Original Research Article

Hemisoleus muscle flap for middle one third leg defect- An Institutional Experience

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Abstract

Introduction: Road traffic accidents [RTA] are very common worldwide. In RTA lower limb trauma are very common. In emergency room compound fractures of leg are managed with slab, dressing, fluid resuscitation with assessment of distal vascularity.then finally skeletal stabilisation and soft tissue reconstruction. **Purpose:** The aim of this study to reconstruct the middle 1/3 leg defects with exposed bone , using hemisoleus muscle flap. **Method:** Twelve patients with defect in the middle 1/3 of leg are included in our study. We did hemisoleus muscle flap with split thickness skin grafting [STSG] in each patient. These procedures performed between Year 2014 to 2016 in national institute of medical science, Jaipur. India **Result:** All the patients having middle 1/3 leg defect because of trauma. We planned medial hemisoleus muscle flap to cover the exposed bone. No necrosis of any flap with complete taken up of STSG. All patient has gone for secondary orthopaedic procedure without any flap complications. **Conclusion:** Hemisoleus muscle flap is very authentic & reliable flap with rich vascularity to control the infection also in middle 1/3 leg defects.

Keywords: RTA,Necrosis

Introduction

Road traffic accidents [RTA] are very common worldwide. In RTA lower limb trauma are very common. In emergency room compound & complex fractures of leg are managed with slab, dressing, fluid resuscitation with assessment of distal vascularity.then finally skeletal stabilisation and soft tissue reconstruction[1-5]Lower limbs have some special characteristics because of which leg wounds are difficult to manage as poor elasticity of skin, little subcutaneous tissue, terminal arterial vascularisation system, [6,7]subcutaneous bone (tibia) and difficulty in venous return by the orthostatic position[9,10]. We have to take these anatomical characteristics in mind to reconstruction of the leg wounds.Considering all above mention characteristics muscle flaps are best option for reconstruction of leg defects. Among these hemisoleus muscle flap is a good choice to cover the defect over middle 1/3 of leg even on osteomyelitic bone too.The soleus is a large muscle, richly vascularised by the posterior tibial artery at segmental level . This flap is very versatile & having a large bulk with good arc of movement. Hemisoleus muscle flap is a half width of whole muscle taken as a flap so no post surgical flap to reconstruct the middle 1/3 leg defects and having good results weakness in plantar flexion will remain there.This is a reterospective study to show the usefulness & effectiveness of hemisoleus muscle without any complications and post operative sequels.

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Methodology

This is a case series in retrospective manner. We included the between 2014-2016. We ensure the quality and consistency of this flap. For this study, twelve patients with post traumatic raw area in the middle third of the leg were selected to cover the defect by Hemisoleus muscle flap.The patients were admitted in the Plastic Surgery Dept of National Institute of Medical Science located in Jaipur, India. Each patient had undergone orthopaedic procedure which was external fixator for skeletal stabilization. The surgeon is a specialist member of the Indian Society of Plastic Surgery and having performed many lower limb surgeries in this hospital. Most of the patients had trauma as the cause of the raw area with exposed bone. Patients' ages ranged from 17 to 59, resulting in an average of 38. There was a predomi- nance of males(75%). As preoperative evaluation, some exams as hemogram, renal function test, proteins and blood sugar were required, besides clinical and cardiological evalua- tion. Besides that, it was instituted a prophylactic antibiotic. Surgery was performed in regional anesthesia. To delimit the area, a line was drawn with methylene blue.

Surgical technique

All surgery were done under tourniquet control. First deride the all devitalised tissue and freshen up the margins.A medial incision was made in the leg, from the medial malleolus to the upper third of the tibia. With the muscles exposure, it was possible, in an easy way, to dissect the soleus to the gastrocnemius. The secondary pedicles were

identified and tied with silk 2.0. The Achilles tendon was separated, allowing a good arc of rotation and divide the muscle in midline through the axis of the muscle and cover the entire exposed tibia. Moreover, cuts were made in the aponeurosis muscle in order to lengthen & widening of the flap, without tension in the muscle borders. The stitches were made in three planes, using vicryl 2.0 or 3.0. Then split thickness skin grafting done on muscle flap. A drain was placed in the posterior region of the leg to drain out collections and it was removed in about four days later. Postoperatively, the patients were hospitalized for approximately 5 days. After that, the patients were followed up in an outpatient basis.

Result

Among these twelve patients, there were nine men (75%) and three women (25%). The ages ranged from 17 to 59, resulting in an average age of 38. All cases , the cause of the injuries was trauma, with bone exposure in all of them, being motorcycle accidents the most prominent. Two patient had osteomyelitis (16.6%), rest (83.4%) having exposed bone without osteomyelitis. As comorbidities, there were two case of hypertension, two of diabetes and three of smoking. (Table 1). Five days after the surgery , patients were discharged. Thus, the hospitalization period was around 6 days. After that, the patients were followed up in an outpatient basis after 10 days, 1 and 6 months and one year. There was one case of infection, with no necrosis of flap or suture dehiscence, neither systemic complication. There were no necrosis of flaps or suture dehiscence, neither systemic complications. In our study no any patient needed further plastic surgery procedure, being categorized in Grade 1 in accordance with the Clavien-Dindo Classification

Table 1:Clavien-Dindo Classification

S.No.	Sex	Age	Comorbidities	Etiology	Complication
1	M	38	Smoking	Trauma	
2	M	59	Diabetes, HT, Smoking	Osteomyelitis	Infection
3	M	31		Trauma	
4	F	17		Trauma	
5	M	32		Trauma	
6	M	24		Trauma	
7	M	51	Diabetes, HT	Trauma	
8	M	30		Trauma	
9	F	55	Smoking	Trauma	
10	F	43		Trauma	
11	M	39		Trauma	
12	M	40		Trauma	

Below, three cases are presented to better illustrate the use of the hemisoleus muscle flap in our service:

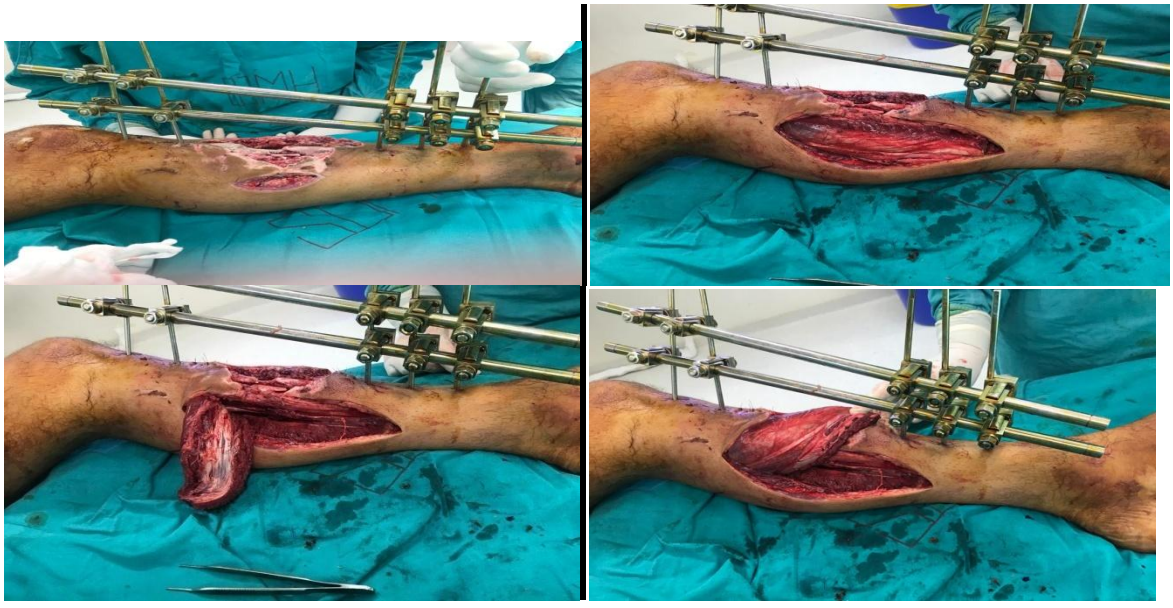

Fig 1:Case 1: Male, 24 years-old, motorcycle accident

Fig 2:Case 2: Female, 43 years-old, runover injury [hemisoleus muscle flap with inferior based fasciocutaneous flap]

Fig 3:Case 3: Male, 40 years-old, motorcycle accident

Discussion

In present scenarios leg defect with exposed bone are due to trauma [3], being related to car or motorcycle accidents or run-over accidents. Moreover, most of them have complex trauma wound and extended treatment by multiple faculties. In addition to that, most patients are economically active for their family & society causing a significant socioeconomic effect. Thus, the aim of the reconstruction is to provide maximum functional ability for the patient to return to work activities as soon as possible [6, 10].Lower limbs have some special characteristics because of which leg wounds are difficult to manage as poor elasticity of skin, little subcutaneous tissue, terminal arterial vascularisation system, subcutaneous bone (tibia) and difficulty in venous return by the orthostatic position[9,10]. We have to take these anatomical characteristics in mind to reconstruction of the leg wounds.In order to reconstruct leg defects, the leg is divided in three zones (proximal, middle and distal) [2, 10]. For the proximal third of the tibia, the gastrocnemius muscle flap is the best choice. For the middle third, the hemisoleus muscle flap is a good option, being frequently used [2, 7, 8]. Sural flaps can reconstruct the distal third of the tibia, for example. Besides that, free tissue transfer are an option to all regions, though, in case of trauma, it is harder to prepare the receiving area after 72 hours because of fibrosis formation and tissue devitalization. After this procedure, grafts can be necessary to cover skin [9].One of the best options for regional reconstruction is the use of muscle flaps, due to its ability to provide good tissue bulk, cover the defect effectively , increase local blood circulation and good blood circulation helps to fight infections [3]. The muscle also provides a good environment for osteogenesis, because of the expression of transforming growth factor-β (TGF-β), interleukine-6 (IL-6) and fibroblast grow factor-2 (TNF-2) [4, 5]. Another option is the fasciocutaneous flap, that is less invasive than the muscle flap and has less blood flow and tissue oxygen tension as compare to muscle flap. Despite that, the muscle has a greater and faster wound repair, considering the facts mentioned above [4]. Another one is the

perforator propeller flap, that has good blood supply and preserves the vascular axes of the limb, although it needs a meticu- lous dissection to isolate the vessels, being careful not to damage them. Besides that, primary closure of the donor site is allowed in most of the cases [12]. If all of these flaps were compared, fasciocutaneous and perforator propeller flap provide a relative facility of elevation if a secondary procedure was necessary [5], but muscle flaps are still the best option for covering leg wounds.Among these the hemisoleus seems to be a good choice option to cover the defect in the middle third of the leg even on osteomyelitic bone too. [13].The soleus is a very large muscle, located in the deep posterior compartment of the leg and originated from the tibia, superior part of the fibula, in the intermuscular septum [1, 2, 3]. It is highly vascularized muscle supplied by the posterior tibial artery and its secondary pedicles [1, 2, 8]. As a muscle flap, it has been used to ensure a rich vascular supply to the defects [13]. Its major function is the plantar flexion of the foot [3], but when the muscle is cut, it loses its function, being taken over by the gastrocnemius muscle and remaining lareral half of soles muscle. [2, 16]The raising of this hemisoleus muscle flap is an easy technique and expendable to reconstruct the defects [8] and has great versatility and having Large bulk with good arc of movement and with richly vascularised being able to cover bone areas [3]. Also, it is useful for controlling infection [1, 13] because muscle flaps allow the supply of antibiotics substances [2]. In addition to that, this muscle flap has minimal complications and postoperative sequels [11].

Conclusion

In this study, the hemisoleus muscle flap was used to reconstruct middle third of the leg defects with exposed bones. This flap can be executed very easily, learning curve is very steep and results are very satisfactory. Moreover, it has negligible functional sequelae. In all cases, our aim was achieved with a great evolution. Therefore, the value of this paper is to reprise the truth that even though the technique is old but old is gold so muscle flaps should not be forgotten, as they may, in some occasions, be a first & valuable option as local flap.

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