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Improvement of methods of treatment of long-term non-healing wounds

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Abstract: Among the common surgical diseases, a special place is occupied by the so-called chronic wounds. Foreign authors use this term to unite a group of complicated wounds of surgical origin (with spontaneous dehiscence of the edges or suppurated), as well as bedsores, fistulas, leg and foot ulcers. In Russian literature, this term is associated with long-term non-healing wounds and trophic ulcers. The prolonged nature of the healing of such defects makes it possible to resort to such a generalizing systematization. The aim of our study was to improve the results of treatment of patients with chronic wounds by using vacuum therapy in a set of measures aimed at positive correction of the prolongedly developing wound process. It has been established that in the treatment of chronic wounds under the influence of a low-dose vacuum on the vulnar zone, local tissue detoxification is observed, which is evidenced by an increase in the level of general toxicity of wound exudate obtained during vacuum therapy of a chronic wound.

Keywords: Long-term non-healing wounds, necrobiotic processes, vacuum therapy.

Introduction: The origins of the vacuum therapy method go back centuries. However, as evidenced by the extensive literature, it is most common in the surgery of postoperative acute purulent wounds. As for the use of low-dose vacuum in another common condition - chronic wounds, it should be noted that their "relationship" is at the level of "friendly", and there is no need to talk about "strong friendship" between them [2, 5, 9].

All attempts to introduce vacuum therapy to the treatment of chronic wounds can be divided into three groups. Building them into a logical sequence, first of all, we will indicate those options for the technical implementation of the method that are aimed at cleaning the wound defect. The "vacuum assisted

closure" (VAC) technique deserves close attention [1, 3, 7].

Following the authors, this technique began to be used in the treatment of bedsores and other types of chronic wounds. Among its advantages, many point out that it is "unpretentious" and requires dressing once every 2-3 days [4, 6, 8].

At the same time, a systematic analysis of numerous publications that speak with admiration of this technique allows us to draw a paradoxical conclusion: the VAC therapy technique does not reduce the treatment time for deep soft tissue defects [7, 9].

This is not surprising, since in accordance with the laws of the biology of the wound process, chronic wounds (trophic ulcers, in particular), especially those of extensive size, eventually heal by scarring. In this case, the possibilities of VAC therapy are limited to cleaning the wound surface, and in the future, skin grafting is required.

In connection with the above, I am more impressed by the works in which VAC therapy, including vacuum assisted closure, fulfills its direct purpose as a means of preparing the wound surface for skin grafting [9].

Considering a wide range of publications that report on the high effectiveness of VAC therapy in the treatment of acute and chronic wounds, the presence of albeit single, but catchy information about the negative consequences of the use of this technique involuntarily attracts attention.

There is an opinion that under its influence, the bacterial contamination of the wound does not change significantly [8]. Of particular concern is the report that anaerobic infection may develop under vacuum conditions [9]. Perhaps this development of events is due to the specificity of the VAC therapy technique itself.

Long-term isolation of the "suffering" zone from the environment creates a greenhouse effect with oxygen-free conditions, so favorable for the reproduction of anaerobes. This also leads to a logical conclusion - the longer the bandage is not changed, the higher the microbial contamination of tissues.

The aim of our study was to improve the results of treatment of patients with chronic wounds by using vacuum therapy in a set of measures aimed at positive correction of the prolongedly developing wound process.

METHODS

The material for the study was the analysis of the results of treatment and examination of 112 patients who were in the clinic of general surgery in the period from 2010 to 2024 for long-term non-healing wounds and trophic ulcers, which in the overwhelming majority of clinical cases were localized on the foot and lower leg (92.7%), in 5.4% of cases on the knee regions, in one case the wound defect was located on the dorsal surface of the hand and on the heel region.

Most of the studied were men (56.3%). The age of patients ranged from 18 to 81 years, and averaged 54.1±1.7 years. Most of the observations were in middle-aged and elderly people (72.3%).

Among the pathological conditions that preceded the formation of chronic wounds, the most common were purulent-necrotic lesions of soft tissues in the form of erysipelas, consequences of mechanical trauma, thermal injuries (57.1%). These patients were included in the study after 6 weeks from the start of treatment, that is, within the period that determines the chronic nature of the wound process, when a long-term non-healing wound is clinically diagnosed.

In the rest of the cases, there was a trophic ulcer, the cause of which was chronic circulatory disorders, including venous against the background of varicose veins of the lower extremities and post-thrombotic disease (25%), as well as arterial ulcer due to atherosclerosis of the leg vessels (17.9%). According to the International Clinical Classification of Chronic Diseases of the Lower Extremities (CEAP), all patients with chronic venous insufficiency had stage 6 of the pathological process, which implies the presence of varicose veins, edema, pigmentation and venous eczema of the skin, lipodermatosclerosis and active ulcer.

In atherosclerotic lesions of the leg vessels on the basis of the classification of chronic arterial insufficiency of the leg vessels, local changes in the soft tissues in all patients with this pathology observed by us corresponded to the third degree of limb ischemia, which is characterized by pain in the extremities at rest, local necrosis of the skin and deeper tissues.

According to the classification of chronic wounds according to Knighton, the depth of tissue damage was distributed as follows. In most cases, the bottom of the wound defect was represented by destructively altered subcutaneous fat (87.5%), which corresponds to the second stage of classification. In 4.5% of cases, the depth of the wound process was limited to the third stage, spreading through the fascia. Deeper lesions, corresponding to the fourth and fifth stages with the involvement of tendons, ligaments, and bones in the destructive process, were recorded in 8% of cases.

The study of the features of the course of the wound process in conditions of chronic inflammation, as well as the assessment of the effectiveness of therapeutic measures, was carried out using general and local

clinical, clinical-laboratory and special methods of examination.

The scientific assessment of certain events associated with the healing of the ulcer defect was based on the classification of the course of the wound process. In accordance with it, the phase of inflammation was distinguished, consisting of two periods - vascular reactions and cleansing, the phase of regeneration, during which the formation of granulation tissue occurs, and the phase of scar reorganization and epithelialization.

Among the general symptoms that must be taken into account in an objective assessment of the course of the wound process, the dynamics of body temperature, as well as non-specific signs of intoxication (weakness, fatigue), were studied. Great importance was given to the study of hematological parameters, including the number of red blood cells, the level of hemoglobin, the number of leukocytes, neutrophilic shift to the left, the sedimentation rate of red blood cells and the leukocyte index of intoxication, which were recorded during a clinical blood test.

Due to the fact that in a number of cases of chronic wound there is a systemic reaction of the body to inflammation with dysfunction of vital organs, to assess the functional state of the liver and kidneys, I tracked the dynamics of such biochemical indicators as the content of total bilirubin and urea in the blood serum. Among other biochemical criteria, the level of glucose, total protein in the blood serum, was studied.

In assessing the condition of the ulcer, the dynamics of local symptoms is of leading importance, including the type of ulcerative surface and the nature of changes in the underlying tissues, the amount of discharge, the presence of granulations and marginal epithelialization, the severity of pigmentation, hyperemia, lipodermatosclerosis, swelling and infiltration of tissues, the degree of manifestations of pain syndrome. The occurrence and relief of the above symptoms were visually and physically monitored daily.

RESULTS AND DISCUSSION

As a result of the fact that against the background of a minimization of the amount of wound exudate and a change in its nature from purulent to serous, complete relief of paravulnar hyperemia and elimination of peeling of the altered epidermis, as well as the elimination of edema, restoration of tactile and pain sensitivity, the wound was noted to develop active reparative processes in the form of filling the defect with granulation tissue along its entire length, and a noticeable marginal epithelialization. On the basis of this, it could be stated that the recipient bed was ready for autodermoplasty. This was discussed due to the fact that patients with deep wound defects, whose self-healing was possible only due to scarring processes, were under our supervision and treatment. Thus, the "active" wound surface obtained as a result of therapeutic measures served as an absolute indication for skin grafting.

As is known, one of the criteria for the readiness of a wound for skin transplantation is its low microbial contamination up to 102 CFU/cm2 [6, 9].

It is quite difficult to get such a condition, especially in the presence of a nosocomial infection. At the same time, bearing in mind that the main role in the success of wound healing is assigned to the macroorganism, and not to the microbial flora, we considered it possible to raise the specified bar of "bacterial well-being".

According to our data, before skin grafting, the microbial contamination of the wound surface can correspond to 105 CFU/cm2, without any catastrophic consequences for the future.

According to the literature, it is advisable to carry out vacuum therapy of a chronic wound with skin flaps transplanted to it within 5-6 days before plantations at the recipient site. Throughout this time, the vacuum pump is changed once every 3-4 days or it is not touched at all [5, 8].

By the end of therapeutic measures, including vacuum therapy, in 4 clinical cases, self-healing of wounds with their complete epithelialization was noted. At the same time, patients were discharged from the hospital with recovery.

In 6 patients, there were indications for cutaneous plastic closure of the wound defect. However, the patients categorically refused the proposed manipulation. At the same time, by the end of the third – at the beginning of the fourth week, the wound surface was mature granulation tissue, which was pink without fibrin, fine- and medium-grained granules. They also had active marginal epithelialization. Complete elimination of signs of inflammation in the surrounding areas with the preservation of the same degree of skin pigmentation. As for the existing wound defect, by the end of the hospitalization period, most of the patients had a scarce number of wound defects and were serous in nature (92.3%).

By 22-25 days of the patients' stay in the hospital, the number of erythrocytes and the level of hemoglobin, as well as moderate leukocytosis (8.99±0.39x109/l) remained the same among the hematological parameters. Against this background, the neutrophilic shift of the leukocyte formula to the left practically disappeared. The dynamics of the leukocyte index of

intoxication was also encouraging, which decreased to a value corresponding to the physiological norm - 0.75±0.12. At the same time, there was a gradual decrease in the sedimentation rate of erythrocytes.

The state of biochemical criteria (serum glucose, total protein, total bilirubin and urea) was quite natural, they were within the physiological norm, which once again testified to the successful course of the wound process.

The cytological picture of smears taken at that time from the existing wound defect indicated a significant decrease in the total number of neutrophils. First of all, this concerned the reduction of degenerative forms, the number of which was almost halved. Under these conditions, the regenerative-degenerative index naturally increased to 4.24±0.57 and testified to the reliable evolution of reparative processes. As finishing touches that completed the picture of the regenerative type of cytograms, a sufficient number of uninucleated cells and fibroblasts visualized in each smear-impression should be indicated.

Summing up the use of vacuum therapy in the treatment of chronic wounds, it should be noted that the method we practice allows us to interrupt the chain of pathological reactions in the trophic ulcer and prepare the wound bed for its successful healing.

The group of patients who underwent autodermoplasty (75.6%) was the most satisfied. It should be noted that the active effect on the wound with the help of vacuum therapy, both as a means of preparing the wound surface for autodermoplasty, and when using this method during the period of wound management after skin-plastic closure of the defect, allows to obtain good clinical results.

Thanks to the vacuum dressing, the skin flaps are kept in a stable condition until they are firmly fixed to the recipient bed. At the same time, it improves redox processes in wound tissues, which have a positive effect on the life support of skin grafts [2, 4]. As a result, their partial rejection is noted in 5-8%.

Only in three cases was there rejection of more than 50% of the transplanted flaps. Their lysis is associated with insufficient preparation of the wound surface for plastic closure, which was localized on the stump of the tibia, in the area of the resected heel bone and on the foot after melanoma removal. He made significant adjustments to this and created an unfavorable background of a "bouquet" of concomitant pathology (chronic and alimentary iron deficiency anemia, coronary heart disease, hypertension, rheumatoid arthritis).

Here it is necessary to pay attention to an extremely important fact that took place in one clinical case. In vacuum therapy after dermoplasty, there was an abundant intake of wound exudate into the corrugation. During dressing, in addition to the abundance of pus in the dressing, its fetid character was noted, which, as is known, is characteristic of anaerobic flora. Despite the fact that this is not bacteriologically confirmed, we are inclined to believe that it was this type of pathogen that felt the favorable conditions of the vacuum dressing, causing abundant exudation and almost complete lysis of the skin flaps. In connection with the above, we recommend that you be careful about the method of treating wounds, including chronic ones.

CONCLUSION

The results of our research clearly show that the use of the vacuum therapy method in the treatment of chronic wounds makes it possible to intervene in the development of the wound process during the healing of chronic wounds and to interrupt the chain of pathological reactions that form a vicious circle of sluggish local inflammation with the subsequent systemic reaction of the body. Thus, directing it in a biologically rational direction. The traditional version of dermoplasty logically completes the treatment of a chronic wound, and today this method is still the most affordable way to close a wound defect. The problem that was exposed in this case – the complexity of fixation of skin grafts – is to a certain extent solved by a number of technological nuances, which are taken into account in the methodology of the vacuum dressing practiced by us, which allows us to hold the flaps quite reliably even when the tissue defect is localized in functionally active anatomical zones.

Ethics approval and consent to participate - All patients gave written informed consent to participate in the study.

Consent for publication - The study is valid, and recognition by the organization is not required. The author agrees to open publication

Availability of data and material - Available

Competing interests - No

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Conflict of interests - The authors declare that there is no conflict of interest.

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