

Original Article

Use of Muscle Flaps in Burn Reconstruction

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Abstract:

Electric burns are deep burns that by once-only or continuing stimulation of the nerves and striated muscles causes massive muscle contractions which can cause ruptures, ligamentous tears, fractures, and joint dislocations. High resistance of bone to the passage of electric current results in periosteal necrosis. Deep burns particularly electric burns when exposes structures valuable for important functions like joints, demands reconstructive options consisting robust viability and huge vascularity. The study was conducted in Department of plastic surgery and burn, Dhaka Medical College Hospital, Dhaka from June, 2011 to January, 2012. 18 patients were included in this series. Among them in ten patients gastrocnemius flap was applied, Lattissimus dorsi muscle flap was applied in 4 cases, Trapezius flap was applied in 2 cases and each of the other two patients were treated with Tensor fascia lata and Transverse Rectus Abdominis myocutaneous flap. Fifteen patients were adult and three patients were from paediatric age group. 88% of flaps were primarily used to cover exposed structures (bones and joints) and others were used to correct deformities. Complications include partial graft loss (3), joint stiffness(3), wound infection(1) and flap loss(1). Though these flaps are very commonly used in trauma reconstruction, their use in reconstruction in burn patients are included in this series.

Introduction

Burns commonly involve skin when it occurs as a result of scald or flame burn. Superficial burns usually heal conservatively on adequate management. Even in a deep burn when the full thickness of skin is involved, it can be covered by skin graft. But, deep burns particularly electric burns when exposes structures like bones or joints, demand use of flaps consisting robust viability and huge vascularity. The release of post burn scar contractures sometimes leads to exposure of vital structures like vessels, nerves or, tendons which also need flap coverage.

Advantages of Muscle Flaps

- The vascular pedicles are specific and reliable.
- The vascular pedicle is often located outside the surgical defect.
- Provides bulk for deep, extensive defects and protective padding for exposed vital structures (e.g. tendons, nerves, vessels, bones and prostheses)
- Muscle is malleable and can be manipulated to produce a desired shape or volume
- Well vascularized muscle is resistant to bacterial inoculation and infection.

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- Often reconstruction by use of muscle or musculocutaneous flaps is one stage procedure.

Disadvantages of Muscle Flaps

- The donor defect may lose some degree of function
- The donor defect may be aesthetically unacceptable
- The flap may provide excessive bulk, leaving an aesthetically unacceptable result
- Flap may atrophy over time and thus fail to provide adequate coverage
- Removal of the flap may produce contour defect in donor site

Materials and Methods

The study was conducted in Department of Plastic Surgery and burn, Dhaka Medical College Hospital, Dhaka from June, 2011 to January, 2012. Total 20 patients were treated with muscle flaps to cover the defects in different areas in body. Patients who required reconstruction by means of muscle flaps either to cover the soft tissue defects due to deep burns or, after correction of the deformity (e.g. post burn scar contracture) resulting exposed bones, joints, tendons etc.

Results

A total of 18 patients were included in this series. Among them gastrocnemius muscle flap was used in ten patients, Lattissimus Dorsi myocutaneous flap was used in four patients, Trapezius flap was used in 2 patients. Tensor Fascia Lata (TFL) and Transverse Rectus Abdominis Myocutaneous (TRAM) were used in each one patient. These flaps were used in a variety and wide range of indications (Table 1). The coverage of flaps were not confined to any anatomical region rather contributed in almost all regions of body (table 2). All but one flap survived but there were some complications like partial graft loss (6 cases), joint stiffness (5 cases), wound infection (3 cases).

Table-I
Indications of reconstruction

Indications	No. of cases
Miscellaneous soft tissue defects	6
Exposed joint	3
Exposed bones	4
Reconstruction after release of contracture	2
Chest wall reconstruction	1
Scar revision	1
Reconstruction of amputation stump	1

Table-II
Sites of reconstruction

Region	No. of cases
Anterior trunk	2
Posterior trunk	2
Upper limb	1
Lower limb	10
Head & neck	3



Fig-1: Stump of a mid arm amputation in a 40 year old man following HVEB reconstructed with LD myocutaneous flap



Fig-2: A boy of 8 years with exposed knee Joint due to High Voltage Electric Burn reconstructed with gastrocnemius muscle flap



Fig-3: Reconstruction of chest wall defects with TRAM flap



Fig-4: Reconstruction of post electric burn defect with trapezius myocutaneous flap

Discussion

Every year in Bangladesh more than 110,000 people suffer from illness of different severity due to electrical injury. Males suffer more compared to females¹. In this study all the patients needed reconstruction as a result of electric burn were male and most of the patients had electric burn from public electricity supply cables. As males commonly go out for work as labourer, they suffer from accidental electric burn more in comparison to females.

In the present days microvascular free tissue transfer has mostly replaced the diverse use of local flap worldwide. Many authors have described the use of free flaps in burn reconstruction and all of them has shown good results. Haluk Duman and his associates used Bilateral free myocutaneous latissimus dorsi flap for reconstruction of the upper limb amputation stumps due to electrical injury and recommended thorough debridement and free flap coverage of unsalvageable limbs in electrical injuries as soon as possible². In this study, in one case pedicled myocutaneous latissimus dorsi flap for reconstruction of a stump of midarm amputation was done. F. De Lorenzi and his co workers have done a study on 39 patients with burn injuries who underwent soft tissue reconstruction of different regions with 53 free flaps. Among them four patients had acute burn injuries with exposure of vital tissues and 35 patients needed reconstructive procedures after contracture release³. In this study 15 flaps were primarily used to cover exposed structures and in three cases the flaps were used to correct deformity or contracture. But in none of the cases free flaps were used. Besides covering defects or vital structures muscles can also be used to restore function.

S. O'Ceallaigh and his colleagues have performed Functional latissimus dorsi muscle transfer to restore elbow flexion in a 35 year old right hand dominant engineer having extensive electrical burn⁴. So, muscle flaps can be used in various purposes in burn reconstruction as described in literatures.

The limitations of this study were a small population size due to short duration of the study and a covering a good number of wounds with fasciocutaneous flaps. Most of the patients were lost in follow up, so a long term outcome could not be assessed. However, in most of the patients a durable cover could be achieved on discharge from hospital.

Conclusion

Muscle flaps are good options, when question of coverage arises in wound of deep burns exposing bones and joints. Though these flaps are very commonly used in trauma reconstruction, their use in reconstruction in burn patients included in this series appears invaluable.

References:

1. Mashreky SR, Hossain MJ, Rahman A, Biswas A, Khan TF, Rahman F. Epidemiology of electrical injury: Findings from a community based national survey in Bangladesh. *Injury* 2012; 43: 113-116.
2. Duman H, Ergin ER, Turegun M, Sengezer M. Bilateral free myocutaneous latissimus dorsi flap repair of the upper limb amputation stumps due to electrical injury. *Burns* 29 2003:87-91)
3. Lorenzi FD, Hulst RVD, Boeckx W. Free flaps in burn reconstruction. *Burns* 2001; 27:603-612.
4. Ceallaigh SO, K.S.A, Ali KSAM, Connor TPFO. Functional latissimus dorsi muscle transfer to restore elbow flexion in extensive electrical burns. *Burns* 2005; 31:113-115