



Research Paper

REPLANTATION OF POST-TRAUMATIC LOWER LIMB AMPUTATION

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Patients who meet with the dreadful accident of post-traumatic amputation are further devastated with the decision making process of whether to salvage the limb or to go for amputation. There are number of factors which need to be considered and include; the scoring systems like Mangled Extremity Severity Score (MESS), patients socioeconomic status, patients compliance and motivation. We present a case of lower leg replantation in a 23 years male patient.

Keywords: Lower limb replantation, Lower limb salvage

INTRODUCTION

Most common cause of lower limb trauma is road traffic accidents. In our case, it was a domestic accident. Various grading systems have been proposed for lower limb injury. But, the decision to amputate or salvage the limb needs to be individualized; the grading systems can be used as a guideline. Amputation is around 3 times more costly than salvage procedure (Joon, 2013).

CASE REPORT

23 years male patient presented with post-traumatic near total amputation of the left leg distal one third; 5 h after injury. The left leg distal one third was severed from the rest of the lower limb after the patient met with an accident in which a water tanker with the cut end of the metal plate

fell on his left limb and went cutting through. On examination, there was an open fracture of the left tibia and fibula with near total amputation of the left leg distal one third with the amputated part hanging by a skin tag and flexor hallucis longus and flexor digitorum longus tendons over the medial aspect of the distal one third of the leg. Distal pulsations were absent. All three main arteries were injured. The posterior tibial and the peroneal arteries were crushed while the anterior tibial artery was cut. Capillary refilling was absent. The limb was cold and the sensations were absent. The MESS score [Mangled Extremity Severity Score] was 7. (2 for Skeletal or soft tissue injury: medium energy - multiple fractures; 3 for Limb ischemia: Cool, paralyzed, insensate, numb limb; 1 for Systolic BP > 90 mm Hg; 1 for

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Age < 30 years). The injury was classified as type III C and type IV as per Gustilo and Byrd open tibial fracture classification respectively (Joon, 2013). There was no other associated injury apart from the left lower limb trauma (Figure 1A, 1B, 1C).

Figures 1A and 1B: Amputated Part



Figure 1C: Xray Showing Fracture Tibia and Fibula



As there were no distal pulsations with near total amputation, after counselling and taking written informed consent in patient's own vernacular language, the patient was taken for replantation of the amputated part. Thorough debridement was done. The bones were fixed by external fixator by the orthopaedic team (Figure 2). The amputated part was then replanted with one arterial and one venous anastomoses. The anterior tibial artery was anastomosed end-to-end

Figure 2: External Fixator *In Situ*



Figure 3A, 3B: Anterior Tibial Artery Anastomosis



(Figure 3A and 3B) and the great saphenous vein was anastomosed end-to-end (Figure 4). Patency and flow were confirmed. There was adequate capillary refilling and 98 % saturation in the left foot toes. The muscles and tendons were repaired. Posterior tibial nerve was found to be intact. The ends of the amputation were closed primarily by suturing (Figure 5A and 5B). The

Figure 4: Great Saphenous Vein Anastomosis



Figure 5A and 5B: Sutured Amputated Part



operation lasted for around 6 h. The postoperative period was uneventful (Figure 6A and 6B). Patient is able to walk now with support. He is undergoing physiotherapy.

Figure 6A and 6B: Postoperative Result 11 Days Postop



DISCUSSION

Lower limb extremity injury has special mention, as it differs in various aspects from upper limb injury. Human being, being a bipedal mammal is often prone for lower limb trauma. Also the importance of lower limb reconstruction lies in the fact that the entire body weight is born by the lower limb. Having said that, none of the limbs can take precedence over one another. Both upper and lower limbs have various important functions to perform.

The primary goal of lower extremity injury is to restore function. This primary goal relies on three basic tenets; i.e., presence of well vascularized

extremity, skeletal continuity so as to support gait and the weight of the body and the last but not the least, presence of protective sensation with the intact innervations to the plantar surface of the foot (Joon, 2013).

The lower extremity injury has been classified by various grading systems. The popular ones used are Gustilo and Byrd lower extremity injury score. They provide some idea as to what are the various options needed for reconstruction of the involved limb. (Shannon, 2013) Table 1.

The MESS scoring system is one such system which takes into account the type of injury, the ischemia time, the perfusion status of the body and the age of the patient. Table 2. (Shannon, 2007) MESS score of greater than or equal to 7 had a 100% predictable value for amputation (Helfet *et al.*, 1990).

Having said that, the decision to amputate or salvage the limb should be individualized and depends on the patient to a great extent and solely

is his decision; provided the surgeon can try salvaging procedure. It also depends on patient's motivation, compliance, understanding to be careful of the future complications like sole ulcers, infections, etc.

Even though in our case, there was near total amputation of the distal one third of the left leg and the MESS score was 7; we went ahead with the salvage procedure. There are certain contraindications to limb salvage procedure. Absolute ones are warm ischemia time more than 6 h and complete disruption of the posterior tibial nerve (Joon, 2013). In our case, the posterior tibial nerve was intact and the warm ischemia time was around 5 h. The patients in whom there will be impaired sensation due to involvement of the peripheral nerve and those with joint destruction will have marginal results with salvage procedure (Gayle *et al.*, 1991).

The other relative contraindications are long duration of final reconstruction, associated serious polytrauma and serious trauma involving ipsilateral foot (Joon, 2013).

Table 1: Classification of Lower Extremity Injury [2]

System	Grade	Details
Gustilo	I	Wound <1 cm; Simple fracture, no comminution
	II	Wound >1 cm Minimal soft-tissue damage Moderate comminution/contamination
	III	Extensive soft-tissue damage, comminuted fracture, unstable
	IIIA	Adequate soft-tissue coverage
	IIIB	Extensive soft-tissue loss with periosteal stripping and exposed bone
	IIIC	Arterial injury requiring repair
Byrd	Type I	Wound <2 cm Low-energy causing spiral or oblique fracture pattern.
	Type II	Wound >2 cm, contusion of skin/muscle Moderate-energy force causing comminuted or displaced fracture
	Type III	Extensive skin loss and devitalized muscle High-energy force causing significantly displaced fracture with severe comminution, segmental fracture, or bone defect
	Type IV	Degloving or associated vascular injury requiring repair Extensive energy forces with type III fracture pattern

Table 2: Mangled Extremity Severity Score (MESS) Criteria

	Variable	Points
A	Skeletal/soft-tissue injury	
	Low-energy (stab, simple fracture, civilian gunshot wound)	1
	Medium-energy (open/multiple fractures, dislocation)	2
	High-energy (close-range shotgun, military gunshot wound, crush)	3
	Very-high-energy (above + gross contamination)	4
B	Limb ischemia*	
	Pulse reduced or absent; perfusion normal	1
	Pulseless, paresthesias, diminished capillary refill	2
	Cool, paralyzed, insensate, numb	3
C	Shock	
	Systolic blood pressure always >90 mmHg	1
	Transient hypotension	2
	Persistent hypotension	3
D	Age	
	<30 years	1
	30–50 years	2
	>50 years	3
Maximum score possible		16
Threshold score for amputation		7
Note: * Score doubled for ischemia time >6 hours.		

The results of various large series study show that lower-leg replantation is still worthwhile in a well-selected patient group, in contrast to the opinion in favor of amputation by many orthopedic and trauma surgeons (Hierner *et al.*, 2005 and 2007)

The goal in lower extremity injury is to preserve a limb which will be more functional than if amputated. In cases, where the extremity cannot be salvaged, the goal then changes to maintain maximum functional length of the limb. Hence,

every effort should be put in to individualize the decision about amputation or salvage of the limb (Armen and Nolan, 2007).

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