Ref: Ro J Infect Dis. 2024;27(3)
DOI: 10.37897/RJID.2024.3.1

Lower limb salvage in an interesting case of recurrent calf cellulitis

Catalin Gheorghe Bejinariu[1], Vladimir-Aurelian Enachescu[2], Irina Mihaela Zaharia[1]

[1]Department of Plastic and Reconstructive Surgery, "Bagdasar-Arseni" Emergency Clinical Hospital, Bucharest, Romania
[2]Bucharest University of Economic Studies, Bucharest, Romania

ABSTRACT

Cellulitis of the lower limb is a complex pathologic entity which might progress to life-threatening complications, such as sepsis, without a prompt and appropriate treatment. Therefore, a delayed diagnosis often requires life-saving amputations. This paper outlines the therapeutic approach in such situations by describing a patient who had already undergone amputation of the right lower limb and where the rapid institution of targeted therapy saved the left lower limb affected by cellulitis. The conclusion of this research is that in extensive infections of the extremities, the institution of triple antibiotic therapy in combination with staged surgical treatment may avoid limb amputation and save the lives of these patients.

Keywords: gram-negative bacillus, *Pseudomonas luteola,* lower limb amputation, cellulitis

INTRODUCTION

Lower extremity cellulitis is regarded as a life-threatening condition if specific therapy is not administered hastily. Furthermore, complications associated with this pathology are often difficult to treat, sometimes leading to rapid decompensation of the patient and MSOF. Even though the most common cause of extensive lower limb infections is trauma, septic complications of orthopedic interventions and osteomyelitis are also responsible for a significant number of cases [1].

The treatment of extensive soft tissue infections is complex. Initially, it involves the use of broad-spectrum antibiotic therapy in combination with multiple surgical interventions consisting of evacuatory incisions and serial excisional debridement. Moreover, taking a sample of wound secretion, on admission, for antibiogram is essential for the proper development of the therapeutic protocol, in order to adapt the antibiotic treatment to the specific pathogen [2]. Once the result of the antibiogram is obtained, the antibiotic regimen is modified accordingly. Consequently, in the absence of pathologic wound secretions, covering of the remaining defects after serial debridement is performed when the inflammatory phenomena have disappeared.

The treatment of patients diagnosed with extensive extremity infections is multidisciplinary, involving a plastic surgeon, an anesthesiologist and an infectious disease physician. Hence, a good collaboration among them facilitates the establishment of a rapid cure and an early identification of severe complications such as MSOF and DIC [3-5].

A very important aspect to be considered in all cases of cellulitis of the lower limbs is the early identification of signs of sepsis, which presents a high vital risk if specific treatment is not promptly instituted [6].

Disseminated intravascular coagulation might also result from the progression of extensive infections of the extremities and is considered by most surgeons to be the most serious complication associated with this pathology. In these cases, careful monitoring of the biological status, together with a thorough observation of the local evolution of the

Corresponding author:
Catalin Gheorghe Bejinariu
E-mail: drbejinariu@gmail.com

Article History:
Received: 15 August 2024
Accepted: 3 September 2024

lesions, may provide relevant information to rapidly identify the early signs of this life-threatening condition [7-9]. Special attention should be paid to patients diagnosed with extensive cellulitis of the lower limbs who have a history of liver failure, steatosis or cirrhosis. In this context, the local and general course of these patients is often marked by the development of complications with a weak response to specific treatment [10]

The therapeutic algorithm for extremity infections is staged, being characterized by an increased adaptability to the medical context, both the therapeutic and the surgical approach may undergo significant changes during the course of treatment [11-13].

In the first stage of the therapeutic protocol of extensive infections of the extremities, pathological secretions are harvested, broad-spectrum antibiotic therapy is instituted, followed by wide evacuatory incisions, copious lavage with anitseptic solutions and excisional debridement of devitalized structures. Emergency surgical treatment is most often performed under general anesthesia to facilitate extensive exploration of the lesions and opening of all loco-regional infected areas, so as to facilitate access to antiseptic substances on one hand and to create local conditions for excision of devitalized tissues at this level on the other hand [14-15].

The second stage is characterized by the institution of specific antibiotic therapy, once the antibiogram result is listed, in combination with serial, limited excisional debridement of the defined lesions and antiseptic lavages, performed under analgosedation [16].

Once the infectious outbreak is cleared, the third stage of the therapeutic protocol is characterized by performing the necessary reconstructions in order to recover the functional deficit and the coverage of the remaining soft tissue defects after serial excision. As a result, the surgical interventions are complex, being often realized under general anesthesia [17-18].

The final stage of the treatment implies the functional recovery performed on an outpatient basis.

MATERIALS AND METHODS

The present article presents the therapeutic approach in a case of cellulitis of the left lower limb in a 37-year-old patient with a personal pathologic history of osteomyelitis and amputation of the right pelvic limb and recurrent infection of the right one.

The patient's history was characterized by multiple hospitalizations for the treatment of localized infections of the left lower limb. The profile of the pathogens identified in the lesions was varied, including *Staphylococcus aureus*, Glucose non-fermenting Gram-negative bacilli and *Pseudomonas aeruginosa.*

On local evaluation, soft tissue necrosis was identified in the middle 1/3 on the anterior side of the left calf, with marked surrounding erythema and abundant wound discharge (Figure 1).

The patient was hospitalized as an emergency, undergoing surgical treatment consisting in an evacuation incision on the anterior aspect of the left calf and excision of the necrotic area at this level. Intraoperative, a bacterial sample was collected from the lesion discharge. In addition, drug treatment was administered, consisting of triple antibiotic therapy with Gentamycin (80 mg, intravenously every 8 hours), Metronidazole (500 mg, intravenously every 8 hours) and Ceftriaxone (1 g, intravenously every 12 hours), in combination with anti-inflammatory medication (Ketoprofen 100 mg/12

FIGURE 1. Preoperative aspect

hours) and gastric protection (Pantoprazole 20 mg/24 hours). The patient was treated in the plastic surgery ward and did not require intensive care unit attention.

Local treatment was continued with daily serial excisions associated with repeated antiseptic lavage until the septic focus was cleared.

For the reason of an antibiogram revealing an infection caused by a fluoroquinolone-sensitive Glucose non-fermenting Gram-negative bacilli, the antibiotic treatment was switched to Ciprinol (400 mg, intravenously every 8 hours) in association with anti-inflammatory therapy and gastric protection administered since admission.

Furthermore, an angiography of the left lower limb was performed during hospitalization, the result of the investigation stating the permeability of the vascular structures at this level.

On day 12, the remission of the inflammation and the lack of pathologic wound secretions allowed the remaining defect to be covered with split-thickness skin graft. The local evolution was favorable and the patient was discharged on day 19 of hospitalization.

During the ambulatory care evaluation at three weeks after the operation, the patient showed complete healing, with integrated graft and no inflammatory signs at the time of the follow-up.

RESULTS AND DISCUSSIONS

Lower limb infections encompass pathological entities with an increased risk of complications, given the local particularities of vascularization and anatomy.

Following excision of the necrotic tissue, under triple antibiotic therapy, the patient's evolution was slowly favorable, the inflammatory phenomena has significantly reduced in time (Figure 2). In these situations, special attention must address the careful wound debridement with regard to avoid tibial deperiosteosis as much as possible. Nevertheless, bone exposure significantly reduces the reconstructive options in these patients.

The favorable local evolution created the context for the coverage of the soft tissue defect of the middle 1/3 of the left calf with a split-thickness skin graft, harvested from the anterior aspect of the left thigh (Figure 3). This method represents a simple solution with considerable advantages in terms of close monitoring of the deep anatomic structures. Despite the fact that the use of loco-regional or free flaps respectively, undeniably offers an increased vascular flow, patient's history might be considered, as ischemic complications might often occur in these particular situations.

Following surgery, the patient's local evolution was favorable, therefore he was discharged 7 days after surgery, with subsequent outpatient follow-up.

Healing in these cases is undoubtedly delayed and patients require close monitoring in order to adequately identify possible recurrences (Figure 4). Supportive treatment should also be instituted with vitamins, a balanced diet, and maintenance of rigorous local hygiene.

In these situations the physician should also mind the psychological profile of the patient. In the present case, the person was profoundly marked by the presence in his personal pathologic history of amputation of the right lower limb, surgery performed in the same clinical context. On presentation at the hospital he requested amputation of his affected lower limb for fear of developing life-

FIGURE 2. Soft tissue defect after necrosis excision

FIGURE 3. The soft tissue defect covered with a split-thickness skin graft

FIGURE 4. Postoperative aspect 3 weeks after surgery

threatening septic complications. Afterwards the results of the investigations and the presentation of all the clinical data, the patient opted for the applied therapeutic protocol and was very satisfied with the outcome of the surgery.

CONCLUSIONS

Cellulitis of the extremities can be life-threatening by the nature of their evolution without early diagnosis and specific therapy. Amputation is the life-saving solution in most severe cases. However, initiation of broad-spectrum antibiotic treatment on admission, careful monitoring of paraclinical investigations and a stepwise therapeutic approach, provide the prerequisites to save these patients without performing elective amputations.

Compliance with ethics requirements:

The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as the national law.

Informed consent was obtained from all the patients included in the study.

Conflict of interest: none declared
Financial support: none declared

REFERENCES

1. Tienpratarn W, Yuksen C, Pauly JD, Vu D, Benbourenane AN, Sangskul N. Factors and clinical prediction score for complication development after cellulitis diagnosis in adult patients. *Int J Emerg Med.* 2024;17(1):68. https://doi.org/10.1186/s12245-024-00646-w
2. Zhou J, Liu J, Zhang C, Zhou Y, Zheng Z, Li H. Elucidating the molecular mechanisms of sepsis: identifying key aging-related biomarkers and potential therapeutic targets in the treatment of sepsis. *Environ Toxicol.* 2024 Jun;39(6):3341-55. https://doi.org/10.1002/tox.24198
3. Bejinariu CG, Enachescu VA, Bordianu A. Disseminated intravascular coagulation – a rare, difficult-to-anticipate complication of limb infections. *Ro J Infect Dis.* 2024;27(2):73-8. http://doi.org/10.37897/RJID.2024.2.1
4. Giamarellos-Bourboulis EJ, Aschenbrenner AC, Bauer M, Bock C, Calandra T, Gat-Viks I, Kyriazopoulou E, Lupse M, Monneret G, Pickkers P, Schultze JL. The pathophysiology of sepsis and precision-medicine-based immunotherapy. *Nat Immunol.* 2024;25(1):19-28. https://doi.org/10.1038/s41590-023-01660-5
5. Kamran F, Tjandra D, Heiler A, Virzi J, Singh K, King JE, Valley TS, Wiens J. Evaluation of Sepsis Prediction Models before Onset of Treatment. *NEJM AI.* 2024 Feb 7:AIoa2300032. http://doi.org/10.1056/AIoa2300032
6. Sun Y, Ding R, Sun H, Liang Y, Ma X. Efficacy and safety of heparin for sepsis-induced disseminated intravascular coagulation (HepSIC): study protocol for a multicenter randomized controlled trial. *Trials.* 2024;25(1):4. https://doi.org/10.1186/s13063-023-07853-5
7. Boussina A, Shashikumar SP, Malhotra A, Owens RL, El-Kareh R, Longhurst CA et al. Impact of a deep learning sepsis prediction model on quality of care and survival. *NPJ Digit Med.* 2024;7(1):14. https://doi.org/10.1038/s41746-023-00986-6
8. Levi M, Scully M. How I treat disseminated intravascular coagulation. *Blood.* 2018;131(8):845-54. https://doi.org/10.1182/blood-2017-10-804096
9. Lee S, Kim J, Ji M, Moon H, Lee W. Clinical outcomes of antithrombin III supplementation in an overt disseminated intravascular coagulation: a longitudinal single-institutional experience and retrospective analysis. *Ann Palliat Med.* 2024;13(3):477-95. http://doi.org/10.21037/apm-23-535
10. Pulia MS, Schwei RJ, Alexandridis R, et al. Validation of Thermal Imaging and the ALT-70 Prediction Model to Differentiate Cellulitis From Pseudocellulitis. *JAMA Dermatol.* 2024;160(5):511-7. http://doi.org/10.1001/jamadermatol.2024.0091
11. Nightingale RS, Etheridge N, Sweeny AL, Smyth G, Dace W, Pellatt RA et al. Cellulitis in the Emergency Department: A prospective cohort study with patient-centred follow-up. *Emerg Med Australas.* 2024;36(4):579-88. https://doi.org/10.1111/1742-6723.14401
12. Zhao H, Dong Y, Wang S, Shen J, Song Z, Xue M, Shao M. Comparison between sepsis-induced coagulopathy and sepsis-associated coagulopathy criteria in identifying sepsis-associated disseminated intravascular coagulation. *World J Emerg Med.* 2024;15(3):190-6. http://doi.org/10.5847/wjem.j.1920-8642.2024.041. PMID: 38855376; PMCID: PMC11153374.
13. Thompson S, Cooper K, Thomas T, Alexander K, Hem-Lee-Forsyth S. A Comparison of the Application of Two Different Scoring Systems in a Patient With Upper Limb Necrotizing Fasciitis. *Cureus.* 2024 Jun 4;16(6):e61682. http://doi.org/10.7759/cureus.61682
14. Muller I, Teasdale E, Cowdell F, Smart P, Santer M, Francis N. Practice and community nurses' views and experiences of helping people manage risk factors for recurrent lower limb cellulitis: A qualitative interview study. Skin Health and Disease. 2024 Apr 30:e395. https://doi.org/10.1002/ski2.395.
15. Bejinariu C, Marinescu S, Enescu DM. The Romanian National Breast Reconstruction Program - Results and Conclusions after 5 Years. *Medicina Moderna - Modern Medicine.* 2019;26(1):23-30. https://doi.org/10.31689/rmm.2019.26.1.23
16. Yürük Atasoy P, Gürbüz E, Alkan S. Prognostic Significance of NLR, LMR, PLR, and CRP-Albumin Ratio in Lower Extremity Cellulitis: A Hospitalization and Recurrence Analysis. *Int J Low Extrem Wounds.* 2024 Feb 28:15347346241235873. http://doi.org/10.1177/15347346241235873
17. Pandian SS, Kumar am. Clinical study of risk factors, clinical presentation and management of cellulitis lower limb. *Int J Acad Med Pharm.* 2024;6(2):7-11. http://doi.org/10.47009/jamp.2024.6.2.2
18. Weledji EP. Disseminated Intravascular Coagulation (DIC): What the Surgeon Should Know. *Clin Surg.* 2024;9;3682.