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BASIC PRINCIPLES OF LOCAL TREATMENT OF WOUNDS AND WOUND INFECTION

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Abstract

Currently, due to the success of antibiotic therapy for soft tissue infections, modern recommendations pay insufficient attention to the surgical aspects of the treatment of wounds and wound infections. This article reflects the evolution of approaches to wound treatment over the past decades and presents an alternative approach to determining the phase of the wound process and selecting drugs for local therapy. The main reasons leading to slower wound healing are formulated and an algorithm for searching for them is proposed. Methods of active wound management by a surgeon, various types of necrectomy, their advantages and disadvantages are considered. The article provides an analysis of modern antiseptics, dressings and the most common ointments used to treat wounds in Russia. The main promising directions that can be used for the treatment of wounds are presented. In conclusion, typical mistakes in wound treatment tactics are shown using specific clinical examples.

Key words: wound, wound infection, wound healing, necrectomy, dressing material, antiseptic, ointment.

A wound is a mechanical violation of the integrity of the skin, mucous membranes, underlying tissues, and internal organs with the development of local, regional and general dysfunctions [1]. The surgeon experiences the greatest difficulties when treating infected wounds. The frequency of surgical infections in the structure of surgical diseases has not decreased in recent years, remaining at the level of 24–36

[1]Kuzin M.I. General principles of treatment of purulent wounds: Method, recommendations. 1985. - 31 p.

% [2]. Inadequate management of patients with surgical infection is one of the reasons for the high mortality rate in this patient population - 25-50 % [3].

Classification of wound process.

A wound is a complex biological system and goes through certain stages in its development. Classification of wound process (according to M.I. Kuzin):

I – phase of inflammation, divided into the period of vascular changes and the period of cleansing the wound from necrotic tissue;

II – phase of regeneration, formation and maturation of granulation tissue;

III – phase of scar reorganization and epithelization .

There is an alternative four-stage classification of wound healing BYRP (Black Yellow Red Pink). In this system, different colors simulate different phases of the wound process. The BYRP classification distinguishes stages: Black (black) - necrosis, Yellow (yellow) - fibrin in the wound, Red (red) - granulation tissue, Pink (pink) - epithelization of the wound. The graphic diagram is close to the real clinical picture, since the color of the wound changes depending on the processes occurring in it. In this case, stages B and Y correspond to phase I of the wound process according to M.I. Cousin. Stages R and P correspond to phases II and III . This classification, based on the identification of three degrees of exudation, is presented in Fig. 1 (insert at the end of the article).

For fresh (acute) wounds without signs of infection, a unified approach has been developed, the essence of which is the rapid surgical closure of the tissue defect. The need for long-term hospital stays, repeated surgical interventions and the use of additional treatment methods arises only when the wound becomes “ chronic ”. A chronic wound is a wound that exists for more than 4 weeks (the exception is extensive granulating superficial wounds after a burn) [4].

[2] Goryunov S. _ V. , Roashov D._V. , Butivshchenko I. _ A. _ Purulent surgery _ Atlas. M.: Binom. – 2004. – 558 s.
[3] Pulgar S., Mehra M., Quintara A., et al. The epidemiology of hospitalized cases of skin and soft tissue infection in Europe. 18th ECCMID, 2008, Barselona , Spain , Abstr . P. 821.
[4]Evans E. Nutritional assessment in chronic wound care. J Wound Ostomy Continence Nurs 2005; 32:317-20.

Causes of impaired wound healing

The probable causes of impaired wound healing are given in Table. 1. Clinically, such wounds are characterized by the presence of necrotic tissue, the absence of developing granulation tissue, the absence of spontaneous epithelization, the presence of infection and signs of impaired local blood supply.

Rare systemic factors that impair wound healing also include:

- disruption of collagen synthesis, usually excessive synthesis (genetically determined, more common in the Negroid race);
- violation of the blood coagulation system, thrombocytopenia;
- vitamin deficiencies (vitamin A);
- deficiency of microelements (Zn);
- necrobiosis lipoidica;
- incomplete osteogenesis ;
- elastic pseudoxanthoma ;
- Ehlers – Danlos syndrome ;
- lax skin syndrome (cutislaxa);
- progeria .

Wound treatment methods

The evolution of ideas about wound treatment has gone through three main stages. Moreover, each of the following stages does not refute, but complements the previous one.

Stage I. The wet theory of wound healing (1962). The advantage of wound healing in a moist environment compared to a dry dressing has been shown. The emergence of new dressings and ointments on a hydrophilic basis. Reducing the role of lipophilic substances[5]

Stage II. Differentiated approach to wound treatment according to the stage of the wound process (1992). Differentiated treatment of wounds depending on etiology and stage. The emergence of modern dressings. The beginning of the application of genetic engineering technologies and biosynthetic analogues of skin to wounds.

[5]Bryan J. Moist wound healing: a concept that changed our practice. J Wound Care 2004; 13:227-8.

Stage III. Theory of wound base treatment « Wound bed preparation " (2000). The need to convert a chronic wound into an acute one. Discovery of high levels of proteases in exudate and phenotypic failure of cells at the base and edges of chronic wounds[6]

Thus, at the present stage, in relation to wounds that do not heal for more than 2 weeks, the following strategy is recommended:

• surgical treatment – necrectomy ;
• adequate drainage;
• wound management with a moist environment;
• use of optimal antiseptics, avoidance of cytotoxic agents;
• use of modern dressings according to the stages of the wound process;
• transport of necessary substances into the wound using ointments and dressings;
• use of additional products with proven effectiveness for the treatment of wounds.[7]

Necrectomy is performed with anesthesia in a hospital, observing asepsis and antisepsis in order to convert a chronic wound into an acute one. At the same time, exudation is significantly reduced, it is possible to obtain adequate material for microbiological research, the time until epithelization begins and the overall treatment time is reduced, and the risk of infectious complications is reduced.

The main uses of necrectomy in wound treatment:

– necrectomy with simultaneous plastic surgery of the tissue defect (used for complete elimination of the source of infection during necrectomy);
– necrectomy with plastic surgery of the defect in the second stage (if it is impossible to perform radical surgical treatment, if repeated necrectomy is necessary);
– necrectomy with wound healing by secondary intention (with a small wound size, when the timing of secondary healing and the timing of treatment with plastic surgery will be the same).

For effective treatment, dressings are combined with ointments. Currently, according to the strategy for wound management in a moist environment, most ointments are made on a hydrophilic base. Ointments have received the same

[6] Falanga V. Classifications for wound bed preparation and stimulation of chronic wounds. Wound Repair Regen 2000; 8:347-52.
[7] Ennis WJ, Meneses P. Wound healing at the local level: the stunned wound. Ostomy Wound Manage 2000; 46(1A Suppl):39S-48S.

specialization as dressings and are used differentiated according to the stages of the wound process. It should be noted that the frequency of application of the ointment, as a rule, affects the therapeutic effect, especially if the ointment is used in conjunction with outdated dressing material. For most ointments, a single application per day is recommended, but according to clinical data, in the first phase of the wound process, 2-4 times the use of ointments with an antibacterial effect is acceptable; in phase II - 1-2 times application to protect granulations; in phase III – 1–3 times – to stimulate reparative processes.

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Additional wound treatment methods

One of the basic principles of wound treatment, which is often forgotten, is unloading the affected area, immobilization. Depending on the clinical situation, immobilization can be: bed rest (large area burns), a sitting wheelchair (neurotrophic ulcers of the heel areas), crutches (wounds of the lower extremities), modern systems such as Total Cast (foot ulcers), as well as splints made of gypsum and polymer materials and other orthopedic products [26]. Immobilization in phases I and II of the wound process prevents the spread of local infection, reduces swelling and pain. Currently, immobilization with removable polymer individual splints or neoprene splints is adequate for the upper extremities. orthoses for the lower extremities - removable and non-removable polymer splints and Total type loading systems Cast, Air Cast, Scotch Cast [8].

Negative pressure has proven itself well. pressure therapy) – VAC therapy (vacuum assisted closure). The essence of the method is to create a sealed environment in the wound and active aspiration using negative pressure up to 250 mmHg. Art. The advantage of the method is the acceleration of the rate of wound cleansing, the growth of granulation tissue, and the ability to transfer the patient to outpatient treatment. Disadvantages: the need for special individual equipment, training for the surgeon and the patient, the risk of developing a severe infection in conditions of isolation of the wound and reduced aeration, the risk of bleeding and increased pain [9].

Prospects for wound treatment

The main scientific advances that can be used to treat wounds in the coming years are as follows:

• application of modern physical methods of necrectomy with objective determination of the boundaries of healthy and altered tissues;
• use of fibroblasts and keratinocytes ;
• creation of a controlled abacterial environment in the wound;

[8] Korhonen K., Hirn M., Niinikoski J. Hyperbaric oxygen in the treatment of Fournier's gangrene. Eur J Surg 1998; 164:251-5.
[9]Silberstein J., Grabowski J., Parsons JK Use of a vacuum-assisted device for Fournier's gangrene: a new paradigm. Rev Urol 2008; 10:76-80.

• widespread introduction of surgical revascularization methods to enable successful treatment of wounds/ulcers in conditions of critical ischemia;
• use of gravity therapy;
• obtaining new antibacterial substances for local therapy.

Clinical examples

Example 1. Patient A, a 67-year-old man, sought medical help due to the formation of a wound after a bruise on the anterolateral surface of the middle third of the leg. After 2 weeks, the wound took on the appearance of a "crater." The wound/ulcer was uninfected, despite daily dressings with hydrophilic ointments, adherence to bed rest, increased in size and was covered with necrosis by 50%. After necrectomy the situation improved, but after 5 days foci of necrosis reappeared. After repeated necrectomy, the size of the ulcer doubled. Conservative treatment continued without improvement, and on the 50th day the patient developed necrosis of the skin of the fourth toe on the side of the ulcer.

Analysis of the situation: localization of the wound in the middle third of the leg, old age, progressive course without signs of infection indicate an ischemic component. In this situation, it was necessary to find out the degree of blood flow disturbance (ABI, Doppler ultrasound), take measures aimed at improving arterial blood flow, and then only perform necrectomy . Necrosis of the finger (dry gangrene) indicates the impossibility of ulcer healing without surgical revascularization, i.e. one of the local factors that impairs wound healing is not taken into account.

Example 2. Patient B, a 55-year-old woman, was treated for a long time by a general practitioner for hypertension. At the same time, the patient did not notice any improvement subjectively. For no apparent reason, the patient developed round wounds with a diameter of 1 cm on both legs near the knee joints. After a course of treatment, which included dressings with Levomekol ointment and physical therapy, the ulcers became epithelialized . After 1 month, skin defects 2 cm in diameter appeared again on both sides. After 2 weeks of dressings with Betadine, one of the wounds healed, the other acquired the features of a chronic ulcer. Later, the ulcers appeared three times and epithelialized, but each time their area increased and reached an area of 100 and 120 cm2 by the 1st year.

Analysis of the situation: symmetry of the lesion, a history of indications of a serious concomitant disease, recurrence of ulcers indicates the presence of a systemic pathology. This situation is Martorell syndrome - the formation of symmetrical ulcers due to arrhythmia and severe hypertension due to thrombosis of perforating vessels. A mandatory component of treatment should be correction of the state of the cardiovascular system, i.e., one of the systemic factors that impairs wound healing is not taken into account.

Analysis of the situation: the attending physician prematurely canceled systemic antibiotic therapy, overestimating the local antibacterial effect of ointments and antiseptics. The patient did not have immobilization of the limb, he continued to walk against the background of an infectious process, which, probably, in the presence of diabetic osteoarthropathy, led to the destruction of bone tissue.

The plastic stage of wound reconstruction was not carried out in a timely manner; a positive effect of the ointment stimulating regeneration was expected. As a result of prolonged wound infection, continued load on the limb, and inactive surgical tactics, the patient was forced to undergo amputation.

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