ORIGINAL ARTICLE

OUR EXPERIENCE WITH PROPELLER FLAP

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ABSTRACT: BACKGROUND AND OBJECTIVES: Propeller flap is based on a vascular pedicle supplying a fascio cutaneous island of skin. It is used to reconstruct soft tissue defects. Flexion contractures are aesthetically deforming post burns sequalae. Various techniques are used to relieve the contractures such as V-Y plasty, X plasty and Z plasties. A propeller flap can also be used to relieve the contractures. Thus there is a need to study the effectiveness of propeller flap in reliving flexion contractures in comparison with conventional V-Y plasty, X plasty and Z plasties in terms of adequacy of release, coverage of vital areas, technical ease, splintage times, patient morbidity, aesthetics and flap survival. **METHODS:** 20 Patients with post burn flexion contractures of durations varying from 1-3 years were randomly selected. Release of the flexion contractures with subsequent cover of the raw areas thus created, with the propeller flap. No prospective comparative study was undertaken using other means of coverage. **RESULTS:** 1. Adequacy of release superior to Z plasty, compares with V-Y plasty, X plasty, inferior to SSG especially in deep contractures. 2. Coverage of vital areas superior to all techniques. 3. Technical ease compares favorably with all techniques. 4. Splintage times are obviated unless muscles are involved. 5. Aesthetics superior to SSG. 6. Flap survival is superior to all methods. **CONCLUSIONS:** Propeller flaps have a very good potential for release of flexion contractures compared to conventional techniques.

KEYWORDS: Propeller flap, flexion contracture release, Flap survival.

INTRODUCTION: A propeller flap is an island flap that moves around a stationary vascular axis and re orients from one axis to the other.[1],[5] Although there are a large number of reports of using perforator based propeller flaps in lower limb reconstruction, the application of this technique in the upper extremity is infrequently reported.[2],[3]

It was first devised by Hyakusoku in 1991. [4] Subsequently a single English language literature report of seven cases was reported from Turkey.

Few experimental studies have studied the effect of pedicle twisting on flap survival.[9][10][11][12][13] Based on these studies and reports and literature, perforator based propeller flaps with rotation up to 180 degree have shown to be viable and versatile.[14][15][16]

Flexion Contractures are the commonest and most debilitating of post burn squealae.[5][6][7][8]

Due to their situation on the flexor aspect, they are easily visible aesthetic deformities. The combination of functional disability and aesthetic deformity makes for severe psychological distress.

Post burn Flexion contracture at the elbow

AIMS AND OBJECTIVES:

1. A flap versatile enough to address and meet the needs of contracture release of the flexor aspect of the joints.
2. Coverage of the vital structures usually lay bare during flexion contracture release with durable tissues.
3. Seeking to highlight the potential of this underreported and underutilized flap.

MATERIALS AND METHODS: 20 Patients with post burn flexion contractures of durations varying from 1-3 years.

Release of the flexion contractures with subsequent cover of the raw areas thus created, with the propeller flap.

Patients were selected randomly without exclusion criteria and no prospective comparative study was undertaken using other means of coverage.

Comparisons were on the basis of regular observations made during the course of other procedures done routinely for release and cover.

TECHNIQUE:

1. A diamond shaped flap is designed over the flexion contracture according to the size of the true defect that would be created following release of the contracture.

Diamond shaped flap design

2. Diamond shaped flap of scar tissue cut over the flexor contracture with the peripheries of the diamond raised with a central portion of scar tissue over the crease left intact to provide the vascular supply.

Fashioning of flap

3. The flap thus raised is rotated by 90 degrees so that the longitudinal axis is now in the transverse axis and vice versa.

This rotation takes place only at the peripheries of the flap.

Rotation of flap

Suturing of flap and primary closure of donor areas

The flap is sutured into place

**The donor areas are subjected to primary closure.
5 days after surgery**

OBSERVATIONS:

Adequacy of release is limited only by contractures of ligaments and tendon and muscle shortening.

In terms of adequacy of release it compares reasonably well with V-Y, X-plasties and is far superior to Z plasties though a laying bare scar release with SSG maybe superior in cases of deep tissue contractures.

Coverage of vital areas: The design of this flap makes it far superior to any of the previously mentioned and usually tried methods because the flap is centered or based over the vital areas. An X plasty tapers right over the vital area, a Z plasty cannot be applied in most cases, a V-Y plasty compromises release for coverage and an SSG cannot protect the vital areas.

The technique favours comparably with all the usual techniques in terms of technical ease and can be performed with a fair degree of proficiency by all.

Technically simpler to perform as it can be done under local anesthesia without resorting to additional donor site anesthesia as in SSG.

Splintage times compare most favorably with SSG as this flap usually does not require splinting unless associated with tendon and muscle shortening.

Similarly donor site morbidity is obviated as SSG is not required in most cases.

A case in which aesthetics were inferior as scar tissue was patchily depigmented

Aesthetics in this technique were slightly inferior where the scar tissues were patchily de pigmented but were still superior to skin grafts.

Flap survival also compares favorably because the centrally based substantial **subcutaneous tissue pedicle** prevents leading edge necrosis as is frequently seen in the other techniques.

The functional outcome was good in all cases and comparable to conventional methods of contracture release and cover.

As regards to complications only one case had partial flap loss which was further corrected with a skin graft.

The functional outcome was good in all cases after follow up of the cases for a minimum of 6 months.

The cosmetic outcome was compared favorably with conventional methods in 17 cases. In the other 3 cases the cosmetic outcome was inferior to conventional methods but still superior to skin grafts. (Table 1).

Case	Age (yrs)	Gender	Type of burns	Site	Complication	Skin graft	Follow Up (Months)	Cosmetic outcome*
1.	22	M	Flame	Elbow	none	-	6	good
2.	43	M	Flame	Elbow	none	-	12	good
3.	32	F	Electrical	Knee	none	-	15	good
4.	24	M	Flame	Elbow	none	-	9	good
5.	19	M	Flame	Axilla	none	-	12	inferior

6.	37	M	Flame	Elbow	none	-	13	good
7.	20	F	Electrical	Tendo achillis	none	-	14	good
8.	20	F	Scald	Knee	none	-	15	good
9.	21	M	Flame	Wrist	none	-	9	good
10.	40	F	Flame	Knee	none	-	8	good
11.	27	F	Flame	Elbow	Flap loss	+	18	inferior
12.	32	F	Flame	Axilla	none	-	12	good
13.	29	M	Flame	Elbow	none	-	8	good
14.	21	F	Flame	Knee	none	-	6	good
15.	35	M	Scald	Tendo achillis	none	-	7	good
16.	39	F	Flame	Wrist	none	-	13	inferior
17.	22	F	Flame	Elbow	none	-	12	good
18.	35	M	Flame	Knee	none	-	12	good
19.	44	M	Flame	Elbow	none	-	12	good
20.	36	M	Flame	Wrist	none	-	9	Good

TABLE 1

*Good - compares favourably with conventional methods
Inferior - Inferior to conventional methods but still superior to skin graft

DISCUSSION: In spite of modern advances in burns care in acute stage and use of early physiotherapy and splints, contractures after burns still present to the plastic surgeon due to improper physiotherapy and / or acquiring the position of comfort. These deformities present a challenge to the surgeon as they significantly alter the quality of patient's life.

Many techniques are utilized to correct the deformity - Z plasty, V-Y plasty, X plasty with or without SSG.

The propeller flap technique is used frequently for reconstruction of tissue defects in traumatic and oncological background. The use of this flap for reconstruction in the setting of contracture release post burns is not a technique frequently used in spite of several disadvantages with the conventional methods of contracture release and coverage.

The results of this study certainly proves that the use of propeller flap is a good alternative for post burns contracture release and reconstruction. Further the use of this technique for elbow, axillary knee, tendoachillis and wrist contractures with good results demonstrates the versatility of the technique (Table 1).

The Cases were performed by randomly selecting the cases without exclusion criteria...

The Comparisons made with other techniques were done on a prospective retrospective basis, based solely on established and uniformly accepted observations concerning these well-established methods vis-a-vis this unusual underutilized, underreported technique which is the subject of this paper.

CONCLUSIONS:

To highlight a hitherto underutilized and under reported technique.

To show the potential in terms of versatility of the technique.

To appreciate a reasonable superiority over existing techniques which have more limitations?

To acknowledge that a more sanguine and emphatic espousal of this technique would require a controlled study with statistically verifiable results.

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