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FEATURES OF CLINICAL MANIFESTATION OF NECROTISING FASCIITIS IN PATIENTS WITH DIABETES MELLITUS

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Abstract: Interest in treating necrotising fasciitis in patients with diabetes mellitus is not decreasing, as evidenced by many publications devoted to this problem. Many methods of local treatment of necrotising fasciitis against the background of diabetes mellitus have been proposed, a variety of methods are used, including nanotechnological dressings, highly organised technologies, and physiotherapeutic procedures, as well as numerous single- and multi-component schemes, and new Medicines. At the same time, there are still no unified tactics for the treatment of necrotising fasciitis against the background of diabetes mellitus, the choice of the optimal intervention or combination in different phases of the inflammatory process has not been determined, which is not least due to the variety of approaches to presenting the results of treatment. To date, there is no standard for describing the features of the course of necrotising fasciitis against the background of diabetes mellitus. In connection with the above, this scientific article is devoted to the analysis of the clinical manifestation of necrotising fasciitis in patients with diabetes mellitus.

Key words: Necrotising fasciitis, diabetes mellitus, clinical manifestation of the disease.

INTRODUCTION

Over the past fifty years, there has been a steady increase in the prevalence of diabetes mellitus around the world [4, 9]. This trend remains very characteristic of industrialised countries, where, along with coronary heart disease, obesity and metabolic syndrome, diabetes mellitus is registered from 5% to 10% [2, 6].

The problem of treating necrotising fasciitis, remaining relevant throughout the history of mankind under conditions of a high incidence of diabetes mellitus, is becoming increasingly important, both clinical and social [1, 3, 5, 11].

Scientists have long studied the pathogenetic factors affecting the course of necrotising fasciitis in patients with diabetes mellitus. It has been proven that diabetes mellitus creates favourable conditions for the development of a wound infectious process. At the same time, the infectious process itself adversely affects the course of diabetes mellitus through the depression of insulin deficiency and, accordingly, provokes the development of metabolic acidosis [1, 4, 7].

Thus, a close relationship is formed, which strengthens the aggressive aspects of the disease.

At the same time, the course of the purulent inflammatory process in conditions of progressive metabolic acidosis is often

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complicated by an accelerated generalisation of infection [8, 11]. Systemic inflammatory reaction syndrome develops, which "randomly" activates the body's immune system [3, 6, 9].

To date, the study of pathogenetic factors in the development of the wound process complicated by the syndrome of systemic inflammatory reaction in patients with diabetes mellitus is becoming paramount, determining the high relevance of this problem.

The protracted course of regenerative processes of wound infection in patients with diabetes mellitus is the starting foundation for the development of systemic inflammatory reaction syndrome and sepsis, which often does not allow for reducing the duration of the inpatient period of treatment. Constant monitoring of both the course of the wound process and the general manifestations of possible generalisation of infection is required. This, in turn, leads to an increase in bed days and a high risk of developing a nosocomial infection. The solution to this problem is possible by optimising the methods of local wound treatment based on objective methods for assessing the phases of the inflammatory process.

METHODS

The results of a comprehensive examination and treatment of 59 patients with necrotising fasciitis against the background of diabetes mellitus, who were in the multidisciplinary clinic of the Tashkent Medical Academy from 2012 to 2023, are analysed.

All patients, as a rule, were admitted to the clinic for urgent indications and underwent a comprehensive clinical examination using modern clinical, biochemical and instrumental research methods.

As express methods of local assessment of the state of the wound process and signs of inflammation intensity, there were hyperemia, oedema and infiltration of tissues in the wound area, the amount and nature of wound discharge, the intensity of necrolysis, the timing and degree of wound epithelialisation and scar tissue formation.

An important method of research was the assessment of the area and level of the spread of the purulent-inflammatory process of soft tissues. The depth was estimated according to the classification of D.N. Ahrenholz, and the prevalence was estimated according to the classification of S.V. Goryunov.

After surgical debridement of the purulent focus, the course of the wound process was carried out by determining the wound area according to the method of L.N. Popova: the wound area, the percentage of reduction in the wound area and the rate of wound healing.

The presence of septic complications was identified based on criteria proposed by the Chicago Conciliation Conference. For differentiation, we adhered to the following specific clinical concepts: systemic inflammatory reaction syndrome, sepsis syndrome, severe sepsis, and septic shock.

Systemic inflammatory response syndrome was assessed by the presence of at least two clinical and laboratory signs of an inflammatory response: tachycardia, tachypnea, leukocytosis/leukopenia, and hyperthermia.

The material for microbiological studies was purulent exudate taken from the deep parts of the wound immediately after the opening of the pathological focus and in the dynamics of the treatment. The material was delivered in vials containing 1 ml of a sterile mixture of 10% lysed blood and 0.9% saline. Inoculation of the material received

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by the laboratory was carried out immediately. Along with inoculations under anaerobic conditions, conventional inoculations were carried out under aerobic conditions on generally accepted media for the isolation of facultative microorganisms according to the standard method. Aerobic microbes were studied according to the standard method of M. O. Birger, and anaerobic microflora according to the method of V. I. Kocherovets. Anaerobic conditions were created in anaerostats using gas packs "Gas Generation Kit" by HaiMedia (India).

To assess the results of the treatment of wound infection complicated by the syndrome of systemic inflammatory reaction in patients with diabetes mellitus, we used a modified technique proposed by the Republican Center for Purulent Surgery and Surgical Complications of Diabetes Mellitus of the Ministry of Health of the Republic of Uzbekistan. In the evaluation structure, the following criteria were distinguished: the wound had healed completely by self-scarring, the anatomical structure of the tissues and the ability to work was completely restored; the wound healed after plastic surgery, the anatomical structure of the tissues was restored within the limits of cosmetic defects and partial restoration of the ability to work; wound healing occurred after repeated necrectomy followed by plastic surgery, there is a rough deforming scar, activity is restored only within the limits of self-care; persistence of the inflammatory process in the wound even after repeated surgical debridements of the purulent focus, the integrity of the wound is not restored, the ability to work is completely lost; death of the patient.

The data obtained during the study were subjected to statistical processing on a Pentium-IV personal computer using the Microsoft Office Excel-2016 software package, including the use of built-in statistical processing functions and BioStat for Windows (version 2007).

Methods of variational parametric and nonparametric statistics were used with the calculation of the arithmetic mean of the studied indicator (M), standard deviation (□), standard error of the mean (m), relative values (frequency, %), the statistical significance of the measurements obtained when comparing average quantitative values were determined by the parametric Student's criterion (t) with the calculation of the probability of error (p) during verification normality of distribution (according to the excess criterion) and equality of general variances (F is Fisher's criterion).

The confidence level $p<0.05$ was taken as a statistically significant changes. The results of the research were expressed in units of the International System of Units. Most of the numerical data were rounded to the second decimal place.

RESULTS AND DISCUSSION

The main manifestations and etiological factors of the development of necrotising fasciitis in patients with diabetes mellitus were purulent diseases of the skin and subcutaneous adipose tissue (furuncle, carbuncle, erysipelas, etc.), as well as acute nonspecific infection of soft tissues of various localisation (mastitis, paraproctitis, hidradenitis, etc.).

Patients with purulent-inflammatory diseases of soft tissues after various invasive interventions (injections, catheterisation, surgery, etc.) are also considered in these statistics.

Meanwhile, summing up these pathological manifestations of wound infection, the main form of the formation of the disease in the form of narcotic fasciitis should be noted. In this regard, the most objective assessment

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of the depth of damage to the tissues of surgical infection is considered to be according to the classification of D.H. Ahrenholz. According to this classification, there were four levels of soft tissue damage by surgical infection: I – damage to the skin proper; II – damage to the subcutaneous tissue; III – lesion at the level of the superficial fascia; IV – damage to muscles and deep fascial structures. At the same time, according to these criteria, categories I-II refer to superficial lesions of soft tissues, and III-IV to deep or severe forms of purulent-inflammatory diseases of soft tissues.

Most of all, there were patients with an IV level of soft tissue damage (40.7%). The number of soft tissue lesions of level III was only 8.5% lower (32.2%). Superficial forms of wound infection were found in 27.1% of patients (Table 1).

Most of the necrotising fasciitis of tissues was located in the extremities (45.8%). The maximum frequency was noted among such patients with the III level of soft tissue lesion depth (18.6%). There were only 3.3% fewer patients with level IV damage in this area of the body.

Table 1

The nature of the distribution of patients by the depth of soft tissue lesions by purulent-inflammatory diseases

DEPTH OF DAMAGE	AFFECTED AREA								ALTOGETHER	
	Head and neck		Legs and arms		Body		Perineum			
	n	%	n	%	n	%	n	%	n	%
I	0	0,0	4	6,8	1	1,7	1	1,7	6	10,2
II	1	1,7	3	5,1	5	8,5	1	1,7	10	16,9
III	2	3,4	11	18,6	4	6,8	2	3,4	19	32,2
IV	0	0,0	9	15,3	7	11,9	8	13,6	24	40,7
TOTAL	3	5,1	27	45,8	17	28,8	12	20,3	59	100,0

Isolated cases of surgical infection of soft tissues were found in the head and neck area at depth level II, in the trunk area at depth level I and in the perineal area at depth levels I and II. This once again confirms that patients with wound infection complicated by the syndrome of systemic inflammatory reaction against the background of diabetes mellitus are characterised by damage at the level of the III and IV levels of the depth of the lesion.

The distribution of patients by zones of damage to body parts showed that among patients with the head and neck area, the depth of soft tissue lesions prevailed with the III degree (66.7%). In the extremities, the depths of level III and IV prevailed (40.7% and 33.3%, respectively). In the trunk area, almost half of the patients were patients with the IV level of soft tissue lesion depth (41.2%). In the perineal area, more

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than half of the patients had an IV level of soft tissue lesion depth (66.7%).

In the proportion of the depth of the lesion among the patients, the analysis of various parts of the body revealed that in patients with the I level of the depth of soft tissue lesions, the zones of the limb prevailed (66.7%). Level II of the depth of soft tissue damage by surgical infection in 50% of cases was noted among patients with lesions of the trunk area. In the III and IV degrees of the depth of soft tissue lesions, patients with limb lesions prevailed (57.9% and 37.5%, respectively).

It should be noted that high rates of the number of patients with the IV level of soft tissue damage by surgical infection were also in the perineal area (33.3%). This is apparently due to the high virulence of microbial contamination in this zone and the presence of complex fascial anatomical structures that contribute to the development of deep purulent inflammatory processes and a severe course of the disease.

The area affected by purulent-inflammatory disease of soft tissues was very diverse but had a certain relationship. In particular, the affected area had a certain relationship with the extent of the lesion (Table 2).

Table 2

The nature of the relationship between the distribution of patients depends on the degree of prevalence of the inflammatory process and the depth of soft tissue damage.

AFFECTED AREA	DEPTH OF DAMAGE								ALTOGETHER	
	I		II		III		IV			
	n	%	n	%	n	%	n	%	n	%
<500 cm^2	3	5,1	2	3,4	0	0,0	0	0,0	5	8,5
500-1000 cm^2	1	1,7	3	5,1	5	8,5	4	6,8	13	22,0
1000–1500 cm^2	2	3,4	5	8,5	8	13,6	9	15,3	24	40,7
>1500 cm^2	0	0,0	0	0,0	6	10,2	11	18,6	17	28,8
TOTAL	6	10,2	10	16,9	19	32,2	24	40,7	59	100,0

The revealed relationship is also due to the volume of surgical treatment of the purulent focus. Thus, among patients with the III and IV degrees of soft tissue lesion depth, patients with more than 1000 cm2 of the affected area prevailed (23.8% and 33.9%, respectively). In general, patients with large areas of soft tissue lesions prevailed (69.5%), which caused the presence of sepsis.

In the early stages after surgical debridement of the purulent focus (3 days), patients with level I of the depth of soft tissue lesions were noted with a high rate of wound healing. Patients with deep forms of purulent-inflammatory diseases of soft tissues, on average, had a very low wound healing rate, amounting to an average of 0.4±0.02% per day. However, already on the 7th day after surgical debridement of the purulent focus in patients with the III and IV

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levels of soft tissue lesion depth, the wound healing rate increased by 6.3±0.9 and 5.0±0.85 times, respectively (p<0.05). And although among patients with superficial forms of soft tissue lesions, the rate also increased. Nevertheless, it was not reliable in the previous study period (Table 3).

Table 3

The nature of the relationship between the change in the wound healing rate from the depth of soft tissue damage by the purulent inflammatory process

DEPTH OF DAMAGE	DYNAMICS OF WOUND HEALING (days)				
	3	7	10	14	28≤
I	3,2±0,9	4,7±0,82	7,2±1,2	9,2±2,1	1,5±0,05
II	1,5±0,06	2,1±0,07*	4,2±0,9*	8,4±0,92	1,3±0,06*
III	0,3±0,05	1,9±0,05*	3,5±0,6*	7,2±0,8*	1,1±0,04*
IV	0,5±0,04	2,5±0,5*	3,7±0,5*	7,4±1,2*	1,6±0,09*
Average	1,4±0,9	2,8±0,12*	4,65±0,75*	8,05±1,4*	1,4±0,7*

p<0,05 – reliable about the previous term

Meanwhile, the 10th day of treatment of patients with wound infection complicated by the syndrome of systemic inflammatory reaction against the background of diabetes mellitus radically changes the dynamics of changes in the rate of wound healing. The acceleration of the process by this time was also due to the elimination of the septic complication of purulent-inflammatory diseases of soft tissues, which will be described in detail below.

The average wound healing rate increases both about three days and 7 days after surgical debridement of the purulent focus (3.3±0.8 times; p<0.05 and 1.7±0.2% times; p<0.05, respectively). It should be noted that this trend continued to grow, and by the 14th day after surgical debridement of the purulent focus, it reached its maximum value to an average level of 8.05±1.4% per day (p<0.05). All patients (p<0.05) were distinguished by significant values, except for those with the depth of soft tissue lesions (p<0.05).

By the last period of wound healing, the rate of this process decreased, and a protracted course of regenerative processes was noted among patients with II and III levels of soft tissue damage (6.5±2.3 times at each level; p<0.05). The maximum value was observed in patients with the IV level of soft tissue lesion depth.

CONCLUSION

Analysis of the course of the local clinical picture of the wound process complicated by the syndrome of systemic inflammatory reaction in patients with diabetes mellitus showed that most patients had severe forms of the disease. The depth of soft tissue lesions also depended entirely on the extent of the lesion, especially in the process of surgical debridement of the purulent focus. The regenerative processes that occurred in the wound after surgical debridement of the

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purulent focus were characterised by a variety of dynamics and often depended on the depth of the lesion. Despite the lesions of deep soft tissue structures, the wound healing process was accelerated, which may have several explanations, both local and general, related to homeostasis in general and the response to the inflammatory process.

Conflict of interest - The author declares no conflict of interest.

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