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Principles of Management of Lower Limb Injuries

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Abstract

Major lower limb injuries involve skin and soft tissue, bone, vascular, and neural elements, which influences evaluation and management for optimal functional outcome. In major lower limb trauma, often polytrauma, the question is whether to salvage or amputate. This issue has conflicting and confusing data. For cultural and practical reasons, patients prefer to keep a deformed limb if it's painless and functional. This review examines the management of lower limb injuries. It also answers other questions that may improve functional outcomes for patients with major limb injuries. After reading this article, participants should be able to evaluate a patient with a lower extremity wound before medical or surgical intervention, recognise that limb amputation and salvage can both be appropriate definitive treatment options, and select proper nonsurgical or surgical techniques for wound management.

Keywords: Lower limb injuries; Management; Principles.

INTRODUCTION

Lower extremity injuries are common in road traffic accidents which ranges from minimal soft tissue injuries to mangled extremity of the lower limbs. The treatment is depended on type of injury involving the soft tissues, bone, vascular and nerve injuries. The scoring system will help in deciding the pathway of treatment say amputation or salvageable. In this article we will discuss about the overall principles in management of lower limb extremity injuries.

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BACKGROUND

An acute injury to the lower limb is a common emergency in any busy emergency room. The orthopaedic service often takes over immediate fracture management, wound debridement, and primary limb amputation once the patient's vitals have stabilised. In the case of a Gustilo-Anderson grade IIIB or IIIC tibia fracture, cosmetic and reconstructive surgeons work in tandem with orthopedic specialists to treat patients who have suffered significant soft tissue loss, vascular injury, or nerve injury.[1] An ortho-plastic approach, in which orthopaedic and plastic surgeons contribute

equally to the treatment plan from the outset, would be ideal.

PRE-HOSPITAL CARE

Prehospital care must prevent soft tissue damage. Avoid touching the damaged area without splinting. When severe deformity or ischemia of the distal limb threatens soft tissue survival, reduction is necessary. Gentle traction and anatomical alignment achieve this. After manipulation, assess distal limb perfusion. Before evacuating, splints are required. In isolated lower limb injuries, strapping to the opposite leg is helpful, and blankets or cushions can be used as splints. Wounds need clean, sterile dressings.[2] Compression and elevation stop external bleeding. Don't clamp stump blood vessels. Rapid hospitalisation is needed. When a patient has a forward vascular injury, a surgeon or doctor should merely contain the bleeding and not try vascular repair. Temporary indwelling shunts can be used to maintain circulation in questionable limbs.[3] In the field, these might be made from intravenous or feeding tubes. Cooling the amputated limb reduces reperfusion injury. Directly placing it on ice can cause frostbite. 12 hours of warm and 24 hours of cold ischemia for digits; 6 hours of warm and 12 hours of cold for large replants.[4]

EVALUATION OF THE PATIENT

The reconstructive surgeon must be knowledgeable about both options. Ischemic time, especially heated ischemia, affects result. The longer an amputated section stays ischemic, the more its cellular metabolism alters, especially in the muscles. These alterations can cause reperfusion syndrome after replantation. Before complete wound closure, debridement is essential. Warm ischemia must be kept under 4 hours to prevent muscle necrosis. Distal vasculature is crucial for limb survival. Local contusion, penetrating injuries, fractures, and significant joint dislocations can occlude blood vessels. Distal pulses are critical for monitoring peripheral circulation in hemodynamically stable patients.[5] A weak or absent pulse signals a vascular damage that must be treated quickly. Pallor or blue-grey skin indicates poor tissue perfusion. Low skin temperature suggests poor perfusion. The nail bed's characteristic pink blush after transitory compression is a sensitive sign. Insufficient circulation will slow or blue this reaction. In ischemia, peripheral nerves lose feeling quickly. Total insensibility in a hand or foot suggests ischemia, as it is implausible that all nerve trunks were injured in one limb. Traumatized limb spasm never causes poor distal circulation. If distal ischemia is discovered, more proximal pulses should be examined, and any severe deformities at the fracture site should be repaired.[6] Major joint dislocations need immediate treatment. Doppler ultrasonography can evaluate limb perfusion, but CT arteriography is superior for vascular injuries. Unconscious or multiple injured patients may not show nerve injury. Documenting neurological function allows for comparison. Mangled extremity severity scoring and Ganga hospital scoring are used to assess extremities for salvage or amputation (Table 1, 2). In addition to soft tissue examination, vascular health must be examined early. Arterial insufficiency must be corrected immediately, with fasciotomies if needed to restore compartment pressures. If pedal pulses are not felt, angiography will be necessary to ensure perfusion of local tissues that could be employed as a flap alternative and to check recipient site inflow if a free flap is indicated. Unexpected vascular anomalies may be present even with clinically apparent distal pulses, especially in younger patients with substantial trauma. If unsure, get an CT arteriogram.[7]

Table 1: Mangled extremity severity score.

Skdctal/Soft tissue group		
Low energy	Stab wounds, simple closed fracture, small caliber gunshot wounds	1
Medium energy	Open or multiple level fracture, dislocations, moderate crush injuries	2
High energy	Shotgun blast (close range), high velocity gunshot wounds	3
Massive crush	Logging, rail road. oil rig accidents	4
Shock group		
Normoteraive hemodynamics	Blood pressure stable in fidd and operating room	0
Transiently hypotensive	Blood pressure unstable in fieldd but responsive to intravenous fluids	1
Prolonged hypotensive	Systolic blood pressure <90 mm Hg in field and responsive to intravenous fluids only in operating room	2

	Ischemia group	
None	Pulsatile limb without signs of ischemia	0
Mild	Diminished pulses without signs of ischemia	1
Mode rale	No pulse by doppler. sluggish capillary refill, paresthesia, diminished motor activity	2
Advanced	Pulseless, cool, paralysed and numb without capillary refill	3
	Age group	
<30 years		0
30-50 years		1
>50 years		2

If ischemia time more than six hours, and 2 points.

Table 2: Gangs hospital open injury severity score.

Covering structures: Skin and fascia	Score
Wounds without skin loss	
Not over the fracture	1
Exposing the fracture	2
Wounds with skin loss	
Not over the fracture	3
Over the fracture	4
Circumferential wound with skin loss	5
Skeletal structures: Bone and joints	
Transverse/oblique fracture/butterfly fragment < 50% circumference	1
Urge butterfly fragment > 50% circumference	2
Comminution/segmental fractures without bone loss	3
Bone loss < 4cm	4
Bone loss > 4 cm	5
Functional tissues: musculotendinous (MT) and nerve units	
Partial injury to MT unit	1
Complete but repairable injury to MT units	2
Irreparable injury lo MT units/partial loss of a compartment/complete injury to posterior tibial nerve	3
Loss of one compartment of MT units	4
Loss of two or more compartments/subtotal amputation	5
Comorbid conditions: add 2 points foe each condition present	
(1) Injury-debridement interval > 12hrs	
(2) Sewage or organic conlamirution/farmyard injuries	
(3) Age >65yrs	
(4) Drug-dependent diabetes mctlitus/cardio respiratory diseases leading lo increased anesthetic risk	
(5) Polytrauma Involving chest or abdomen with ISS > 25/Fat embolism	
(6) Hypotension with systolic blood pressure < 90 mm Hg at presentation	
(7) Another major injury to the same limb/compartment syndrome	

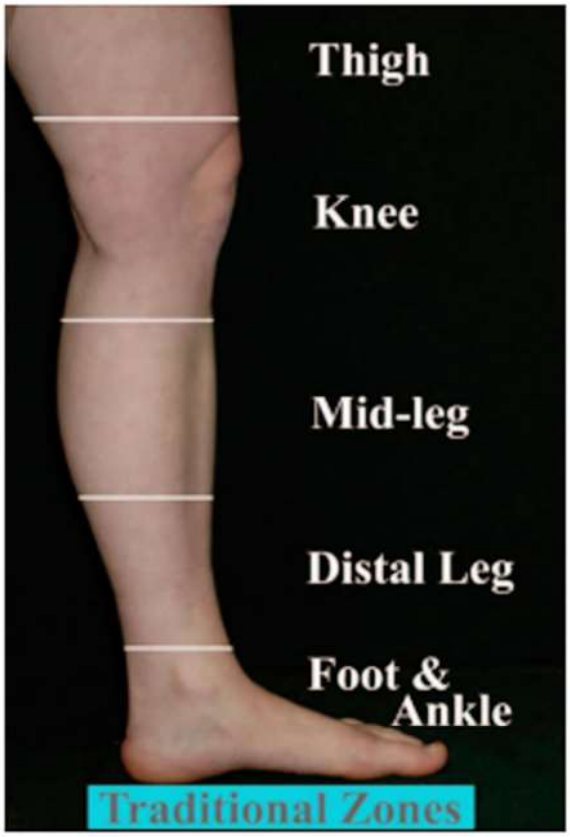

Fig. 1: Traditional zones of lower limb injuries

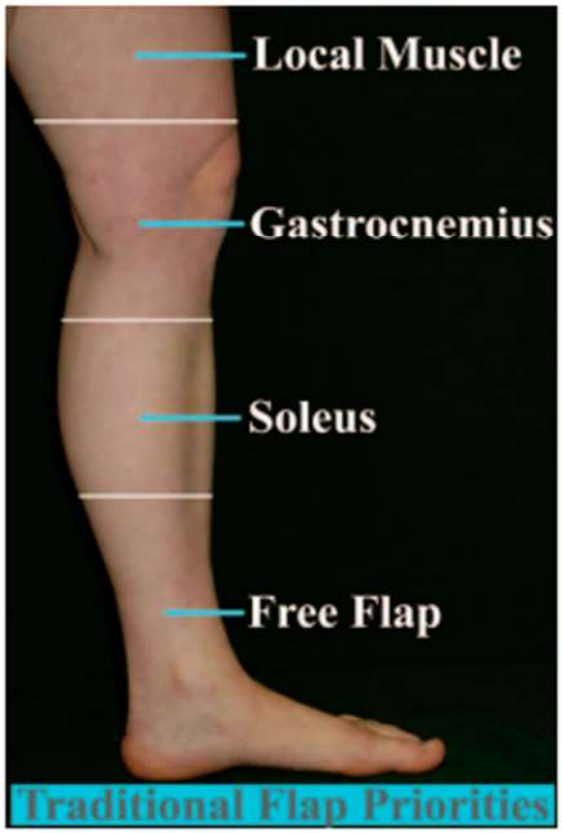

Fig. 2: Traditional flap priorities of the lower limb

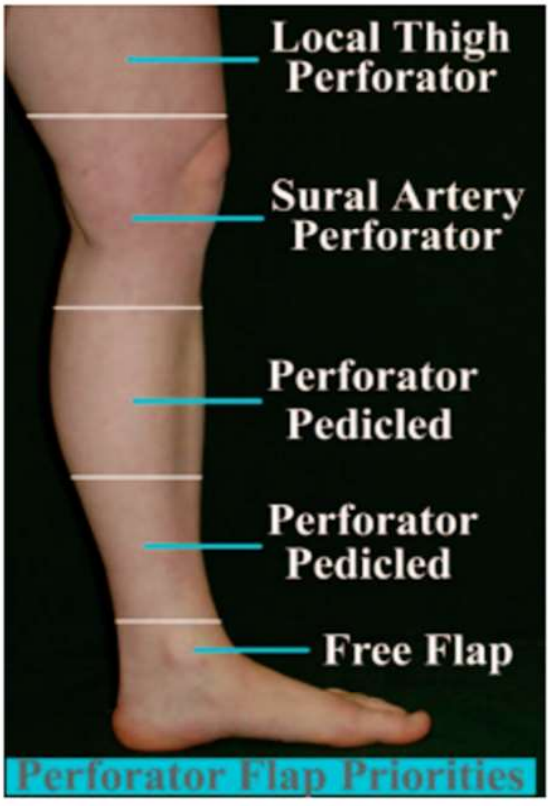

Fig. 3: Perforator flap for specific regions

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