

Evaluation of efficacy of lower limb rotational flap coverage followed by single sitting PTSG for management of post traumatic osteomyelitis

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Abstract

Introduction: In the management of the “post traumatic osteomyelitis-PTO” various types of the flaps are employed. Hence we assessed the efficacy of lower limb rotational flap coverage followed by single sitting “partial thickness skin grafting (PTSG)” for management of PTO. **Material and Methods:** We conducted a prospective clinical study among 40 subjects with PTO. They were treated with rotational flap coverage followed by single sitting partial thickness skin grafting. The various observations made were noted a comparison was made with the muscle flaps. **Results:** Thirty two of 40 initial flaps survived. All the subjects had the follow up for a minimum period of one year. The flap survival among the local and diffuse osteomyelitis and among those with and without risk factors was not significant. The second predictor- reconstructed successfully flap was significant between the local and diffuse osteomyelitis. The reconstructive success among the local and diffuse osteomyelitis was not statistically significant. **Conclusion:** This study found rotational flap coverage followed by single sitting partial thickness skin grafting can be successfully used for the reconstruction of lower limb trauma.

Keywords: Lower Limb Rotational Flap, PTSG, Post Traumatic Osteomyelitis.

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Introduction

The open fractures and the modalities to treat them have been attributed to the cause of the Osteomyelitis. This is in particularly significant in the cases of the lower limbs [1-3]. These kind of fractures are associated with the road traffic accidents, and the war injuries. In the chronic cases of the lower limb osteomyelitis, the soft tissue bed with the scar that may also be in addition to a draining sinus with drainage is seen. To remove the infection in such cases the sequestrum has to be removed. In such cases after the removal of the sequestrum the open area has to be covered with a tissue that can be procured from the local site or distantly. These may also be used to deliver the antibiotics locally. The “Gastrocnemius rotational flap” employing either the lateral or the medial head can be used for the treatment of the tibial proximal third, soleus rotational flap for the tibial middle third and free flap from a distant site for the distal third [4-6]. In our study we evaluated the efficacy of lower limb rotational

flap coverage followed by single sitting partial thickness skin grafting for management of post traumatic osteomyelitis.

Material and methods

We conducted a prospective clinical study in the department of orthopaedics at GMC Jammu for a period of 4 years (2016 to 2020). We included 40 subjects who had PTO after taking consent from them. The institutional ethics clearance was taken for the study. We included both the sexes for the study between the ages 20-80 years. All the risk factors and the cause of the osteomyelitis were noted. The Osteomyelitis after being confirmed by cultural and the radiologically they were grouped as, infected Diffuse and Localized equally into 2 groups of 20. All the subjects were treated with the sequential “saucerization” to be treated by rotational muscle flap and followed by single sitting PTSG [Figure 1].



Fig 1: Clinical pictures of the “Rotational flap coverage followed by single sitting PTSG”.

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Later the antibiotic regime for a period of 2 months was prescribed. The various locations of the flaps were ankle, calcaneus, distal and proximal thirds in 8, 5, 6 and 20 patients respectively. The follow up for all the subjects was done for 1-2 years.

The following criteria were considered at the reviews: walking, total healing of the PTO and the bone defect, survival of the flap, reconstruction achieved and the success of the procedure was assessed. We have considered two of outcomes (incidence of diffuse osteomyelitis, and the risk factors related to host) and predictors (survival of the flap & success of the reconstruction) for the statistical analysis. SPSS ver.20 was used and the $p < 0.05$ was deliberated as significant.

Results

Thirty two of forty initial flaps survived and were successfully reconstructed. All the subjects had the follow up for a minimum period of one year. The flap survival among the subjects with diffuse osteomyelitis was 80%; while with local osteomyelitis was 87%.

which on comparison was not statistically significant. The first predictor- flap survival in those subjects with and without risk factor was 81% and 76% respectively that was not statistically significant. The second predictor- reconstructed successfully flap in the local osteomyelitis was 90% and in diffuse osteomyelitis was 55% that was statistically significant. In the reconstructive success in those subjects with and without risk factor was 87% and 77% respectively that was not statistically significant. In our study we had four reconstruction failures in subjects with local osteomyelitis subjects. Those subjects were treated with saucerization and soleus rotational flap. The eight reconstructive failures resulted in: amputation 4, failed flap refused amputation 2, and successful flap continued drainage 2. The bacterial cultures showed Staph Epidermitis 7, Staph Aureus 7, Pseudomonas Aeruginosa 17, gram-negative organisms 23 and gram-positive organisms 24. In about 90% of these subjects after one year also no infections were seen [Table 1].

Table 1: Comparison of the various treatment predictors and the outcomes.

Observation	Number	p Value
Survived	32	
Failed	8	
Follow up after the flap.	1 year	
The rate of flap survival -diffuse osteomyelitis	80	0.584
local osteomyelitis	87	
The rate of flap survival-one or more risk factors	81	0.478
no risk factors	76	
The reconstructive success rate		0.05
local osteomyelitis was	90%	
diffuse osteomyelitis	55%	
A reconstructive success		0.987
subjects with no risk factors	87%	
subjects with risk factors	77%	
Cultures showed -"Gram-positive organisms"	24	
"Gram-negative organisms"	23	
Pseudomonas aeruginosa	17	
Staph. aureus	7	
Staph. epidermitis	7	
End of follow up after year no recurrent infection seen in	90%	

Discussion

The Osteomyelitis is usually seen in the contaminated wounds especially in the long bones. This has been treated successfully when it is attended to at the earliest, by debriding and the coverage with various types of the flaps [7-10]. This constitutes the bone and the surrounding soft tissue removal, the removal of the dead space. The prescription of the antibiotics is of great importance in these cases as they are essential for aseptic conditions at the site of flap reconstruction. The margins of the bone- sequestrum that has been infected can be removed by assessing with the help of the radiographs and the tomographs. Care should be taken to remove all the infected bone margins. Any part of the infected bone left may act as a source of re-infection. In the cases where the extensive bone removal has to be done that may hamper the strength of the bone the transplant may be considered [1, 8-17]. In the study of Lowenberg *et al.*, the union was seen in all the cases except one in the acute open fracture, non-union cases [11]. They have considered the grafts for the delayed and the simultaneous cases using the Ilizarov apparatus. In our study we also performed the same in 2 cases. Some reports have supported a bone graft under a free flap / rotational flap [11-13]. Cultures of lower than 105 organisms / gram of tissue can sustain a skin graft or flap. In other cases they will require aggressive debridement before the soft tissue coverage. Muscle flaps are usually advantageous in these

conditions [11-14]. The ideal local muscles for the proximal and middle third of the tibia are gastrocnemius and the soleus respectively. Still, local trauma may have damaged the muscles preventing their transfer. Free muscle transfer is generally used for the distal third of the tibia but can be used for more proximal coverage when the gastrocnemius or soleus is damaged. The free muscle must be anastomosed to a local vessel and a vascular injury may preclude this. The posterior tibial artery is the artery of choice because the anterior tibial vessel is prone to spasm and is in general a smaller diameter [4]. Antibiotic are very important for the prevention of the osteomyelitis [9, 18-20]. The antibiotic beads will also help in the filling of the dead space. After the saucerization, they can be placed beneath a flap. This can later be replaced with a bone graft filling the defect. In our study the reconstructive success and flap survival were greater in the local osteomyelitis than with diffuse osteomyelitis. The variation in reconstructive success was significant while the difference in flap survival was not. This could be due to significance smaller sample size. It is evident that the bony involvement is one of the main factors that will impact the outcome. In the study of Cierny *et al.*, they have stated the significance of the patient related factors for the success of the acceptance of the grafts. In our study the success of the reconstruction was successful in those without the risk factors [5]. In our study 40 cases of PTO of the lower limb were treated with bone debridement trailed by a lower limb rotational flap coverage

followed by single sitting “partial thickness skin grafting”. At the end of a year follow up 90% were ambulatory with established soft tissue coverage and recurrent infection were not seen. The limitation of our study was the smaller sample size and the follow up was only done for a small period of one year.

Conclusion

Different opinions concerning the most suitable flap in the reconstruction of a soft tissue defect of the lower limb remains to be explored. Our study supports the rotational flap coverage followed by single sitting “partial thickness skin grafting” can be used successfully in those with the lower limb post traumatic osteomyelitis. Further studies with larger sample and longer follow up are advised.

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