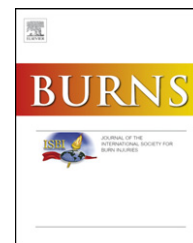


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# The eight-limb modified propeller flap—A safer new technique

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## ABSTRACT

**Introduction:** Contracture deformities affecting the flexor aspect of the elbow joint and the 1st web space are not uncommon sequelae of burns. Surgical treatment is contemplated in those patients with established contractural deformities in whom non-surgical treatment is ineffective or functional integrity of the joint is at jeopardy. Surgical treatment consists of incising the scar tissue to release joint contracture and covering the defect that might result with skin grafting or various tissue flaps. In this work, we used a modification of the multilobed propeller flap to treat eight patients with contracture deformities.

**Materials and methods:** Eight patients with contracture deformities of the elbow (five patients) and 1st web space (three patients) were subjected to release and modified propeller flap coverage. The modification implies planning eight limbs based on a central axis so that rotation occurs in 45° instead of 90° in the original propeller flaps.

**Results:** All patients had acceptable results with complete range of movement regained in affected joints and no serious complications. Only a case of partial loss of skin graft and another case with congestion of one lobe were reported, and both were managed conservatively.

**Conclusion:** The new modification has the advantages of being flexible, can be tailored to best match the defect so that it can be closed primarily or needs smaller skin grafts, can be used even when there is much scarring and, finally, the resultant appearance is cosmetically acceptable with little donor morbidity, if any.

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## 1. Introduction

The hand and upper extremity are commonly affected in burns. They are affected in more than 50% of burn cases [1]. Contractural deformities affecting the elbow and hand are common sequelae of burn injuries. Up to 39% of burns involve some portion of the hand or upper extremity [2]. Joint problems and contracture deformities are usually encountered in those patients, and are attributed to many factors including acquiring the position of comfort during acute phase

of recovery and/or improper splinting and physiotherapy. The deformity is then aggravated by soft-tissue contracture that finally ensues [3].

Surgical treatment is contemplated in those patients with established contractural deformities in whom non-surgical treatment is ineffective and performed when the scar tissue becomes fully mature.

For elbow contractures, surgical treatment comprises release of the contracture by incising the scar tissue and then covering the resultant defect with one or more of various types of tissue coverage including skin grafts, Z plasty, V–Y flaps,

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**Table 1 – Criteria of patients and results.**

Case #	Site	Age (years)	Gender	Tissue deficiency (cm)	Length added (cm)	Grafting	Follow-up (months)	Complication
1	Elbow	22	F	8	10	–	6	–
2	Elbow	34	F	9	12	–	13	Venous congestion
3	Elbow	18	M	15	10	+	14	–
4	Elbow	42	M	7	9	–	9	–
5	Elbow	28	F	11	12	+	10	Partial graft loss
6	1st web	23	M	4.2	5.6	–	14	–
7	1st web	44	F	3.8	5	–	18	–
8	1st web	19	F	3.6	4.8	–	16	–

local or distant fasciocutaneous flaps, muscle or myocutaneous flaps and free flaps, each of them having its advantages and disadvantages. The choice between them depends on the availability of healthy skin near to the affected area.

Thumb contractures remain a very difficult issue in the reconstructed hand that may involve shortening of the adductor muscle in severe cases, necessitating the release of its transverse head. In less severe cases, release can be done using simple Z-plasty or better four-flap or five-flap Z-plasty.

The propeller flap was first introduced by Hyakusoku et al. in 1991 [4] to release burn contracture of the elbow, using the scarred tissue. Shortly afterwards, some modifications to avoid its shortcomings were added such as the multilobed propeller flap [5], scar band rotation flap [6] and the pin-wheel flaps [7].

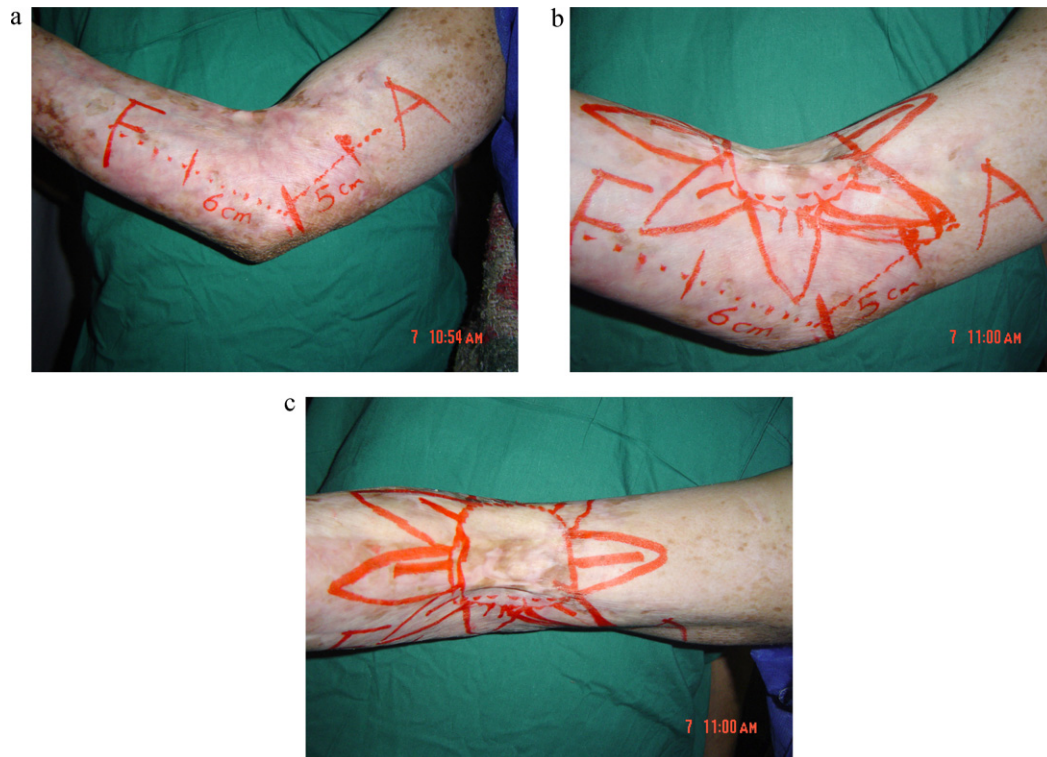
In this work, a new modification of the propeller flap is proposed aiming at resolving the shortcomings of the previously mentioned propeller flaps by decreasing their axis of rotation.

## 2. Patients and methods

This work involved eight patients, three males and five females, with a mean age of 28.75 years (18–44 years) with burn scar contracture deformities affecting the elbow (five cases) and the hand 1st web space (three cases) (Table 1). The scars were stable and mature with almost no healthy skin in the vicinity. On the other hand, cases with joint disease, immature scars or previously operated upon were excluded.

### 2.1. Preoperative planning

The flap design consists of a central subcutaneous pedicle and eight triangular lobes based on a mathematically integrated way. The length that needs to be added to compensate for the shortening is calculated from the contralateral limb or along



**Fig. 1 – Preoperative planning showing: (a) the calculation of the amount of shortening by measuring through the midaxial plane of the arm (A) and forearm (F). In this case it is estimated that after release of contracture; the defect will be approximately 11 cm. (b and c) Anterior and lateral views of the 8-limbs of the modified propeller flap are then drawn so that the distance between the summits of the two lobes that will lie along the contracture should be 11 cm or slightly more.**

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