The use of lateral arm perforator flap in the reconstruction of post-burn cubital contracture

Ahmed Abdelkarim (ahmed.abdelkarim@med.aun.edu.eg)
Assiut University Faculty of Medicine
https://orcid.org/0000-0001-7672-4089

Tarek Raief
Assiut University Faculty of Medicine

Mohamed Elyounsi
Assiut University Faculty of Medicine

Research Article

Keywords: Lateral arm flap, Reconstructive surgery, Postburn, elbow defects perforator, posterior radial collateral

Posted Date: May 24th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-2732339/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License
Abstract

Introduction

Elbow contracture is a challenging problem to the reconstructive surgeon owing to the wide range of extension that should be achieved and due to the common unavailability of local tissues to be used for reconstruction of the elbow. (1) The lateral arm flap (LAF) is a popular flap transfer, which can be applied in many procedures. Described in 1982 and since its clinical application has been increasing. Perforator flaps become indispensable tool which help not too sacrifice the pedicel (2)

Objective: to describe using the lateral arm perforator flap for reconstruction of cubital contracture secondary to burn.

Methods: It is a retrospective analysis of patients who underwent cubital fossa reconstruction.

Results: In the current series, ten patients were included with the mean age 24 years (8 to 36). they were operated for definitive reconstruction on average 72 months (24m to 120m) after the initial injury. The reconstruction for 10 cases in our study was performed as one stage procedure. In the current study, complications were observed in three cases (27.3%), the wound dehiscence was recorded in one patient also, we faced two patients with dissatisfied results due to bulkiness of the flap in the elbow.

Conclusion: We concluded that the lateral arm perforator flap is a versatile and reliable option for the reconstruction of all types of elbow contracture, releasing defects with satisfactory results in terms of function and esthetic outcomes.

INTRODUCTION

Elbow joint is one of the most frequent joint susceptible for stiffness which will result contracture after inadequate treatment of burn wound which will continue the viscous cycle as they effect affect each other resulting on more difficulty of management with high incidence of recurrence considering the previous statement, it is preferred as a general rule distant local Fasciocutaneous flaps and we consider lateral arm flap one the beneficial, reasonable flap with good success rate and have the possibility of less donor site morbidity as it could be closed primary.

The lateral arm flap was first described as a free septocutaneous flap for soft tissue coverage for various hand defects by Song et al(3) and then was described as reversed flap as local flap by Culbertson and Mutimer (4) for the coverage of soft tissue defects around the elbow joint and in the treatment of post-burn antecubital contractures further the anatomy and clinical application are more defined as combining a apart of vascularized humerus and then more definition by raising it as a perforator flap.(5)

Designing the flap
The flap axis is centered by a line drawn from the lateral epicondyle to the deltoid insertion which represent the lateral intermuscular septum which is between brachialis and brachioradialis muscles anteriorly and lateral head of the triceps muscle posteriorly which represent the central axis of the flap. Then the flap island pattern is designed according to the defect. (Fig. 1) Flap width commonly should not exceed 6 cm to allow for primary skin closure of the donor defect and the flap was raised based on the most distal perforator.

**PATIENTS AND METHODS**

Retrospective study Between May 2019 and June 2020. A perforator-based lateral arm flap was used to treat ten patients with cubital fossa deformities generated by scarring from a post-burn.

**Preoperatively:**

The patient's history was obtained with specific attention to the initial care in the acute period and the subsequent physiotherapy, which was the chief cause of contracture because practically all patients ceased Physiotherapy owing to discomfort. Medical problems and other deformity were excluded by general examination. Then local examination done for the degree of contracture, and lastly the condition of surrounding skin which was good in all cases. Preoperative flap design was done while the patient was on operative table and also some photographs were taken preoperatively according to patients’ acceptance.

**Operative procedures:**

The recipient sites were first released under general anesthesia while the patients were supine, and then the demands were assessed. The flap could be harvested with the upper limb either on the table or on the patient's chest as shown on (Fig. 2) and sutured to cover the defect as shown on (Fig. 3)

**Postoperatively:**

Patients were scheduled for follow-up after one week, one month, and three months. Active physiotherapy was started as soon as feasible, accompanied by physiotherapy once the sutures were removed. With a mean age of 24 years, there had been eight men and two women (range, 6 and 38 years). The length and breadth of the lateral arm flaps ranged from 12 to 24 cm and 5 to 8 cm, respectively.

**Results**

The patients' ages varied from 6 to 38 years old, with a mean of 24 years. The right elbow was affected in five of the ten cases (50 percent); the left elbow was involved in four instances (45 percent); and both elbows were involved in one case (5 percent). There were nine cases of flame burn and one case of chemical burn. The interval since the injury ranged from 2 to 10 years, with an average of 72 months. In every case, the contracture was of the third type. The contracture magnitude ranged from mild (30-90
degrees) to severe (less than 30 degree). In our cases, the degree of flexion ranged from 0 to 60 degrees. In all cases lateral arm flap was done.

The degree of extension was re-evaluated after surgery. Except for two patients who were displeased by the difficulties in complete adduction due to the bulkiness of the flap in the elbow, all of the patients were satisfied with the results and with this follow up there is no recurrence of contracture.

**Discussion**

Due to the wide range of motion of the elbow joint, inappropriate or inadequate treatment of full-thickness burns involving the cubital fossa inevitably results in flexion contractures, which cause various degrees of restriction in the extension of the elbow joint. When contracture develops, it will be difficult for reconstructive surgeons to release the contracture, resulting in a large defect that should be replaced with skin that is similar in nature as pliable and elastic.(6)

A wide range of local skin, fasciocutaneous, and musculocutaneous flaps have been documented, each with its own set of benefits and drawbacks. The major cause of this contracture in our study was intolerance to physiotherapy. Combined with an intensive exercise program under the guidance of a physical therapist, the patient has the highest chance of surviving his injury with hardly any functional impairment.

Physiotherapy with a patient in severe pain or with a therapist insisting on this movement despite pain could not be sustained by the patient's enthusiasm, resulting in the endeavor's termination. Almost all of the studies cases had the same history of no or minimal physiotherapy and persistent elbow splinting during the acute phase.(7)

In this study, ten cases of extreme degree contracture almost obliterating the elbow were operated on using a lateral arm flap and ten cases of post scar release of burn damage.

The following are the advantages of the perforator lateral arm flap for reconstruction of the defect around the elbow joint:

1. The pedicle of the lateral arm flap is dependable.
2. Flap dissection is straightforward and takes less than an hour.
3. The pedicle of the lateral arm flap is dependable.
4. Flap dissection is straightforward and takes less than an hour.
5. Does not sacrifice a major vessel, and in the case of the perforator type, no sacrifice is made at all.
6. Physiotherapy could be commenced immediately postoperatively.
7. It's a one-step reconstruction.
7. with follow up there is no relapse on the gained range as the flap is pliable and the suture line usually away for the lines of stretch.(7)

During our studies, we found one to three perforators, the largest of which is the distal, which is employed to elevate the perforator lateral arm flap for cubital fossa coverage.(8).

When employed as a vascularized flap for elbow reconstruction, the risk of contracture or recurrence after skin grafting in this area is reduced, postoperative splinting is eliminated, early elbow movement is possible, and the time required for rehabilitation is reduced. The single-stage lateral arm flap is ideal for resurfacing big lesions including the elbow. Our flaps had a maximum size of 24 x 8 cm in our investigation. The primary closure of the donor sites has been accomplished. If the defect was less than 8 cm wide, the Fasciocutaneous flap was the best option for covering it once the elbow was released away from pediatric patient in which we used pinch test to be sure that the donor site will close without graft.

**CONCLUSION**

With its reliable blood supply, large coverage area, one-staged reconstruction, low donor-site morbidity, no need for rigorous post-operative physiotherapy or splintage, and no recurrence of contracture, the perforator lateral arm flap is the best option for reconstruction of elbow contractures. It also grows with age, especially in children, providing the desired functional and aesthetic outcome.

**Declarations**

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest: this no conflict of interest for the research

Ethical approval: this research was approved by institutional review board and fulfilled all requirements as governed by declaration of Helsinki.

The local approval number is 04-2023-300156

Consent to participation: the original consent is in Arabic it translates to the patient consent to reconstruction of his or her elbow contraction using lateral forearm flap and also the other possible reconstructive methods possible for him was explained and the necessity for physical therapy after surgery and possible complication, recurrence and anesthesia complications. They consent for the ability for using the pre, intra, post operative records and photos could be used for research and retrospective studies.

Consent for publication: patients whom added to the study was consented by our institution general consent for the ability to use their operative data for retrospective researches and publication.
Availability of data and material: data is available if needed.

Code availability: no special code was used for data.

Author contributions: All authors participated in this paper and agreed for submission as following all was involved on writing of the paper and was finally revised by AA, Data analysis was revised by TR, patient was operated and data collected by ME

References


Figures
**Figure 1**

Showing lateral arm perforator flap design and marking the dominant perforator.
Figure 2

Intra-operative showing the pedicle supplying the flap.
Figure 3

Immediate post-operative.