

Original Research

Some aspects of rash in patients with diabetes mellitus

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Abstract

Background and aims: The aim is to find out the frequency of different forms of erysipelas among the general population of the disease and the peculiarities of its course in patients with diabetes. **Materials and methods:** Two hundred and eighty-four case histories of patients who were hospitalized in the center of purulent-septic surgery in the Non-profit municipal enterprise “City Hospital N^o 3” in Zaporizhzhia for the period 2016–2020 were analyzed retrospectively and prospectively. **Conclusions:** Erythematous and necrotic forms of erysipelas are observed with equal frequency in patients with diabetes mellitus and without it. However, in patients with diabetes mellitus with an erythematous forms of erysipelas, the localization of the process on the face predominates in similar to that in patients without diabetes. Complications of erysipelas are significantly more common in patients with diabetes mellitus. Radical surgery and timely targeted ABT are key elements of success in the treatment of surgical forms of erysipelas and are not subject to revision. Procalcitonin is a diagnostic marker that can predict the development of sepsis.

Keywords: erysipelas, diabetes mellitus, procalcitonin.

Introduction

Recently, there has been a significant increase in infectious diseases caused by B-hemolytic streptococcus group A. According to the literature of recent years, the incidence of erysipelas in Europe is from 4.3 to 10 thousand adults. In general, for this disease, there is an increase in the number of young and middle-aged patients. More than 60% of patients suffering from erysipelas, the age of which ranges from 40 years and older, and the disease mainly affects women [3, 5].

In recent years, the problem of purulent intoxication of the whole organism, infectious-allergic manifestations of the disease, as well as an increase in the proportion of complicated forms of erysipelas and, characteristically, its recurrence [2].

Very often there are changes in the clinic and, above all, the course of the disease, which is accompanied by the development of severe complications and sepsis. Patients with purulent-necrotic complications, especially those that require surgery range from 6.7 to 21%. Mortality among the necrotic form of erysipelas ranges from 5.9 to 82% [4, 8].

It should be noted that this disease aggravates the course of comorbidities and often develops against the background of metabolic syndrome, pathology of the cardiovascular system, chronic lymph venous insufficiency of the lower extremities of various etiologies, dermatoses and other diseases [3].

The clinical picture of erysipelas. As a rule, it is characterized by the development of such purulent-necrotic complications as



abscesses, phlegmons, purulent fasciitis, which are very often prone to recurrence (25–30%), which often leads to a more severe course of the disease, and often to disability of such patients [5].

According to many authors, the development of the pathogenesis of erysipelas is characterized primarily by local immune disorders, disorders of cellular and humoral parts of the immune system, increased sensitization to antigens of beta-hemolytic streptococcus serogroup A (according to Lansfield), transition to chronic streptococcal disease in the form of foci of endogenous infection, including in the macrophages of the dermis, as well as, excessive production of T-lymphocytes and mononuclear cytokines that have a bio damaging effect [1, 6].

The use of trivial treatments does not allow to obtaining of the desired results. Despite the development of new methods of treatment of complicated forms of erysipelas, the problem still loses its relevance due to reduced conservative therapy, the development of resistance of microorganisms to therapy and reduced immunological and general reactivity of such patients [7, 9, 10].

Thus, all the above proves that the problem of treating patients with erysipelas is far from being solved and remains relevant.

The aim of the work

The article is aimed to find out the frequency of different forms of erysipelas among the general population of the disease and the peculiarities of its course in patients with diabetes.

Materials and methods

Two hundred and eighty-four patients' histories were examined who were hospitalized in the center of purulent-septic surgery in the Non-profit municipal enterprise "City Hospital № 3" in Zaporizhzhia for the period 2016–2020 were analyzed.

All patients were diagnosed with erythema during hospitalization, by forms:

erythematous – 59 (20.8%), bullous – 69 (24.3%), phlegmonous – 116 (40.8%), necrotic – 40 (14.1%). Recurrent cases were observed in 46 (16.2%) patients.

In terms of gender: men – 117 (41.2%), women – 167 (58.8%). The average age of patients was 62.1 ± 2.6 years. Verification of the diagnosis was performed on the basis of clinical anamnestic data according to the classification of V.L. Cherkasov (1986) [6].

The patients were divided into two groups. The main group consisted of 106 (37.3%) patients with erysipelas who had diabetes mellitus. The comparison group included 178 (62.7%) patients with the same pathology who did not have diabetes mellitus.

There was no significant difference between the main group and the comparison group by sex ($\chi^2=0.08$; $p=0.7715$). According to age characteristics (WHO classification, 2012) groups did not differ statistically ($p=0.107236$): the average age of patients was (61.3 ± 0.78) years in the main group and (63.5 ± 1.12) years in the comparison group and ranged from 37 to 81 years and from 41 to 83 years, respectively. By concomitant pathology, the main group did not differ significantly from the comparison group ($p>0.05$).

Among the hospitalized: middle-aged patients accounted for (38.2%), the elderly (32.7%). If among men this disease was observed mainly in young and middle age – (49.2%), in women – in the middle (74%) and old age – (26%).

The complex of laboratory tests included general clinical tests of blood and urine, determination of glycemia, biochemical parameters of liver and kidney function (bilirubin, aminotransferases, sediment samples, creatinine, and urea), coagulogram, total protein and its fractions, blood test for glycosylated hemoglobin (HbA_{1c}) and urinalysis for microalbuminuria. Collection of material was performed during hospitalization and in the dynamics.

Glycosylated hemoglobin was determined by enzyme-linked immunosorbent assay on a biochemical automatic analyzer "Olympus AU 640" (Japan). The concentration of both HbA_{1c} and total hemoglobin was determined. The HbA_{1c} /total hemoglobin ratio was expressed in mmol/mol or as % HbA_{1c} . Analysis of urine for

microalbuminuria was performed using diagnostic strips “MicroalbuFAN”, designed for semi-quantitative analysis of albumin and creatinine in urine.

According to the analysis of blood for glucose and glycated hemoglobin, patients of the main group are divided according to the severity and compensation of diabetes mellitus. In the course of diabetes, the average severity of the disease prevailed – 93 (87.7%) patients.

In terms of the degree of compensation, most patients in the main group due to the level of glycated hemoglobin ($HbA_{1c} > 7.5\%$) were in the decompensated stage of diabetes mellitus.

Microbiological examination of wound secretions was performed using an automatic microbiological analyzer “VITEK-2” or “BaCT/ALERT” Compact (manufactured by BioMerieux, France), designed to identify microorganisms and determine their sensitivity to antibiotics. This technique allows identifying a wide range of microorganisms: gram-negative, gram-positive, *Neisseria* and hemophilia, anaerobes, yeast, and bacillary. Modern automatic methods of research of crops of a wound center allow fixing growth of microorganisms within 6–8 hours that allows receiving exact identification of the activator in 24–48 hours.

It should be noted that the microflora of primary foci in destructive forms of erysipelas has changed both quantitatively and qualitatively. Increasingly, streptococcus was sown in microbial associations.

Statistical analysis was performed using the software package “Statgraphics Plus for Windows 7.0”.

Research results

It was found that most often the local focus was localized in the lower extremities. However, in the erythematous form of erysipelas, the localization of the process on the face (11 patients: 9 in the main group, 2 – in the comparison group) in patients with diabetes mellitus significantly prevailed over that in patients without diabetes ($\chi^2=4.70$; $p=0.0302$).

The most common clinical manifestations of intoxication in bullous and phlegmonous forms

of erysipelas were: general weakness, hyperthermia, muscle pain. In the necrotic form of erysipelas, patients showed signs of severe intoxication with nausea, vomiting, and confusion.

A significant proportion of patients (52%) with erysipelas came to the hospital in the long term from the onset of the disease. This was due to self-medication, a long outpatient examination. It should be noted that the longer the pre-hospital period, the more pronounced the symptoms of intoxication.

Patients with a bullous form of erysipelas in 42.9% of cases went to the hospital (or were referred by the surgeon of the polyclinic) in 1–2 days of the disease. Apparently, patients are concerned about the fact that blisters appear on the background of hyperemia of the extremities, and this seems unusual to them.

With the development of destructive forms of the disease, the pain syndrome decreases slightly, but the general condition worsens. Some patients hope that everything will pass and do not rush to the doctor and only the phenomena of general intoxication lead them to seek help. It should be noted that destructive forms of erysipelas in patients with diabetes mellitus prevailed over similar forms in patients without diabetes, respectively, 59.5 vs. 40.5% ($\chi^2=5.63$; $p=0.0177$).

In the complex treatment of patients with erysipelas, the main place belongs to antibiotic therapy (ABT) and early surgical treatment of the area of the pathological process. This statement does not apply only to the erythematous form of erysipelas when with the help of local and conservative treatment it is possible to eliminate the pathological process.

In complicated forms of erysipelas, surgery should be both earlier and as radical as possible and include extensive disclosure of the local infection, removal of devitalized tissues, full drainage.

In patients with a bullous form of erysipelas, the surgery consists of opening the bulla with the evacuation of pathological fluid and drainage.

In phlegmonous and necrotic forms of erysipelas, it is a decompression contour dermatomy.

The most common surgical procedure is required for patients with circular erysipelas

when a section is performed within the area of inflammation with longitudinal and transverse wavy sections throughout the pathological focus. This method provides complete drainage, outflow of infected lymph and reduction of pressure deep into the underlying tissues. If after radical surgical treatment of the local focus the general toxic manifestations do not disappear, it is necessary to suspect existence of sepsis irrespective of research results on blood cultures.

The nature of the clinical course of the disease, including the nature of the local inflammatory focus, depends on the set of pathogenetic properties of the microbes that form the microbial landscape.

The trigger for the development of any form of erysipelas is group A streptococcus (*S. pyogenes*) in 58–68% of cases, group C (*S. equisimilis*) – in 14–25%, group B (*S. agalactiae*) – in 3–9%.

Currently, procalcitonin is considered a highly sensitive and specific marker of inflammation, with which it is possible to assess the severity of the patient's condition [8, 10]. As infection and multiorgan failure progress, procalcitonin concentrations increase, as evidenced by the correlation between the severity of the condition and the severity of multiorgan dysfunction, which is characterized by the APACHE II and SOFA scale systems.

Determination of procalcitonin in serum makes it possible to assess the progression and generalization of the process and is a sensitive test for the effectiveness of treatment. This is important in the choice of treatment methods, duration, and scope of surgery.

On admission to the in-patient department of the Non-profit municipal enterprise “City Hospital № 3” of Zaporizhzhia City Council for 1–2 days, all patients with destructive forms of erysipelas were evaluated for procalcitonin. It should be noted that in patients with an erythematous form of erysipelas at the time of hospitalization, and subsequently, there was no increase in PCT. In patients with phlegmonous form, only 1 patient had a slight increase in serum PCT levels of 1–1.5 ng/ml, but on day 3 the PCT level returned to normal.

The most severe complication of streptococcal infection is the necrotic form of erysipelas, which is characterized by severe disease,

development of infectious-toxic shock, respiratory distress syndrome, multiple organ failure and is accompanied by up to 80% mortality. According to our data, the necrotic form of erysipelas was observed with the same frequency in patients with diabetes mellitus and without it ($\chi^2=0.09$; $p=0.7698$). In the treatment of this pathology, it is necessary to recognize the onset of sepsis as early as possible and to prescribe the necessary conservative treatment in a timely manner. In patients with necrotic erythema, the level of procalcitonin in 10 patients was more than 2 ng/ml. This gave us reason to consider them as patients with sepsis. In the dynamics of the study, the level of PCT in them remained high for 2 weeks and only with the stabilization of the general condition and clinical recovery, it return to normal. It should be noted that in these patients the blood test for blood culture was negative, 6 patients died; mortality was 60.0%.

The main treatment for complicated forms of erysipelas is surgery, which includes individual choice of the method depending on the prevalence, the nature of changes in the skin and subcutaneous tissue, the general condition of the patient and targeted ABT.

In our clinic, we adhere to restrained surgical tactics in the treatment of patients of this profile. The general condition of the patient comes to the fore. In the case of septic shock and unstable hemodynamics, surgery is postponed until the condition stabilizes or there is a positive response to infusion therapy; we use the same principles when setting indications for repeated treatment of purulent foci, without defining a strict time frame. In addition, during necrectomy only non-viable tissues are removed, revealing the openings widely. Active local treatment allows controlling the wound process, to set indications for repeated necrectomy in time. Tactics of maximum possible preservation of viable tissues during surgery, the use of possible longitudinal rather than circular and wavy sections, ultimately reduce the area of wounds as a result and prevents the subsequent formation of transverse scars, which contribute to the progression of lymphostasis.

The duration of inpatient treatment of patients with an erythematous form of erysipelas was 6.4 ± 0.8 days, with bullous 10.2 ± 1.7 days,

patients with phlegmonous form were treated for 24.4±2.3 days. It should be noted that in patients with diabetes mellitus, the length of stay in the hospital was significantly ($\chi^2=5.63$; $p<0.0177$) more increased than in similar patients without diabetes. As a rule, patients with a necrotic form of erysipelas were hospitalized for more than 1 month (it depended on dermatoplasty). Thus, the more severe the form of erysipelas, whether there is diabetes mellitus – the longer the duration of inpatient treatment and greater material costs of this category of patients.

Discussion

Erythematous and necrotic forms of erysipelas are observed with the same frequency in patients with diabetes mellitus and without it [11–14]. Complications of erysipelas are significantly more common in patients with diabetes [15–17]. The most serious complication of streptococcal infection is the necrotic form of erysipelas. The main treatment for complicated forms of erysipelas is surgery [18,19]. Radical surgery and timely targeted ABT are key elements of success in the treatment of surgical forms of erysipelas. Procalcitonin is a diagnostic marker that can predict the development of sepsis.

Conclusions

1. Erythematous and necrotic forms of erysipelas are observed with equal frequency in patients with diabetes mellitus and without it. However, in patients with diabetes mellitus with an erythematous form of erysipelas, the localization of the process on the face predominates similar to that in patients without diabetes.

2. Complications of erysipelas are significantly more common in patients with diabetes mellitus.

3. Radical surgery and timely targeted ABT are key elements of success in the treatment of surgical forms of erysipelas and are not subject to revision.

4. As a diagnostic marker that allows predicting the development of sepsis, is considered procalcitonin.

Ethic approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Conflict of interest

The authors declare no conflict of interest.

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