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Fissazione esterna nel trattamento delle emergenze e traumi militari, tecniche di ricostruzione degli arti e trattamento degli esiti postraumatici

ROMA

2025

16-17 MAGGIO 2025

Crush Injury: a case report

Proximal Femoral Fracture Fixation and ipsilateral Transfemoral Amputation in complicated crush injury : A Life-Saving Strategy

S.Cerbasi - G.Di Sante - D.Carola - S.Cecconi

Crush Injury

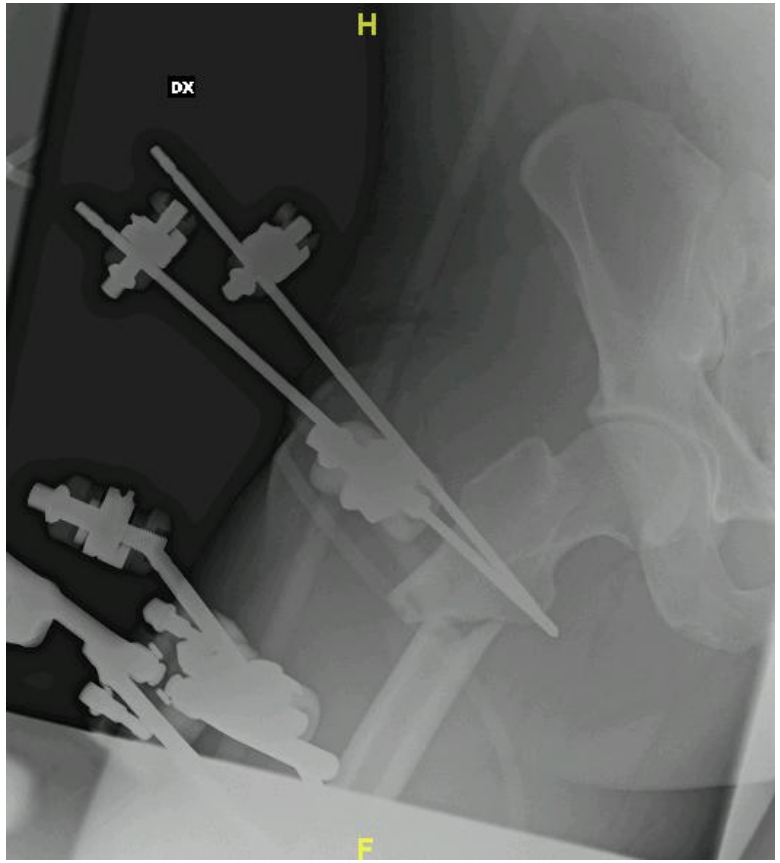
- A crush injury occurs when a body part is compressed between two objects, causing damage to muscles, nerves, and blood vessels.
- Crush injuries can result in fractures, dislocations, and even amputations.

Ingrassia PL et al. Introduction to structural collapse (crush injury and crush syndrome). In: Ciottone GR, ed. Ciottone's Disaster Medicine. 2nd ed. Philadelphia, PA: Elsevier; 2016

CASE REPORT

- 30-year-old man, work-related trauma
- crushing injury of the right lower limb with a proximal femoral fracture, ipsilateral open knee dislocation, and associated vascular injury

DAMAGE CONTROL: Ex-fix; femoropopliteal by-pass



Something wrong…

- high value of myoglobin (19.000 ng/mL)
- three days after hospitalization, the patient became febrile
- on the 4th day, we expanded the fasciotomies
- blood cultures revealed a *Staphylococcus aureus* infection
- Plastic surgeons suggested deep tissue necrosis with superinfection on fasciotomy sites, so on the 8th day, they made a surgical revision

Something wrong…

- patient became febrile again and unresponsive to antibiotics and antipyretic medications
- tachypneic, hypocapnic, and hypoxemic;
- liver dysfunction and renal shutdown due to myoglobin nephrosis and hyperkalemia (MOF)
- leukocytosis, high C-reactive protein, and procalcitonin level

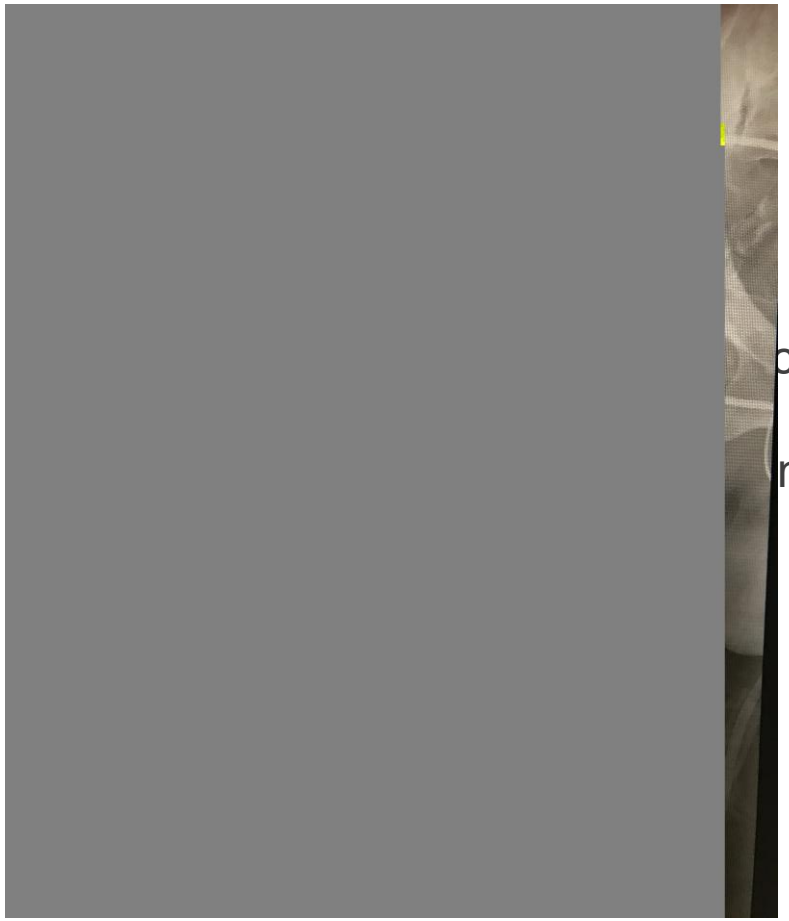
MULTIDISCIPLINARY APPROACH

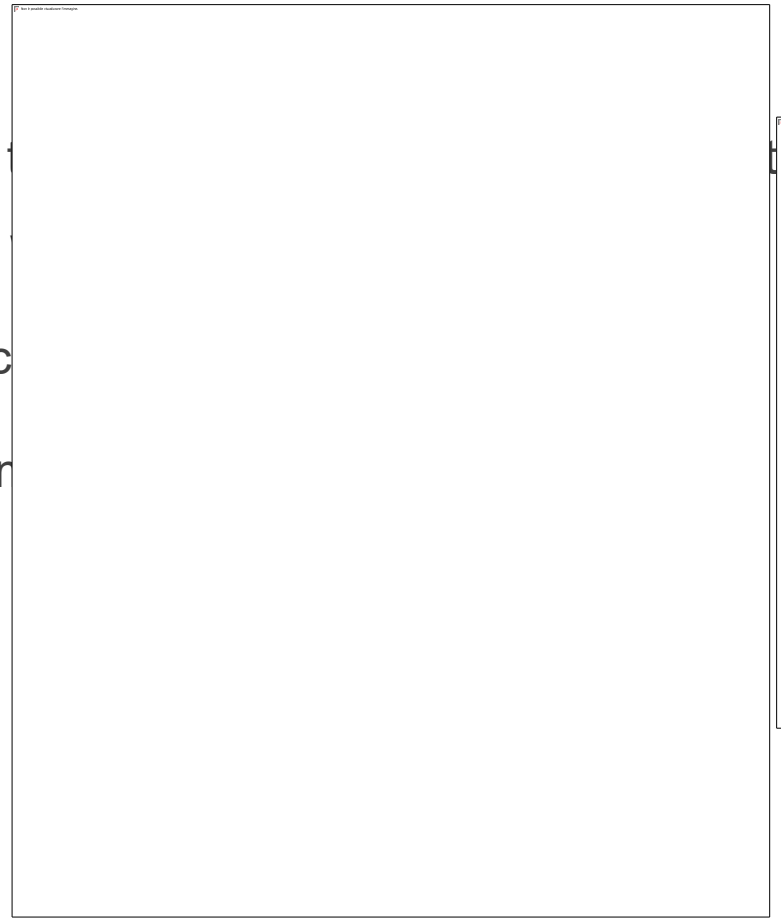
to conduct a transfemoral amputation

TRANSFEMORAL AMPUTATION D DAY

Learning objectives

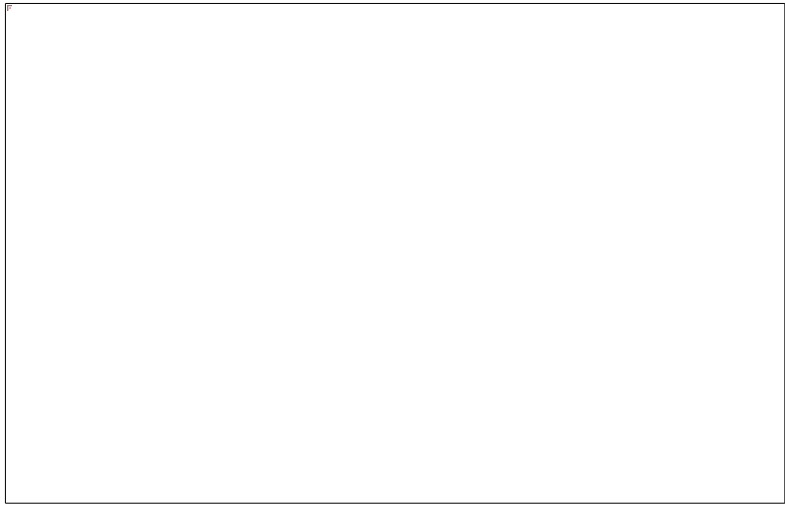
- Understand the pathology
- Identify the fracture
- Choose the fixation device





DAY AFTER

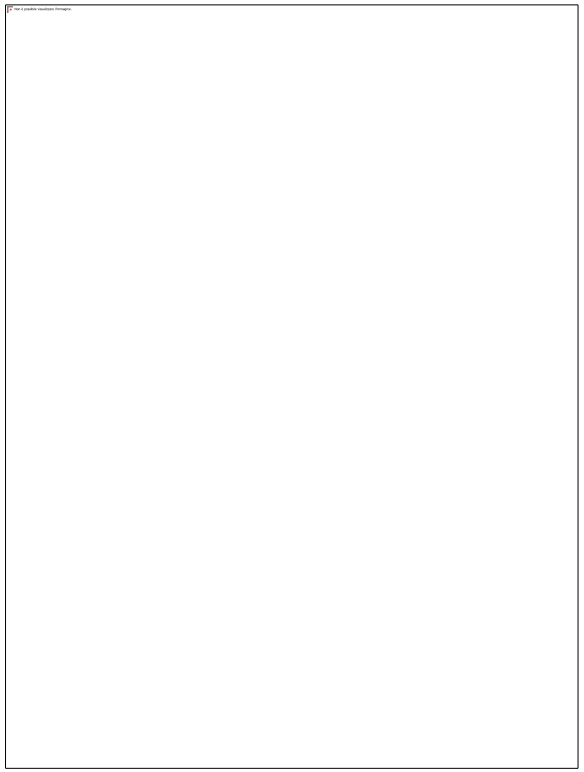
- The general condition improved
- Gradual decrease in leukocytes, C-reactive protein, and procalcitonin levels. Liver markers, myoglobin, and creatine phosphokinase were also declining
- *Acinetobacter baumannii* was identified in the central venous catheter , *Stenotrophomonas maltophilia* was cultured from the surgical wound swab

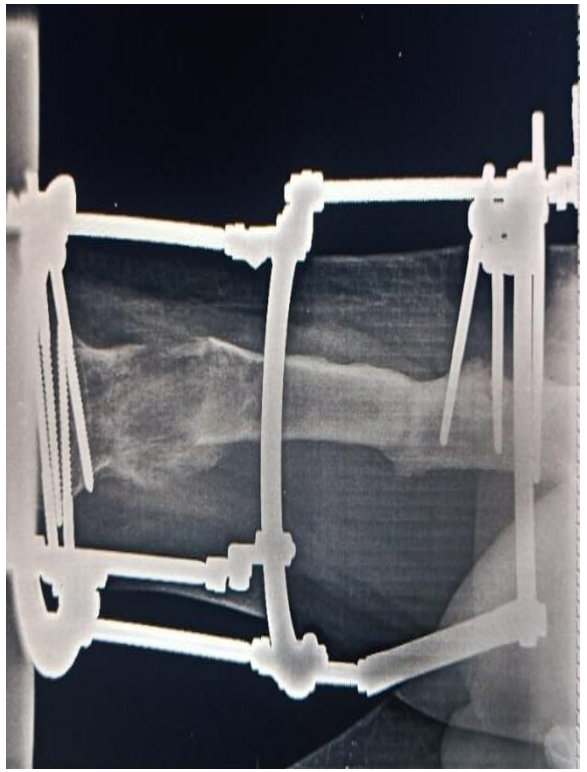


EARLY RECOVERY

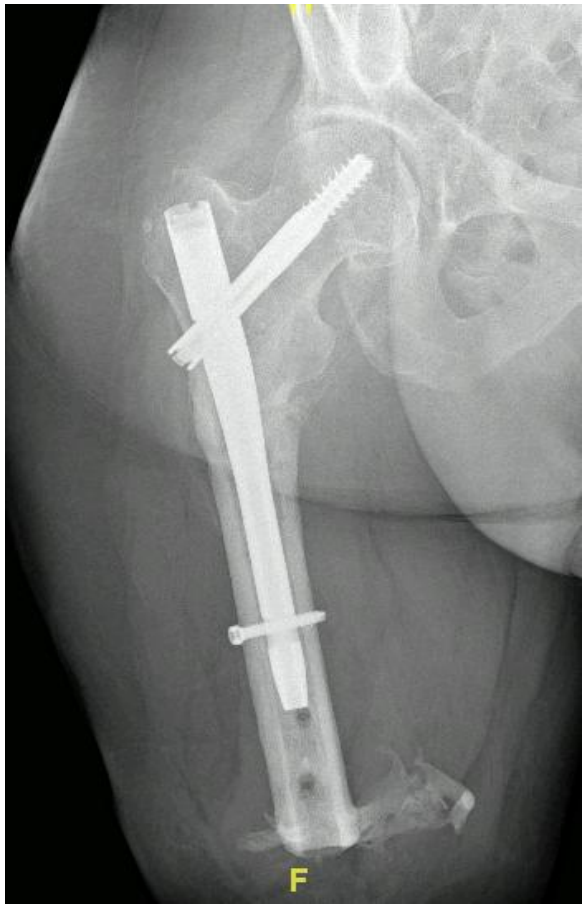
- The patient started functional rehabilitation with weight-bearing 2 months after the injury. He got a custom-made prosthesis.

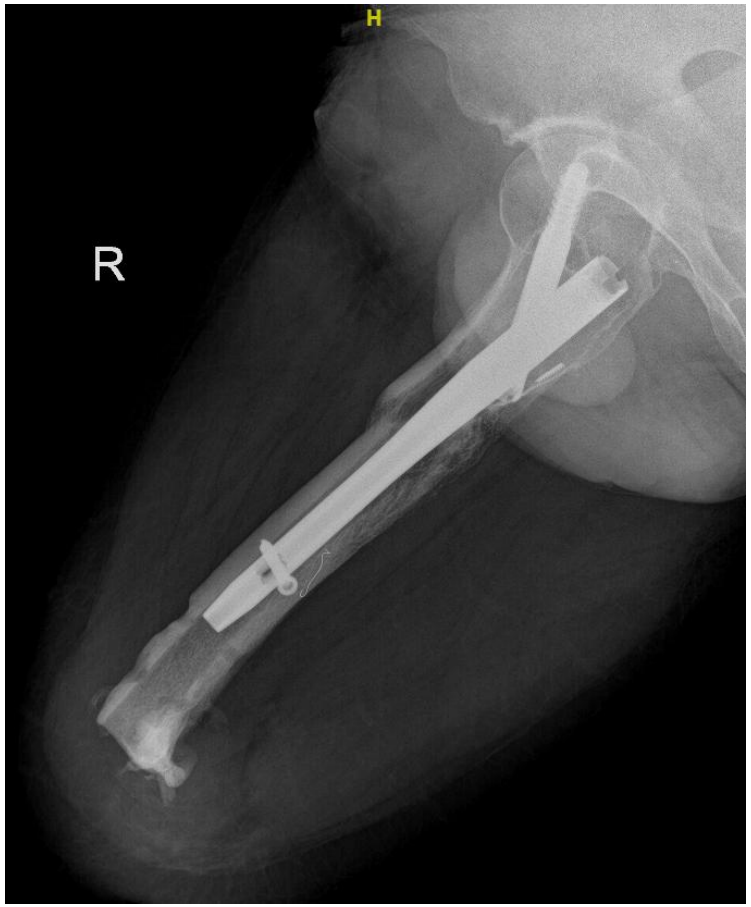
1 year -FOLLOW UP





1 year - FOLLOW UP





Discussion: FUNCTION FIRST

- When a young adult in good general condition requires a lower limb amputation, it is best to immediately provide a limb prosthesis for the patient to achieve early function and mobility

Pohjolainen T et al. Prosthet Orthot Int,1990

- Amputee patients might receive more targeted rehabilitation in the early stages of recovery than people with limb salvage, who may have to wait 3 months or more before they can fully bear weight (to allow time for fractures and bone defects to heal)

Doukas WC et al.. J Bone Joint Surg Am 2013

DISCUSSION

- Severe crushing injury of the lower limb presenting as a concomitant femoral subtrochanteric fracture, ipsilateral open knee dislocation, and associated popliteal artery injury is unusual

In **12%** of knee dislocations, a **surgical amputation is needed in case of complications**

Medina O et al. Vascular and nerve injury after knee dislocation: A systematic review. Clin Orthop Relat Res 2014

- Few works conducted on soldiers in war scenarios can be comparable with our report

These described fractures of the long bone proximal to "*traumatic amputations*." In these cases, the site is often contaminated. Debridement and irrigation of the open lesions are necessary and immediate definitive fixation of the proximal fracture is precluded. External fixation is usually applied and only internal fixation is subsequently performed.

Pickard-Gabriel CJ, 2007 - Gordon WT, 2010- Wagner SC, 2015 - Lim PK, 2018

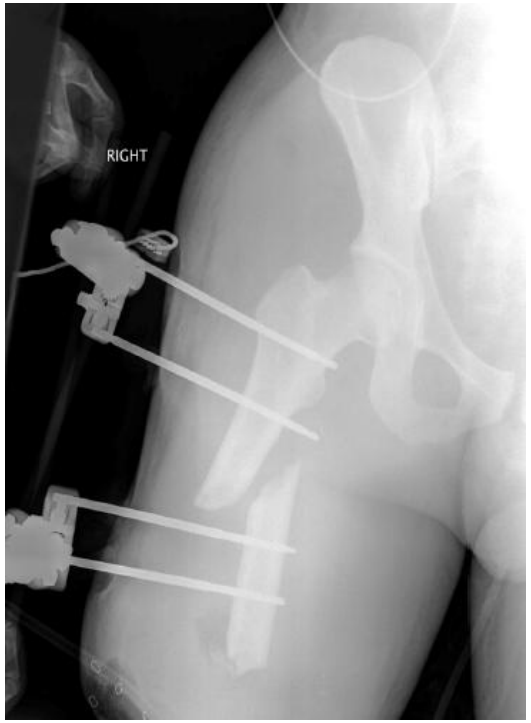
DISCUSSION

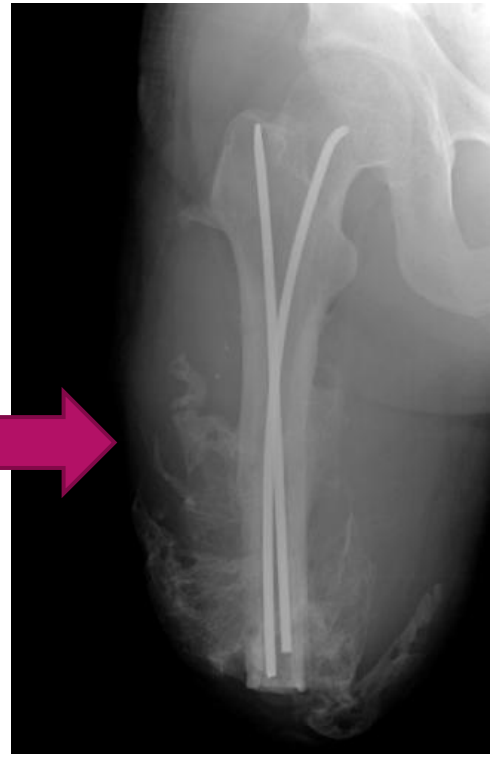
Pickard-Gabriel *et al. (2007)* showed the results of two patients treated with femoral fixation in acute transfemoral amputation

Traumatic Transfemoral Amputation with Concomitant Ipsilateral Proximal Femoral Fracture

A Report of Two Cases

By Second Lieutenant C. Jesse Pickard-Gabriel, BA, Major Cheryl L. Ledford, MD, Lieutenant Colonel Donald A. Gajewski, MD, Colonel Robert R. Granville, MD, and Lieutenant Colonel Romney C. Andersen, MD





DISCUSSION

Wagner *et al. (2015)* described a technique of retrograde intramedullary fixation of fractures through open traumatic amputations and presented good clinical outcomes in ten patients

TECHNICAL TRICK

(*J Orthop Trauma* 2015;29:e203–e207)

Retrograde Intramedullary Fixation of Long Bone Fractures Through Ipsilateral Traumatic Amputation Sites

Scott C. Wagner, MD,† Benjamin B. Chi, MD,*†*
Wade T. Gordon, MD,† and Benjamin K. Potter, MD*†*

DISCUSSION

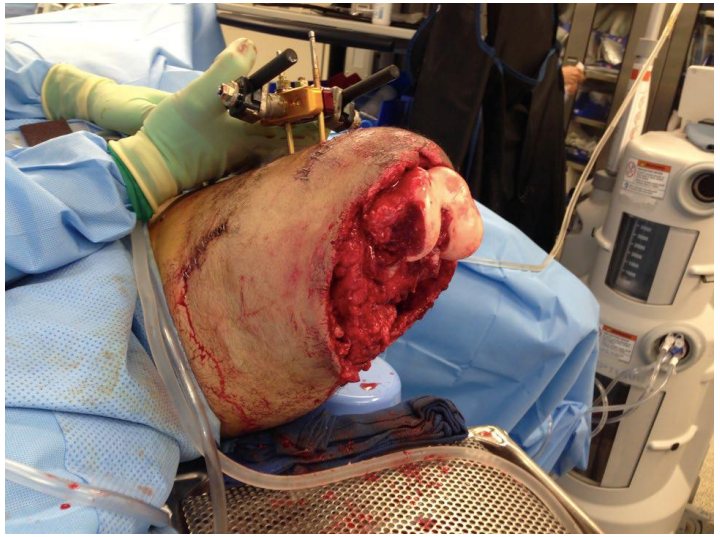
Kim et al. (2018) showed the case of a patient with a complex traumatic limb amputation with proximal open femur fracture.
Acute femoral shortening through the fracture and retrograde intramedullary fixation

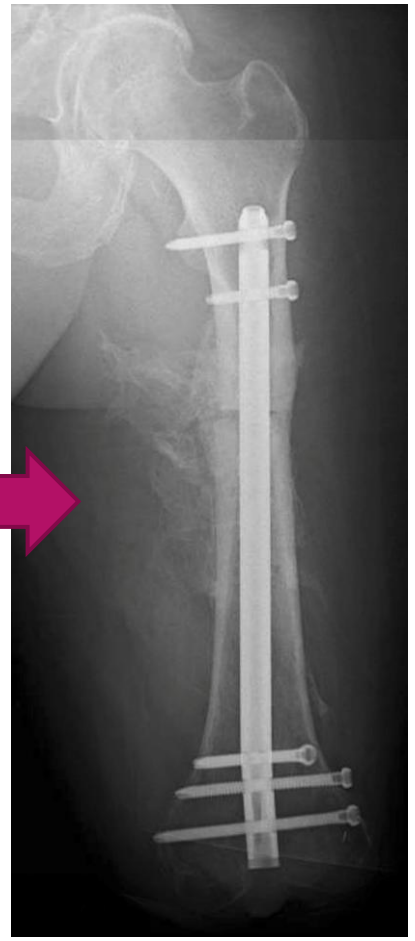
Strategies In Trauma and Limb Reconstruction (2018) 13:185–189
https://doi.org/10.1007/s11751-018-0311-4

CASE REPORT

Acute femoral shortening for reconstruction of a complex lower extremity crush injury

Philip K. Lim[1] · Bharat Sampathi[2] · Nathan M. Moroski[1] · John A. Scolaro[1]





DISCUSSION

THE JOURNAL OF BONE & JOINT SURGERY · JBJS.ORG | VOLUME 83-A · NUMBER 1 · JANUARY 2001

A PROSPECTIVE EVALUATION OF THE CLINICAL UTILITY OF THE LOWER-EXTREMITY INJURY-SEVERITY SCORES

BY MICHAEL J. BOSSE, MD, ELLEN J. MACKENZIE, PHD, JAMES F. KELLAM, MD, ANDREW R. BURGESS, MD, LAWRENCE X. WEBB, MD, MARC F. SWIONTKOWSKI, MD, ROY W. SANDERS, MD, ALAN L. JONES, MD, MARK P. MCANDREW, MD, BRENDAN M. PATTERSON, MD, MELISSA L. MCCARTHY, SCD, AND JULIANA K. CYRIL, MPH

Investigation performed as part of a larger study (the Lower Extremity Assessment Project) at eight level-I trauma centers in the United States

TABLE I Components of Lower-Extremity Injury-Severity Scoring Systems

	Scoring Systems*				
	MESS	LSI	PSI	NISSSA	HFS-97
Age	X			X	
Shock	X			X	X
Warm ischemia time	X	X	X	X	X
Bone injury		X	X		X
Muscle injury		X	X		
Skin injury		X			X
Nerve injury		X		X	X
Deep-vein injury		X			
Skeletal/soft-tissue injury	X			X	
Contamination				X	X
Time to treatment			X		

*MESS = Mangled Extremity Severity Score; LSI = Limb Salvage Index; PSI = Predictive Salvage Index; NISSSA = Nerve Injury, Ischemia, Soft-Tissue Injury, Skeletal Injury, Shock, and Age of Patient Score; and HFS-97 = Hannover Fracture Scale (1997 version).

WAS IMMEDIATE AMPUTATION NECESSARY IN OUR CASE ?

CONCLUSIONS

- Nowadays, there are still few tools that can help surgeons manage these uncommon injuries in the civil environment. The decision to proceed with definitive treatment can be challenging
- No fixation technique has been shown to be superior to the others, and the **standard procedures cannot be applied**
- It is best to immediately provide a limb prosthesis for the patient to achieve early function and mobility
- Our strategy saved the patient's life, and intramedullary fixation with a short nail provided reliable bone stability for rapid and better functional recovery

Thanks

Cerbasi S et al. Femoral fracture fixation followed by ipsilateral amputation: A case report. J Musculoskelet Surg Res, 2023;7:128-34. doi: 10.25259/JMSR_156_2022