

Use of Latissimus Dorsi Myocutaneous Flap for Coverage of Raw Areas in the Elbow and Proximal Third of the Forearm: An Appropriate Solution for a Common Problem

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ABSTRACT

This study was conducted on 9 patients suffering from post-burn elbow contracture. After release of the contracture and determining the lack of any local flaps for coverage of the resultant defect, the pedicled Latissimus dorsi myocutaneous flap was utilized to cover the defect. Contrary to the previous literature that stated that the pedicled flap could only reach the elbow joint, in this study we were able to reach as far as 10 cms into the forearm. There was no flap loss neither partial nor complete. Mild infection occurred in 3 cases (33.3%) 2 of which were in the donor site and one only in the recipient site all responding to repeated dressings. The donor site was closed primarily in all but 2 cases that needed a split skin graft. We can safely come to the conclusion that the pedicled Latissimus dorsi flap can reach as far as the upper third of the forearm making it a valuable workhorse for coverage elbow and the proximal forearm. As already established, the versatility of the muscle and the minimum donor site morbidity give it a superior cosmetic result together with dispensing with the locally disturbed burn tissue.

INTRODUCTION

A normally functioning elbow joint is important for the daily vital activities of every individual. The elbow region is a common site of trauma and post-traumatic deformities can significantly impair the patient's life style in activities as simple as combing his hair or reaching for his food [1]. Burn is a leading cause for contractures in all body joints with the elbow not exempted. The burn damage is usually not localized to the elbow per se but extends to the distal arm and proximal forearm making local tissues unsuitable for reconstruction [2]. Different techniques are described to deal with the

resultant defect after release of post-burn elbow contractures. These include Z-plasty, Y-V or rectangular flaps, local or distant fascio-cutaneous flaps, muscle or myo-cutaneous flaps. Reversed adipo-fascial flaps, free flaps, tissue expanders and non-surgical modalities [3]. The Latissimus dorsi myo-cutaneous flap is a reliable flap with a wide skin paddle whose harvesting leaves a minimal donor site morbidity [4]. The pedicled flap is well described to cover raw areas as far as the elbow region [5]. The aim of this work is to verify the possibility of extending the use of the pedicled Latissimus dorsi to cover elbow and proximal forearm defects, a new use for this reliable myocutaneous flap.

PATIENTS AND METHODS

The study was conducted on 9 patients with post-burn elbow contractures (Figs. 1,2) in 2 cases earlier grafting was done after which contracture recurred. The decision to use the pedicled Latissimus dorsi flap was taken after confirming the exhaustion of all local tissues in the vicinity of the released contracture.

Operative technique:

Release of the contracture was done as distal as possible from the elbow joint taking care to avoid injury of important deeper structures that may have a distorted position due to the burn contracture. The release was done till achievement of full extension, after which testing for the vascularity and perfusion of the limb distally was tested. Measurement of the raw area was done next and a design was made for the donor site targeting direct closure. This should be possible provided the skin paddle does not exceed a width of 13 cms. Flap harvesting started by incising the skin paddle; care being taken that the distal end of the skin does

not lie more than 5 cms from the inferior edge the latissimus dorsi muscle. Dissecting into the areolar tissue to expose the muscle edge then began. Anchoring sutures are taken from the subcutaneous tissues to the muscle fascia to prevent any shearing effect. The muscle is elevated from below upwards taking care to ligate the intercostal perforators. The vascular pedicle is exposed and dissected towards the axilla. A subcutaneous tunnel is created into the arm to the recipient site. The flap is then tunneled through taking care not to kink the vascular pedicle or constrict it in the tunnel. The flap was adjusted in its bed and the vascularity checked again. Insetting of the flap was done by fixing the muscle to the surrounding fascia and the skin paddle to the edges of the raw area. A suction drain was fixed under the muscle. The donor site was closed primarily over a suction drain (Fig. 3) or a

split skin graft was done if undue tension was observed on the edges. The limb was splinted in extension for 6 days before beginning flexion exercises.

RESULTS

Mean patient age in this study was 28 ± 11 years with an almost equal male to female ratio. There was no operative mortality. Average hospital stay was around 4 days. Donor site infection occurred in 2 cases and grafting was needed to close the donor site in another 2 cases. Infection around the flap occurred in one case and responded to repeated dressings with no effect on flap viability. The functional outcome was satisfactory to all patients with no recurrence of contracture and an acceptable cosmetic look (Figs. 4,5).



Fig. (1): Preoperative view of case with previous attempt at release and grafting.



Fig. (2): Preoperative view showing severe contracture.



Fig. (3): Primary closure of donor site.



Fig. (4): Postoperative view of the first case after 3 weeks of release and flap coverage.



Fig. (5): Postoperative view of second case.

DISCUSSION

The elbow joint is a vital joint for performing regular daily activities as feeding, combing and holding objects [1]. This lead a lot of authors to recommend very early ambulation of this joint after burns and even suggested early grafting or local transposition flaps to cover any defects in the overlying skin to prevent stiffness from prolonged immobilization till healing occurs [6]. However, deep burns in this area can lead to exposure of vital structures in the elbow region. Aggressive debridement of devitalized and infected tissues should be followed by urgent coverage by well vascularised tissues to protect these vital structures and allow early ambulation [7].

Coverage of soft tissue defects around the elbow has many options starting from simple direct closure to free tissue transfer. It is important to note the lack of dispensable local tissues in the upper extremity rendering coverage of large defects a challenging problem. To get around this the adipofascial turnover flap from the forearm was described to cover defects around the elbow. This flap had the merit of being a one stage procedure that left no residual donor site disfigurement as it dispenses with the skin of the forearm and uses a split skin graft to cover the fascial flap [8]. However, in deep burn patients, the burn usually has a damaging effect on the local subcutaneous tissues rendering its separation from the skin unsafe for donor site skin viability [3].

The Latissimus dorsi muscle is known to be a reliable and versatile flap. It has a constant rather long neuro-vascular pedicle that is far from any damage by the burn accident in the overlying area [9]. The muscle is a flat sheet whose surface anatomy is easily delineated making identification and consequent elevation of the muscle a straight forward job. It is a dispensable muscle whose sacrifice leaves a minimum donor site morbidity [10]. The skin paddle over the muscle can cover the whole muscle and can even support a distal random skin

area due to the rich subcutaneous vascular anastomoses. This plexus is developed between smaller perforators of the major pedicle and lateral dorsal cutaneous branches of the intercostal and lumbar vessels. This is in contrast to a free muscle flap whose distal end is usually not well perfused by the smaller perforators alone [11]. The aforementioned virtues made the Latissimus dorsi muscle a valuable work-horse for coverage of shoulder, arm and elbow defects in addition to being a functional aid for restoration of elbow movements [12]. However, due to technical considerations mainly related to tunneling and inseting of the flap it was not recommended to exceed the elbow joint with this flap as this would increase the risk of flap loss [13]. To get around this a free tissue transfer could be done but this demands microsurgical technical expertise and needs far more operative time. In contrast, some authors advocated this pedicled flap for coverage of defects as far as 8 cms from the olecranon process [14]. In this study the pedicled flap reached as far as 10 cms from the olecranon process with no partial or complete flap loss in any case. This is superior to free tissue transfer as it is less time consuming, does not need special equipment and is much less technically demanding. This pedicled flap solved the problem of rapid coverage with undamaged skin to allow early ambulation of this vital joint. It is highly recommended to be considered in the armamentarium of all reconstructive surgeons confronted with defects in the elbow and proximal forearm region.

REFERENCES

- 1- Elliott L.F., French J.H.Jr., Grotting J.C., et al.: Flaps: decision making in clinical practice. Springer 1997.
- 2- Rivet D., Boileau R., et al.: Restoration of elbow flexion using the Latissimus dorsi musculo-cutaneous flap. *Ann. Chir. Main.*, 8 (2): 110-23, 1989.
- 3- Yang J.Y.: Experience with reversed medial arm flaps in the reconstruction of burned elbow scar contracture. *Burns*, 15-5: 330-4, 1989.
- 4- Mordick T.G.: Pedicled Latissimus dorsi transfer for immediate soft tissue coverage and elbow flexion. *Plastic & Reconstructive Surgery*; May, 99 (6): 1742-4, 1997.
- 5- Delay E., Toyatier J.L., Kollali et al.: Salvage of extensively burned upper limbs by a pedicled Latissimus dorsi flap. *Burns*, Sept., 21 (6): 449-52, 1995.
- 6- Elkhatab H.A.: Island fasciocutaneous flap based on the proximal perforators of the radial artery for resurfacing of burned cubital area. *Plastic & Reconstructive Surgery*; Sept., 100 (4): 919-25, 1997.
- 7- Stern P.J. and Carey J.P.: The Latissimus dorsi flap for reconstruction of the brachium and shoulder. *3. Bone Joint Surg. Am. Apr.*, 70 (4): 526-35, 1988.
- 8- Lai C.S., Lin S.D., Yang C.C. et al.: The adipo fascial

- turnover flap for elbow coverage. *Ann. Plastic Surgery*. Feb., 28 (2): 190-4, 1992.
- 9- Pierce T.D. and Tomaino M.M.: Use of the pedicled Latissimus dorsi flap for upper extremity reconstruction. *Am. Acad. Orthop. Surg. Sept.*, 8 (5): 324-31, 2000.
- 10- Sherman R.: Soft tissue coverage for the elbow. *Hand Clinics*, May, 13 (2): 291-302, 1997.
- 11- Cormack G.C. and Larnberty Gil: *The arterial anatomy of skin flaps*. Churchill Livingstone, 1994.
- 12- Chang L.D., Goldberg N.H., Chang B., et al.: Elbow defect coverage with a one-staged, tunneled Latissimus dorsi transposition flap. *Ann. Plastic Surgery*, May, 32 (5): 496-502, 1994.
- 13- Hirayama T., Tada H., Katsuki M., et al.: The pedicled Latissimus dorsi transfer for reconstruction of the plexus brachialis and brachium. *Clin. Orthop. Dec.*, 309: 201-7, 1994.
- 14- Stevanovic M., Sharpe F., Thonvi-en V.D., et al.: Latissimus dorsi pedicle flap for coverage of soft tissue defects about the elbow. *J. Shoulder Elbow Surgery*, Nov., 8 (6): 634-43, 1999.