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Original Research Paper

Plastic Surgery

USE OF A COMBINATION OF TWO IPSILATERAL FLAPS TO COVER POST TRAUMATIC LEG DEFECTS

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ABSTRACT

INTRODUCTION-With advancement in the microsurgical techniques the free tissue transfer has become the first choice to manage large leg defects which cannot be covered with a local flap.The other option is the cross leg flap.Free flaps need an expert team, expensive instruments and plenty of time. Cross leg flaps lead to a difficult postoperative period for the patient. When the tissues surrounding the defect are healthy and a careful planning is done, a combination of two local flaps which are otherwise used singly for smaller defects may obviate the need for a free or cross leg flap in certain cases.In this study we evaluated the patients who had undergone a combination of gastrocnemius muscle and fasciocutaneous flaps for covering the large leg defects.

AIMS AND OBJECTIVES-The aim is to study the role of a combination of two local flaps to provide cover for the large leg defects.

MATERIAL AND METHODS-A retrospective analysis of 30 patients operated from June 2016 to July 2021 for the leg defects involving the upper 2/3rd of the leg was done.In these patients the upper half of the defects was covered with gastrocnemius muscle flap and the lower half was covered with inferiorly based fasciocutaneous flap. All patients had been followed till the wound cover became stable.

RESULTS-All patients were males between the age group of 16 to 46 years. Leg defects were exposed tibia or implant and were post-traumatic in all the cases. Size of the defects ranged from 16cm to 18cm. In all the patients both flaps survived well. Two patients had marginal necrosis of fasciocutaneous flap and one had discharge from underneath the muscle flap but were managed conservatively.

CONCLUSION- A combination of gastrocnemius muscle and fasciocutaneous flaps is a safeoption for covering large leg defects involving the upper 2/3rdwhere surrounding skin and muscles are healthy.

KEYWORDS : Gastrocnemius muscle flap, fasciocutaneous flap, leg defects, trauma

INTRODUCTION

The lower limb defects resulting from trauma constitute the most common of all soft tissue defects and require the services of a plastic surgeon for providing the suitable cover. For convenience for the purpose of providing soft tissue cover the leg is divided into three parts upper, middle and lower 1/3rd [1]. Traditionally the soft tissue defects restricted to the upper 1/3rd are covered by gastrocnemius muscle flap, middle 1/3rd are covered by fasciocutaneous flap and lower 1/3rd by cross leg flap or free flap. For larger defects free tissue transfer is the only option. The facility of free tissue transfer or microsurgery is still not available in many institutions. Various patient-related factors may preclude the use of free flaps even in units with available expertise and infrastructure [2]. The fasciocutaneous flaps and gastrocnemius muscle flaps provide a reasonable stable cover for the middle 1/3rdand the upper 1/3rddefects respectively[3,4].The use of a combination of these two local flaps from the same leg to cover the larger leg defects can be expected to be a good alternative for free flap cover.

AIMS AND OBJECTIVES:

The aim is to study the role of a combination of two local flaps to provide cover for the large leg defects.

MATERIAL AND METHODS

After taking approval from the institutional ethical committee (Vide letter no GMC/IEC/21/SS/44 Dated3/11/2021), a retrospective analysis of 30 patients from a tertiary care hospital in Punjab who were operated in the department of plastic surgery for leg defects, from June 2016 to July 2021 was done. The record of these patients who had post traumatic soft tissue defects of the leg or exposed implant after undergoing ORIF under Orthopaedics department was studied in detail. All the patients were males between the age group of 16 to 46 years (mean age was 29 years). The aetiology, site and size of the wound were recorded. The patients had undergone routine investigations (CBC, RFTs, LFTs, and viral markers). The surgery was done under spinal anaesthesia in all cases. The patients having defects restricted to upper 2/3rd of the leg and knee were included. The patients in which lower 1/3rd was involved were not taken. None of the patients included suffered from any medical problem or peripheral vascular disease.All patients had been referred from orthopaedic department after initial management in the form of debridement and bone fixation.

It was found that for the sake of ease of planning of surgery all defects were divided into two halves upper half and lower half. The upper half which actually was over upper 1/3rd of the leg or knee was planned to be covered by gastrocnemius muscle flap. The lower half which actually was over middle 1/3rd of the leg was planned to be covered by inferiorly based fasciocutaneous flap.

Operative records of all the patients were studied in detail. In the procedure adopted, the inferior based fasciocutaneus flap was planned in reverse based on the perforators of Posterior Tibial artery in cases where medial head of gastrocnemius muscle was planned and the perforators of Peroneal artery in cases where lateral head of gastrocnemius muscle was planned. The fasciocutaneous flaps were raised by the method described by Bhattacharya and Watts [3]. After raising the fasciocutaneous flap gastrocnemius muscle flap was raised by the standard method described in Grabb's encyclopaedia of flaps [4] and insetted over the upper part of the defect. The inset of the fasciocutaneous flap done over the lower part of the defect. SSG was harvested from the opposite thigh in all the cases and applied to cover the muscle flap as well as the donor area of the fasciocutaneous flap. ASD was done. Foot drop POP splint was given to immobilise the limb. Primary dressing was done on 5th postoperative day. Drain was removed by 7th postoperative day. The sutures and staplers were removed on 10th postoperative day. All patients were followed biweekly till the flap cover became stable. (Figures 1&2)

Figure1. A case of posttraumatic soft tissue defect upper 2/3rd of leg covered with medial inferiorly based fasciocutaneous flap and medial head of gastrocnemius muscle (a) Pre-operative (b) intraoperative with both flaps raised (c) flaps inset over the defect (d) skin graft applied over the gastrocnemius muscle and donor area of the flap (e) Post-operative day 7

Figure2. A case of posttraumatic soft tissue defect over knee and upper part of leg with exposed implant as well as tibia, covered with lateral inferiorly based fasciocutaneous flap and lateral head of gastrocnemius muscle (a) Pre-operative (b) Post-operative(c) Post-operative day 7 (d) Post-operative 3 months

RESULTS

All the patients were males. All had post traumatic soft tissue defects. The size of the defect ranged from 16 cm to 18 cm in length (mean 16.8 cm) and 7cm to 9 cm in width (mean 8cm) (figure 3). 20patients had exposed bone as a result of road side accident. 9 patients who were also victims of road side accident had exposed implants as well as exposed bone. One case was of gunshot injury leading to loss of bone as well as soft tissue (figure 4). The exposed bone was tibia in all the cases. In 18 patients (60%) medial gastrocnemius muscle head and fasciocutaneous flap based on the perforators of Posterior Tibial artery were used. In 12 patients (40%) lateral gastrocnemius muscle head and fasciocutaneous flap based on the perforators of Peroneal artery were used (figure 5).

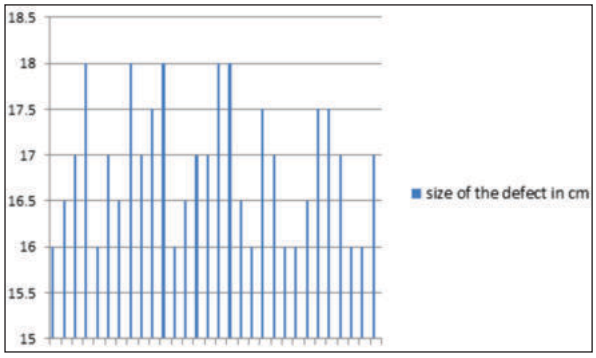

Figure 3: distribution of the patients with respect to the size of the defect.

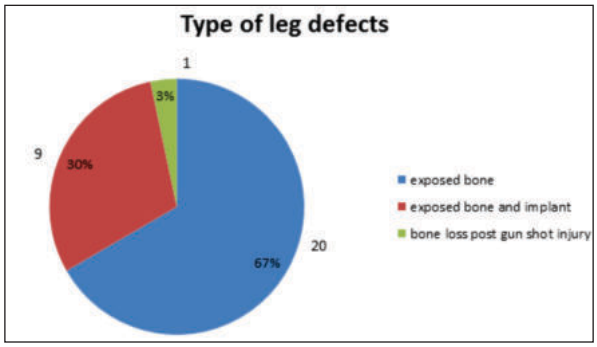

Fig 4: Distribution of patients with respect to the type of leg defects

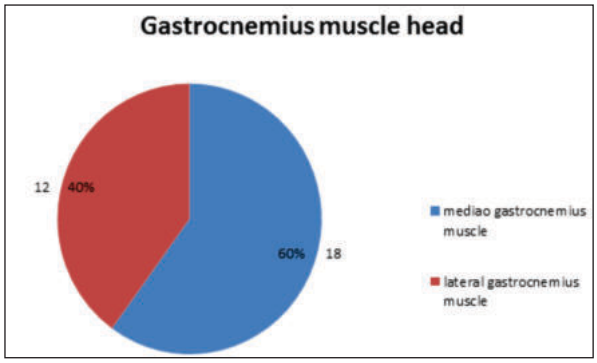

Fig 5: Distribution of the patients with respect to the gastrocnemius muscle head used

The duration of the procedure ranged from 105 minutes to 120 minutes (mean 115 minutes).

Two patients had marginal flap necrosis. One patient had discharge from underneath the gastrocnemius muscle flap. They were managed conservatively. Both flaps survived well in all the cases.

At the end of three weeks all flaps healed and became stable.

Bony union/fracture healing evaluation was not a part of this study.

DISCUSSION

Microsurgical free tissue transfer is now regarded as the gold standard in the management of complex lower extremity trauma in most centres[5-7]. With more and more training in microsurgery,free flap transfer is being performed with more ease and increased success rate[8]. This is first choice for

reconstructing lower extremity defects in many centres[2]. However situation may arise in which an alternative method may be necessary and cross leg flap becomes a simple and effective option[9]. The cross leg flaps and flaps from a distance may give good results but the disadvantages of both of them are well known. Free flap technique needs a trained team, expensive instruments and plenty of time [10].

The immobilisation of both the lower limbs together for 3 weeks, joint stiffness and chances of thromboembolism are certain difficulties faced with cross leg flaps.

Ponten in his experience of 23 fasciocutaneous flaps where 20 out of 23 flaps survived stressed the importance of these local flaps which he considered is the simplest procedure in lower limb reconstruction. Comparing the free flap with a local skin flap he pointed that a local flap is much simpler,requires less time and involves less risk to the patient[10].

Gastrocnemius muscle flap is very reliable flap for the coverage of upper leg or knee defects. It is easy to extract and has a reliable blood supply and is the flap of first choice for upper 1/3rd of leg and knee [4,11,12]. Even if some authors enlarge the size of gastrocnemius muscle by scoring and claim to cover very large defects by this flap but truth is it cannot be reached beyond knee or upper one third of leg. Fasciocutaneous flaps though ideal for middle third have been used for upper third as well as lower third leg defects with success[1,10].In the study done by Chittoria et al all 20 fasciocutaneous flaps survived well[1] but they alone cannot cover large defects involving more than 1/3rd of leg. The defects restricted to the lower 1/3rd of leg and around ankle require RSA or cross leg flaps[3].Perforator flaps have been claimed as an alternative to free flaps in a study done by Yasir etal[13] but even in their study the defects were limited to 1/3rd of the leg only.However Rao et al in their study on 25 cases of upper 2/3rd leg defects used gastrocnemius myocutaneous flap successfully with partial necrosis in 8% and discharge in 16% of cases[14].

In cases where even if tissues surrounding the defects are not crushed or degloved and perforators of vessels are expected in good condition but the defect is large and involving nearly 2/3rd of the leg, the coverage by any one of the local flap is not possible. The combination of two local flaps can save the patient from the cross leg or free flap.

Inferiorly based fasciocutaneous and gastrocnemius muscle flaps are very reliable, sturdy and stable flaps used routinely in every plastic surgery unit for leg defects. Therefore reliable results can be expected if we select these two flaps for a combination. Gastrocnemius muscle can be easily harvested after raising fasciocutneous flap. In our study we selected only those patients where the defects involved the upper 2/3rd of the leg and covered the upper part of the defect with gastrocnemius muscle flap and the lower part with the inferiorly based fasciocutaneous flap. Use of cross leg flap and free flap for these large defects involving the upper and middle third of leg could be obviated by use of a combination of flaps. In all cases flaps survived well. 2 cases (6.7%)with marginal necrosis and1 case (3.3%) with discharge which were minor complications were managed conservatively.

In another study a combination of medial gastrocnemius and hemisoleus flaps for large or double soft tissue defects was used with success[15].The advantage of our procedure may be that we used only one head of gastrocnemius muscle well preserving the other head and soleus and thus the power of lower limb. In relation to fracture healing, recent studies show that no difference exists in fracture healing between muscle flap and fasciocutaneous flap[16].

When there is degloving of the skin a fasciocutaneous flap cannot be planned reliably. In case of injury to the muscles, they cannot be used as a flap [11]. The other limitation is the defects involving the lower 2/3rd where combining two flaps may not be possible therefore these defects were not included in our study. In such a situation there is no alternative to free flap or a cross leg flap.

The value of free flap transfer technique cannot be underestimated and its supremacy in lower limb reconstruction is unchallenged but in an institution where the department of plastic surgery is small with limited man power and resources the combination of two local flaps can be a useful tool and save patients from referrals to the higher centres in spite of few aforementioned limitations.

CONCLUSION

The use of a combination of gastrocnemius muscle and fasciocutaneous flap is a safe and reliable alternative to free tissue transfer or cross leg flap for covering of large leg defects restricted to upper 2/3rd and with reasonably healthy surrounding skin and muscles.

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