



TREATMENT TACTICS FOR PURULENT-NECROTIC LESIONS OF THE FOOT IN PATIENTS WITH DIABETES MELLITUS

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Abstract

Purulent-necrotic lesions of the foot remain one of the most severe complications of diabetes mellitus, often leading to disability and high rates of lower limb amputation. The comprehensive treatment of this pathology requires a multidisciplinary approach aimed at correcting metabolic disorders, improving microcirculation, controlling infection, and accelerating wound healing. The study emphasizes the importance of combined methods, including rational antibiotic therapy, surgical interventions, local treatment of wounds, and physiotherapeutic procedures. Special attention is given to innovative techniques such as intra-arterial and lymphotropic administration of drugs, which provide high concentrations of antibiotics directly in the affected tissues and lymphatic system. The obtained results demonstrate that an integrated approach significantly reduces the frequency of amputations, improves treatment outcomes, and enhances the quality of life in patients with diabetic foot syndrome complicated by purulent-necrotic processes.

Keywords: diabetes mellitus, diabetic foot, purulent-necrotic lesions

Introduction

The clinical picture of purulent-necrotic lesions of the foot (PNLF) in patients with diabetes mellitus (DM) is characterized by an atypical course. This is associated with high bacterial contamination, a tendency of pus to spread through the surrounding tissues and tendon sheaths, and more frequent generalization [2,3,7]. Considering the predominance of microflora that is poorly sensitive or insensitive to antibiotics in wounds, as well as the increased incidence of non-clostridial anaerobic infections [1,5,6], the search for new methods of treating purulent wounds continues. The relevance of the problem of local drug therapy of PNLF in



DM patients is due to the low effectiveness of traditional means of treating purulent processes, whose main drawback lies in their impact only on individual components of the wound process [4,8,9]. In patients with diabetic foot syndrome, exacerbation of microthrombosis caused by acute microcirculatory disorders hinders the full therapeutic effect of medications on the pathological focus of the lesion.

Purpose of the Study

to improve the effectiveness of treatment for diabetic foot complications by using methods and agents that influence the development of endogenous intoxication at all stages of the pathogenesis of the purulent process in this severe category of patients.

Material and Methods

We analyzed the treatment outcomes of 102 patients with purulent-necrotic lesions of the foot (PNLF), who developed a purulent-necrotic process. Newly diagnosed diabetes mellitus (DM) and DM lasting up to 10 years was observed in 14.7% of patients, more than 10 years – in 28.1%, more than 15 years – in 27.7%, and more than 20 years – in 29.5%. Mild severity was observed in 19.5% of patients, moderate severity – in 38.3%, severe form – in 40.1%. Insulin-dependent DM was present in 20.9%, non-insulin-dependent in 81.2%. Almost 23.9% of patients did not receive any treatment for DM, 27.6% were treated irregularly, and 47.5% received regular treatment. This circumstance inevitably affected the increase in the proportion of patients with decompensated forms of DM among all patients. Due to the lack of positive results from treatment in other medical institutions, 56.4% of patients were transferred to us in an attempt to save the limb. The patients' age ranged from 28 to 79 years. Men accounted for 63.4%, women for 36.6%. Concomitant diseases were found in 73.4% of patients, with cardiovascular pathology prevailing, while liver and lung diseases were also frequently observed. Often, these conditions determined the severity of the patients' state and were the cause of death.

Bacteriological findings. In 86% of cases, aerobic-anaerobic associations were isolated, most often including obligate anaerobic non-spore-forming bacteria (*Peptococcus spp.*, *Peptostreptococcus spp.*, *Bacteroides fragilis*, *Prevotella*



melaninogenica), facultative anaerobes (*Staphylococcus epidermidis*, *Staphylococcus aureus*), and anaerobic microorganisms (*Pseudomonas aeruginosa*). The high frequency of *Pseudomonas aeruginosa* isolation should be emphasized, which was probably due to prolonged treatment of many patients in other hospitals. The highest sensitivity was noted to the following antibiotics: gentamicin, ceftriaxone, kanamycin, macropen, norfloxacin, and ofloxacin.

Surgical treatment. In PNLF, surgical treatment consisted of sparing, organ-preserving surgical techniques and sanitation of the lesion, aimed at maximum preservation of the supporting function of the foot. Operations were performed differentially, depending on the nature of the pathological process. At the onset of gangrene, conservative treatment was attempted, with every effort made to convert it into a dry form. In case of failure and with a tendency of the process to progress proximally, amputation of the limb was performed. In cases of purulent-necrotic changes in the toes, after preliminary preparation, amputation of the foot or disarticulation of the toe was performed depending on the extent of the lesion.

Results and Discussion

In patients with diabetic foot, due to a pronounced disturbance of the microcirculatory system, progressive microthrombosis prevents therapeutic agents administered into the systemic circulation from exerting their full effect on the pathological area. Based on this, in order to achieve a sufficient concentration of antibiotics in the affected regions of the body and in the lymphatic vessels—which represent the main pathway for the spread of microbes from the primary focus—we did not abandon traditional antibiotic therapy, but only modified the site and method of administration, applying it via a lymphotropic route. The procedure was carried out for 7–8 days, twice a day. Considering that the majority of patients with complicated diabetic foot are elderly and senile individuals with severe comorbidities, we used the method of enterosorption (ES) for detoxification of the body as a simple, accessible, non-invasive, yet highly effective means of combating endogenous intoxication. As a sorbent, we used Polyphepan at a daily dosage of 1.0 g/kg body weight for 8–9 days. For local treatment of purulent wounds, given the extensive purulent-necrotic process and the presence of pronounced infiltration of surrounding tissues, we applied application sorption (AS) with Polyphepan. In cases of detected non-clostridial anaerobic infection and antibiotic-resistant



microflora, a 0.1% sodium hypochlorite solution was used for wound irrigation. These methods of efferent therapy were applied in the first stage of the wound process until the wound was completely cleansed of pus and necrotic tissue. Inclusion of regional lymphotropic antibiotic therapy (RLAT) and the proposed efferent methods of therapy in the treatment complex of 87 patients with diabetes mellitus (DM) and purulent-necrotic foot lesions had a positive impact on the course of the disease. The detoxification effect manifested clinically from the very first days of treatment. Along with the improvement of the general condition, thirst rapidly subsided, appetite and sleep improved. Normalization of body temperature, relief of pain, elimination of tachycardia and dyspnea occurred by day 2–3. The effective impact on the purulent focus and the pronounced detoxification effect of this treatment contributed to early compensation of carbohydrate metabolism, which occurred on day 5.6 ± 0.8 . Subsequently, the course of the disease was stable, and DM became manageable.

Immediately after abscess opening and before the start of treatment, patients with purulent-necrotic diabetic foot (PNDF) demonstrated pronounced acidosis in the wound, with pH reaching 5.0–5.2. This contributed to expansion of tissue damage and maintained the activity of the infectious process. When local AS with Polyphepan and sodium hypochlorite was used, a clear tendency toward alkalization of the wound environment appeared from the first days, and by day 5 the pH had normalized to 7.28 ± 0.15 . At admission, microbial contamination of the tissues was 10^8 – 10^9 Lg CFU/g. After surgical intervention and local use of AS with Polyphepan and sodium hypochlorite, by day 3–4 it had fallen below the critical level to 2.60 ± 0.10 Lg CFU/g. In subsequent observations, only single microbial growths were noted, indicating an uncomplicated course of the wound process. Such a rapid decrease in microbial contamination of wound tissues is most likely also due to early alkalization of the wound environment, since an alkaline medium is destructive for many microorganisms, particularly staphylococcus.

The dynamics of the wound process are of special interest. By days 2–3 of treatment, pain and swelling subsided, infiltration of tissues around the wound decreased, and the amount of purulent discharge reduced. By 5.6 ± 1.4 days, the wound was usually cleared of necrotic tissues. A pronounced necrolytic effect was observed, with dead tissues lifting above the base and edges of the wound and being easily removed. By 7.1 ± 1.2 days, fresh, juicy, granular, easily bleeding



granulations appeared. The size of pockets and the overall wound area decreased significantly.

A vivid and important indicator of treatment effectiveness should be considered the preservation of the limb, reduction of amputation level, maintenance of supporting function, and restoration of the function of the preserved limb.

The use of RLAT, ES, AS with Polyphepan, and sodium hypochlorite in complex treatment, aimed primarily at controlling the purulent-inflammatory process, converting wet gangrene into dry gangrene (observed in 11 patients), and compensating carbohydrate metabolism, allowed preservation of the supporting function of the limb in 86% of patients. Amputations at the thigh level were performed in 11 (10.7%) patients, at the shin level in 4 (3.92%), at the foot level in 16 (15.7%), exarticulations of toes in 28 (27.5%), and necroectomies in 34 (33.2%) patients. Mortality was 3.92% (4 patients died). The average length of hospital stay was 16.7 ± 1.3 days.

Conclusions

The obtained data indicate that inclusion of the proposed efferent methods of therapy in the treatment complex for patients with complicated diabetic foot rapidly suppresses the purulent process, prevents its generalization, and creates favorable conditions for reparative processes. Along with shortening treatment duration, it reduces complications such as gangrene, lowers the level and number of amputations, and decreases disability rates, which is important not only from a practical but also from a social perspective. These efferent therapy methods successfully complement each other, as they act on different mechanisms of the complex multi-stage wound process in PNDP in patients with DM. Reduction in the frequency of high-level amputations is a decisive factor in prolonging the lives of one of the most severely affected categories of diabetic patients.

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