SPECIFICITY OF SOFT TISSUE SURGICAL INFECTION IN DIABETES

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ABSTRACT

The problem of treatment of surgical infection of soft tissues against the background of diabetes mellitus continues to be relevant. It is associated that acute suppurative inflammation of skin and soft tissues processes are frequent complications of diabetes mellitus that significantly exacerbates the development of the disease and makes threat of infection generalization with expansion of the area of purulent necrotic changes. This leads to catastrophic growing of hyperglycemia, glucosuria, and ketoacidosis. Purulent septic complications remain a serious clinical and epidemiological problem. The need of differentiated approach in the treatment of these patients has been demonstrated on 144 patients with surgical infections of different localization and the focus is given on emphasizing a tiered approach in the diagnosis and treatment of patients with diabetes mellitus. Treatment of patients admitted to the center for the second time is carried out in primary care and the reasons for the development of complications are analyzed. For reasons given, the necessity for an integrated approach using the classification of levels of soft tissue damage and the development of algorithms of local treatment have been stressed.

Key words: surgical infection; purulent-necrotic diagnosis, phlegmon, necrotic fasciitis.

I. INTRODUCTION

Soft tissue surgical infections are the leading pathology in the primary care structure of surgical patients visiting the clinic on an outpatient basis, and 40% of all contagious disease in the hospital are postoperative nosocomial soft tissue infections (2,3).

In the 21st century, the field of surgery has developed and prospered in many ways, not only with practical improvements, but also with significant achievements enriched with solid scientific potential. Surgery as one of the major disciplines of medicine is closely related to broad concepts such as ‘wound’ and ‘wound infection’, and the treatment of purulent wounds has been a concern of mankind since the dawn of time. Despite the scientific advances in world medicine, they remain relevant today (8).

Wound healing has always been a priority in surgical practice. Many difficulties arise in the treatment of wounds with a combined infection, which is associated with a “sleeping” infection, the aggressiveness of which is determined by the changeability of the microflora and the reactivity of the organism (5.6).

Deterioration of treatment outcome in patients with purulent surgical infections is manifested as follows:
- an increase in the number of complex forms of surgical infections of soft tissues that are not severe and not suitable for standard treatment;

- treatment prolongation of this category patients in primary care;

- there are frequent cases of transition of purulent-inflammatory processes to a chronic form;

- accelerated development of complications in the form of generalization of the process;

- lack of a single approach (algorithm) in the treatment of patients with soft tissue surgery;

- to preserve the term purulent infection, which puts patients in the background, when it is expedient to call a surgical infection in the sense of ongoing pathological changes;

Despite such a frequency and undoubtedly important role in practice, the classification of infections of the skin and subcutaneous tissue is not yet complete. According to common local guidelines for general and purulent surgery the infections are divided into purulent, putrid, anaerobic (Clostridial and non-Clostridial) and specific (syphilitic, tuberculosis, lepromatosis, etc.). The monograph includes A.P. Kolesova and others' the clearest description of this classification with the rules: "First, it is built on an unequal basis: purulent and putrefactive infections are determined by clinical and morphological features, anaerobic - is determined depending on the exchange of pathogens, and specific infections - determined depending on their species;

Secondly, there is mutual exclusion or recurrence. Both purulent and putrefactive processes can be caused by anaerobes, and pathogens that usually considered as aerobic - they are often facultative anaerobes."

We can say that such a classification is not only of theoretical importance for it includes the indicated contradictions, but also practical - it only misleads the surgeon without defining specific measures for therapeutic tactics. According to the rules of this classification, the degree of damage to the soft tissue formation, rather than the type and shape of the discharge or tissue during the infectious process, is distinguished (1).

According to D.H. Ahrenholz, four surgeries implicate soft tissue infection:

Grade I - skin self-injury;

Grade II - damage to subcutaneous tissue;

Grade III - damage of the superficial fascia;

Grade IV - damage to muscles and deep fascial structures.

One of the most difficult areas of purulent surgery is the development of a surgical infection in diabetes. Diabetes is a global medical and social problem of our time. The prevalence of diabetes is increasing worldwide, especially among non-European populations (11). By 2025, the number of people with diabetes will reach 300 million (9). The number of new cases increases by 5-7 percent per year and doubles every 15 years (14,15).

Its most important factors are:

1) prolongation of life expectancy due to improved quality of medical care, hygiene, social and general living conditions;

2) prolonging the life of patients with diabetes through insulin therapy and other therapeutic measures;

3) people with diabetes are getting older than a few decades, they are getting married and having children - a factor that has led to a further increase in the number of people with diabetes;
4) the presence of a genetic predisposition to diabetes in the conditions of modern civilized society;

A study of the prevalence of diabetes in the regions of Uzbekistan showed that in 2001, only 77,031 patients were registered at the dispensary, of which 35,828 were men and 41,203 were women, including 708 children and 415 adolescents. Of course, the actual prevalence of the disease is several times higher than the number of patients registered with diabetes. The frequency of identified patients is proportional to the level and quality of endocrinological care in the field, the availability of adequate medication, timely and active identification of patients and their complications, proper organization of dispensary follow-up and treatment, self-monitoring of patients with diabetes mellitus (10.12).

**Research purpose** is to improve the results of treatment of surgical soft tissue infection in the background of diabetes mellitus.

**II. MATERIAL AND METHODS**

At the Republican Center for Diabetes Purulent Surgery and Surgical Complications, 144 patients with different localizations of the purulent-inflammatory process were treated during the year (Table 1, in terms of 2018). Depending on the characteristic of the purulent process, patients are shown as follows.

**Allocation of patients by nosology.**

<table>
<thead>
<tr>
<th>Nosology</th>
<th>Quantity</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phlegmons of the body</td>
<td>40</td>
<td>27.7</td>
</tr>
<tr>
<td>Interstitial and testicular phlegmons</td>
<td>7</td>
<td>4.9</td>
</tr>
<tr>
<td>Saramas</td>
<td>17</td>
<td>11.8</td>
</tr>
<tr>
<td>Soft tissue abscess</td>
<td>14</td>
<td>9.7</td>
</tr>
<tr>
<td>Carbuncles</td>
<td>45</td>
<td>31.3</td>
</tr>
<tr>
<td>Purulent processes in the limbs</td>
<td>13</td>
<td>9.0</td>
</tr>
<tr>
<td>Parapractice</td>
<td>8</td>
<td>5.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>144</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

In order to unify the approaches to the treatment of patients, taking into account the combination of localization of pathological foci, we used the classification of the grade of soft tissue inflammation according to Ahrenholz (Table 2). However, I would like to emphasize that isolated inflammation of a single structure is very rare, often there is inflammation combined with retention of several segments.

**Allocation of patients based on the grade of injury.**

<table>
<thead>
<tr>
<th>grade - I</th>
<th>grade - II</th>
<th>grade - III</th>
<th>grade - IV</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 (5.5%)</td>
<td>72 (50.0%)</td>
<td>24 (16.7%)</td>
<td>40 (27.8%)</td>
<td>144 (100%)</td>
</tr>
</tbody>
</table>

Among those hospitalized, 82 (57%) were women and 62 (43%) were men. The majority of hospitalized patients are middle-aged (77.7%) and less elderly (15.2%). The disease is most common among older and middle-aged
women aged 18 (12.5%) and 81 (56.2%) (Table 3). The allocation according to the degree of injury showed that women had the most common soft tissue injuries at grade - II 44 (30.5%) and grade - IV 24 (16.6%). Less frequent occurrence of grade III injury, cases of necrotizing fasciitis as an isolated process are very rare. The allocation of the disease among women in the study groups can be explained by the prevalence of diabetes and the development of obesity among this population. Prolonged storage of microorganisms in endogenous foci of infection in such patients leads to a decrease in the body's resistance to microbes, disruption of the immune response helps to change the clinical course of the disease. In addition, the presence of mixed flora as a result of long-term pre-hospital treatment has affected the ineffectiveness of conventional antibiotic therapy.

Classified patients by age and sex.

Table 3

<table>
<thead>
<tr>
<th>Age groups</th>
<th>I Grade</th>
<th>II Grade</th>
<th>III Grade</th>
<th>IV Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>under 41 years old</td>
<td>8 (5.5%)</td>
<td>72 (50.0%)</td>
<td>24 (37.6%)</td>
<td>40 (6.9%)</td>
</tr>
<tr>
<td>41-50 years old</td>
<td>-</td>
<td>4 (2.1%)</td>
<td>3 (4.2%)</td>
<td>2 (3.5%)</td>
</tr>
<tr>
<td>51-60 years old</td>
<td>6 (4.2%)</td>
<td>34 (23.5%)</td>
<td>12 (18.0%)</td>
<td>23 (16.3%)</td>
</tr>
<tr>
<td>61-70 years old</td>
<td>1 (0.7%)</td>
<td>17 (11.8%)</td>
<td>1 (1.4%)</td>
<td>3 (2.1%)</td>
</tr>
<tr>
<td>71-80 years old</td>
<td>-</td>
<td>6 (4.2%)</td>
<td>1 (1.4%)</td>
<td>-</td>
</tr>
<tr>
<td>Average age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In order to emphasize the need for a unified approach in the treatment of patients with soft tissue surgery on the background of diabetes mellitus, access analysis to a specialized facility after initial treatment was conducted both in the outpatient department and in the hospital. (see table 4).

Allocation of patients in primary care according to the duration of treatment.

Table 4

<table>
<thead>
<tr>
<th>Durations of treatment before hospitalization</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 5 days</td>
<td>-</td>
<td>4(4,2%)</td>
<td>-</td>
<td>2(2,1%)</td>
<td>6(6,3%)</td>
</tr>
<tr>
<td>up to 6-10 days</td>
<td>-</td>
<td>27(28%)</td>
<td>17(17,7%)</td>
<td>19(19,8%)</td>
<td>63(65,6%)</td>
</tr>
<tr>
<td>more than 10 days</td>
<td>-</td>
<td>18(18,7%)</td>
<td>4(4,2%)</td>
<td>5(5,2%)</td>
<td>27(28,1%)</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>49(51%)</td>
<td>21(21,8%)</td>
<td>26(27,1%)</td>
<td>96(100%)</td>
</tr>
</tbody>
</table>

The analysis shows that 96 (66.6%) out of the 144 patients treated at the multidisciplinary clinic of the Tashkent Medical Academy are secondary, in other words they had been treated in other hospitals and only 48 (33.4%) sought immediate medical attention. The main contingent of secondary patients had to undergo long-term treatment in residential medical facilities, where they were provided with surgical care with medical interventions. As a result of the development of the pathological process, they were transferred to a specialized center.

Admitted patients underwent a comprehensive examination, including: clinical examination taking into account laboratory parameters, radiation diagnostics, ultrasound examination, operation with computed tomography, identification and planning of the scope of operation. The tactics of admission of patients were as follows: after diagnosis, if surgical intervention was necessary, emergency preparation with surgery was carried out before surgery and carried out with the mandatory support of the anesthesiologist group. The essence of the surgical intervention was determined in the operating room and consisted mainly in the removal of the pathological focus with the obligatory radical necrectomy of all non-living tissue within the healthy tissue. This is the key to preventing the generalization of the diabetes process. High levels of hyperglycemia do not cause surgical delay, and the presence of a purulent process is a criterion for maintaining high glycemia because it is known that 1 ml of pus inactivates 10-15 U of endogenous or exogenous insulin. The next stage of the purulent-inflammatory process depended on the quality of the surgical intervention. An intra-arterial catheter was then inserted into the

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arterial pool, which provided blood circulation to the affected area. All patients were converted to insulin therapy and were under the daily supervision of an endocrinologist. The digital material was reprocessed by the method of variation statistics.

III. RESULTS AND DISCUSSION

Microbiological analyzes showed that mixed aerobic-anaerobic infection was not detected in 81.2%, aerobic infection in 10.4%, and microflora growth in 8.4% of patients. Perhaps this is due to long-term antibiotic therapy at the center before hospitalization. However, mixed infection with culture of fungal flora was noted in 48 (53.3%) secondary patients with II-III-IV grade lesions, which was the basis for antifungal therapy. The range of soft tissue injuries grade is very wide, they can start from normal skin damage, but often the infection quickly spreads to the deeper layers of soft tissue, fascia and muscle cortex. This momentarily leads to exotoxinemia along with intoxication, requiring intensive therapy and mandatory surgical intervention aimed at eliminating the pathological focus. The local treatment algorithm is varied depending on the stage of the wound process. However, all patients with stage I used: differentiated water-soluble ointments (miramistin, levomecol, dioxidine, levosin, nitacid), proteolytic enzymes (trypsin, chymotrypsin, hemopsin, humumazine, etc.). Dimexidum in the lotion component helps to stop the inflammatory component and promotes better penetration of the drugs used through the tissue barriers. Stage II: water-soluble ointments, ointments with moderate osmotic activity (streptonitol), aerosols (alazol, hyposol, etc.), iodine-containing drugs (iodonate, betadine, etc.).
Case study: A patient M.R., was born in 1940, admitted to the ward on January 27, 2018 with complaints of pain in the suprascapular area and general weakness. Diagnosed with type 2 diabetes mellitus. In the decompensation phase. Carbuncle-II degree in the suprascapular area.

Anamnesis: Has had diabetes for 18 years.

According to the patient, during the last 7 days he has a painful swelling in the suprascapular area, he was treated at the clinic in the place of residence and used folk remedies. The patient's condition is relatively stable, the temperature held up 37°C. The therapy was ineffective, the swelling increased, the pain increased slightly, but the temperature remained subfebrile.
Figure 1. Swelling and hyperpigmentation of the tissues of the scapula.

The patient was treated for about 10 days at the place of residence and, as noted above, the clinical sign was atypical, attributable to patients with acute surgical infection. The patient then went to the multidisciplinary clinic of Tashkent Medical Academy, where he was hospitalized for further treatment. At the time of admission to the center, the patient's condition was moderate, in consciousness, the skin was pale. Complained of pain and general weakness in the upper shoulder area. The patient was examined: Hb-98g / l, ESR - 59mm, L - 10.3 -10, total protein - 61, blood glucose - 13.8 mmol / l, AST - 0.8, ALT - 0.9, urea-8.9, creatinine - 112, bilirubin - 16. A / D - 130/80, Ps - 90 times / min, NS - 24 times per minute. The ECG shows metabolic changes. Local: the scapular area is tense, cyanotic, tumor-like swelling, moderately painful on palpation, with a sign of fluctuation, 30-25 cm (Fig. 1).

After preoperative preparation, the patient underwent carbuncle opening surgery under intubation anesthesia. During the surgical intervention, it was found that the pathological process is widespread with soft tissue damage in the form of a "wet sponge", which is characteristic of this type of inflammation. For this reason, the patient underwent necrectomy in healthy tissue (Fig. 2).

Figure 2. 3 days after surgery. Inflammatory processes with foci of necrosis continue.

In the postoperative period against the background of antibacterial therapy - drop infusion 2.0 * 2 times, balgil 100.0 * 3 times, mercacin 500 mg * 2 times a day, 100.0 * 1 time fludar were added and carefully sanitized using Levomekol programs, ointment and dimexid solution.
In the dynamics, necrosis and inflammation was preserved in the background of wound healing, and for this reason on the third day the local medication FarGALS was used in a two-stage form. This allowed to achieve the appearance of focal losid granulation with a sharp decrease in perifocal inflammatory events (Fig. 3).

![Figure 3](image1.png)

**Figure 3.** Manifestation of granulation with a distinct decrease in perifocal inflammatory processes.

On repeated examinations (in 1 month) during treatment with FarGALS, general granulation is noted with the appearance of focal rejected necrosis and marginal epithelialization (Fig. 4). The patient is transferred to oily programs (sea buckthorn oil) and in 2 months the patient was again hospitalized for autodermoplasty.

![Figure 4](image2.png)

**Figure 4.** Dynamic follow-up after 1 month. The wound is covered with a glossy granulation in the form of winged epithelium.

On day 6, the patient was discharged for outpatient treatment. One of the factors that can ensure the successful treatment of patients is to appoint a relative of the patient and teaching him the rules of care for this wound. This provides a reduction in nosocomial infection of the clean wound.
Figure 5. Appearance of autodermoplasty injury after 3 months.

This clinical situation clearly demonstrates the importance of radical, step-by-step comparative treatment of patients with soft tissue surgery. Against the background of local treatment, patients underwent intensive therapy, including antibacterial, antifungal, detoxification, immunocorrection, water-energy loss replenishment and infusion program.

IV. CONCLUSION

The following remarks should be considered in the treatment of surgical soft tissue infection associated with diabetes:

- daily monitoring of glycemia and changeover to insulin therapy under the supervision of an endocrinologist;
- surgery under general anesthesia, which allows to adequately review the affected tissue;
- comparative approach to local treatment, taking into account the degree of soft tissue injury;
- it is preferable to intravenously administer a broad-spectrum antibiotic in combination with metronidazole and aminoglycosides;
- introduction of antifungal therapy in a set of therapeutic measures;

Consequently, despite advances in medicine, surgical soft tissue infection in diabetes mellitus is one of the most severe purulent surgical diseases leading to generalization, it indicates the need to seek more effective methods of diagnosis and treatment of patients with this pathology, especially in the initial stages.

CONFLICT OF INTERESTS AND CONTRIBUTION OF AUTHORS

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