

THE OUTCOMES OF NEGATIVE PRESSURE THERAPY ON BILATERAL PLANTAR LESIONS DUE TO SYSTEMIC SCLEROSIS. CASE REPORT

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Summary

Systemic sclerosis is a chronic autoimmune condition of the connective tissue characterized by the appearance of inflammatory changes, vascular abnormalities and fibrosis, often with a multisystemic involvement. The ongoing vasculopathy, along with functional vasoconstriction and tissular damage, predisposes to ischemia, necrosis and skin ulcers. There is little information in the scientific literature regarding the benefits of negative pressure therapy in the healing process of skin ulcers in patients with systemic sclerosis.

We report the case of a 49-year-old female patient, who presented in our dermatology department for painful bilateral plantar ulcers, the first one progressing for 9 months, with local signs of infection and a recent rapid unfavorable evolution. The presence of Raynaud's phenomenon, sclerodactyly and post-ulcerative digital scar lesions on both hands, specific facial skin changes, specific autoimmune positive tests (positive antinuclear antibodies, positive Anti-SCL-70 antibodies), histopathological examination and investigations to assess disease extension (cardio-vascular, pulmonary and others) confirmed the diagnosis of severe systemic sclerosis with vascular, lung and skin involvement. Arterial and venous Doppler ultrasound examination of the lower limbs revealed the presence of femoral vascular axes stenosis and the presence of distal popliteal and interdigital flows. The bacteriological examination revealed an infection of skin ulcers with *Staphylococcus aureus* and *Streptococcus agalactiae*. Therapeutic management was complex by merging systemic treatment (antibiotic therapy according to antibiogram results, alprostadil vasodilator treatment) with local therapy (surgical debridement, topical antiseptics, topical application of skin-neutral ointment dressing in addition to negative pressure wound therapy). The evolution was favorable with complete wound healing within 3 weeks.

In conclusion, negative pressure therapy has proven to be beneficial in healing plantar ulcers in a systemic sclerosis patient by: diminishing pain, removing the exudate, stimulating the development of granulation tissue and maintaining a sterile optimal local environment throughout the whole healing process.

Key words: systemic sclerosis, atypical skin ulcers, negative pressure wound therapy, chronic wound healing

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Introduction

Systemic sclerosis is a chronic autoimmune condition of the connective tissue, often with a multisystemic involvement, characterized by the appearance of vascular abnormalities, inflammation, fibrosis, diverse clinical manifestations, and antibodies production [1,2]. The ongoing vasculopathy, along with functional vasoconstriction and tissular damage, predisposes to ischemia, necrosis and skin ulcers [2,3].

Non-neoplastic atypical wounds are rare diseases, with a tendency towards a chronic course, being different from typical ulcers (venous, arterial, diabetic, bedsores, etc.) by their clinical appearance and manifestations, special setting and resistance to standard therapies, demanding an advanced dermatological and/or surgical approach [1,2,3].

Negative pressure therapy could represent a feasible option, but there is little scientific information regarding its benefits in the healing process of skin ulcers in patients with systemic sclerosis [4,5].

Case report

We report the case of a 49-year-old female patient, who presented in our dermatology department for painful bilateral plantar ulcers, with local signs of infection and a recent rapid unfavorable evolution. The clinical examination showed the presence of a well-defined, irregular,

plantar ulceration of the right lower limb with a chronic course from two month ago, a diameter of about 8/7 cm, reddish edges and purulent secretions, cellular detritus and fibrin at the base; there was focal epithelialization (Figure 1A). The perilesional skin presented cutaneous xerosis, erythema and edema. At the level of the left foot, the patient also presented a post-punch biopsy painful ulceration, with delayed healing, progressing slowly for the last 9 months, with a diameter of 1 cm, irregular edges and the base covered with purulent secretions.

The presence of Raynaud's phenomenon, necrotic angiodermatitis, sclerodactyly, post-ulcerative digital scar lesions on both hands and specific skin changes (generalized hardened skin, "Byzantine icon" facial features with pinched nose, lip thinning, retraction and microstomy) were also observed at the physical examination.

The patient had a medical history of gastroesophageal reflux disease, autoimmune thyroiditis, dyslipidemia and iron deficiency anemia, ongoing treatment with venotonic agents, antithrombotic agents and peripheral vasodilators.

Paraclinical investigations were performed to confirm the diagnosis of systemic sclerosis and to assess its extent. Laboratory investigations revealed leukocytosis with neutrophilia (leukocytes $11.35 \times 10^3 / \mu\text{L}$; neutrophils $8.90 \times 10^3 / \mu\text{L}$) most probably related to wound infection. While laboratory tests excluded a biological inflam-



Figure 1. The evolution of the right lower limb plantar ulceration
A- Right lower limb plantar ulceration at admission: with a diameter of about 8/7 cm, irregular edges, the base with focal epithelialization and covered with purulent secretions, cellular detritus and fibrin.
B - The clinical aspect of the right plantar ulceration after 10 days of negative pressure wound therapy use.
C - The clinical aspect of the right plantar ulceration after 3 weeks of negative pressure wound therapy use.

matory syndrome, hepatic and renal impairment, they revealed mixed dyslipidemia and positive specific serologic autoimmune tests: antinuclear antibodies (ANA 13.0, N: <1), anti-SCL-70 antibodies (188.5 U/ml, N: 0-15 U/ml); serology was negative for anti-U1RNP antibodies and anti-centromere antibodies.

Bacteriological examination showed the presence of a mixed infection with non-methicillin resistant *Staphylococcus aureus* and antibiotic-susceptible *Streptococcus agalactiae* (group B). Mycological examination revealed the absence of yeast.

Histopathological examination of a punch biopsy probe from left plantar skin was consistent with scleroderma changes and excluded the presence of other sclerotic diseases (Figure 2).



Figure 2. Histopathology (hematoxylin and eosin; 10X) of a punch biptic sample of the left plantar ulceration showed atrophy, sclerosis, and parakeratosis.

While the electrocardiogram examination was within normal limits, the Holter examination showed: isolated atrial extrasystoles and the appearance of blocked atrial paroxysmal tachycardia along with isolated ventricular extrasystoles, without ventricular repolarization. Changes detected on Holter examination were interpreted as secondary to the autoimmune thyroid disorder of the patient, who allegedly discontinued therapy.

Arterial and venous Doppler ultrasound examination of the lower limbs revealed the presence of femoral vascular axes stenosis, right limb marked subcutaneous edema and the presence of distal popliteal and interdigital flows.

While the chest radiograph did not show significant fibrotic changes, the chest computed tomography underlined pulmonary interstitial fibrosis at the level of the middle pulmonary lobe and both inferior pulmonary lobes, with minimal involvement of the pulmonary superior lobes. Respiratory tests revealed severe pulmonary impairment with restrictive dysfunction, a reduction in total lung capacity and a decreased diffusion of carbon dioxide across the alveolar membrane.

There were issued the following diagnosis: severe systemic sclerosis, with vascular, pulmonary and cutaneous impairment, infected plantar ulcerations, developed as a result of obliterating arteriopathy and vasculitis in the context of scleroderma. The management of the disease was multidisciplinary with the involvement of physicians of various specialties (dermatology, rheumatology, cardiology, pneumology and cardiovascular surgery).

The wound management was complex by combining systemic therapies (antibiotic therapy according to the results of the antibiogram, alprostadil vasodilator treatment) with local treatment. Daily local care of the left plantar ulceration and periodic local care of the right plantar ulceration were performed, with: surgical debridement, application of topical antiseptics, topical application of skin-neutral ointment dressing and a specific negative pressure therapy dressing (V.A.C.[®] GRANUFOAM[™] sponge), followed by the connection with the and negative pressure therapy device.

The clinical evolution of the patient was favorable with the healing of skin lesions within 3 weeks (Figure 1 B, C).

Regarding the systemic autoimmune disease, there were also prescribed systemic immunosuppressive therapy with mycophenolate mofetil (500 mg daily), prednisone (5 mg daily) and pentoxifylline (400 mg daily).

Discussions

Scientific research papers underlined the beneficial results of negative pressure wound therapy of atypical ulcers that can develop in various pathologies such as [1]: autoinflammatory pathologies (e.g., pyoderma gangrenoso-

sum [2], inflammatory bowel disease - perineal ulceration [3-6]), post-surgical wounds from orthopedic, reconstructive or vascular surgery [7-9], inflammatory diseases (e.g., hydrosadenitis suppurativa), infectious conditions (e.g., deep mycoses, post-surgical abscesses) [5], vascular / vasculopathic (e.g., cutaneous vasculitis, Martorell's ulcer and calciphylaxis as a result of atherosclerosis) [10,11], metabolic diseases [12], genetic conditions, post-drug administration or psychiatric disorders [13]. However, there is little information about its contribution in healing skin ulcers in patients with systemic sclerosis [11,14-16].

Vascular damage in systemic sclerosis, with thickening of the intima, collagen deposition and obliteration of the vascular lumen along with microvascularization damage predisposes to a favorable environment for the development of ischemia [17-19]. Ulcers are debilitating conditions, affecting the patient's quality of life and tend to have a chronic course and delayed healing [14,17-20]. Scleroderma is thus a complex disease that certainly delays the healing process of ulcers due to inflammatory changes, vascular abnormalities and fibrosis [14].

Vascular changes in systemic sclerosis have a critical role in pathogenesis of this condition, usually involving large and small arteries [21,22]. Prior to vacuum-assisted wound closure, it is essential to be assured of the presence of adequate perfusion, as it may lead to transiently reduced perfusion and initial ischemia [21,22]. There are rare reports on the benefits of negative wound pressure therapy in patients presenting ischemic wounds and some authors even consider this pathology a relative contraindication [21,22]. However, references regarding the effects of the negative pressure wound therapy on ulcerations in the context of systemic

sclerosis have shown beneficial results and it is considered an efficient alternative in many of the clinical cases analysed [10,16].

The negative pressure wound therapy device is an integrated system of therapeutic approach of various etiologies wounds, and can be used both in acute care settings and at home [2,23,24]. Negative pressure therapy has proven to be useful in healing plantar ulcers by: reducing pain and the surface of the skin lesions secondary to the negative pressure applied; creating an optimal sterile healing environment, by sealing the ulceration under the special skin-neutral ointment compresses and creating an ideal humidity by continuously removing excess exudate; stimulating the development of granulation tissue and healing, by preparing the wound for closure and reducing edema [2,23,24].

Conclusions

The particularity of this case consists in the difficult management of painful chronic plantar ulcerations in a patient with arterial vascular damage due to complex, autoimmune and atherosclerotic mechanisms, in the context of systemic sclerosis. Atypical skin ulcers often require a multidisciplinary approach and the specialized treatment of associated pathologies (medical and / or surgical), as well as specific wound care, that could certainly include negative pressure therapy due to its multiple beneficial effects stimulating the development of granulation and healing tissue.

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Conflict of interest
NONE DECLARED

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