

# SURGICAL MANAGEMENT OF POST-BURN ANTERIOR NECK CONTRACTURES

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## SUMMARY

Burn scar contracture of the anterior neck represents a continuing problem for plastic surgeons. For many years, treatment of neck contractures has been troublesome to both patients and surgeons. A review of 17 neck release procedures performed between 1990-1993 in the Burn Center at Gülhane Military Academy is presented. The authors discussed their various approaches to correct postburn contractures of the neck. Free flaps, expanded free flap, Z plasties and, split and full thickness skin grafting procedures were used for reconstruction purposes.

**Key Words :** Burn contracture, neck, free flap transfer, radial forearm flap

## ÖZET

Boyun ön yüzde yerleşimli yanık kontraktürleri, plastik cerrahlar için önemli bir sorun olmaya devam etmektedir. Yıllardır boyun kontraktürlerinin tedavisi hem cerrahi hem de hastayı sıkıntıya sokmaktadır. 1990-1993 yılları arasında GATA Yanık Merkezi'nde 17 hastaya boyun kontraktürü nedeniyle kontraktür serbestleştirilmesi girişimi yapıldı. Rekonstrüksiyon amacıyla serbest doku ve ekspande edilmiş serbest doku aktarımları, Z-plastiler, tam ve parsiyel kalınlıkta deri greftleri kullanıldı. Bu yazıda boyun yanık kontraktürlerinin rekonstrüksiyonu için değişik yaklaşımlar ve sonuçları tartışılmaktadır.

**Anahtar Kelimeler :** Yanık kontraktürü, boyun, serbest doku aktarımı, önkol flebi.

## INTRODUCTION

With the advent of improved surgical techniques, parenteral antibiotics and better nutritional and ventilatory support a greater number of burn injury patients are now surviving their injury<sup>1</sup>. But these patients present new and greater challenges in burn scar reconstructive procedures, one of the most important, being anterior neck contracture. Scar contracture of the neck depends on the laxity of neck tissue and contractile properties of the platysma<sup>2</sup>; even relatively minor injuries, particularly chemical and electrical in origin, can produce significant functional and aesthetic deformities. Although patients seldom lose their lives from neck contractures, the physical and mental stresses they constantly suffer from are enormous. The most common associated complications are difficulties with eating, drooling and chronic follicular

infection in men<sup>2</sup>. Mandibular underdevelopment and resultant deformity in neglected children are distressing consequences of these injuries. So the timing of release of burn scar contractures of the anterior neck is especially important in children. Early correction of all scar contractures of the neck in patients whom bone growth is still active is essential<sup>3</sup>.

When the contracture is limited to small areas, Z-plasties and/or local skin flaps offer solutions with virtually no remaining problems. When the contracture is extensive, on the other hand, conventional methods such as skin grating or pedicled skin flap transfer have not always yielded good results and required secondary procedures<sup>4</sup>.

The treatment of burn scar deformities of anterior neck region varies according to their magnitude. In general, burn deformities of

anterior neck can be divided into three groups - An isolated linear scar contracture (Group I), linear scar contracture with scarring of the adjoining skin that is limited to a portion of the neck (Group II), and complete scar contracture with almost total loss of anterior neck skin (Group III)<sup>3</sup>.

**MATERIALS AND METHODS**

Seventeen patients underwent operative procedures for releasing of burn scar contractures of the anterior neck in the Burn Center at Gülhane Military Medical Academy between 1990 and 1993 years. All patients were male and their ages ranged from 20 to 25 (mean 22.1) years. Three patients were skin grafted previously, but anterior neck contracture was still present in all because of incomplete release or recurrence of the contracture. All patients complained of limitation in the neck movements in daily life, in addition, most of them complained of their appearances.

Patients were categorized according to Edlich et al. classification<sup>3</sup>. There were seven patients in Group I, two patients in Group II and eight patients in group III. The patients in Group I underwent Z-plasty procedures because linear contractures could easily be released by Z-plasty. Group II patients underwent multiple Z-plasties and split thickness skin grafting procedures. But in Group III, all patients necessitated resurfacing of the whole anterior neck since the skin defects left behind after contracture release were too large. Therefore four of the eight patients in this group underwent free flap procedure; radial forearm flaps were used in all four patients (Table I). In one patient radial forearm flap was expanded prior to flap transfer since the resultant defect was too large to be covered by forearm skin (Fig 1-a,b). All radial forearm flap donor sites necessitated skin grafting, but skin graft needed or expanded radial forearm flap donor site was considerably smaller. No splints were used postoperatively and none of the patients underwent defatting procedure. The other four patients underwent full thickness skin grafting procedure. Full thickness skin graft was harvested from anterior abdominal wall by the aid of Humby knife and donor site was grafted

with split thickness skin graft harvested from lateral thigh. Both donor sites healed uneventfully. Polyurethane foam dressing beneath pressure collar was applied to achieve pressure over the graft. In order to minimize the laryngeal movements that accompany swallowing, patients received nasogastric feeding for one week. A neck extension appliance or graft pressure collar was worn by the patient for two months continuously, after which no further immobilization was need.

**Table I:** Distribution of the patients according to the types of management.

Groups	Types of Management	No. of Patient
Group I	Z-Plasty	7
Group II	STSG	2
Group III	FTSG	4
	RFF	4
Total		17



**Fig 1a:** Preoperative anterior view of the same patient with expanded radial forearm is seen. **b:** Appearance of the patient at 6 months follow up. Expanded radial forearm flap facilitated the closure by use of a smaller graft.

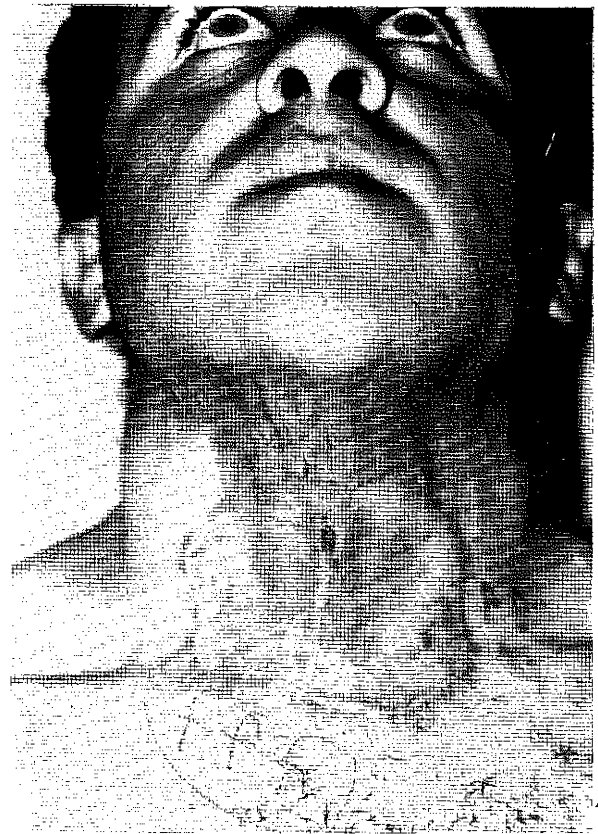
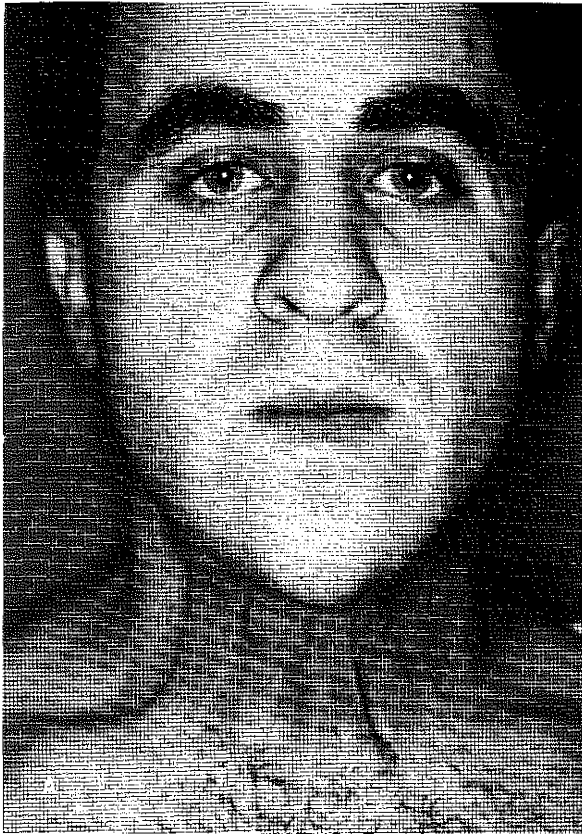


Fig 2a: Preoperative view of the patient treated by full thickness skin grafting taken from abdominal wall. b: Postoperative appearance of the patient at 3 weeks Note the minimal graft loss due to laryngeal movements.

### RESULTS

There were seven patients in Group I. All scar contractures were vertically oriented. Therefore, transposition of two triangular flaps that lengthen the linear contracture solved the problem. One patient developed incomplete flap necrosis, which was then debrided and grafted. This was because of avascular

necrosis. In Group I, no patient developed recurrence at six months follow-up.

In Group II, two patients underwent operations for releasing of burn scar contracture and, Z-plasty and split thickness skin grafting procedure, a static splint was used for six months only during the day. But poor color and texture in addition to recurrence

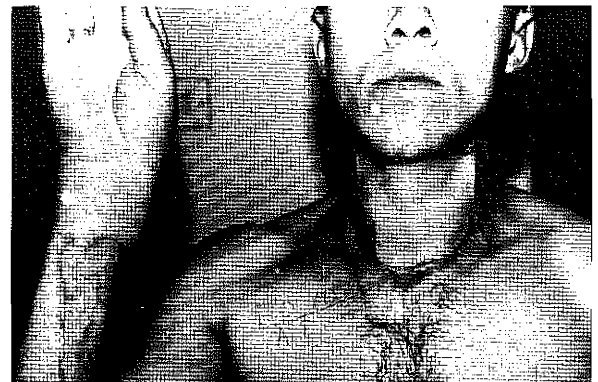
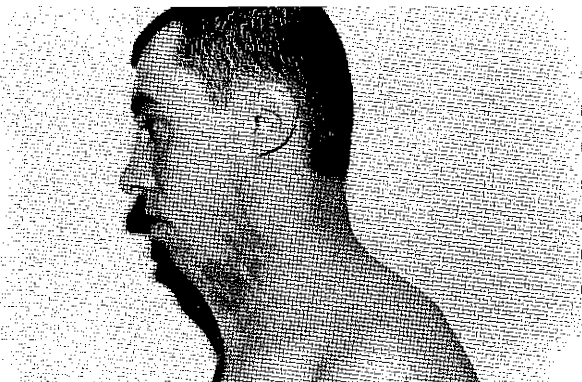


Fig 3a: Preoperative appearance of the patient where submental angle was obliterated by the anterior neck burn. b: Submental angle was restored by radial forearm free flap. Patient is seen 2 months postoperatively.

revealed unsatisfactory results.

Four patients in Group III underwent contracture releasing and full thickness skin grafting procedures. Two patients developed partial midline graft loss induced by laryngeal movements (Fig 2-a,b). These defects healed well with secondary intention. No problem was observed in both donor sites. The color and texture of grafted areas were found to be satisfactory and no recurrence was observed at six months follow up. In the remaining four patients in Group III, whom the treatment of choice was radial forearm flap, postoperative cosmetic appearance and functional neck movements of the patients were very good (Fig 3-a,b). The follow up period ranged from 3 months to 2 years. No recontracture was observed and full range of neck motion was achieved in all patients. Natural profile and appearance were restored six months, so no defatting procedure was needed.

#### DISCUSSION

The goal of the treatment of the anterior neck contractures is to release the contracture thoroughly, to prevent recurrences and to regain natural profile and appearance. Particularly in children the full release of neck contracture must be performed as soon as possible, and the patients have to be free from recurrence, because if they have their neck contracted for a long period, growth of the head and neck region may be disturbed.

Several methods have been advocated and used in the treatment of neck contracture<sup>5,6</sup>. They are Z-plasties, local skin flaps, pedicled skin flaps, full thickness skin grafts, split thickness skin grafts and free flaps<sup>4</sup>. When the contracture is limited to a small area as in Group I, Z-plasty will give good results, since the aim is to lengthen the linear contracture. Transposition of two triangular flaps does not only lengthen the linear scar contracture, but also realign the scar perpendicular to the dynamic skin tension. In case of large transposition flaps, whose central limb length exceeds 4 cm, the survival of the distal portions of the flap may be jeopardized because of the risk of avascular necrosis. The rounded ends of transposition flaps (S-plasty) may give better

survival rates than the triangular ends of the flaps in classic Z-plasty.

Neck release should be performed by incising through the burn scar down to the unburned tissue. This often necessitates dividing the platysma until the strap muscles are encountered, taking care to leave the external jugular veins intact. The incision should be extended from axis to axis on each side, well into the nonburned tissue on the lateral portions of the neck to allow a full release. The amount of release obtained by this method will often be dramatic and require large amount of skin for resurfacing.

After neck contracture release, thin split thickness skin grafting procedures don't always give good results. Skin grafting can cover the wide raw surface, that appears after scar release. However, it is not uncommon that neck contracture occur again after skin grafting. To prevent the recurrence of contracture the patient has to wear a splint device that keeps the patient's neck extended for several months following the operation. Another disadvantage of skin grafting is, its difficulty in restoring a natural contour of the neck. In full thickness grafted necks the recurrence rate could be reduced and appearance would be better. Keeping this in mind, we preferred full thickness skin grafting in resurfacing of the large defects resulting after contracture release, involving the entire surface of the neck. We observed much better results with full thickness skin graft compared to split thickness grafts applied to two patients in Group II. We overcame the difficulty of harvesting such large amount of full thickness skin graft by the technique described above.

Free flaps can cover wide areas such as the entire neck from the chin to the clavicle. Recurrence of the contracture is seldom seen<sup>4</sup>. Natural contour and good appearance are yielded by this procedure. Thus, the use of free flaps is one of the best ways to treat broad neck contractures after burn injury.

In selecting a free flap for treating an anterior neck contracture our choice was radial forearm flap. The main reason for this choice is the thinness and pliability of the skin itself. The size of the flap available measures 7-10 cm in

width and 18-20 cm in length. The length of the vascular pedicle will depend on the size of the flap but may be up to 6-8 cm. Narrow defects may allow primary closure of the donor site closure as in one of our patients. In our patients treated with free radial forearm flap, neck contour and cosmetic appearance were excellent.

The groin, parascapular, dorsalis pedis, lateral thigh, latissimus dorsi and deltopectoral flaps have been used for severe neck contractures<sup>2</sup> Although the functional result are considered to be good, the aesthetic results are not so satisfactory, particularly where scapular, lateral thigh and latissimus dorsi flaps are used<sup>8</sup>. But radial forearm flap does not have disadvantages such as bulkiness and dimpling of skin color and texture and we have observed good aesthetic and functional results with it.

In conclusion, it is necessary to emphasize once again the necessity of detailed preoperative planning. This should include the correct choice of surgical technique. We used both full thickness skin grafting and free flap transfer in extensive neck contractures and achieved good aesthetic and functional results. Our choice of treatment is free tissue transfer preferably radial forearm flap. We also recommend full thickness skin grafting procedure as described in the paper as an alternative treatment in the institutions where microsurgical facilities are

not available.

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