° other criteria of youthful neck have been described in literature, like distinct mandibular border, visible thyroid cartilage bulge, visible subhyoid depression, and visible anterior border of sternocleidomastoid, which should ideally be restored for best aesthetic results⁵. During reconstruction, upper submental and lower neck region should be addressed separately so that the junction acts as the cervico-mental angle. To attain this, either two separate sheets of skin grafts can be applied horizontally or flap in one region while skin graft for other region can be done. We have used several pedicled flaps in our study, viz. supraclavicular artery flap⁷⁹, trapezius flap¹⁰⁰ and delayed cervico-humeral flap¹¹. The flaps are primarily advantageous because of better patient compliance. There is no need of long-term splints. Whether we use free or pedicled flap to drape the whole neck defect after release of contracture, the problem that inevitably arises is that all the neck contour-defining structures become ill defined. Moreover, free distant flaps produce colour and texture mismatch. Besides having poor appearance, bulky flaps prevent neck flexion. In cases of flap reconstruction, multiple stages are required for thinning the bulky flap. In our study we have not used free flaps but we have used several pedicled flaps. The above-mentioned problems are present with all of these flaps. Out of the flaps we used, supraclavicular artery flap had the least of these problems but this flap is possible only when the surrounding supple neck skin is available. Flaps were not attempted in type 3 contractures because of lack of donor sites sufficient enough to cover the large defects created after release of contracture. Thus, these flaps were possible only in type 2 contractures. Due to these disadvantages, we preferred skin grafting. The advantages of skin grafts are that it is simple to perform, can cover large defects, can achieve most of the youthful neck criteria and require only single procedure. The elevated borders of the scar at the border of skin graft usually settle to great extent with the use of pressure garment. The primary problems that occur with skin grafting are greater chances of re-contracture and poor patient compliance. Both these problems are interdependent, the more compliant the patient, less are the chances of re-contracture. Patients have to do regular neck extension exercises, wear moulded cervical collar and chin strap pressure garment for 6 months. In our study 23 patients underwent resurfacing with skin grafts only. Three patients had skin grafts along with local flaps. 10 out of these patients had re-contracture. Out of these, 6 patients had meshed grafts, 2 had partial graft loss and 2 were non-compliant. Even with re-contracture, at least, the severity of contracture decreased.

CONCLUSION:

The limitations of this study are relatively small sample size, lack of long term follow up more than 6 months, and no use of free flaps. From this study, we get an impression that although flaps are usually considered to be better than skin grafts in neck reconstruction by other authors, we consider that the time-tested technique of skin grafting is still the most suitable technique, provided that the patient shows good compliance.

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Legends of figures



Fig 1: type 1b contracture



Fig 2: type 2b contracture



Fig 3: type 2b contracture



Fig 4: type 3c contracture



Fig 5: measuring cervicomenital angle with a goniometer



Fig 6: fishtail marking for release of neck contracture



Fig 7: marking of supraclavicular artery flap



Fig 8: result of supraclavicular artery flap



Fig 9: follow up of trapezius flap with bulky appearance



Fig 10: moulded cervical collar after skin grafting



Fig 11: results of unmeshed skin grafts in a compliant patient



Fig 12: poor aesthetic appearance of meshed skin grafts

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