Egyptian Journal of Surgery Vol. (23), No. (2), April, 2004

THE TREATMENT SEVERE AXILLARY CONTRACTURES USING OF THE PARASCAPULAR FLAP IN CONJUNCTION WITH OTHER RECONSTRUCTION TECHNIQUES

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Axillary scar contracture is observed frequently after severe burn insult and is usually accompanied by injuries to the adjacent area. (Kim et al)
Inappropriate treatment of axillary burns frequently results in adduction contractures.
Management of severe axillary contractures is a challenging task and requires well-planned management.
One should always aim at restoring full function, and this is best accomplished by performing full release of the contracture to restore the full range of movement together with the creation of a natural non bulky axillary pit with the minimal possibility of recurrence of the contracture and with minimal donor site morbidity.
Although many therapeutic methods, including skin grafting, Z-plasties, local flaps, island flaps, and free flaps, have been established, each technique has its own advantages and disadvantages in specific situations. The decision regarding which technique to use can only be made after consideration is given to the merits of the individual case.
In this study the parascapular flap was used to reconstruct only the axillary pit and the residual raw area on the chest wall closed either using Z-pasty technique or split thickness skin graft and the residual raw area on the inner aspect of the upper arm is either closed primary or covered with a split thickness graft, and very good functional and esthetic results could be accomplished using this technique.
We concluded that the parascapular flap either pedicled or island (for reconstructing the axillary pit combined with z-plasties or split thickness skin grafts to cover any residual raw areas in the arm or chest wall) is the best choice for reconstruction of severe types of axillary contracture, releasing defects with satisfactory results in terms of function and cosmoses

Key Words: Axillary scar contracture; Z-plasties; skin grafting; island flap; local flap; parascapular flap

INTRODUCTION

Post burn axillary contracture causes both functional and esthetic problems and presents a challenge for plastic surgeons. This contracture causes discomfort and major disability because of loss of abduction of the shoulder joint. Because of scar formation and subsequent deformity. The deforming forces of the scar contracture associated with axillary burns often involve primarily the skin and secondarily the musculoskeletal structures.

Different methods to treat post-burn axillary contractures have been proposed [3,6]. Proper treatment for axillary contractures can be planned in the light of the classification of Kurtzman and Stern in 1990 which is based on the severity and the extent of the contracture in which:

Types 1A: injuries involving anterior axillary fold, type 1B: injuries involving posterior axillary fold, type 2: injuries involving both anterior and posterior axillary fold, type 3: injuries type 2 plus axillary dome[6].

Z-plasties, skin grafts are indicated only if the contracture is limited to a small area as in type 1(either anterior or posterior axillary folds), but when the contracture is extensive and involving both the anterior and the posterior axillary folds, flap transfer should be considered.

The parascapular flap has the advantage of being a relatively thin flap, which makes it ideal for the reconstruction of the axilla.

The proximity of the flap to the recipient site which is the released axilla allows us to perform the whole procedure with the patient lying in a lateral decubitus without necessity of turning the patient in any other position.

The parascapular flap offers large coverage surface, and still the donor site could be closed primary, with limited donor site scar.

Vascular anatomy: The circumflex scapular artery arises from the subscapular artery approximately 3 to 4 cm from its origin at the axillary artery.

The artery passes posteriorly through the triangular space bordered by the teres minor above, the teres major below, and the long head of the triceps laterally, and in this space it gives off the following branches:

1. The infrascapular branch, which enters the subscapular fossa deep to the subscapularis, muscle.
2. One or two muscular branches to the teres minor and the teres major muscles
3. The descending branch which goes back as its continuation and emerges posteriorly from the triangular space; it then divides into two main cutaneous branch, right at the edge of the lateral border of the scapula
4. The cutaneous scapular branch that runs horizontally over the posterior aspect of the scapula
5. The cutaneous parascapular branch that proceeds to the inferior angle of the scapula descending along the lateral border of the scapula.
6. Before dividing into the two main cutaneous branches, the circumflex scapular artery gives off several small branches that penetrate the lateral border of the scapula.

Both the circumflex scapular and the cutaneous arteries are accompanied by two veins, one of which usually has a larger diameter than the other. They are responsible for the venous drainage of the area

Surface anatomy: The location of the triangular space is marked using the following method:

The distance from the midpoint of the scapular spine can be derived from the formula: D1= (D-1)/2, where D is the distance between the midpoint of the spine and the tip of the inferior angle of the scapula

PATIENTS AND METHODS

In this study only patients with severe axillary contractures type 2 and 3 contractures were included (with obliterated axillae and lost both anterior and posterior axillary folds)

The study included 28 patients (18 female and 10 male).

The age of the patients ranged from 24 months to 34 years.

Follow up of the patients ranged from 1 to 4 years.

The procedure consisted of two main steps, the first step was performing full release of the axillary contracture and the second step was the recreation of the axillary pit using the fasciocutaneous parascapular flap either pedicled or island flap.

Flap planning: The site of emergence of the descending branch of the circumflex scapular artery from the triangular space is determined by the method mentioned above or it could be estimated roughly as being at 2 cm above and 2 cm lateral to the tip of the posterior axillary fold in an average adult (if this one is intact and not affected by the burn contractures otherwise the first method is used instead).

The upper end of the flap is located at the level of emergence of the pedicle from the triangular space. The long axis of the flap follows the lateral border of the scapula and extends beyond it. The width of the flap is estimated to be 12 to 15 cm to allow direct closure of the donor site however the final length and width of the flap is determined intraoperatively after full release of the axillary contracture is performed. The length of the flap could reach up to 25 to 30 cm below the site of emergence of the vessels from the triangular space

The procedure: The procedure is performed entirely with the patient is in the lateral decubitus.

The procedure is started by performing full release of the axillary contracture using sharp dissection together with meticulous haemostasis. Full release is checked by performing full abduction of the shoulder and testing for tension on any border of the released axilla.

After full release the measurements of the defect created are taken, the length from the pivot point of the flap (which is the site of emergence of the vessels from the triangular space) to the distal end of the defect is measured

to determine the length of the flap, if the width of the defect is larger than 12 to 15 cm the flap's width is drawn at 12 to 15 cm to allow direct closure of the donor site and the residual defect will be dealt with later on.

Flap elevation: As the parascapular branch of the circumflex scapular artery is constant in its presence and location in all cases we start our dissection from below upwards. We start by a cutaneous incision of the lower end of the flap and the medial border of the flap down to the fascia. Dissection is started from below upwards including the fascia over the latissimus dorsi muscle, which is fixed by two stitches to the skin to avoid the sheering movement of the flap.

The dissection is carried out at the same plane till we reach the lower border of the scapula. Careful dissection is carried out, as the plane here is not very well defined, transillumination of the flap can be very helpful in identifying the pedicle. Once the pedicle had been identified dissection is carried out to the site of emergence of the vessels from the triangular space, however skeletonisation of the vessels inside the triangular space is not necessary and is better avoided to prevent vascular spasm of the pedicle.

The next step is to transpose the flap to the axillary defect. The lower border of the flap is sutured to the anterior borders of the defect ,we uses the parascapular flap to reconstruct only the axillary pit and any residual raw areas remaining in the inner arm or the lateral chest wall are either closed primarily if possible or covered with previously designed Z-pasties or with split thickness graft . (Fig.2 a,b)

A suction drain is used to prevent haematoma or seroma formation under the flap.

The donor site is closed primarily in two layers over a suction drain.

RESULTS

We have not had any total flap loss in all our 28 patients.

We experienced congestion and subsequent sloughing of the distal 2 cm of one flap.

Full range of movement was restored in all patients after postoperative physiotherapy.

The time that took the physiotherapist to restore full range of movement at the shoulder joint varied between one to five months in the most severe case of contracture.

We have experienced one case of minimal donor site infection, which was easily managed by frequent dressings and topical antibacterial agents.

There was no incidence of haematoma or seroma formation neither at the donor site nor under the flap, as meticulous haemostasis and good suction drainage were insured in every case.

CLINICAL CASES

Figure 1: **a,***b intra-operative view after full release of the contracted axilla totally dissected flap ready to be transposed into the axilla.*


Figure 2: a, b*: views at the end of the procedure after using the parascapular to reconstruct the axillary pit and closing the residual raw areas on the arm and the chest wall using split thickness skin grafts*


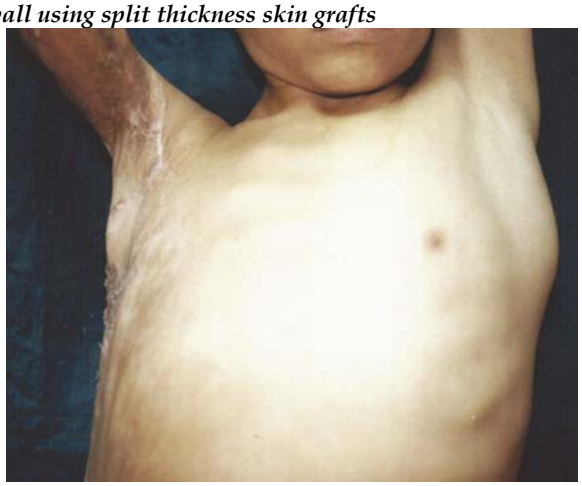

Figure 3: a, b: a. ***preoperative view of a fourteen years old male patient suffering from severe right axillary contracture.*** **b.** ***one year after full release of the contracture and a pedicled parascapular flap was used to reconstruct the axillary pit, the residual raw area in the arm was closed using Z-plasty technique primarily and combined split skin graft and Z-Plasty were used to cover the residual raw area on the chest wall***


Figure 4: a, b: a. ***preoperative view of a three years old female patient suffering from severe left axillary contracture.*** **b.** ***one month after full release and a pedicled parascapular flap was used to reconstruct the axillary pit, the residual raw area in the arm was closed primarily and split skin graft was used to cover the residual raw area on the chest wall***

Figure 5: a, b: a. ***preoperative view of a twenty four years old female patient suffering from severe right axillary contracture.*** **b.** ***four months after full release of the axilla and parascapular flap use to reconstruct the axillary pit ,both residual raw areas on the chest wall and on the arm produced by the release were covered with split thickness skin graft.***

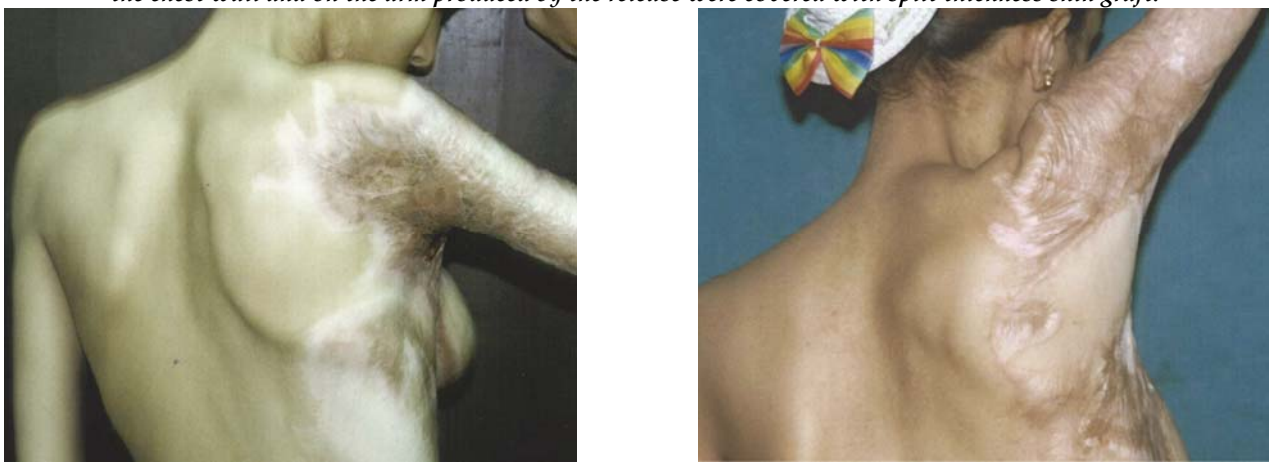

Figure 6: a,b: ***back view of the same patient***

Figure 7 : a, b,c: a. ***preoperative view of a nineteen years old female patient suffering from severe right axillary contracture.*** **b.** ***Two years after full release of the axilla and parascapular flap use to reconstruct the axillary pit, both residual raw areas on the chest wall and on the arm produced by the release were covered with split thickness skin graft.*** **c .** ***post operative view of the same patient after two years***

DISCUSSION

Axillary scar contracture is observed frequently after severe burn insult and is usually accompanied by injuries to the adjacent area. The treatment of severe axillary contracture aims at releasing the contracture, restoring the normal axillary contour, and preventing recontracture. Although many therapeutic methods, including skin grafting, Z-plasties, local flaps, island flaps, and free flaps, have been described, each technique has its own advantages and disadvantages in specific situations.(Nisanci et al,2002) The decision regarding which technique to use can only be made after consideration is given to the merits of the individual case. When the axillary contracture is limited to one of the axillary folds, either the anterior or the posterior axillary folds with no involvement of the axillary pit, Z-plasties are indicated provided that there is no severe scaring of the flaps of the Z-pasty. Skin grafts have several disadvantages such as recontracture, discoloration, difficult resurfacing, and donor-site scarring. Local flaps do not provide ample skin to reconstruct severe axillary contractures and are reserved to reconstruct a minor to moderate contractures.

Cadaveric dissection of 20 parascapular flaps was conducted by Nassif et al in 1982. Study of the vascular anatomy of the scapular flaps was conducted later by dos Santos in 1984 on 35 cadavers. Both reached the same conclusion that the circumflex scapular vessels have a constant anatomy with along pedicle and a large diameter (2.0-3.5 mm). They both described the parascapular flap as a flap which has the following advantages: large coverage surfaces with the possibility of primary closure of the donor sites, excellent intradermal networks with rich anastomosis, thin and hairless skin, limited donor site scars, and reliable pedicle.

Both esthetic and functional results are important for surgery of post burn axillary contracture, and the functional outcome is always considered first. The use of the parascapular flap for reconstruction of severe contracted axillae yielded an excellent functional restoration together with very good esthetic results as the parascapular flaps provided ample amount of soft, pliable and relatively thin skin, together with minimal donor sites scars which were closed primarily in all of our cases. the use of the parascapular flap to reconstruct the central area of the defect (i.e. axillary pit) and closing the residual raw areas on the arm and the chest wall with either Z-plasties or split skin grafts makes us harvest a flap with reasonable width that allows primary closure of the donor site, and dividing the defect into three small defects where the central one is closed with the parascapular flap and the upper and lower ones are either closed primarily or covered by previously designed Z-plasties or split skin graft allows for maximum release with minimum or no recontracture.If the parascapular flap is used alone to reconstruct the released axillary contracture the flap is either small to allow for primary closure of the donor site and full abduction could not be achieved or the flap is of good width to allow for full abduction but its too bulky over the arm and chest wall and too heavy which compromises both functional and esthetic results .

CONCLUSION

For severe post burn axillary contracture with involvement of both the anterior and the posterior axillary folds and with obliteration of the axillary pit, the parascapular flap is the best option for reconstruction with its reliable blood supply, large coverage area, and low donor-site morbidity to provide the desirable functional and esthetic effect expected by both the patient and the surgeon, combining the parascapular flap with other reconstructive tools such as Z-plasties or split thickness skin grafting for covering the residual raw areas on the inner aspect of the upper arm and the lateral chest wall has the advantage of decreasing donor site morbidity by allowing the harvesting of a narrower flap and closing the donor site of the flap primarily without jeopardizing both the functional and esthetic results., by using the parascapular flap for reconstruction of the central part of the defect only and dividing the reconstructed defect into 3 separate areas allows early and full restoration of abduction of the shoulder joint

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