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TACTICS OF SURGICAL TREATMENT OF PATIENTS WITH NECROTISIUS FASCIITIS IN PATIENTS WITH DIABETES MELLITUS



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ҚАНДЛИ ДИАБЕТИ БЎЛГАН БЕМОРЛАРДА НЕКРОТИК ФАСЦИИТНИ ХИРУРГИК ДАВОЛАШНИНГ ТАКТИКАСИ

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ТАКТИКА ХИРУРГИЧЕСКОГО ЛЕЧЕНИЯ НЕКРОТИЧЕСКОГО ФАСЦИИТА У БОЛЬНЫХ САХАРНЫМ ДИАБЕТОМ

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Резюме. *Бизнинг замонавий тиббиёт адабиётларимизда ўлим даражаси юқори бўлиши, касалхонада узоқ муддат даволанишига, ногиронликни юқори фоизига ва реконструктив операцияларга зарурият туғулишига қарамасдан, некротик фасциитга етарлича эътибор берилмайди ва терминология ноаниқ бўлиб қолмоқда. Терминологик "синонимлар" деб номланганлар орасида қуйидагиларни: прогрессив эпифасциал флегмона, синергетик тери ости целлюлити ва ҳатто сарамаснинг некротик шаклларини топиш мумкин. Адабиётларга кўра қандли диабет билан оғриган беморларда некротик фасциитнинг клиник кечиши қандли диабети бўлмаган беморлардан кескин фарқ қилади.*

Калит сўзлар: *некротик фасциит, қандли диабет, хирургик даволаш.*

Abstract. *In contemporary literature on domestic medicine, there exists a lack of adequate focus on necrotizing fasciitis, a condition characterized by significant mortality rates, prolonged hospital stays, a substantial incidence of impairment, and the necessity for reconstructive surgical procedures. Furthermore, the nomenclature associated with this condition remains ambiguous. Within the realm of terminological synonyms, the following can be identified: The conditions mentioned include progressive epifascial phlegmon, synergistic subcutaneous cellulitis, and necrotic erysipelas. Based on the available research, it is evident that the clinical progression of necrotizing fasciitis in individuals with diabetes mellitus significantly contrasts with those without diabetes mellitus.*

Key words: *necrotisius fasciitis, diabetes mellitus, surgical treatment.*

The concept of relevance holds significance in various academic disciplines. It refers to the degree to which the clinical presentation of necrotizing fasciitis (NF) has been documented in historical records dating back to 1871, when it was first described by Joseph Jones, an American military physician, under the term "hospital gangrene." In the year 1924, Meleney made the discovery that the etiological agent responsible for this particular pathological condition is hemolytic streptococcus. The condition was classified as hemolytic streptococcal gangrene. However, in 1972, B. Wilson introduced a significant diagnostic indicator known as fascial necrosis. Hence, the widely acknowledged definition of necrotizing fasciitis, as proposed by B. Wilson, has been established [13]. In contemporary literature on domestic medicine, there exists a lack of adequate focus on necrotizing fasciitis, a condition characterized by significant mortality rates, prolonged hospital stays, a substantial incidence of impairment, and the necessity for reconstructive surgical procedures. Furthermore, the nomenclature associated with this condition remains ambiguous. Within the realm of terminological synonyms, the following can be identified: The conditions mentioned include progressive epifascial phlegmon, synergistic subcutaneous cellulitis, and necrotic erysipelas [3]. Based on the available research, it is evident that the clinical progression of necrotizing fasciitis in individuals with diabetes mellitus significantly contrasts with those without diabetes mellitus [7, 11]. The prognosis, course, and outcome of the disease are influenced by several factors, including the prompt identification of fascial necrosis, quick and comprehensive surgical surgery, and appropriate administration of etiotropic antibiotics [9]. One of the topics that lacks significant development and is subject to controversy is the early diagnosis of fascial necrosis. The issue of early diagnosis is highly pertinent due to the clinical resemblance between necrotizing fasciitis in its early stages and other soft tissue infections. Necrotizing fasciitis is a disease that poses a significant risk to life. It is characterized by a swiftly advancing infection of the superficial fascial structures, resulting in necrosis of the skin and subcutaneous adipose tissue. Notably, the underlying muscles are not primarily affected by this pathological process. The disease

is accompanied by pronounced intoxication and severe pain. Several authors have identified several conditions that may predispose individuals to the occurrence of necrotizing fasciitis. These factors include being over the age of fifty, having excess body weight, peripheral vascular disease (microangiopathy), immunodeficiency, chronic alcoholism, diabetes mellitus, the use of corticosteroids, drug injections, and experiencing infectious complications in the postoperative period [4]. In 1979, a study conducted by J. Fisher et al. aimed to establish a systematic approach for diagnosing necrotizing fasciitis in individuals with diabetes. Six characteristics were identified to characterize this disease. The criteria encompass several factors, namely: significant necrosis of the superficial fascia with extension to surrounding skin, lack of primary muscle involvement in the pathological process, absence of clostridial microorganisms in the wound smear, absence of vascular blockage as a contributing factor to tissue death, and the presence of moderate to severe systemic intoxication accompanied by impaired consciousness [10]. The superficial fascia serves as a barrier, preventing the subcutaneous adipose tissue from extending beyond its full length. The structure in question is a rather narrow stratum composed of compacted connective tissue, characterized by densely arranged clusters of collagenous fibers. The underlying musculature is enveloped by a homologous layer. Within the interstitial space of the two fascial layers, there exists a layer of loose fibrous connective tissue, which may exhibit varying degrees of prominence, along with regions containing adipose tissue. The inflammatory process exhibits a distinctive nature as it advances specifically along the interfascial layer of loose connective tissue [2]. This state facilitates the ideal circumstances for the introduction of secondary infections, such as anaerobic infection. In the context of diabetes mellitus, these infections can progress rapidly [10]. The disruption of nerve ending trophism due to elevated interstitial pressure results in the manifestation of severe pain, which is atypical for individuals with diabetes. This presentation contrasts with the usual latent progression observed in diabetic polyneuropathy. The stated process leads to the detachment of the subcutaneous tissue and skin from the underlying muscles, resulting in the accumulation of contaminated fluid in this anatomical compartment. The loss of sensitivity of the skin above the focus occurs as a result of necrosis of nerve endings, while the development of gangrene in the skin is caused by thrombosis of blood vessels [5]. The primary determinant of fascial necrosis is the abnormal development of vascular thrombi, which impede the perfusion of fascia and significantly diminish the transportation of oxygen to tissues [1].

Due to the commencement of the pathogenic process at a deep tissue level, the earliest phases of illness development are characterized by limited clinical manifestations that progressively intensify as the infection advances. Hence, the first symptoms exhibit minimal variation when compared to those observed in phlegmon and abscesses [8]. According to Sudarsky et al. (6), a range of symptoms have been seen, including erythema, tight edema, skin discoloration characterized by a gray hue with a bluish undertone, the appearance of bullae containing hemorrhagic contents, as well as the occurrence of ulcers and skin necrosis. Several approaches have been proposed for the early detection of fascial necrosis, including ultrasonography and MRI imaging of soft tissues [11, 13]. Additionally, tissue cryobiopsy followed by morphological evaluation has also been suggested [7]. The objective of this study was to examine the predictive clinical factors for necrotizing fasciitis in individuals diagnosed with diabetes mellitus.

Material and research methods. The primary focus of this study involves the examination of the therapeutic interventions administered to a group of 20 individuals diagnosed with necrotizing fasciitis, in conjunction with associated diabetes mellitus, throughout a five-year period spanning from 2018 to 2023. Furthermore, this study aims to examine the overarching concerns associated with this particular disease, as outlined in both domestic and international medical literature published in recent years.

The focus of our attention was directed towards the paper authored by T. Simonart et al. (2004), wherein the authors emphasize the significance of assessing the activity of serum creatine phosphokinase, an enzyme found in muscle tissue, for the purpose of promptly diagnosing NF. The occurrence of fascial necrosis typically elicits a response in the adjacent muscle tissue, leading to an elevation in the activity of creatine phosphokinase (CPK) [12].

Furthermore, in their study, C. Wong et al. (2004) put out the suggestion of utilizing the NF laboratory risk score (LRINEC) as a means of promptly distinguishing this particular pathology from other potential diagnoses. The scale incorporates multiple indicators that are assessed using a point-based approach.

Table 1. Indicators of LRINEC and their mark scale

Indicator of blood	Value	Marks
C-reactive protein, mg/l	<150	0
	>150	4
Total leucocyte count, mm3	<15	0
	15–25	1
	> 25	2
Hemoglobin, g/l	> 135	0
	110–135	1
	< 110	2
Serum of natrium, mmol/l	> 135	0
	< 135	2
Serum of kreatinine, mkmol/l	< 141	0
	> 141	2
Glucose, mmol/l	< 10	0
	> 10	1

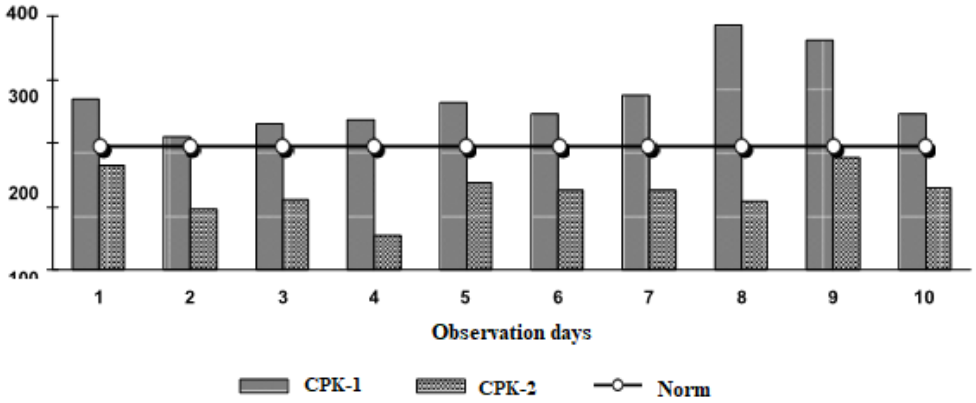

Fig. 1. Determination of CPK activity upon admission of patients to the hospital and after 10 days

The risk of Neurofibromatosis (NF) is calculated by the cumulative scores, as indicated by previous research [15]. The Laboratory Risk Indicators for Necrotizing fasciitis (LRINEC) indicators are shown in Table 1. It is worth mentioning that individuals who obtain a cumulative score of 5 points or lower are associated with a low risk, which is less than 50%, of developing NF. Conversely, those who score between 6 and 7 points are considered to have an average risk, estimated at 75%. Lastly, individuals who score 8 points or more are deemed to have a high risk, exceeding 75%, of developing NF. A score below 5 demonstrates a negative predictive value of 96% in predicting the absence of NF, whilst a score over 8 indicates a positive predictive value of 93% in predicting the presence of NF. During the period spanning from 2018 to 2023, a group of authors conducted a study in the department of purulent surgery at the multifunctional clinic of the Tashkent Medical Academy. The study focused on the treatment of 20 patients with necrotizing fasciitis (NF) in the presence of diabetes mellitus (DM). The mean age of participants in the primary study cohort was 58.9 years, with a range spanning from 36 to 78 years. The gender ratio observed in the sample was 3:1, with 15 women and 5 men.

The predisposing factors seen in the sample of nine patients included an age over 50 years for all patients, two patients with a history of alcohol misuse, one patient with opium addiction, one patient with atherosclerotic lesions in the lower extremities, two patients classified as obese, and one patient who had been using corticosteroids for an extended duration. All individuals in the study cohort exhibited diabetes mellitus, with an average disease duration of 11 ± 5.7 years. Upon admission, a comprehensive examination was conducted by an endocrinologist to assess the patients' medical condition. Additionally, measures were taken to fix any abnormalities in their blood glucose levels.

Results and discussion. The overall average period from disease onset to hospitalization in a surgical hospital was 5.9 days, with a range of 2 to 13 days. In the majority of instances, the localisation of the process in patients was observed in the limbs, with 3 cases affecting the upper limbs and 8 cases affecting the lower limbs. The mean extent of soft tissue injury was found to be 4.95%, with a range spanning from 2% to 8%. During the process of planting the wound at a remote location, the subsequent strains were seen and confirmed: The distribution of bacterial species in the sample was as follows: Staphylococcus aureus (S. aureus) was found in 12 instances, Streptococcus pyogenes (S. pyogenes) in 5 instances, Escherichia coli (E. coli) in 1 instance, and Pseudomonas aeruginosa (P. aeruginosa) in 2 instances. Upon admission to the hospital, all patients exhibited significant leukocytosis, with an average count of 19.2 x 10^9 / l (ranging from 13.6 to 23.1 x 10^9 / l). Furthermore, it is worth noting that a general blood test revealed the presence of relative lymphopenia in all patients. The average percentage of lymphocytes seen was 8.4%, ranging from 4% to 16%. In order to facilitate the process of differential diagnosis, blood samples were collected from all patients within the initial hours of arrival to assess the activity of creatine phosphokinase (CPK). To mitigate the occurrence of false positive outcomes, it was imperative to subject patients to a thorough examination by a cardiologist subsequent to the recording of an electrocardiogram (ECG). This step was crucial in order to exclude any potential cardiac issues, as an elevation in creatine phosphokinase (CPK) activity might be observed not only in cases of acute coronary pathology and myocardial ischemia, but also in instances of traumatic injury to a significant muscle mass. Blood samples were collected multiple times and the activity of creatine phosphokinase (CPK) was measured during the patient's hospitalization for a period of 5 days. These measurements were taken after the necrectomy procedure was completed and antibiotic medication was began.

The study's findings are presented in Figure 1, illustrating the data acquired. In this figure, "CPK-1" represents the enzyme's activity upon the patient's admission to the hospital, while "CPK-2" represents the enzyme's activity after a period of 10 days. The horizontal line in the figure represents the upper threshold of the normal CPK activity, which is equal to 195 U/L. Upon admission, it was observed that all patients exhibited an elevated level of creatine phosphokinase (CPK) activity. The mean surplus of the upper threshold of the standard range was 77.4 U/L, on average. Following a period of 5 days, the markers remained within the range of normal values without exceeding them.

The NF laboratory risk scale, also known as LRINEC, was employed to assess the risk levels of patients. The findings revealed that seven individuals had a cumulative score below 5, while five patients acquired a score of 7. Additionally, eight patients exhibited a cumulative score of 8 or higher. The initial day following the patient's admission to the hospital. The mortality rate within the primary study group was seen to be 10%. This was attributed to the death of a 78-year-old patient, who experienced multiple organ failure as a result of sepsis, and a 53-year-old patient, who succumbed to acute intoxication.

The mean duration of hospitalization for those diagnosed with NF was found to be 16 days. Prior to receiving the results of bacteriological tests and determining the sensitivity of the microflora, all patients had a combination decolonization antibacterial therapy using broad-spectrum medicines. The number of necrectomies performed on a single patient did not surpass four over a period of time.

A surgical procedure including the removal of the lower limb was conducted on an individual presenting extensive muscular lesions affecting the lower leg and thigh. All patients required additional reconstructive procedures throughout the postpartum term. Simultaneously, a total of 5 patients, accounting for 25% of the sample, received secondary delayed sutures for wound closure. The remaining 13 patients underwent a combination of reconstructive surgical techniques, including autodermoplasty, wound plasty using local tissues, and secondary sutures.

Discussion. The postoperative outcomes of patients with NF are directly influenced by the promptness and adequacy of the main surgical intervention. At this juncture, the significance of antibiotic therapy cannot be overstated; nonetheless, its efficacy is rendered null in the presence of widespread necrotic tissues. The challenges associated with early diagnosis, limited awareness among practical surgeons, terminological ambiguity, and the absence of distinct clinical symptoms that indicate the presence of rapidly advancing and irreversible morphological changes contribute to the difficulties encountered in treating necrotizing fasciitis in individuals with diabetes mellitus. Regrettably, it is not always the case that physicians possess access to imaging modalities, such as ultrasound and MRI, which have the capacity to effectively address diagnostic uncertainties. Furthermore, the utilization of a readily accessible parameter such as the activity of creatine phosphokinase can offer substantial assistance in the identification of necrotizing fasciitis. The laboratory risk scale for necrotizing fasciitis, which we have tested, merits consideration as an additional approach for accurately establishing the first diagnosis.

Conclusions. In individuals with diabetes mellitus, the occurrence of a purulent-inflammatory process in soft tissue poses a significant risk (77.5%) for the advancement of the pathogenic focus, affecting both the superficial layer of the skin and the deeper tissue structures such as the fascia of the subcutaneous tissue and muscles.

The presence of severe diabetic polyneuropathy presents challenges for surgeons in terms of diagnosing and treating the condition. This is primarily due to the atypical clinical presentation of the disease, which often includes painless necrotizing fasciitis and a lack of obvious local or general complaints.

The primary objective in preventing severe multiple organ failure and secondary infection, and thus preserving the quality of life for individuals with diabetes mellitus, is the prompt and sufficient identification and treatment of the pathogenic focus.

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ТАКТИКА ХИРУРГИЧЕСКОГО ЛЕЧЕНИЯ НЕКРОТИЧЕСКОГО ФАСЦИИТА У БОЛЬНЫХ САХАРНЫМ ДИАБЕТОМ

Матмуротов К.Ж., Парманов С.А., Нажмитдинова Д.Г.

Резюме. *В современной отечественной медицинской литературе некротизирующему фасцииту, несмотря на высокую летальность, длительность пребывания пациентов в стационаре, высокий процент инвалидизации и необходимость реконструктивных операций, уделяется недостаточно внимания, а терминология остается неясной. Среди так называемых терминологических «синонимов» можно встретить следующие: прогрессирующая эпифасциальная флегмона, синергический подкожный целлюлит и даже некротическая форма рожистого воспаления. По литературным данным клиническое течение некротического фасциита у пациентов сахарным диабетом по большому счету резко отличается от больных без сахарного диабета.*

Ключевые слова: *некротизирующий фасциит, сахарный диабет, хирургическое лечение.*