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The Problem of Diagnosis and Treatment of Necrotizing Soft Tissue Infections

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ABSTRACT

Necrotizing soft tissue infections have been known for millennia and continue to impose a significant burden on both patients and society in terms of morbidity, mortality and resource allocation. While it was once categorized as a rare disease, its incidence has been increasing in recent years, especially in patients with diabetes mellitus. The manifestation of the disease can vary from a lightning-like manifestation to barely noticeable and insidious development. A significant proportion are patients with late complications of surgical infections of soft tissues, the treatment of which presents certain difficulties. The basic principles of diagnosis, rapid and broad antimicrobial therapy, and aggressive sanitation have remained unchanged, but the increasing incidence suggests that new diagnostic and treatment methods are needed to combat this deadly disease. This review highlights the basic principles of diagnosis and management of necrotizing soft tissue infections. The review provides the historical context, etiology, pathogenesis and diagnosis of the disease, emphasizing the problem of early diagnosis.

Keywords: *necrotizing fasciitis, necrotizing soft tissue infection, sepsis, diagnosis.*

Skin and soft tissue infections (SSTI) are common clinical conditions that are represented by various forms of necrotizing infections, ranging from mild to severe, often resulting in fatal outcomes [1,2]. Lethality in this pathology varies widely. Thus, according to McHenry C.R[3] and Frantsuzov V.N. [4], lethality in the development of such infections ranges from 13.9 to 30%, and lethality in the development of severe necrotizing forms of soft tissue infection ranges from 6 to 76% [5, 6].

Necrotizing fasciitis (NF) is a rapidly progressing severe infectious disease of superficial fascial structures, with involvement of skin and subcutaneous tissue in the necrotic process, without primary involvement of underlying muscles in the pathological process [7, 8].

The earliest report of this disease dates back to the fifth century B.C., when Hippocrates first described the “swarm” in patients with rapidly spreading soft tissue infections that were accompanied by high mor-

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tality [23, 24]. The first description of "modern" necrotizing fasciitis was given by J. Johnson, who was a military surgeon in the Confederate Army during the American Civil War. In 1871, he used the term "hospital gangrene" to describe 2642 cases in soldiers who developed "virulent" infections with "grayish and greenish plaques," with a mortality rate of 46% [25, 26].

In 1883, Jean Alfred Fournier reported five cases of perineal necrosis and the type was named "Fournier's gangrene" in his honor [24]. In 1924, Meleni first found a correlation between NF and group A beta-hemolytic streptococcus in 20 patients at a hospital in Beijing, calling the condition "acute hemolytic streptococcal gangrene". Since then, this condition has been known under different terms such as "phagema", "non-clostridial gas gangrene", and "necrotizing rye" [24,26].

Historically, the clinical picture of necrotizing fasciitis (NF) has been known since 1871 when it was described by the American military physician Joseph Jones as "hospital gangrene". In 1924, Meleney determined that the causative agent of this pathology is beta-hemolytic group A streptococcus. The disease was labeled as hemolytic streptococcal gangrene. However, later, in 1952, B.Wilson established the leading pathognomonic sign - fascial necrosis, so the definition of B.Wilson - "necrotizing fasciitis" became generally recognized [8]. However, necrotizing fasciitis in isolation is quite rare and it is more appropriate to use the term necrotizing soft tissue infections.

Since many clinical manifestations of SSTI are not cultured, the most frequent pathogens generally remain undefined, although Staphylococcus aureus and beta-hemolytic streptococci are considered dominant [10-13].

As factors predisposing to the occurrence of NF, a number of authors highlight the following conditions: diabetes mellitus, immunodeficiency states, soft tissue injuries, drug injections, corticosteroid use, infectious complications in the postoperative period, presence of excessive body weight, age over fifty years, peripheral vascular lesions [9].

Diabetes mellitus is the predominant factor in the development of surgical soft tissue infection. Surgical infection and diabetes mellitus, running simultaneously, are characterized by a number of features. First, any, even insignificant, purulent focus causes a violation of all metabolic processes, leading to insulin deficiency, progression of diabetes mellitus and its decompensation. Secondly, metabolic disturbance slows down tissue regeneration and repair, complicates and aggravates the course of the inflammatory process, contributing to its spread and generalization. At the same time, among the deceased patients suffering from diabetes mellitus, infectious processes were the cause of death in almost 25% of patients [14-15].

The increased risk of SSTI among diabetics may be partly related to the increased difficulty of diagnosis, as well as the late presentation of patients [21]. However, the work of Muller L.M., highlights studies that show that patients with a background of diabetes mellitus are at increased risk of developing soft tissue infections [22].

The difficulty in diagnosis lies in the fact that there are early and late clinical signs. Since the pathologic process begins in deep tissues and fascia, early clinical manifestations may be subtle, which leads to the predominance of advanced forms [27, 28, 29].

A systematic review including 317 limbs (102 upper limbs) with necrotizing fasciitis reported that erythema (73%), pain (63%), and edema (49%) were the most common clinical manifestations, followed by skin thickening, pus, flaccidity, hyperthermia, and bullae [30].

Yeung et al, retrospectively analyzed 29 patients with necrotizing infections of the upper extremities and reported that erythema, soreness, and pain out of proportion to clinical findings were the most common symptoms in the early stages. Later, as the disease progresses, hemorrhagic bullae, skin anesthesia or crepitation, and gangrenous changes (classic "severe signs" of the disease) may appear. Moreover, Schecter et al. In a study of 33 cases of necrotizing fasciitis of the upper extremities concluded that all patients had erythema, edema, soreness, and heat sensation, while bullae, crepitation, and skin necrosis were less common symptoms.

Systemic manifestations should not be overlooked, although in the initial stages they are rare and patients may be without their manifestations. Alarming signs are fever, tachycardia and hypotension. In later stages, symptoms of septic shock or multiorgan failure may appear, resulting in hypotension, increased leukocyte count, coagulopathy, weakness, mental status changes, and metabolic acidosis [30].

Increased vigilance is required in cases of the acute/millennial type because of the undetected early course and rapid progression. Iwata et al. described 5 cases of the lightning-type with no signs of skin inflammation such as redness and fever, with purpura being the only initial clinical sign [30]. Kato et al. also described a case of the lightning-type with petechiae as the first clinical sign [30].

Laboratory-instrumental methods of diagnosis are of no small importance, only their data are detected only

when late clinical signs appear [30]. It is noteworthy that laboratory data on leukocytosis and hyponatremia improve sensitivity only in clinical examination. Admission lactate >6 mmol/L and serum sodium levels <135 mEq/L have been shown to be independent predictors of in-hospital mortality in patients with necrotizing soft tissue infections [30].

In 2004, Wong et al. developed the Laboratory Indicator of Risk of Necrotizing Fasciitis (LINEC) scale. This score uses white blood cell (WBC) count, hemoglobin, sodium, glucose, serum creatinine, and serum C-reactive protein to develop a system to assess the likelihood of necrotizing fasciitis [27]. A recent multicenter prospective evaluation of the LINEC scale reduced the hype surrounding this prognostic tool; moreover, the LINEC score may be artificially inflated in other musculoskeletal infections [28].

CONCLUSION

Of the instrumental studies, CT and MRI, are useful adjuncts for diagnosis when the diagnosis is not accurate on clinical evaluation. Magnetic resonance imaging and computed tomography have some value in the management of this condition; however, cost and availability limit use. CT with contrast demonstrating the absence of fascia enhancement, along with fascia involvement with infection, is more specific for necrotizing fasciitis than air or edema alone. MRI is useful to distinguish necrotizing infection from non-necrotizing infection in case of uninformative CT and conventional radiographs such as soft tissue edema.

The rapidity and mobility of ultrasound is attractive, but evidence is currently limited to sporadic reports, and more data are needed before it can be considered a mainstream diagnostic modality.

In summary, the mainstay of treatment for necrotizing soft tissue infections remains surgical, which allows the extent of tissue damage and the extent of intervention to be determined. However, the delayed diagnosis of patients leads to the progression of systemic complications that lead to multiorgan failure and death.

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QANDLI DIABET BILAN OG'RIGAN BEMORLARDA YUMSHOQ TO'QIMALARNING NEKROTIK INFEKTSIYALARINI TASHXISLASH VA DAVOLASH MUAMMOSI.

Kasimov U.K.

Toshkent tibbiyot akademiyasi

ABSTRAKT

Yumshoq to'qimalarning nekrotik infektsiyalari ming yillar davomida ma'lum bo'lib, bugungi kunda kasallanish, o'lim va resurslarni taqsimlash nuqtai nazaridan bemorlarga ham, jamiyatga ham katta yuk bo'lib qolmoqda. Bir paytlar bu kasallik kamdan-kam uchraydigan deb hisoblangan bo'lsa-da, so'nggi yillarda, ayniqsa, qandli diabet bilan og'rigan bemorlarda ko'payib bormoqda. Kasallikning namoyon bo'lishi chaqmoq tez namoyon bo'lishidan zo'rg'a seziladigan va makkor rivojlanishgacha o'zgarishi mumkin. Jarrohlik yumshoq to'qimalar infektsiyasining kech asoratlari bo'lgan bemorlarning sezilarli qismini davolash muayyan qiyinchiliklarga olib keladi. Diagnostikaning asosiy tamoyillari, tez va keng agressiv terapiya, mikroblarga qarshi davolashlari o'zgarishsiz qoldi, ammo kasallanishning ko'payishi ushbu halokatli kasallik bilan kurashish uchun yangi diagnostika va davolash usullari zarurligini ko'rsatadi. Ushbu sharh yumshoq to'qimalarning nekrotik infektsiyalarini tashxislash va davolashning asosiy tamoyillarini yoritadi, tarixiy kontekstni, etiologiyasini, patogenezini taqdim etadi va erta tashxis qo'yish muammosini yoritadi.

Kalit so'zlar: nekrotizan fasiit, yumshoq to'qimalarning nekrotizan infektsiyasi, sepsis, tashxis.

ПРОБЛЕМА ДИАГНОСТИКИ И ЛЕЧЕНИЯ НЕКРОТИЗИРУЮЩИХ ИНФЕКЦИЙ МЯГКИХ ТКАНЕЙ У БОЛЬНЫХ САХАРНЫМ ДИАБЕТОМ.

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АБСТРАКТ

Некротические инфекции мягких тканей известны на протяжении тысячелетий и продолжают налагать значительное бремя как на пациентов, так и на общество с точки зрения заболеваемости, смертности и распределения ресурсов. Хотя когда-то это заболевание считалось редким, в последние годы его заболеваемость растет, особенно у пациентов с сахарным диабетом. Проявление болезни может варьировать от молниеносного проявления до едва заметного и коварного развития. Значительную долю составляют пациенты с поздними осложнениями хирургических инфекций мягких тканей, лечение которых представляет определенные трудности. Основные принципы диагностики, быстрая и широкая антимикробная терапия, агрессивная санитарная обработка остались неизменными, однако рост заболеваемости свидетельствует о том, что необходимы новые методы диагностики и лечения для борьбы с этим смертельным заболеванием. В этом обзоре освещены основные принципы диагностики и лечения некротизирующих инфекций мягких тканей, представлен исторический контекст, этиология, патогенез, подчеркнута проблема ранней диагностики.

Ключевые слова: некротический фасциит, некротизирующая инфекция мягких тканей, сепсис, диагностика.