

ORIGINAL ARTICLE

Reliability of Single Perforator Based Free Anterolateral Thigh Flap Reconstruction among Children with Post Traumatic Limb Defects

SHIZA, MUHAMMAD ASLAM KHAN, WASEEM HUMAYOON, HASSAN SAEED KHAN, AMMAR ALI RAZA, FARHAN GOHAR

*Department of Plastic Surgery, Children's Hospital, Lahore**Correspondence to Dr Muhammad Aslam Khan, Assistant Professor. Email: muhammad.raoaslam@gmail.com***ABSTRACT**

Aim: To evaluate reliability of anterolateral thigh flap based on a single perforator in pediatric population for lower limb post traumatic defects.

Study design: Retrospective cross sectional study

Place and duration of study: Pediatric plastic surgery department of the children hospital & university of child health science, Lahore from January 2018 to January 2022.

Methodology: After approval from ethical review board, 50 patients who underwent a free Alt flap reconstruction were included in this retrospective analysis. All flaps for lower limb post traumatic raised on a single perforator were included and reliability of flap was assessed for technical feasibility, outcomes and safety. Data was entered and analysed in SPSS ver: 21.0 and presented as frequency and percentages.

Results: Mean age was 8.2 ± 3.45 years 64% were males. 96% had undergone road traffic accident (4% burn). Lower limb was affected in majority of patients 80% (upper limb 20%). 78% of patients were discharged at 10th post-operative day and 8% had partial flap loss.

Conclusion: We concluded in this study free tissue transfer of anterolateral thigh flap based on a single perforator in children for covering large defects is a reliable method with good safety margin and minimal complication rate.

Keywords: Anterolateral thigh flap, single perforator, pediatric population, free flap, free tissue transfer, perforator flap reliability

INTRODUCTION

The lower extremity is one of the most frequently injured body parts in high-energy traumas, such as motor vehicle accidents and falls from height. Once high-energy traumatic injuries occur in the lower limbs, the injuries typically result in heavily contaminated open tibia fractures, which require repeated radical debridement. However, multiple debridements may create extensive soft tissue defects with exposed bone in some patients, and reconstructing these defects can be technically challenging, even for experienced surgeons¹.

Pediatric population now presents with enormous challenges due to increasing incidence of road traffic accidents and burns leading to large defects which are difficult to be reconstructed with simple procedures like grafting, local and regional flaps. Since the first description of free groin flaps in children by Hari and Ohmori in 1975, free tissue transfers have become popular in pediatric population as well² and with time anterolateral thigh flap has become workhorse flap in pediatric reconstruction. The versatility of this flap allows it to be used in various anatomical locations. Free flap reconstruction has become the paradigm of reconstructive surgery in plastic surgery over the last few years but there has been reluctance and apprehension in its use in young population due to misconception of its technical feasibility and complications. But in recent years with better understanding of pediatric patients anatomy and advances in microsurgical techniques, pediatric free flap transfer has gained widespread acceptance³.

The ALT flap offers many benefits, including thin, malleable skin; useful pedicle vessels with sufficient length and caliber; and the ability to be harvested as various combinations of tissues, such as skin, fascia, and muscle. Although the ALT flap has been widely used to reconstruct massive soft tissue defects, the maximum size of the ALT flap, free from the risk of partial flap necrosis, has not yet been clearly determined. However, some surgeons have suggested that the upper limit of skin paddles that can be harvested based on a single perforator ranges from 240 to 630 cm²^{4,5,6}.

With the introduction of ultra-delicate microsurgical instruments and fine suture material with 30 to 80 μ m needles, the surgeon has become more comfortable performing microsurgical

reconstructions in pediatric patients⁷. The initial concerns regarding increased chances of vasospasm in pediatric population has been negated by researches showing data that vessels in children are not more prone to spasm since the immature vessels has less component of muscle than the adult⁸.

Anterolateral thigh flap has over the time become the preferred "workhorse flap" for reconstruction due to its consistent anatomy and versatile nature. It is because of the unique anatomy of the thigh, various types of tissues can be included in the flap based on the defect size and requirement⁹.

Anterolateral thigh (alt) flap based on the descending branch of the lateral femoral circumflex artery was first introduced by song et al. in 1984¹⁰ and further was popularized by koshima et al in 1993¹¹. It can be harvested as suprafascial flap when a thin flap is required¹² or as a fasciocutaneous flap which is ideal to cover superficial complex wounds, providing excellent gliding surface for tendons & most importantly, can easily be elevated when staged tendon, bone or nerve reconstruction is expected¹³. The persistent cutaneous perforators at known anatomical sites¹⁴ allow easier and faster intraoperative dissection. Our retrospective study was thus conducted to evaluate the reliability of single perforator alt flap in children by demonstrating its technical feasibility, outcomes and safety.

METHODOLOGY

A retrospective study was conducted in a period of 4 years. by analyzing the personal information, indication of surgery, wound size, duration of hospital stay and post op Complications of patients who have undergone free ALT reconstruction for lower limb. Study was conducted in Pediatric plastic surgery department of Children Hospital & university Of Child Health Science, Lahore from January 2018 to January 2022. All Patients with exposed vital structures on lower limb having defects large enough which could not be covered with local or distant flaps were included in study. Patients with bleeding disorders or having syndromes or cardiac issues were excluded from the study.

Data collection procedure: The hospital and office records of 50 patients having undergone free alt flap from January 2018 to January 2022 in department of plastic surgery in children Hospital Lahore were analyzed. Personal information, indication of surgery, wound size, duration of hospital stay and post op complications of patients who have undergone free ALT reconstruction for lower limb were noted.

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RESULTS

Fifty 50 patients between 10 months to 12 years of age were included in this study with mean age of 8.2±3.42 years. 64% of them were boys. Out of these 96% of the patients had undergone road traffic accident leading to defects large enough to be treated by a free flap while 4% had undergone extensive burn injuries leading to post burn contractures and deformity which was treated with release of contracture leading to a defects large enough that could only be treated with a free flap reconstruction. Lower limb was affected in majority of patients accounting for 40(80%) while upper limb was affected in 10(20%) of patients.

Table 1: Demographic and clinical characteristics of subjects

Variables n= 50	Frequency	Percent
Age Mean±SD = 8.2±3.42 years Min = 8 Max = 12		
< 4 years	28	56.0
5 -12 years	22	46.
Gender		
Male	32	64.0
Females	18	36.0
Cause of Injury		
Road traffic Accident	48	96.0
Burn	2	4.0
Site of Injury		
Upper limb	20	20.0
Lower limb	40	80.0
Complications		
Partial Flap loss	4	8.0
Venous Congestion	4	8.0
Donor site infection	2	4.0

The average size of defect was 120cm². Outcomes were assessed by comparing early post operation complications at donor and recipient site and length of hospital stay. 64(78%) of patients were discharged at 10th pod, 12% at 11th pod and rest 10% at 12th & 13th day. Complications with reference to arterial thrombosis, venous congestion, re-exploration, hematoma/seroma, partial flap loss and complete flap loss were taken into account. 4(8%) patients had venous congestion leading to partial flap loss which was treated with conservative management with multiple dressings and split thickness graft at secondary operation.2(4%) patients had donor site infection which was treated with wound wash and daily dressings.

Fig. 1: 10 years old patient received ran over INJURY leading to a defect of 8*10 cm on dorsal surface of his right foot with exposed tendons. Debridement was done & recipient vessel was explored and prepared for anastomosis. Perforators of contralateral Alt flap were marked using a hand held Doppler and a fasciocutaneous flap based on a single perforator was raised



Fig. 2: Dorsal defect debrided, flap marked and elevated and anastomosed. Last picture shows flap at 3 months follow up



Fig. 3: This ill-fated 12 years old boy received a post road traffic accident wound over dorsal aspect of his left forearm and hand with a defect of approximately 11*8 cm with extensors exposed. ALT was raised and insetted. flap at 3 months follow up



DISCUSSION

In the pediatric population, reconstructive microsurgery has gained widespread acceptance after an initial period of concern regarding the technical feasibility and reliability of the procedure. In the same way, perforator free flaps have been shown to be a valuable alternative in children¹⁵.

Pediatric age group has always been a surgical challenge for surgeons. Reluctance in performing complex procedures hindered the use of advanced microsurgical procedures for a long time in this population. Harii et al¹⁶ first reported about microsurgery in pediatric patients in the mid-1970s, despite its consideration as technically difficult because of the size of the vessels and the tendency for vasospasm. Today, high success rates and good results in pediatric free flap reconstruction have been reported.

In a 3-year retrospective study of 1148 cases at a tertiary center within the country, more than 50% of all injuries in children were consequent to road traffic accidents, but only approximately 10% of them involved the lower limb; such injuries were more likely to occur in the 6 to 15 years of age groups. School going children are more vulnerable to sustain lower limb injuries following road accidents, and these predominantly involve the ankle and foot rather than the leg¹⁷. In our study similar pattern was seen as road traffic accidents being the primary etiology of trauma and affecting lower limbs of school going patients.

In a study conducted with 102 free ALT flaps for the reconstruction of traumatic foot defects in children, 95.1% of flap survival rate was noted with only two complete and three partial flap losses due to vein thrombosis¹⁸ which is very close to our own study experience.

CONCLUSION

We concluded in this study free tissue transfer of anterolateral thigh flap based on a single perforator in children for covering large defects is a reliable method with good safety margin and minimal complication rate. No major complication was seen in any of the patient and single perforator free ALT flap is an excellent option to cover large defects in pediatric population.

Recommendation: Based on findings of our research we recommend that a prospective study with a larger sample size should be conducted and we recommend that with proper surgical expertise and equipment free anterolateral thigh flap should be utilized as a good and reliable option for reconstruction of large defects.

Conflicts of interest: None

Funding: Care of patients was done under the shadow of government of Pakistan.

Ethical Approval: Ethical approval and informed consent was taken from ERB of Children hospital Lahore.

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