

1. Introduction

According to the World Health Organization, it is diabetic foot syndrome (DFS) that is the major cause of non-traumatically high lower extremity amputations in the world. It should be noted that the average life expectancy of patients after a high amputation is no more than 2 years due to the frequent development of severe diseases associated with a sedentary lifestyle, such as pneumonia, pressure ulcers, disorders of cerebral and coronary circulation [1, 2].

Vacuum therapy (VAC, NPWT) is one of the methods of treatment that involves the prolonged exposure of negative pressure to the wound or cavity. It meets requirements of level III of evidence-based medicine in the treatment of long-granulating wounds, volumetric wounds of extremities, trunk, body cavities. It is used in the treatment of diabetic foot in compensated peripheral circulation and after pre-nephrectomy and purulent foci repair. Optimal amount of negative pressure for rational wound healing – 125 mmHg. Pressure in VAC therapy: low 50 mmHg; average 90–100 mmHg; high 125 mmHg and above if necessary. Operating mode: constant, intermittent, cyclic [3].

The cornerstone of DFS treatment has long been considered the optimal choice for the method of cleaning the wound surface from detritus – so-called wound debridement. The use of bandages with active components (activated carbon, silver, human collagen, platelet growth factor, maggot therapy), unloading with the use of immobilization by type total contact cast, massive anti-infective therapy, topical application of vacuum therapy are already gone extensive therapeutic techniques. However, standardized approaches to the application of many techniques may sometimes fail to deliver the expected result due to the particularities of the disease [4, 5]. Thus, using the classical method of vacuum therapy of wounds in patients with severe forms of diabetic foot syndrome, we have encountered the problem of de-

APPLICATION OF VAC-THERAPY IN THE TREATMENT OF DIABETIC FOOT

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Abstract: The aim. To substantiate the effectiveness of the use of VAC-therapy in the treatment of wounds in patients with diabetic foot syndrome.

Materials and methods. The patient with a complicated form of diabetic foot syndrome was examined. The monitoring of the course of the wound process is supplemented by clinical, cytological, microbiological and morphological criteria. In the treatment of patients we used vacuum therapy apparatus. Vacuum wound therapy was performed in negative pressure regimens in the range of 80–125 mm Hg.

Results. In the pattern of morbidity in economically developed countries, diabetes mellitus (DM) occupies one of the first places. Its prevalence is 1.5–6 %. The number of patients with diabetes in Ukraine is likely to reach 14 million by 2020. Lesions of the lower extremities of different genesis occur in 30–80 % of people with impaired carbohydrate metabolism. Most often, these lesions are complicated by the development of chronic peptic ulcer defects, which, when untimely diagnosed and inadequate treatment, leads to amputation of the affected limb. Even when radical surgery is avoided, the long and costly treatment of trophic disorders of the soft tissues of the feet and legs leads to huge costs of both material resources and time for medical staff. In 15 % of patients with DM, trophic ulcers of the lower extremities are diagnosed. Recent studies have focused on such important aspects of the study of this issue as the early diagnosis of soft tissue lesions in individuals with DM, the development of treatment aimed at preventing amputations, facilitating the further rehabilitation of patients. Vacuum therapy is one of the new methods of treating wound defects, including in patients with diabetic foot syndrome. Topical application of vacuum therapy has already become an integral therapeutic option for wound debridement in patients with diabetic foot syndrome. However, when applying the classic vacuum therapy technique, these patients have the problem of delaying the outflow of tissue exudate and lysis detritus to the vacuum system.

Conclusions. Optimization of the technique of the influence of negative pressure on the wound by applying forced drainage with irrigation of the wound with an antiseptic can maintain a constantly high concentration of antimicrobial agent in the wound, increase the speed of wound dialysis and prevent clogging of pores of the sponge and the bacterial colonies in it. The application of this technique avoids high amputation, accelerates the time of wound healing, and retains the supporting function of the lower extremity.

Keywords: diabetes mellitus, diabetic foot syndrome, vacuum-therapy, debridement, wound, amputation, lower limb.

laying the outflow of tissue exudate and lysis detritus (due to the large amount of fibrin) in the vacuum system. The time of effective use of the vacuum system in these cases was not more than 3 hours, in the future there was a “sticking” of the pores of the sponge, and further use of the technique was associated with the risk of progression of infectious processes in the wound [6, 7]. We made the decision to optimize the technique of the effect of negative pressure on the wound in such patients by the use of tidal drainage. The essence of the method was that a flat drainage was installed at the bottom of the wound, and only then a microporous sponge was placed and the system was sealed using a surgical film. We used octenisept solution for continuous wound flushing through the drained drainage. This technique allowed us, first, to maintain a constantly high concentration of antimicrobial agent (octenisept) in the wound, to increase the rate of wound dialysis and, secondly, to prevent clogging of the pores of the sponge and the development of bacterial colonies in it. One of the results of treatment is given in future work.

The aim of the work. To study the effect of vacuum therapy on the course of acute and chronic wound process in patients with diabetic foot syndrome, depending on the pathogenetic form of the lesion, and to improve the results of surgical treatment of the above pathology on the basis of the obtained data.

2. Clinical case

Positive impact of VAC therapy:

- reduction of the level of endotoxemia and endotoxemia due to the removal of the products of cellular decay from the wound and the lack of their resorption;
- reduction of edema due to the evacuation of intercellular fluid from the tissues at the site of perifocal edema;
- increased microcirculation in the soft tissues of the lower extremities;
- prevention of lateralization of wound edges;

– rapid cleansing of wounds from detritus and necrotic tissue residues;

– prevention of nosocomial infection by reducing bandages.

Absolute contraindications for the use of VAC therapy:

- 1) bleeding that is not stopped; unstable hemostasis;
- 2) a large number of necrotized tissues or defects in the walls, which do not allow to create a closed space;
- 3) an active septic site that was not previously subject to rehabilitation;
- 4) absence of peripheral blood flow [8, 9].

Patient M., 47 years old, suffering from type 2 diabetes, receives 70 U of insulin per day, previously operated in the clinic for severe DFS on both feet (left and right phlegmons were dissected). Repeatedly received an appointment on June 15, 2018 with a clinic for severe DFS, systemic inflammatory response syndrome – purulent wounds in the metatarsus on the plantar surface of both feet, the situation was regarded as Wagner 3–4, Texas 3B limb. At USDG-screening – blood flow on both feet of the main character. After a short preoperative preparation, including detoxification therapy, empirical therapy with antimicrobials from the carbapenem group in combination with clindamycin, the patient was operated on 15.06.2018. It is established intraoperatively that the purulent-necrotic process on the right foot is totally spreading; interfascial ulcers are formed with purulent melting of the distal heads of the metatarsal bones, plantar aponeurosis. Resection of the foot was performed according to Chopar.

On the left foot in the purulent-necrotic process involved the distal heads of the 2nd, 3rd metatarsal bones with their sequestration, the formation of peri-articular phlegmon, the spread of the process to plantar aponeurosis in the form of purulent-necrotic fasciitis. The wounds were not sutured on either foot, with octenisept swabs installed. The method of vacuum therapy was decided to apply from the second day of treatment, given the pronounced intraoperative bleeding from the soft tissues.

15.06.2018 during ligation we revealed that in the postoperative wounds on both feet there were signs of active infectious purulent cellulitis, fasciitis (Fig. 1).

Both feet are equipped with a vacuum system in our version with the irrigation drainage down.



Fig. 1. Right leg and foot view (1st day after surgery)

The vacuum level is 120 mmHg. In addition, the patient in the postoperative period is continued complex therapy, including the correction of glycemia, antibacterial drugs, detoxification, vitamin therapy, alpha-lipoic acid, immobilization. Changing the sponge and the suction-irrigation circuit of the vacuum system was carried out every other day. Against the background of treatment on June 25, 2018, a complete treatment of wounds was achieved, the plastic was made of wound defects with local tissues with the formation of a stump of both feet, with the continuation of treatment by the method of exposure to negative pressure. 30.06.2018 from the stump of the right foot, drainage was removed, 2/3 of the wounds were represented by the compared skin flaps, 1/3 – pink granulations. Subsequently, the dressing of the wounds on the right foot was performed daily using water-soluble ointments without vacuum aspiration. On the left, despite the vacuum aspiration, on the plantar surface in the projection of the distal head was stored wound canal with purulent discharge and its termination in the area of the 1st plus-phalangeal joint. 06.07.2018 – revision of the wound canal, intraoperatively revealed that the capsule of the 1st metatarsophalangeal joint is totally affected by the purulent process. 16.07.2018 – against the background of treatment with negative pressure, skin flaps on the left foot consolidated independently, marked pronounced marginal epithelialization (Fig. 2). 07/20/2018, a patient in satisfactory condition was discharged for outpatient treatment. At the inspection examination 24.07.2018 – the stumps of the feet are formed; small epithelial defects are preserved on both feet.



Fig. 2. Leg appearance (25th day of treatment)

Thus, we have the case of successful treatment of severe DFS, which threatens the viability of both lower extremities, using an optimized vacuum wound therapy technique – irrigation vacuum therapy. The advantage of this method is the possibility of its use in the case of complex wounds, when it is necessary to remove a large amount of viscous wound exudate, wounds with large sections of tissue in a state of necrobiosis, delayed fasciitis, “hyperfibrinous” wounds in patients with diabetes. It should be noted that the method is technically simple, does not require the development of complex design solutions and can be combined with any device for vacuum therapy.

4. Discussion and conclusions

VAC therapy is a modern technological solution in the complex treatment of diabetic foot syndrome, which can be

used both alone and in combination with other methods of treatment.

However, in the research conducted in the field of study and the role of vacuum therapy in the treatment of patients with diabetic foot syndrome, there are contradictions regarding the indications, methods and technologies of the famous scientists in the field of surgery [10–12]. It also needs its further differentiated study of the effect of vacuum on the course of acute and chronic wounds in patients with DFS, depending on the pathogenetic form of the lesion, in order to work out the optimal indications and methods of using this method, which will improve the results of surgical treatment of DFS.

We have investigated the use of VAC therapy and studied the pathological conditions of diabetic foot syndrome in our own clinical studies.

Optimized irrigation vacuum therapy is a promising method of treating patients with delayed purulent-necrotic wound process, which is accompanied in patients with diabetes mellitus with impaired phases of the wound process [13]. The technique of irrigation vacuum therapy can significantly reduce the length of stay of the patient in the hospital, which reduces the risk of nosocomial infections and complications, enables early activation of the patient, social adaptation and return to the usual way of life, improves quality of life.

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