

Role of Lower Extremity Guidelines for Salvage in Lower Limb Defects

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Abstract

High velocity lower limb injuries due to the road traffic accidents will cause the loss of upper and lower limb extremities. In tertiary care centre, where orthopaedic Surgeons and plastic surgeons can work together in the centre for limb salvage. The role of the surgeons is to decide on the treatment plan to prevent further damage. In this case report we will assess the role of lower limb salvage guidelines in the treatment of lower limb and upper limb extremity injuries.

Keywords: Lower limb injuries; Guidelines; Salvage.

INTRODUCTION

Ortho plastic approach is for patients who were being threatened with limb loss, upper and lower extremity. Lower Extremity Guidelines for Salvage (L.E.G.S) grew out of the establishment of the Penn Ortho plastic Limb Salvage Centre. Ortho plastic is a term that Dr. Levin coined more than 30 years ago that describes applying the principles and

practice of both orthopaedics and plastic surgery to clinical conditions simultaneously to optimize care as it centres around what we call limb salvage in limb salvage centre, using the Ortho plastic approach, which has orthopaedics and plastic surgeons working together on a patient's problem, the orthopaedic surgeons obviously predominantly expert in bone and joint surgery, in fracture fixation, in joint replacement and reconstructive plastic surgeons are knowledgeable about soft tissue reconstruction and particularly microvascular surgery, which is transferring tissue from one place in the body to another on its blood supply.^{2,3,5}

MATERIALS AND METHODS

In our case report which took place in JIPMER hospital, Our Patient 24 year old male came with alleged history of RTA sustaining fracture in Left tibia and avulsion injury causing raw area over the right knee on 5/12/21. Patient underwent closed

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reduction and external fixation for the left tibia fracture on 5/12/21. Patient has been referred to plastic surgery department on 27/12/2021. Local Examination Right knee shows raw area over the right knee, wound covered with unhealthy granulation tissue, wound margins healthy and sloppy, surrounding skin healthy. Movements of knee joint were restricted due to external fixation. Sensation was normal. Distal pulses were felt. In our department we decided to use the staged key stone local flap to cover the defect over the knee joint. The raw area over the knee healed with less scarring.

RESULTS W

In this case report, Role of Lower extremity salvage guidelines in preserving the lower limb extremity injuries is established with the exposed left knee joint with local key stone flap. In this report, We covered the exposed knee joint with the local key stone flap.

Table 1: L.E.G.S. Lower Extremity Guidelines for Salvage.

Trauma of the Extremities which can be attempted to Salvage and can be Successful.¹²

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| 1 | Massive severe burns with open long bone fractures |
| 2 | High velocity ballistic or projectile injury |
| 3 | Open fracture with bone loss |
| 4 | Patients who will require special social, psychological, or rehabilitative intervention |
| 5 | Traumatic lower extremity injuries requiring micro vascular reconstruction Absent distal pulses, concern for vascular injury/known disease |
| 6 | Open fracture with significant comorbidities (e.g. Diabetes, Immuno- compromised, Hypertension, Venous Insufficiency) |
| 7 | Significant foot/ankle soft tissue loss, including any plantar soft tissue loss |
| 8 | Crush or blast mechanism injury involving multiple fascial compartments |
| 9 | Open fracture exposed bone/joint, or exposed instrumentation with soft tissue loss not amenable to primary closure |
| 10 | Fracture with associated compartment syndrome |
| 11 | Poly-trauma with limb injury meeting above criteria following initial stabilization as necessary based on triaging physician's judgment |
| 12 | Absent plantar sensation, concern for nerve injury |

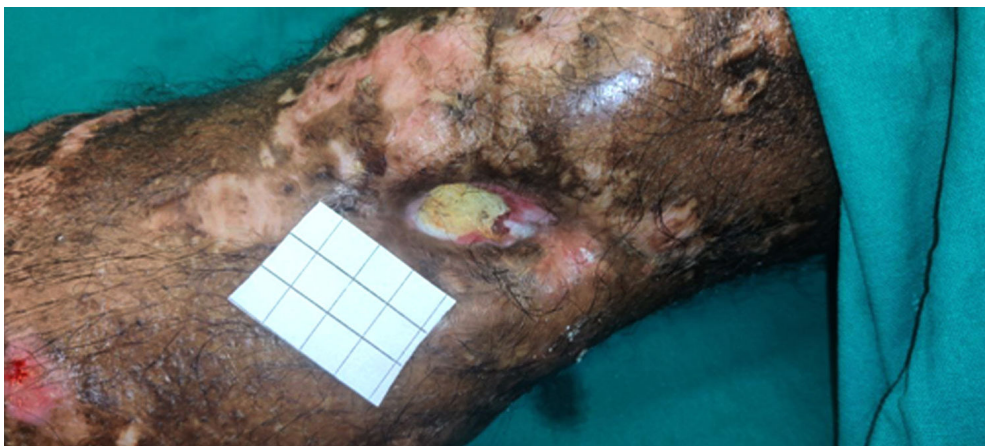


Fig. 1: Raw area over left knee Exposing Joint on the lateral Aspect.

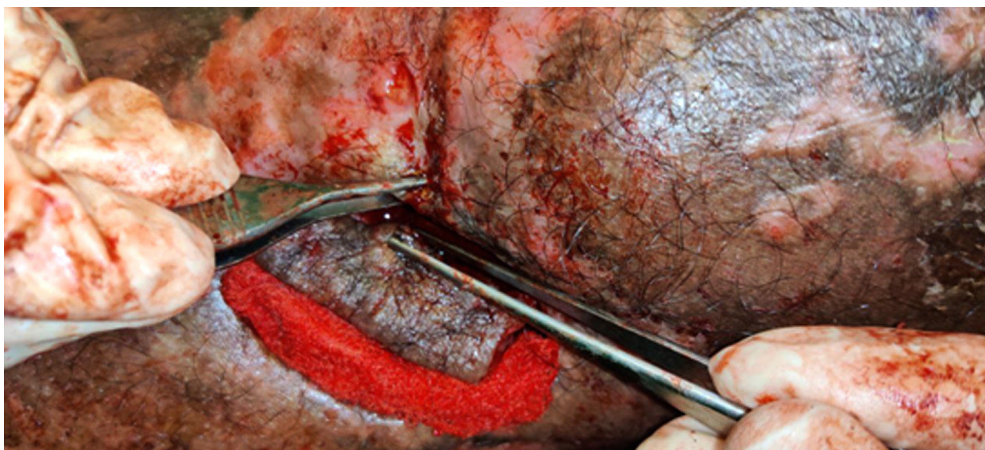


Fig. 2: Keystone local flap - Intra-operative picture.



Fig. 3: Wound Post-operative Day 10 key stone flap.

DISCUSSION

The Gustilo Anderson classification is commonly used in the emergency room to classify limb wounds. Assessing the severity of the damage based on the Gustilo Anderson classification and the involvement of nerves, arteries, tendons, bone, and soft tissue is crucial for triaging Lower Extremity trauma. The local soft tissue envelope is significantly damaged and inadequate for coverage in a Gustilo-Anderson type IIIB fracture; therefore, free tissue transfer is required, and a higher-type Gustilo Anderson IIIC injury necessitates emergent revascularization prior to further reconstructive procedures.^{1,2} In Gustilo Type IIIB/IIIC traumatic injuries, free flap reconstruction should be considered the gold standard for soft tissue abnormalities.³ When compared to patients who were admitted immediately for all future care, patients who were transferred to our limb salvage centre from other hospitals reported significant delays in lower extremity soft tissue covering and higher incidence of osteomyelitis.⁴ Marko Godina, a pioneer in microsurgery with a desire for limb salvage, highlighted the usefulness of free tissue transfer for catastrophic lower extremity injuries in 1986.¹³ He found lower incidences of non-union and osteomyelitis in patients who had soft tissue coverage for less than 72 hours after the injury. Techniques, antimicrobial medication, and temporary wound coverage adjuncts such as negative pressure dressings have all improved since the Godina era. As a result, current evidence suggests that the early soft tissue covering period can be safely extended without compromising microsurgical outcomes. The necessity to initially perform debridement, vascular, and orthopaedic interventions at the Lower Extremity site, or operations linked to other organ system injuries, was the reasons for delays in soft tissue coverage beyond 3–10 days in the

current study. The flap success rates at a tertiary trauma centre were independent of timing, as shown by multivariate model. The reconstructive surgeon must consider the patient's preferences and expectations while allowing enough time for the patient to comprehend the situation's complexity and be sufficiently informed before giving consent. Chronic osteomyelitis and discomfort were the most common reasons for amputation after an initial salvage effort at our institution, both of which have previously been linked to salvage failure. The key to saving the limb is early debridement and soft tissue covering.⁶ Many other disciplines, such as musculoskeletal radiologists, vascular surgeons, infectious disease and pain experts, physical therapists, prosthetists, and specialised nursing personnel, now contribute to limb salvage.^{7,8,9} If these procedures are not available in the triaging hospital, the patient should be sent to a more specialist limb salvage trauma centre as soon as possible. Patients with compartment syndrome and those with more than 2 cm of bone loss have been demonstrated to have a higher risk of infection, therefore they may benefit from an early transfer and admission to a specialised limb salvage centre after acute care of their emergent pathology.^{10, 11} Microsurgical reconstruction for severe lower extremity damage is successful regardless of when patients are transported or admitted to an Orthopaedic limb salvage centre.^{14, 15} PVD was detected as an independent risk factor in the complications of limb amputation in multivariate analysis for amputation, which was likely underpowered.

CONCLUSION

In this case report we are able to establish the role of salvage guidelines of lower limb extremity with the exposed knee joint in the left lower limb with the help of local key stone flap. As this was the single case report, validity of the study to be strengthened with the observation on large group of people. Lower Extremity Guide for Salvage (L.E.G.S.) of patients with severe lower and upper limb extremity injuries is used to preserve the limb in specialized centre and also plays a major role in providing indications for referring the patient from the primary and secondary care centre to specialized centres without delay and referral to higher centre, as the decision to amputate is irreversible. Future efforts are directed towards validation of transfer criteria, earlier transfer for salvage and timely intervention by orthopaedic and plastic surgeons to work together to salvage the limbs.

Conflicts of interest: None

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REFERENCES

- Gustilo R.B., Anderson J.T., Prevention of infection in the treatment of one Thousand and twenty-five open fractures of long bones: retrospective and Prospective analyses, *J. Bone Joint Surg. Am.* 58 (1976) 453-458.
- L.S. Levin, The reconstructive ladder. An orthoplastic approach, *Orthop. Clin. North Am.* 24 (1993) 393-409.
- S.C. Azoury, J.T. Stranix, S.J. Kovach, et al., Principles of orthoplastic surgery for lower extremity reconstruction: why is this important? *J. Reconstr. Microsurg.* 37(1) (2019) 42-50.
- P. Sommar, Y. Granberg, M. Halle, et al., Effects of a formalized collaboration between plastic and orthopedic surgeons in severe extremity trauma patients; a retrospective study, *J. Trauma Manag. Outcome* 9 (2015) 3, <https://doi.org/10.1186/s13032-015-0023-4>.
- O.Z. Lerman, S.J. Kovach, L.S. Levin, The respective roles of plastic and orthopedic surgery in limb salvage, *Plast. Reconstr. Surg.* 127 (1) (2011) 215S-227S.
- A.N. Pollak, A.L. Jones, R.C. Castillo, et al., The relationship between time to surgical debridement and incidence of infection after open high-energy lower extremity trauma, *J. Bone Jt. Surg. Ser. A* 92 (9) (2010) 7-15.
- R.W. Trickett, S. Rahman, P. Page, et al., From guidelines to standards of care for open tibial fractures, *Ann. R. Coll. Surg. Engl.* 97 (2015) 469-475.
- M.D. Fischer, R.B. Gustilo, T.F. Varecka, The timing of flap coverage, bone-grafting, and intramedullary nailing in patients who have a fracture of the tibial shaft with extensive soft-tissue injury, *J. Bone Jt. Surg. Ser. A* 73 (1991) 1316-1322.
- Henry S. Byrd, Spicer, E. Thomas, G. Cierney III, Management of open tibial fractures, *Plast. Reconstr. Surg.* 76 (1985) 719-730.
- A.N. Pollak, M.L. McCarthy, A.R. Burgess, Short-term wound complications after application of flaps for coverage of traumatic soft-tissue defects about the tibia. The Lower Extremity Assessment Project (LEAP) Study Group, *J. Bone Joint Surg. Am.* 82 (2000) 1681-1691.
- U.K. Olesen, R. Juul, C.T. Bonde, et al., A review of forty five open tibial fractures covered with free flaps. Analysis of complications, microbiology and prognostic factors, *Int. Orthop.* 39 (2015) 1159-1166.
- Z.H. Lee, J.T. Stranix, W.J. Rifkin, et al., Timing of microsurgical reconstruction in lower extremity trauma: an update of the Godina paradigm, *Plast. Reconstr. Surg.* 144 (2019) 759-767.
- M. Godina, Early microsurgical reconstruction of complex trauma of the extremities, *Plast. Reconstr. Surg.* 78 (1986) 285-292
- M. Cherubino, L. Valdatta, P. Tos, et al., Role of negative pressure therapy as damage control in soft tissue reconstruction for open tibial fractures, *J. Reconstr. Microsurg.* 33 (2017) S8-S13.
- Y.L. Karanas, J. Nigriny, J. Chang, The timing of microsurgical reconstruction in lower extremity trauma, *Microsurgery* 28 (2008) 632-634.