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From desiccated to dynamic: a 12-week multimodal rescue of the "devastated" diabetic limb

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Introduction

This report describes the successful salvage of a "threatened" lower extremity of an 18-year-old male with Type 1 Diabetes Mellitus (T1DM). Despite aggressive debridement for cellulitis and crusted scabies, the patient was left with a two-thirds tibial exposure and complete periosteal necrosis. Using the Ilizarov Tibial Transverse Transport and Console Wire Distraction as biological "pumps" for angiogenesis, we successfully induced surface granulation tissue on bare cortical bone surfaces without the use of fenestrations. This intensive preparation was then followed by a definitive Split Thickness Skin Graft (STSG) closure, resulting in 95% closure of the defect and limb salvage.

The clinical crisis

In October 2025, the patient was admitted with a life and limb-threatening infection triad:

Figure 1 Slough over the tissue on the medial aspect of leg.

Figure 2 Exposed Tibia with necrotic periosteum on the lateral aspect of leg.

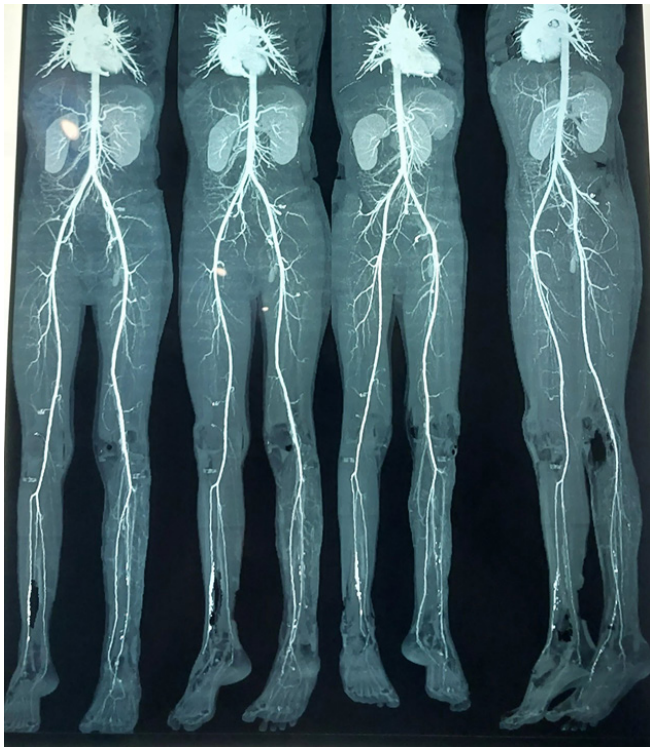


Figure 3 CT angiogram shows flow reduction of lower limb vessels.

Systemic compromise: Microangiopathy caused by T1DM, arresting the natural healing cascade.[1–3]

Parasitic infestation: Crusted scabies, compromising the skin and allowing the invasion of virulent *Streptococcus pyogenes*.

Mechanical deficit: Radically debrided necrotic periosteum, leaving the upper two-thirds of the tibia exposed, dry, and without its primary vascular supply.[4–6]

The multimodal "Biological engine"

The surgical strategy was designed to avoid primary amputation and utilize a 12-week regenerative protocol to "force" angiogenesis from the bone marrow to the cortical bone surfaces.[4,6]

Phase I: Radical debridement

The non-viable periosteum and infected soft tissue were completely removed. The bone was debrided until punctate bleeding, referred to as the 'chili powder sign,' occurred. However, unlike previous methods, the cortex was left intact without fenestrations to preserve structural integrity.[7,8]

Figure 4 Sign of Viability appears to soft tissues/

Phase II: The Ilizarov stimulation (12-week frame duration)

A circular Ilizarov frame was applied to convert the bone into a living vascular pump. This was done through two methods:

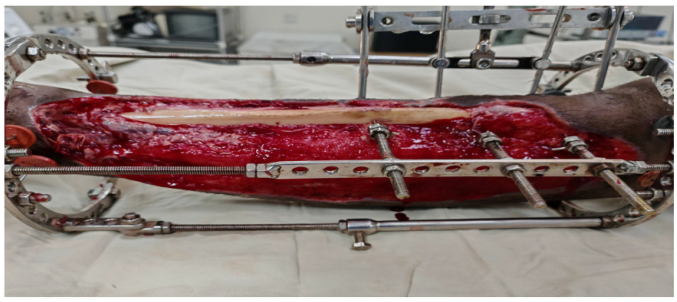
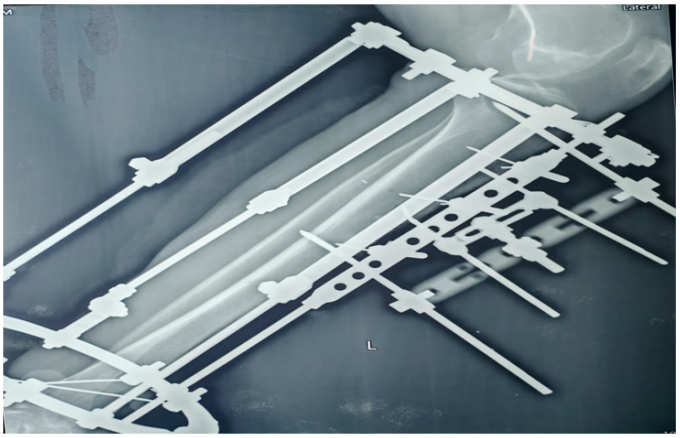


Figure 5 Granulation started after Ilizarov stimulation by TTT and Wire technique distraction.

Figure 6 Granulated wound over the medial aspect of the leg

Tibial transverse transport (TTT): The bone flap was distracted transversely (1 mm/day). This resulted in a systemic increase in pro-angiogenic growth factors (VEGF) and endothelial progenitor cells.[1,2,7]

Figure 7 X-ray Shows TTT and Wire technique on the Tibia by Ilizarov



technique.

Console wire distraction: Specialized wires were inserted through the exposed cortex into the second cortex. Tensioning these wires resulted in a localized stimulus, 'pushing' intraosseous blood flow through the Haversian systems to the bone surface.[2,9]

Phase III: Synergistic NPWT

At the same time, 8 cycles of Negative Pressure Wound Therapy (-125 mmHg) were administered. This provided an external 'pull' to meet the internal 'push' from the wires, allowing small islands of granulation tissue to coalesce into a continuous moist tissue carpet.[4,8]

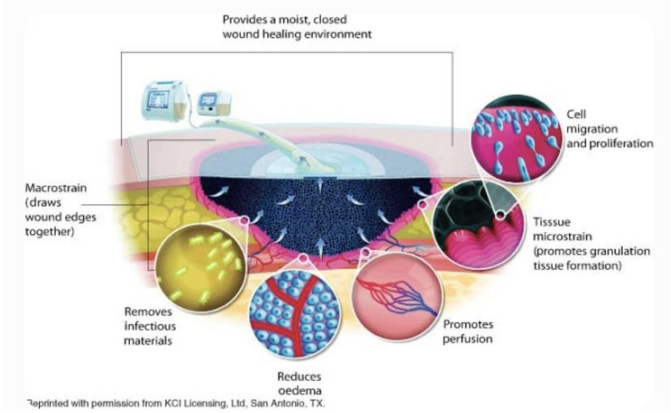


Figure 8 Process and mechanism of NPWT method.

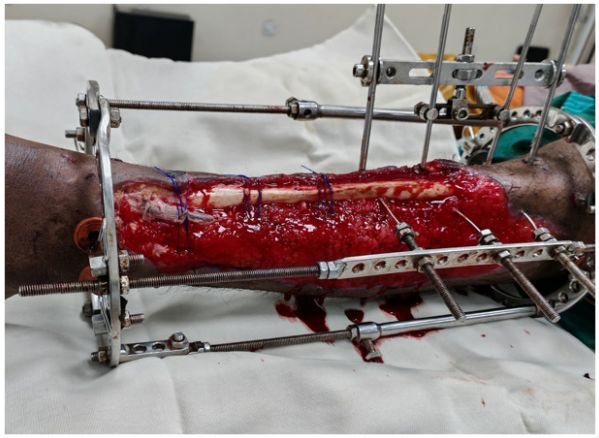


Figure 9 Granulation tissues started growing over the tibia.

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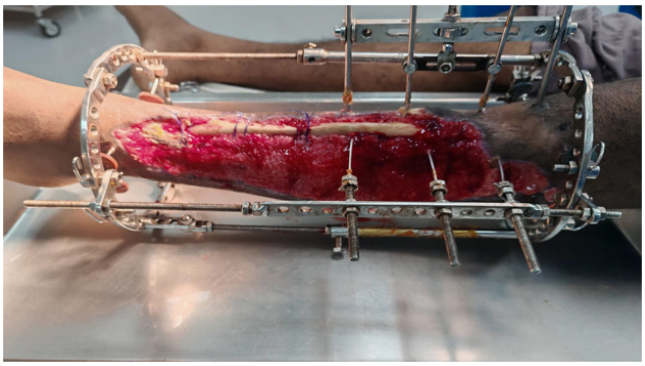

Figure 10 Gradually granulation tissue grow over the exposed tibia.

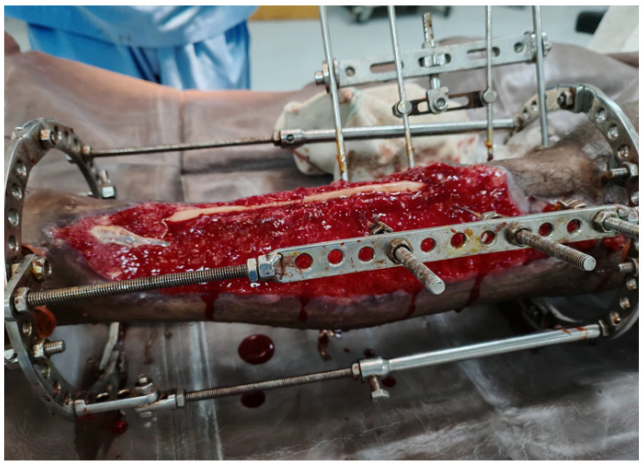

Figure 11 After giving 6th Episode of NPWT the granulation tissues growing over the tibia.

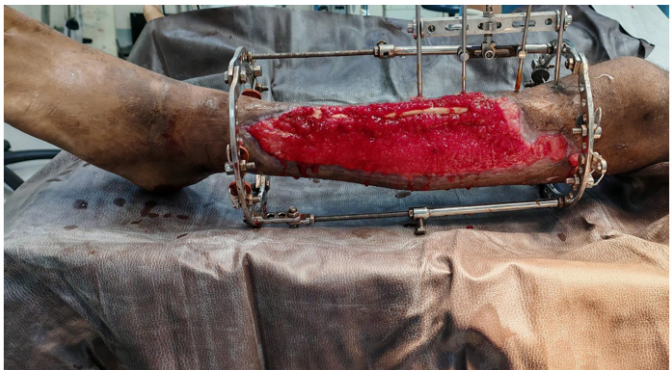

Figure 12 On 7th Episode of NPWT the Tibia almost covered with granulation.

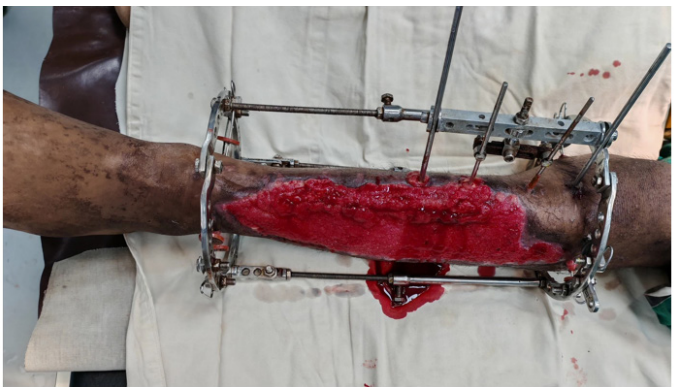

Figure 13 The tibia is fully covered with granulation after 8th Episode of NPWT.

Figure 14 The wound over medial side is healed completely

Integrated management protocol

Parameter	Tibial transverse transport (TTT)	Console wire distraction	Split thickness skin graft (STSG)
Primary Goal	Regional Vascular Recruitment	Cortical Circulation Stimulus	Definitive Wound Closure
Biological Role	Recruits systemic progenitor cells	"Pumps" blood to bare bone	Re-establishes skin barrier
Mechanical Action	Bone flap transport (1 mm/day)	Tensioning through 1st & 2nd cortex	0.3 mm skin transplantation
Timeline	12 Weeks (Total Frame Time)	12 Weeks (Total Frame Time)	After Frame Removal
Success Marker	Reversal of local ischemia	Full coverage of denuded tibia	95% Graft "Take"

Definitive reconstruction: post-frame STSG

The Ilizarov distraction-stabilization device was removed after 12 weeks of distraction and stabilization. The bone surface that was previously "dead" was now completely covered by a high-quality reddish granulation tissue bed. A meshed Split Thickness Skin Graft (STSG) was then harvested and applied. The strong vascularization that occurred during the 12-week "pump" phase ensured successful graft adherence in spite of the metabolic problems posed by T1DM.[2,9,10]

Figure 15 X-ray after removal of Ilizarov apparatus.

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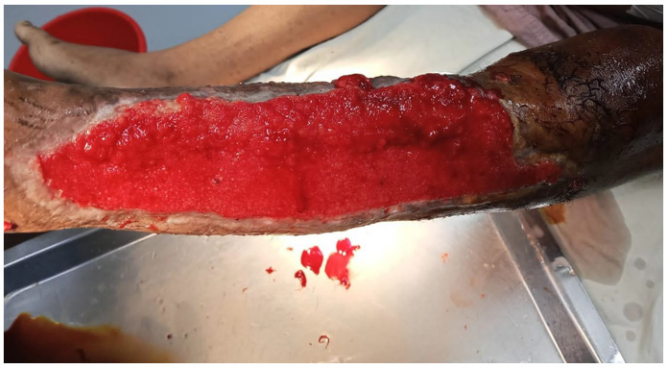

Figure 16 After proper granulation and tibia is completely covered the Ilizarov apparatus was removed.

Figure 17 After proper granulation STSG was done.

Rehabilitation and weight-bearing schedule

Weeks 1-8: Protected weight-bearing in the Ilizarov frame to encourage bone consolidation at the TTT site.

Weeks 9-12: Full weight-bearing in the Ilizarov frame to assess the stability of the newly formed soft tissue.[1,5]

Post-Frame/Post-STSG: 2 weeks of immobilization to protect the graft, followed by a gradual return to independent ambulation with metabolic monitoring.[8]

Discussion

This case questions the need for cortical fenestration and microvascular flaps in severe tibial trauma. By stimulating the second cortex with console wires, we harnessed the *Law of Tension-Stress* to circumvent the absent periosteum. The 12-week carrying of the frame was essential. This allowed the window for distraction histogenesis—the development of new blood vessels and soft tissue—to achieve a state of biological maturity. By the time the frame was removed, the wound was no longer "diabetic and stagnant" but a living, breathing environment ready to support a skin graft on its own.[2,5,6]

Conclusion

Limb salvage in the "devastated" diabetic limb is possible with the judicious use of mechanical forces. The combination of TTT, Console Wire Distraction, and NPWT represents a biological amplification that mandates tissue regeneration in the face of failed physiological healing.[1,4,6] This 12-week multimodal treatment regimen represents a potent alternative to amputation, ensuring functional return for young patients with catastrophic orthopedic injuries.

Acknowledgements

None.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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