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To study and analyse various management options of middle one third leg defects

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Abstract
Aim: To study and analyse various management options of middle one third leg defects.
Methodology: This Prospective Clinical study conducted in the department of Plastic and Reconstructive surgery, Osmania General Hospital, Hyderabad, Telangana includes 30 cases of middle one third of leg defects admitted between November 2016 to November 2018.
Results: Age of the patients ranged between 20 and 60 years with a mean age of 34years. 27 patients were males and 3 were females. 18(60%) patients had middle one third defects of right leg and 12(40%) patients had middle one third defects of left leg. Leg defect was on anteromedial site in 21(70%) patients and anterolateral site in 9 (30%) patients. Trauma (Road traffic accidents) was the cause in 26 (86.6%) patients and post operative defect exposing Implant in 3(10%) patients. The size of the defect ranged from 4 sq.cm to36sq.cm. Time of presentation to hospital ranged from less than 1week to 1year after injury. Tibia was the common component exposed in all patients. Associated Grade III B compound fractures with external fixator were present in 18(60%) patients. Minor complications were seen in 4(13.3%) patients. Partial Graft loss was present in 1 patient (3.3%) over flap donor site which was managed conservatively. Flap tip necrosis (1cm) was present in 3 patients which was debrided and grafted. The follow up period was up to six months with adequate physiotherapy. In most of the cases, satisfactory results with good aesthetic appearance was present.
Conclusion: There are many related advantages of this flaps such as being a simple technique allowing full tissue coverage in a one-stage operation, and it is present in the dissection field. Full tissue coverage, functional recovery, and good esthetic results are achieved with minimum damage to the donor site. In addition, the surgical procedure is relatively short and easy to perform, and it does not require microsurgical skills and instruments.

Keywords: flap tip necrosis, anteromedial site, partial graft, physiotherapy

Introduction
Middle-one third leg defects represent a major challenge to the plastic surgeon due to liability to trauma. The difficulty comes from the limited mobility and limited availability of the overlying skin and soft tissue in the pre-tibial area. About one third of the tibial circumference and most of its length is subcutaneous. The unique anatomy of the tibia with its associated soft tissue and their vulnerability to severe injury produces most of the problem like limb salvage, problems with soft tissue cover, infection and nonunion which are all too common and result in severe disability.

Among the traumatic injuries, open tibial fractures are the main cause of soft tissue defects in legs. The relatively unprotected anteromedial portion of tibia results in exposed bone after trauma, which requires specialized soft tissue cover. This Institute has more number of patients presenting with leg defects due to various etiological factors like electrical burns, trauma from RTA, post-operative wound which have to be treated as early as possible in order to prevent complications.

The management of lower extremity has evolved over the last two decades to the point that many extremities that would require amputation are routinely salvaged. This is mainly because of better understanding of anatomy and vascular patterns of the areas, resulting in expansion of available choices to cover a wide range of defects. Local options available for soft tissue coverage of leg include muscle, fasciocutaneous and adipofascial flaps. Free tissue transfer has now become the gold standard option for the large complex defects of the lower limb.

Clinical study of management of middle one third leg defects was done to analyse the various

reconstructive procedures for leg defects and also to enhance the quality of work done to produce good results with minimal complications as possible. While considering reconstructive options, the plan must always be tailored to the individual patients needs and due attention be given to functional outcome. Although primary closure is feasible in some cases, the main stay of treatment involves local tissue rearrangement with or without split thickness skin graft. Early surgical attempt to cover the defect with a well-vascularized tissue provides excellent healing, osteogenesis, low rate of infection and requires no surgical debridement of the bone in the early phase and has a short hospital stay.

Aims and Objectives

Aim

To study and analyse various management options of middle one third leg defects

Objectives

- To study the incidence of middle one third leg defects
- To study the different flaps for covering the defect of middle one third leg defects

Patients and Methods

This Prospective Clinical study conducted in the department of Plastic and Reconstructive surgery, Osmania General Hospital, Hyderabad, Telangana includes 30 cases of middle one third of leg defects admitted between November 2016 to November 2018.

Inclusion Criteria

1. Patients >15years of age are included in thisstudy.
2. Soft-tissue defects of middle one third leg requiring flap cover are included in thisstudy.

Exclusion Criteria

1. Paediatric cases (1-14years),
2. Pregnant women (1sttrimester),
3. Patients unfit for anaesthesia,
4. Polytrauma with unstable conditions,
5. Patients with multiple comorbidities,
6. Patients not willing to participate in this study, are excluded.

Methodology

Pre-operative assessment

Most of patients came to plastic surgery department immediately after trauma (RTA). Few Patients were referred from orthopaedics department for coverage of soft tissue defect after stabilization of fracture site. After receiving patient, routine surgical profile was done for fitness for surgery .In addition to this, lower limb radiography was done to know the status of underlying bones and color Doppler was done to know the status of lower limb vessels

Most of the patients were operated under spinal anaesthesia. Debridement of wound was done to create true defect, followed by primary flap cover.

Patients admitted with electric burns were initially resuscitated from burn shock. After hemodynamic stabilization of the patients, detailed systemic examination of the patient and the local examination of the wound was done. Swabs were collected for culture and sensitivity. Once the patient was found fit for surgery, patient was taken up for serial debridements & then was taken up for delayed flap cover.

Flaps used in this study

Fasciocutaneous flaps- superiorly based and inferiorly based
Gastrocnemius flaps- myocutaneous flaps
Soleus flap
Advancement flap

Observations

A total number of 30 cases with middle one third leg defects were admitted between November 2016 to November 2018. Detailed analysis of these 30 cases with middle one third leg defects are done in terms of

1. Age
2. Sex
3. Etiology
4. Time of presentation
5. Site of the defect
6. Size of the defect
7. Limb involvement
8. Associated injuries
9. External fixator in situ/not
10. Type of flap cover
11. Timing of surgery
12. Primary / Delayed Primary / Secondary flap
13. Complications.
14. Duration of the hospital stay.

Age Distribution

In this study, the commonest age of patients is between 21 to 30 years (46.6%). The mean age is 34.

Table 1: Age distribution

Age at presentation	No. of patients	Percentage
<20	2	6.6%
21-30	14	46.6%
31-40	7	23.3%
41-50	2	6.6%
51-60	5	16.6%

Sex distribution

In this study 27(90%) patients were males and three (10%) patients were female.

Table 2: Sex Distribution

Sex	No of patients	Percentage
Male	27	90%
Female	3	10%

Aetiology

In this study, common cause of middle one third leg defect was trauma (due to RTA) in 26(86.6%) patients, followed by Electric burns in 2(6.6%) patients and 2(6.6%) patient with post operative defect exposing implant.

Table 3: Aetiology

Aetiology	Number of patients	Percentage
Trauma (RTA)	26	86.6%
Electric Burns	1	3.3%
Post operative defect exposing Implant	3	10%

Site of the Defect

In this study, commonest site of defect was Anteromedial site of leg in 21(70%) patients, followed by defect on Anterolateral site in 9(30%) patients.

Table 4: Site of the defect

Site of leg	Number of patients	Percentage
Anteromedial	21	70%
Anterolateral	9	30%

In this study, leg defects were common in right leg 18(60%) patients, followed by left leg in 12(40%) patients.

Table 5: Limb involvement

Limb Involvement	Number of patients	percentage
Right	18	60%
Left	12	40%

Size of Defect: Size of the defect in this study ranged from 4 sq.cm to 36 sq.cm. 11 patients (55%) had medium size defects of size 9 sq.cm to 15 sq.cm. 4 patients (20%) had small size defects of size 4 sq.cm. 5patients (25%) patients had large size defects of size 24 sq.cm to 36 sq.cm. Mean size of the defect was 14 sq.cm.

Table 6: Size of Defect

Size of defect in cm2	No. of patients	Percentage
4 cm2	6	20%
9 cm2	9	30%
12 cm2	3	10%
15 cm2	6	20%
24 cm2	2	6.6%
25 cm2	2	6.6%
30 cm2	1	3.3%
36 cm2	1	3.3%

Time of presentation

In this study, 50%(15)cases presented within one week of injury followed by 30%(9) cases in 4 weeks. 20%(6) cases presented from 2 months to 1 year duration following injury.

Table 7: Time of presentation

Time of presentation	No. of patients	Percentage
< 1 week	15	50%
4 weeks	9	30%
2 months	3	10%
5 months	2	6.6%
1 year	1	3.3%

Component Exposed: In all patients, component exposed was middle third of tibia. Commonest type is Defect exposing the fracture segment in 15 patients (50%).

Table 8: Component exposed

Nature of defect	No. of patients	Percentage
Only defect	9	30%
Defect with surrounding raw area	6	20%
Defect exposing the fracture segment	15	50%

Timing of Flap Cover: In 50% (15) cases primary flap cover was given within a week. Delayed flap cover was given in 40% (12) cases. In 3(10%) patients with post-operative defect exposing implant, secondary flap cover was given after 1year.

Table 9: Timing of flap cover

Flap cover	No. of patients	Percentage
Primary flap	15	50%
Delayed primary flap	12	40%
Secondary flap	3	10%

Grade IIIB compound fractures with external fixator

60% (18) cases were associated with fractures with external fixator

Table 10: Grade IIIB compound fractures with external fixator:

Compound fractures with external fixator	No. of patients	Percentage
Present	18	60%
Absent	12	40%

Operative Procedures

In this study, commonest flap cover were fasciocutaneous flapin60% (18) case. In 9 patients Gastrocnemius flap was done (6 medial head of Gastrocnemius Myocutaneous Flaps and 2 Lateral head of Gastrocnemius Myocutaneous Flaps). Fasciocutaneous Flaps were done in 18 patients (60%), superiorly based in 6 patients and inferiorly based in 12 patients. Bipedicle Advancement Flap was done in 1 patient.

Table 11: Operative Procedures

Procedure of Reconstruction	Number of patients	Percentage
Superiorly based fasciocutaneous flap	6	20%
Inferiorly based fasciocutaneous flap	12	40%
Medial head of Gastrocnemius muscle/ myocutaneous flap	6	20%
Lateral head of Gastrocnemius muscle/ myocutaneous flap	2	6.6%
Soleus musle flap	3	10%
Advancement flap	1	3.3%

Post – Operative complications

Minor complications were seen in 4(13.3%) patients. Partial Graft loss was present in 1 patients (3.3%) over flap donor site which was managed conservatively. Flap tip necrosis(1cm) was present in 3 patient which healed well with debridement and grafting. In rest of 26 patients (86.6%) Complete closure of the wound was achieved with flap covers and Split skin grafting, which went on without any further complications.

Table 12: Post – Operative complications

Surgery	No. of patient	Flaps	Complications	Follow up
Within 1 week of admission	1	Gastrocnemius flaps (90%)	1 Donor site graft loss (conservatively managed)	good
After 1 week of admission	3	Fasciocutaneous Flaps (60%)	1 distal flap necrosis (Debridement+SSG)	good

Associated Injuries: grade IIIB Compound fractures in18(60%) patients and raw areas in 9(30%) patients were present for which fracture fixation and grafting was done respectively.

Hospital stay

The average hospital stay following trauma is 10 days and 24 days following electric burns.

Follow-UP

No morbidity was found. Dog ears settled well. Discharged patients were adviced post op physiotherapy. They were followed up initially twice weekly for 15 days followed by once a week for next one month and once in a month thereafter, with satisfactory results. Follow up was no more than six months as most of the patients are poor, illiterate and hail from remote places and did not return for follow-up

Case 1

17 years old male Ashok with Right middle one third leg defect of size 4cm x 6 cm for which inferiorly based fasciocutaneous flap was done.

Intraoperative

Fig 1: Preoperative

Fig 2: Postoperative

Case 2

32 years old male Bheem rao with post traumatic defect of Right middle one third leg defect over lateral side of size 8 cm x 6 cm for which Medial Gastrocnemius Muscle Flap+ SSG was done. Surrounding raw area grafted**.**

Intraoperative

Fig 3: Preoperative

Fig 4: Postoperative

Results and Discussion

Open injuries and deformities in the lower extremity result from trauma, tumor resection, and chronic diseases such as peripheral vascular disease and diabetes; these wounds need reconstruction for some reasons. Initially, any uncovered bone that is not secured by vascularized soft tissue is at risk for osteomyelitis, bone necrosis, and sepsis. Osteomyelitis is a noteworthy reason for amputation in patients after leg trauma or patients with systemic illness, most commonly diabetes [9, 10]. Second, open injuries cause chronic pain, inability to ambulate, significant therapeutic costs, and unemployment. Uncovered tendons become dry and necrotic, and exposed blood vessels are at hazard for rupture.

Thirty patients with middle one third leg defects were treated in the Department of Burns, Plastic &Reconstructive surgery OGH in the period between November 2016 & November2018. Age of the patients ranged between 20 and 60 years with a mean age of 34years. 27 patients were males and 3 were females.

This high incidence in male is because they are commonly involved in Road Traffic Accident (RTA) [8].

18(60%) patients had middle one third defects of right leg and 12(40%) patients had middle one third defects of left leg. Leg defect was on anteromedial site in 21(70%) patients and anterolateral site in9(30%) patients. Trauma (Road traffic accidents) was the cause in 26 (86.6%) patients and post operative defect exposing Implant in 3(10%) patients [8, 9]. The size of the defect ranged from 4 sq.cm to36sq.cm. Time of

presentation to hospital ranged from less than 1week to 1year after injury. Tibia was the common component exposed in all patients. Associated Grade III B compound fractures with external fixator were present in 18(60%) patients. Nature of the defect was of leg defect exposing the fracture segment in 15(50%) patients, only leg defect in 9(30%) patients and leg defect with surrounding raw area in 6(20%) patients [10]. The operative procedure was chosen according to the nature and size of the defect. The earliest flap cover was given within 1 week of trauma. Primary flap cover was given in 15(50%) patients, delayed primary flap cover in 12(40%) patients and secondary flap cover in3 (10%) patient. Fasciocutaneous Flaps were done in 18 patients (60%). In 8 (26.6%) patients Gastrocnemius flaps were done, soleus muscle flap were done in 3 patients and Advancement Flap in 1 patient (5%) were done [6, 7]. The average hospital stay was 10days following trauma and 24 days following electric burns. Minor complications were seen in 4(13.3%) patients. Partial Graft loss was present in 1 patient (3.3%) over flap donor site which was managed conservatively. Flap tip necrosis(1cm) was present in 3 patients which was debrided and grafted [10]. The follow up period was upto six months with adequate physiotherapy. In most of the cases, satisfactory results with good aesthetic appearance was present.

Conclusion

The referral for reconstruction is not done early enough sometimes, and so the residual morbidity of the skeleton makes the reconstruction redundant. Antibiotic coverage and anti microbial needs are not standardized yet. Ilizarov fixation is still a bugbear for reconstruction. Restricted operative field makes the surgery difficult and sometimes it becomes necessary to redo the whole reconstruction. Free flaps have not been taken up in the right earnest, probably due to logistics, but in future we are trying to do free flaps, which will ultimately improve our armamentarium.

References

1. Saint-Cyr M, Schaverian MV, Rohrich RJ. Perforator flaps: history, controversies, physiology, anatomy and use in reconstruction (CME). Plast Reconstr Surg. 2007;123:132e-145e.
2. Ong YS, Levin LS. Lower limb salvage in trauma. Plast Reconstr Surg. 2010;125:582-588.
3. Ambroggia G, Oberto E, Teich-Alasia S. Twenty years' experience using the cross leg flap technique. Ann Plast Surg. 1982;9:152.
4. Thatte RL. One stage random pattern de-epithelialized 'turn over' flaps in the leg. Br J Plast Surg. 1982;35:287.
5. Serafin D, Georgiada NG, Smith DH. Comparison of free flaps with pedicled flaps for coverage of defects of the leg or foot. Plast Reconstr Surg. 1977;59:492.
6. Knobloch K, Vogt PM. The reconstructive sequence of the 21st century-the reconstructive clockwork. Chirurg. 2010;81:441-446.
7. Barklay TL, Cardoso E, Sharpe DT, Crockett DJ. Repair of lower leg injuries with fasciocutaneous flaps. Brit J Plastsurg. 1982;35:127-132.
8. Pu LL. The reversed medial hemisoleus muscle flap and its role in reconstruction of an open tibial wound in the lower third of the leg. Ann Plast Surg. 2006;56:59-63.
9. Harris AM, Althausen PL, Kellam J, Bosse MJ, Castillo R. Lower Extremity Assessment Project (LEAP) Study Group. Complications following limb-threatening lower extremity trauma. J Orthop Trauma. 2009;23:1-6.
10. Saddawi-Konefka D, Kim HM, Chung KC. A systematic review of outcomes and complications of reconstruction and amputation for type IIIB and IIIC fractures of the tibia. Plast Reconstr Surg. 2008;122:1796-1805.