

Comprehensive Management of Delayed Pediatric Nail Puncture Injury Complicated by Severe Soft-Tissue Infection: The Adjunctive Role of Negative Pressure Wound Therapy

Viktor Marku¹, Chrysa Andrikopoulou², Ioannis Fragkakis³, Vasileios Leivaditis⁴, Theodora Skoura⁵, Panagiotis Antzoulas⁶, Konstantinos Tasios⁷, Elias Liolis⁸, Andreas Antzoulas⁹, Dimitrios Litsas¹⁰, Panagiotis Dimitrios Papadopoulos¹¹, Thomaella Tsouvaltzi¹², Sosanna Ierodiaconou³, Konstantinos Nikolakopoulos¹³, Spyros Papadoulas¹³, Agron Dogjani¹, Francesk Mulita^{2,9*}

¹Department of Orthopedics and Trauma Surgery, University Hospital of Trauma, Tirana, Albania

²Department of General Surgery, General Hospital of Aigio, Achaia, Greece

³Department of Orthopedics and Trauma Surgery, Karamandaneio Children's Hospital of Patras, Patras, Greece

⁴Department of Cardiothoracic and Vascular Surgery, Westpfalz Klinikum, Kaiserslautern, Germany

⁵Medical School Researcher, National and Kapodistrian University of Athens (NKUA), Aretaeion Hospital, Athens, Greece

⁶Department of Orthopedics, General University Hospital of Patras, Patras, Greece

⁷John Radcliffe Hospital Emergency Department, University Hospitals NHS Foundation Trust, Headley Way, Headington, Oxford UK

⁸Department of Oncology, General University Hospital of Patras, Patras, Greece

⁹Department of Surgery, General University Hospital of Patras, Patras, Greece

¹⁰Department of Surgery, General Hospital of Lamia, Lamia, Greece

¹¹Department of Surgery, Spital Herisau, Appenzell Ausserrhoden, Switzerland

¹²Healthcare Center of Akrotas, Achaia, Greece

¹³Department of Vascular Surgery, General University Hospital of Patras, Patras, Greece

Abstract

Background: Puncture wounds in children are frequently underestimated, particularly when presentation is delayed or the initial injury goes unnoticed. Retained foreign bodies substantially increase the risk of deep soft-tissue infection, abscess formation, septic arthritis, and osteomyelitis. Prompt diagnosis and appropriate surgical management are essential to prevent serious complications.

Case Presentation: A 4-year-old child presented with a 10-day history of progressive pain, swelling, erythema, and purulent discharge of the right foot following a nail puncture injury. Clinical and radiological evaluation revealed extensive soft-tissue infection associated with retained foreign material. Following aggressive surgical debridement, foreign-body removal, and irrigation, empirical intravenous antimicrobial therapy was initiated and subsequently guided by microbiological culture results. Negative pressure wound therapy (NPWT) using a vacuum-assisted closure (VAC) system was applied for three weeks. At one-month follow-up after completion of NPWT, the wound demonstrated complete coverage with healthy granulation tissue, marked reduction in wound size and depth, resolution of infection, and satisfactory functional recovery without the need for further surgical intervention.

Conclusion: This case highlights the importance of early recognition and comprehensive management of delayed pediatric puncture wounds. Combined surgical debridement, appropriate antimicrobial therapy, and adjunctive NPWT can effectively control infection, promote wound healing, and facilitate successful limb preservation in complex pediatric soft-tissue injuries.

Keywords: puncture wound, retained foreign body, soft-tissue infection, negative pressure wound therapy, pediatric wound, delayed presentation