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Case Series

Durability and versatility of free lattismus dorsi muscle flap in leg defects in tertiary care hospital

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ABSTRACT

Reconstruction of the legs and feet is challenging. Because of the composite tissue defects, inadequate and tight local tissues and poor circulation, soft tissue scarcity around the lower portion of the leg presents a significant challenge to the reconstructive surgeon. The aim of this study was to assess the outcome of free Lattismus dorsi (LD) muscle flap used for soft tissue reconstruction of leg defects. This prospective non-randomized study was conducted on 13 patients with leg defects of different causes attended emergency unit and outpatient clinic of plastic surgery department of plastic surgery and burn unit, Dhaka medical college hospital (DMCH) in the period between July 2017 and June 2018. Durability of coverage, flap success, infection and overall satisfaction were studied. The age distribution of the study population highest number of patients (46.15%) were in middle (31-40 years) age group whereas lowest are in older group (>51 years). Highest number of patients (84.61%) were standard myocutanous type of flap whereas lowest were in (15.31%) were chimeric flap and partial latissimus muscle flap. There were one case of total flap loss. Two patients had seroma formation among them one patient had partial necrosis. The outcome of reconstruction of n=13 patients 76.92% patients discharged with excellent recovery, (15.38%) patients discharged with good outcome, 1 (7.69%) patients had total flap loss. Flap is easy to dissect, anatomical variation is rare, long pedicle length which allow to anastomose with suitable recipient artery and finally donor morbidity is negligible.

Keywords: Durability, Versatility, Muscle flap, Reconstruction

INTRODUCTION

Free flaps offer a great variable of available tissues to cover larger, composite soft tissue. They also improve the perfusion of the infected and poorly perfused areas. The choice among different free flap is dependent upon their location, size and depth that is the recipient site requirement. However, reconstruction with latissimus dorsi free flap is now a versatile tool in coverage.[1] Earliest application of the latissimus dorsi for head and neck reconstruction was described by Quillen in 1978 and microvascular free tissue transfer of the flap was described by Watson in 1979.[2] The latissimus dorsi may be used to provide a sensate reconstruction when it is transferred with an intact neurovascular bundle. Importantly, using the latissimus dorsi does not compromise the use of other regional flaps such as the deltopectoral flap and pectoralis major flap, which can then be used in secondary reconstructions if required.[3] The latissimus dorsi muscle has a dual blood supply; dominant from the thoracodorsal artery, which is the terminal branch of the subscapular artery. It's a

secondary blood supply arises from posterior paraspinous perforators. The artery has a diameter of 2.5-4 mm and the vein usually ranges from 2.5-4.5 mm. Only one vein accompany the artery which is typically larger than the artery.[4]

Besides, it has very few limitations like needs of specialty centre, high performance surgical team, donor site complications like seroma formation, widened scar if larger skin paddle than 5 cm and skin grafting which creates contour deformity if greater than 10 cm width of harvested tissue. The aim of this study was to assess the outcome of free LD muscle flap used for soft tissue reconstruction of leg defects.

Flaps supplied by the subscapular axis of vessels can be harvested as combined flaps on one vascular pedicle. Here latissimus dorsi muscle can be combined with the serratus muscle on the thoracodorsal pedicle or can be combined with scapular or parascapular flaps by extending the dissection of the pedicle to the subscapular vessels.

CASE SERIES

This case series study was conducted on 13 patients with leg defects of different causes attended emergency and outpatient clinic of department of burn and plastic surgery, Dhaka medical college hospital (DMCH) in the period between July 2017 and June 2018. Durability of coverage, flap success, infection and overall satisfaction were studied. Inclusion criteria were patients with soft tissue defect in different parts of the body following trauma, burn and correction post burn deformity and presence of adequate recipient vessel identified by hand held Doppler probe. Exclusion criteria were patients with potential injuries to the pedicle of both the donor and recipient site due to previous trauma or surgery, patients with significant major co-morbid medical conditions and patients not consenting to take part in the study. Other necessary investigations were done if clinically indicated and to prepare the patient for anesthesia. Statistical analysis of the results was obtained by using window-based computer software devised with statistical packages for social sciences (SPSS-24). This study was simple random sample, every member of the population has an equal chance of being selected. Inclusion criteria were patients of both gender, patients with resolve the LD muscle flap in leg defects. Exclusion criteria were patients who would not give consent, unstable patients with resolve the LD muscle flap in leg defects.

Highest number of patients (46.15%) were in middle (31-40 years) age group whereas lowest are in older group (>51 years). The lowest age was 20 years and the highest age was 58 years. Highest number of patients (84.61%) were standard myocutanous type of flap whereas lowest are in (15.31%) were chimeric flap and partial latissimus muscle flap. The lowest age was 20 years and the highest age was 58 years. There were one case of total flap loss. Two patients had seroma formation among them one patient had partial necrosis. The outcome of reconstruction of n=13 patients 76.92% patients discharged with excellent recovery, (15.38%) patients discharged with good outcome, 1 (7.69%) patients had total flap loss.

Table 1: Age distribution and demographic characteristics of the study (n= 13).

Characteristics	N	%
Age group (years)		
20-30	3	23.07
31-40	6	46.15
41-50	3	23.07
>51	1	7.69
Mean±SD	35.65±10.81	100.0
Range	20-51	
Sex distribution		
Male	11	84.61
Female	2	15.38
Education		
Illiterate	2	15.38
Primary	5	38.46
Secondary	3	23.07
Higher secondary	2	15.38
Graduate and above	1	7.69
Occupation		
Service	1	7.70
Electrician	1	7.70
Student	3	23.07
Housewife	2	15.38
Labour/worker	2	15.38
Others	4	30.77

Table 2: Distribution of patient according to donor site morbidity (n=13).

Nature of complications	N	%
No morbidity	10	76.92
Seroma	2	15.38
Wound infection	1	7.69
Total	13	100.0

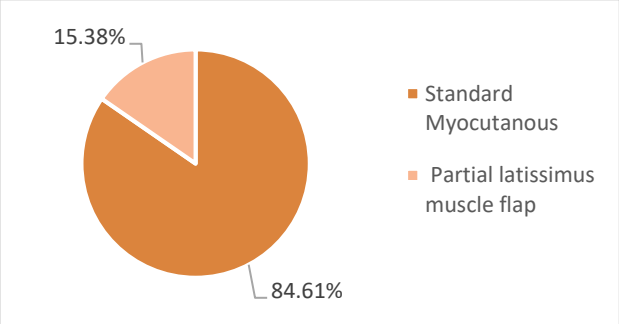

Figure 1: Distribution of patients according to type of flap (n=13).

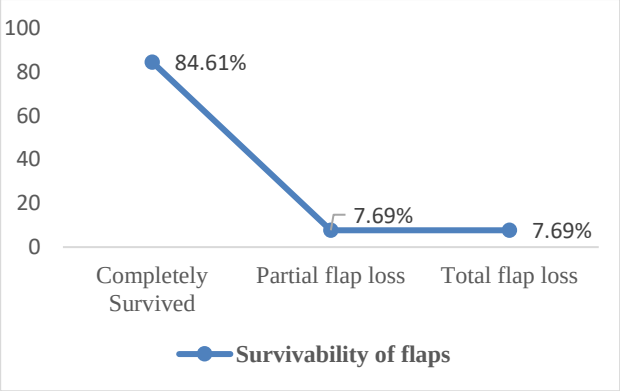

Figure 2: Distribution of patients by survivability of flaps (n=20).

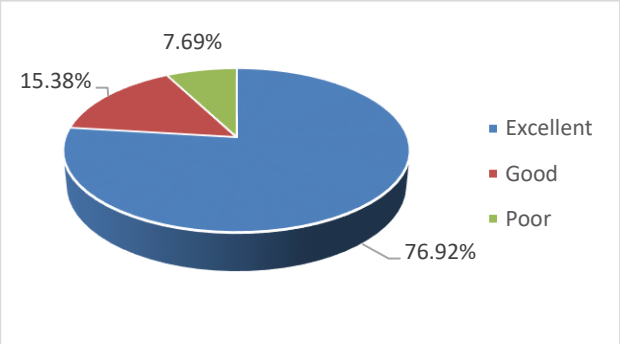

Figure 3: Outcome of reconstruction (n=13).

DISCUSSION

Reconstructive surgery is always a magnificent combination of classical principles of surgical technique, critical anatomical assessment and application with innovative formulation of newer options. It always search for near like with like matching, maximum functional regain with dynamism, finess and minimum donor morbidity. Thus every options were modified and challenged with newer ideas. In these consequences latissimus dorsi muscle flap was verified with different techniques, combination, in variable body parts with different purposes required by the recipient site.

Like other reported series free LD muscle flap has been preferred for reconstruction of extreme part of the body as lower extremity and scalp for its known favorable anatomical features.[5,6] It was the largest muscle of the body (up to 20×40 cm^2). So it became the only option when recipient site was complex and extensive. It can be taken as mega flap in combination with serratus anterior (chimeric flap) .On the other hand, it can be tailored easily partial muscle according to the size of the defect and can be harvested without significant donor site functional deficit. The vascular pedicle was long and possess vessels of compatible size to match with different vessels which allowed microsurgical anastomosis outside the zone of injury without need for vein graft.[7] In this study, free LD flap had done in different age group of patients. The age range was 20-58 years with a mean age of 35.65 years. It reflected that this type of injury was more common among young and active population. The average age was 33 years in Herrera et al with age range of seven to seventy nine. It was 26.4 in Song et al study. In Hossain et al study, the sample age range was 23-56 years with a mean age of 36.6 years. None of the available studies showed any increased tendency of flap related complications or increased recurrence rate in aged individual. So these flaps can be done safely in any patients irrespective of their age.

Sex distribution of the study was male 84.61% and female 15.38% (5.5:1). Male female ratio was found 4:1 in Hossain et al study which was also held in Bangladesh seven years back. So male female ratio showed a bit difference than previous series in Bangladesh.

This study included 13 cases of soft tissue defect in lower extremity. Among the cases of lower extremity, distal leg was involved in 10 cases. In remaining three cases, one was over ankle joint, one over dorsum and another was over sole of the foot. The study of Hossain et al included 10 cases in his study of lower extremity soft tissue defect and shows the maximum cases (50%) wound were located in the distal part of leg. Among the other locations, dorsum of foot 2 (20%), over ankle joint 2 (20%), and another 1 (10%) was in sole of foot and the rest one was in the extensive involving distal leg and foot.[8] Biswas et al which was conducted in plastic surgery department of Dhaka medical college hospital and Uttara Adhunik medical college hospital showed almost similar pattern. The have performed 10 cases of lower limb defect. There were many studies were available where LD muscle flap was performed, over the complex defect of midfoot Akcal et al lower leg Kim et al fabricated chimeric LD flap in extensive foot defect Song et al combined LD and serratus anterior muscle flap with rib for composite defect Tragnano et al.[8-11] Herrera et al performed secondary microvascular scalp reconstruction in the 23 patients; all secondary flaps completely survived except for two cases which sustained partial flap loss. Flap choices included 17 LD based flaps (two partial superior LD flaps with and without reinnervation, two LD combined with serratus flap, one LD combined with parascapular flap, one LD combined with split rib and 11 only LD flaps with STSG).[12] Thereby versatility was observed for latissimus dorsi muscle flap to be used in different combination in various parts of body.

In this study the flap dimension ranged between 120 to 384 cm^2 with an average of 229.25 cm^2. Flap dimension was 18×11 cm^2 to 8×6 cm^2 in Hossain et al study.[8] They discussed 2 cases that had marginal flap necrosis were the relatively larger ones. Although the largest flap was not associated with any complications. So there was no clear cut co-relation between increased flap size and chance of postoperative complications, as revealed in this current study also. Akcal reported two cases of midfoot bone and soft tissue reconstruction with 50-112 cm^2 perforator-

based skin island, 225-300 cm^2 LD muscle flap and 6 to 8cm^2 section of scapular bone were raised with the thoracodorsal and angular arteries following gunshot injury.[9] Herrera et al performed LD muscle flap for defect area of average of 442 cm^2 (range, 120 to 900 cm^2). The LD flap was combined with serratus, parascapular and split rib to address composite and more extensive defects in that study. For smaller defects, the latissimus can be split longitudinally on a transverse intramuscular branch of the thoracodorsal vessels to address rectus muscle sized defects. They claimed their institution first described the latissimus muscle flap as a partial superior latissimus flap, thereby preserving form and muscle function. This modification was used in two cases of smaller size defects (150 cm^2). Song et al used fabricated chimeric flap for extensive foot defects with size ranging from 23×12 cm^2 to 38×14 cm^2. Thus versatility can be found in flap dimension and composition in different studies.[17]

In the current study, cutaneous paddle was preserved only in extremity defect. It produced contour irregularities in sole and dorsum of foot. Herrera et al mentioned general preference of split thickness skin grafts as coverage to allow the muscle flap to atrophy over time and give a better overall aesthetic appearance in non-hair bearing males. The large size, predictable blood supply, long pedicle, versatility and ease of harvesting LD flap make it as their first choice for scalp coverage when necessary.[10] In this study, medial sural artery (n=3), anterior tibial artery (n=5), posterior tibial artery (n=3) and arteria dorsalis pedis were used as recipient vessel in the current study. Song et al used either anterior (n=3) or posterior tibial artery (n=2), Hossain et al used anterior tibial artery (n=5), posterior tibial artery (n=3) and arteria dorsalis pedis (n=2) as recipient vessel for lower leg reconstruction. Length of thoracodorsal vessels allowed to access variable recipient vessels for anastomosis.

In this series, major flap loss occurred two in one case. The cause was postoperative venous thrombosis started on 2nd POD in scalp case and on 4th POD. Re-exploration was done but failed. Hossain et al study revealed, out of their 10 cases 6 (60%) cases healed without any complications. Wound infection occurred in 2 (20%) cases, flap margin necrosis occurred in 2 (20%) cases. There was no incident of total flap loss. Out of the 4 cases that had postoperative complications 2 (20%) were treated conservatively, 2 (20%) were treated with excision of unhealthy margin followed by direct closure. None needed any advancement after excision or any other alternative procedure of reconstruction.[8] In the 8 cases operated by Bishwas et al there was no report of postoperative wound infection, only one case developed total flap loss due to logistic problem. Necrosis of distal tip of flap occurred in 2 (20%) cases which were repaired with excision and direct closure in both of the study.[13] In the study of El-Shazly et al there was a intraoperative failure of free LD flap. It occurred due to patient's hemodynamic instability through the procedure in the form of an insufficient intravenous fluid therapy and inadvertent vasopressor injection to raise the blood pressure by a junior anaesthesist, which led to irreversible arterial spasm. This patient was treated then with a temporary coverage by a STSG. But they didn't mention about postoperative infection or partial flap necrosis.[14] The overall microvascular success rate in Herera et al series showed 92% which was consistent with the literature's success rates.[10] Kim et al showed all his flaps survived with minor complication was there like donor site wound disruption.[15]

This series showed outcome of reconstruction was excellent 10 (76%) in term of no infection, no flap loss and excellent flap adhesion, good 2 (15.38%) as there was seroma formation or minor donor site infection or marginal necrosis but salvagable and poor 1 (7.69%) due to total flap loss. The study of Hossain et al revealed 6 (60%) good acceptable in 4 (40%) cases. None of the cases had any poor outcome.[8] No debulking procedure was performed in our study as well as in the 8 cases operated by Bishwas et al.[13] In that study, they mentioned that different studies showed that the flap reached its maximum bulkiness in the 1st month and then gradually become static after a mean of 7.8 months with no further changes for at least 23 months. The mechanism of edema formation was free flap was still unclear. Out of their 10 flaps, 7 flaps were bulky at the end of 7 month. They were using pressure stockings.[2] Song et al used the flap combination which provided the patients with both more tissues and better functions. Most of the functional areas obtained effective coverage and no recurrent ulcer and flap breakdown developed in chimeric flap areas in their 3.5 years long follow up period.[11] Trignano et al showed the result at 2 years from surgery which was also was good both from an aesthetical and functional point of view as the patient was able to walk without support and wear shoes. Only one patient required debulking procedure. The patients occasionally complained of foot pain when standing or walking for a long time.[12]

In this series the follow up period was very short only 3 months and the flaps showed excellent result within this follow up period. But to see its effectiveness in the long run, a longer follow up was needed.

The present study was conducted in a very short period due to time constraints and funding limitations. The small sample size was also a limitation of the present study.

CONCLUSION

LD free muscle flaps are useful with high versatility for a range of defects and complex reconstructive problem. It contains maximum tissue components and can be tailored to fulfill the recipient site requirement.

Recommendations

This study can serve as a pilot to a much larger research involving multiple centers that can provide a nationwide picture, validate regression models proposed in this study for future use and emphasize points to ensure better management and adherence.

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