Carbohydrate metabolism in patients with erysipelas

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Abstract

Objective. To determine the frequency of erysipelas and the frequency of carbohydrate metabolism disorders in patients of the purulent–septic centre in Zaporizhzhya.


Results. It was found that 359 (2.3%) patients had erysipelas inflammation in the setting of type 1 or type 2 diabetes mellitus. Destructive forms of erysipelas were recorded in 315 (87.7%) patients, in 30 (9.5%) of them the disease was complicated by sepsis. In uncomplicated forms of erysipelas, diabetes mellitus was observed in 29 (65.9%) patients, and in destructive forms – in 246 (78.1%).

Conclusions. Patients with diabetes mellitus have a significantly higher risk of developing septic complications than patients without carbohydrate metabolism disorders.

Key words: erysipelas; diabetes mellitus; sepsis; mortality.

According to the International Diabetes Federation, there are currently about 400 million people with diabetes mellitus (DM) in the world [1]. Taking into account the growth rate of diabetes mellitus, experts of the World Health Organisation predict that the number of people with diabetes will reach 592 million by 2035, but the actual number is 3 to 4 times higher.

An analysis of the etiological structure and dynamics of infectious diseases shows that the epidemic situation in Ukraine and the world continues to deteriorate. Among infectious pathologies, erysipelas inflammation ranks fourth in terms of frequency of registration after acute respiratory infections, viral hepatitis and HIV infection. Among all inflammatory diseases of the skin and subcutaneous tissue, erysipelas accounts for 15–20%. According to the latest estimates, the incidence of erysipelas ranges from 10 to 100 per 100,000 inhabitants per year. Women aged 40 to 60 suffer from this pathology most of all [2].

It should be noted that erysipelas complicates the course of concomitant diseases and often develops against the background of metabolic syndrome (type 2 diabetes, obesity), cardiovascular disease (coronary heart disease, hypertension) and other diseases [3].

Most often, erysipelas is caused by β–haemolytic streptococcus – Streptococcus pyogenes, followed by streptococci of groups B, C and G. Rarely, erysipelas is caused by Staphylococcus aureus. If there is no immunogenetic predisposition to streptococcal antigens, the penetration of microorganisms into the skin leads to the development of a banal purulent process or the disease does not occur at all [4].

The vast majority of patients with this disease have a genetic or acquired predisposition to it. Hereditary predisposition to the disease is noted in 10–15% of patients. In this regard, in the case of the development of the disease, the presence of such predisposing factors as congenital and acquired venous insufficiency of the lower extremities, diabetes mellitus, cardiovascular diseases, as well as diseases accompanied by the development of edema, requiring the use of corticosteroids, cytostatics is of great importance [5].

Patients with diabetes not only have a higher incidence of infectious diseases, but also a more severe course. The opposite is also true: infection is the cause of DM decompensation, and in 20–25% of patients it is the first sign of it [6, 7]. At the same time, the data on mortality in the combination of T1D and erysipelas are contradictory. Some scientists report an increase in mortality, while others do not see a corresponding impact on the final outcome of the disease. There are even reports of increased survival of patients with erysipelas in the setting of T1D [8].

Close attention is paid to glucose levels in erysipelas. There are different opinions in this regard. For some authors, target glucose values in the range of 4.4–6.1 mmol/l are associated with a decrease in mortality, and for others, an increase.

The risk of developing septic complications in erysipelas in the setting of DM is associated with immune deficiency, macro– and microvascular complications, and autonomic neuropathy [9]. Impaired microcirculation leads to a slow response to microbial invasion and impairs the healing of skin and mucosal defects, damaging their barrier function.

As a result, the frequency of skin and soft tissue infections increases. In addition, the addition of lower limb sensory impairment as a consequence of sensory neuropathy to this unfavourable background is accompanied by asymptomatic microtrauma of this location and increases the risk of infection [10].

The aim of the study was to determine the frequency of erysipelas and the frequency of carbohydrate metabolism disorders in patients of the purulent–septic centre in Zaporizhzhya.
Materials and methods

We retrospectively and prospectively analysed 15,612 case histories of patients who were treated in the purulent–septic centre of Zaporizhzhya City Hospital No. 3 for the period 2003–2023. It was found that 359 (2.3%) patients had erysipelas in the setting of type 1 or type 2 diabetes.

During hospitalisation, they were diagnosed with the following forms of erythema: erythematous – 55 (15.3%), bullous – 84 (23.4%), phlegmonous – 174 (48.5%), necrotic – 46 (12.8%). Relapse of the disease was noted in 58 (16.2%) patients. There were 139 men (38.7%) and 220 women (61.3%). The average age of patients was (62.1 ± 2.6) years.

Inclusion criteria for patients in the study: erythematous, bullous, phlegmonous and necrotic forms of erysipelas, both primary and recurrent. Criteria for exclusion of patients from the study: postpartum erythema, acute cardiovascular disease, pregnancy, and the need for haemodialysis.

All the examined patients were born and reside in Zaporizhzhya region, they provided informed written consent to participate in the study, which was approved by the Bioethics Committee of Zaporizhzhya Medical Academy of Postgraduate Education of the Ministry of Health of Ukraine. The study was conducted in accordance with the ethical and moral requirements of the Order of the Ministry of Health of Ukraine No. 281 of 01.11.2000 and in accordance with the research plans of the Institute of Sepsis of Zaporizhzhya Medical Academy of Postgraduate Education of the Ministry of Health of Ukraine "Sepsis in patients with surgical forms of erysipelas" (state registration number 0122U110228).

The statistical numerical results were processed using Statistica (StatSoft Statistica v.6.0; licence number STA 862D175437Q) with the Wald–Wolfowitz test.

Results

The study revealed that 359 (2.3%) patients had erysipelas inflammation in the setting of type 1 or type 2 diabetes mellitus. Diabetes mellitus was present in 29 (69.5%) patients with uncomplicated erysipelas and in 246 (78.1%) patients with destructive forms, 30 (9.5%) of whom had sepsis.

Close attention was paid to glucose levels in erysipelas. Target values of glucose in the range of 4.4–6.1 mmol/l were considered to be associated with a reduction in mortality.

Disorders of glucose homeostasis are especially relevant in the development of sepsis in patients with erysipelas in combination with diabetes mellitus. On the one hand, they have not always corrected disorders of carbohydrate metabolism, and on the other hand, a septic process that releases counterinsulin hormones.

In the uncomplicated course of erysipelas, no sepsis was observed in patients with or without DM. In contrast, in destructive forms of the disease, sepsis was recorded in 30 patients, of whom 27 (90%) had type 2 diabetes.

Necrotising fasciitis (NF) was observed in 46 (12.8%) patients, and it is accompanied by a high mortality rate. Initially, the infection develops in the subcutaneous tissue, then quickly spreads to the fascial spaces. The upper and lower extremities are most often involved in the process. With generalisation, the course of NF was complicated by the development of septic shock with a mortality rate of 65.2% (27 patients died).

Discussion

When it comes to the problem of the combination of diabetes and sepsis, the etiology and type of diabetes (type 1 or type 2) are usually not emphasised, and all complications are considered as derivatives of hyperglycaemia. But there is an opposite opinion: in type 2 diabetes, the course of the infection is more severe. This is explained by the peculiarities of the pharmacokinetics of antimicrobial drugs in case of concomitant obesity, which leads to changes in their distribution and metabolic disorders. Despite the reliability of the difference, the authors were unable to explain the mechanisms of their occurrence. In our opinion, the contradiction in the results of different studies can be explained. First of all, the authors analysed different groups of patients, used different statistical programs and mortality registration periods. In our opinion, it is important to take into account comorbidities and their impact on the final results.

Conclusions

1. Among 15,612 patients in the purulent–septic centre, 359 (2.3%) had erysipelas.
2. Diabetes mellitus was present in 29 (69.5%) patients with uncomplicated erysipelas and in 246 (78.1%) patients with destructive forms, 30 (9.5%) of whom had sepsis.
3. Patients with erysipelas in the setting of diabetes mellitus have a higher risk of developing septic complications than patients without carbohydrate metabolism disorders.

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