Volume 2, Issue 6, June 2024 ISSN (E): 2938-3765

DIFFERENTIATED APPROACH IN THE TREATMENT OF NECROTIZING SOFT TISSUE INFECTIONS DUE TO DIABETES MELLITUS

U. K. Kasimov
F. M. Abdurakhmanov
Tashkent Medical Academy, Tashkent, Uzbekistan

Abstract
One of the most difficult areas of purulent surgery is the development of surgical infection of soft tissues against the background of diabetes mellitus, when necrotic changes dominate. To speed up the process of cleansing and subsequent healing of soft tissue wounds in patients with diabetes, antibacterial drugs, proteolytic enzymes, and ointment dressings are used, depending on the stage of the wound process using physical methods. In this regard, the purpose of this study is to study the antibacterial and anti-inflammatory effect of the drug FarGALS in necrotic soft tissue infections associated with diabetes mellitus. The study was carried out on 103 patients with purulent-inflammatory diseases who were hospitalized at the Republican Center for Purulent Surgery and Surgical Complications of Diabetes Mellitus.

Keywords: purulent wound; necrotizing infection, anti-inflammatory activity; wound area; FarGALS, diabetes mellitus.

Introduction

The search for methods to combat wound infection has a long history. Over the centuries, humanity has been developing various methods of treating wounds, strictly focusing on the stage of the wound process, the characteristics of infectious complications caused by various microorganisms [1, 16] . Many difficulties arise in the treatment of wounds with associated infection, while a “dormant” infection is especially dangerous, the aggressiveness of which is determined by the variability of the microflora and the reactivity of the body [1 4 , 15 , 1 7 , 1 8 , 19].

The problem of treating purulent wounds remains relevant . There are 3 phases of the wound process: the first period is the phase of inflammation (hydration); the second is the regeneration (dehydration) phase; the third is the phase of scar reorganization and epithelization [7 , 8, 13].

In phase I, it is necessary to limit the process, cleanse the wound from dead and non-viable tissue, create conditions for the outflow of wound exudate, suppress the vital activity of wound microflora, for which use ointments on a water-soluble polyethylene oxide base “Levosin”, “Levomekol”, which contain chloramphenicol and methyluracil.

In phase II, it is necessary to create conditions for the growth of granulation. Acceleration of regeneration is possible with the use of creams and ointments “Solcoseryl”, “Bepanten”, “Actovegin”. “Solcoseryl” and “Actovegin” contain a natural biological component—hemoderivat, which has the ability to accelerate wound healing by stimulating cell growth and collagen synthesis [2, 3, 21].

In the III phase of scar maturation and epithelization, agents based on dexapanthenol (“Bepanten”,

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

"Panthenol"), "Actovegin" are widely used in any dosage form for external use [5, 9, 11].

The principle of selecting medications and using treatment methods that are effective in one or another phase of the wound process has been practically worked out and has not traditionally been revised for a long time [4 , 6 , 10 , 12 , 20] . All this indicates that the combination of diabetes mellitus and surgical infection forms a vicious circle in which the infection negatively affects metabolic processes, increasing insulin deficiency and increasing acidosis. In this regard, the purpose of this study is to study the antibacterial and anti-inflammatory effects of the drug FarGALS in purulent-inflammatory diseases associated with diabetes mellitus.

To achieve this goal, it is planned to conduct a comparative assessment of the effectiveness of the drug FarGALS in a clinical setting among two groups. Against the background of general treatment in both study groups, a distinctive feature of each was that after sanitation and emptying of the pathological focus, patients in the main group used the drug FarGALS, while in the control group, after the treatment measures, Levomekol ointment, which has hyperosmolar properties, was applied topically and allows you to limit the inflammatory process. The main condition was the presence of an underlying disease – diabetes.

Research Methods

We studied 103 patients with purulent-inflammatory diseases who were hospitalized at the Republican Center for Purulent Surgery and Surgical Complications of Diabetes Mellitus. The original wound healing drug "FarGALS" was used as the object of study . The drug "Levomekol" (Nizhpharm, Russia), which contains chloramphenicol and methyluracil, was used as a comparison drug. All patients were divided into 2 groups: the control group was represented by 45 (43.7%) patients whose purulent wounds were treated with Levomekol ointment. The main group included 58 (56.3%) patients who were treated for purulent-inflammatory diseases using the drug FarGALS. In terms of age and gender, the compared groups were as follows: there were 41 (39.8%) men, 62 (60.2%) women. The patients were distributed by age as follows: from 20 to 40 years there were 9 patients, which was 8.7%, from 41 to 50 years - 16 (15.5%), from 51 to 60 - 47 (45.6%) sick and over 61 years old - 31 patients, accounting for 30.1% of the total.

Table 1. Distribution of patients with purulent surgical diseases different localization according to nosology

Nosology	Control group		Main group	
	Qty	%	Qty	%
Cellulitis of various localizations	13	29.0	19	32.8
Abscess of various locations	9	20.0	10	17.2
Carbuncles of various locations	6	13.3	7	12.1
Boils of various locations	4	8.9	4	6.9
Acute paraproctitis	4	8.9	2	3.4
Erysipelas n/a	2	4.4	2	3.4
Suppuration of postoperative wounds	1	2.2	2	3.4
Purulent-necrotic wound	2	4.4	7	12.1
Festering coccyx cyst	1	2.2	1	1.7
Hidradenitis	1	2.2	2	3.4
Felon	2	4.4	2	3.4
Total	4 5	100.0	58	100.0

The structure of purulent-inflammatory diseases of soft tissues was different. As can be seen from Table 1, the most common were phlegmons and abscesses of various locations, which were noted in 31.1% and 18.4% of cases, respectively. Less common were carbuncles (8.7%), boils of various

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

locations in 7.8% of cases. In all patients, the purulent-inflammatory process of soft tissues developed against the background of diabetes mellitus (Table 1) .

In total, patients in the control and main groups underwent 144 surgical treatment methods. The main share of operations was necrectomy 55 (38.2%) and opening of purulent foci 89 (61.8%). The total number of surgical operations in the control group of patients was 65 (45.1%), and in the main group, respectively, 79 (54.9%). When performing surgical operations, the pathological focus was opened and in the presence of a necrotic process with damage to structures, necrectomy was performed, the proportion of which was accordingly high 55 (38.2%). I would like to note that in case of damage to soft tissues by a purulent-inflammatory process, this operation was mandatory, because locally necrotic changes dominate. In the postoperative period, the wounds were dressed daily using Levomekol ointment in the control group, and the domestic drug FarGALS in the main group, while staged necrectomies were performed in both groups. In all cases, the wounds healed by secondary intention.

Upon admission after a preliminary examination, all patients were examined by an endocrinologist, followed by daily observation, with preference given to transferring patients to insulin therapy, using short-acting insulin. On the day of admission, patients were prescribed antibacterial therapy using an empirical approach. Combinations of cephalosporins (ceftazidime, ceftriaxone), aminoglycosides (netromycin, amikacin) and metronidazole were used. Subsequently, antibiotics were changed depending on the sensitivity of the identified microorganisms. If fungi were detected, fluconazole was added to treatment.

The control group of patients was represented by 45 (43.7%) patients with necrotizing soft tissue infections of various locations. In all of them, the surgical infection developed against the background of diabetes mellitus, the duration of which varied from 3 to 25 years, with type II diabetes mellitus dominating. I would like to note that the main contingent of patients was secondary, i.e. They received primary treatment at their place of residence. By age, older and elderly people dominated in the control group, so 40.0% of patients were aged 51-60 years, and 35.5% were over 61-60 years old. Young and middle-aged people were less common, which indicates the prevalence of diabetes among older people. The gender difference indicated the dominance of women, of whom there were 28 patients, corresponding to 62% (Table 2).

Table 2. Distribution of patients with purulent surgical diseases different locations by gender and age

Age (years)	Control group					
	Husband.		Women		Total	
	abs	%	abs	%	abs	%
20-40	2	4.4	2	4.4	4	8.9
41-50	4	8.9	3	6.7	7	15.6
51-60	5	11.1	13	28.9	18	40.0
61 and older	6	13.3	10	22.2	16	35.6
Total:	17	37.8	28	62.2	45	100.0

Studying the severity of the wound process on a point scale, it was revealed that the main contingent of patients were patients with average severity of the wound process, which was noted in 29 patients, which corresponded to 64.4%. Severe wound healing was noted in 16 patients.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Table 3. **Severity of the wound process**

Heaviness	Qty	Point
Light	-	-
Average	29	12±0.4
Heavy	16	26±1.3

At the time of admission of patients with mild severity of wound process was not detected (Table 3) .

The essence of the treatment measures carried out was as follows: upon admission, after short-term preoperative preparation, the patients underwent surgical intervention aimed at opening the pathological focus, its adequate necrectomy within healthy tissues and, if necessary, the cavity was drained, but in most cases the wounds remained open, which allowed evaluate the effectiveness of local changes against the background of treatment. Thus, in the control group, a high proportion was accounted for by the opening of phlegmon, which was performed in 23.1% of patients. In second place were the opening of abscesses of various locations, which was performed in 9 patients, accounting for 13.8%. I would like to note that necrectomies were most often performed, the proportion of which was 38.4%. This is explained by the fact that this operation is performed during the initial surgical intervention and subsequently, as necrotic tissue appears, during local treatment (Table 4).

Table 4. The nature of surgical interventions performed in patients in the control group

Type of operation	Control group	
	Qty	%
Opening a boil	4	6.2
Opening the carbuncle	6	9.2
Opening an abscess	9	13.8
Autopsy of phlegmon	13	20.1
Necrectomies	27	38.4
Autopsy of paraproctitis	4	6.2
Autopsy of hidradenitis	1	1.5
Opening of a coccyx cyst	1	1.5
Autopsy of felon	2	3.1
Total	**65**	**100**

When studying clinical and biochemical parameters on the day of admission, it was revealed that all patients had signs of severe intoxication and sepsis, manifested in sharp tachycardia 108 ±2.8 beats per minute, tachypnea 28 ±2.0 times per minute, an increase in systolic blood pressure to 140 ±8.0 mmHg Art., hyperthermia 38.8 ±0.4 ^{0} C and leukocytosis (15.1 ±0.9 10 ^{9}), LII reached the level of 4.8 ±0.6. Moreover, against the background of high toxemia (OSM 322 ±8.7), patients showed signs of hypoproteinemia 54 ±3 , 2 g/ l On the day of admission, the patients' glycemia was at the level of 13.3 ±1.9 mmol/l. For other parameters, no significant deviations were observed (Table 5).

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Table 5. Dynamics of changes in clinical and biochemical blood parameters in patients in the control group

Index	Observation period			
	1 day	3 days	7 days	14 days
Pulse, beat. per minute	108 ±2.8	102 ±2, 6	102 ±2 .0	98 ±1.5**
NPV	28 ±2.0	26 ±1.9	23 ±1.6	20 ±1.1**
Systolic blood pressure, mm Hg.	140 ±8.0	140 ±8.0	130 ±4.5	130 ±3.8
Diastolic blood pressure, mm Hg.	90 ±6.0	90 ±6.0	80 ±5 .0	80 ±3.5
Temperature, °C	39.1 ±0.8	38.5 ±0.4	38.0 ±0.2	37.0 ±0.2
Leukocytosis ×10 ^{9} /l	15.1 ±0.9	12.7 ±0.7 *	11.5 ±0.6 **	8.2 ±0.4 ***
ESR, mm/h	48 ±1.8	45 ±1.8	28 ±1.4***	18 ±1.2***
OSM	322 ±8.7	286 ±7.1 **	230 ±6.4***	217 ±5.2***
LII	4.8 ±0.6	4.0 ±0.5	2.7 ±0.5 *	1.8 ±0.4 ***
Total protein, g/l	54 ±3 , 2	46.1 ±3.0	51 ±2.8	56 ±1.9
Blood sugar, mmol/l	13.3 ±1.9	14.1 ±1.5	10.3 ±0.8	8.4 ±0.7*

Note: * - differences relative to the group data on day 1 are significant (* - P <0.05, ** - P <0.01, *** - P <0.001)

Thus, the treatment of purulent-inflammatory diseases of soft tissues with the use of Levomekol ointment in the control group of patients has an antibacterial effect. But its effective effect is manifested only in the adsorption of exudate and a slight decrease in the activity of inflammatory-destructive changes, while diffuse inflammatory and necrotic phenomena remain in the deep layers of the dermis and subcutaneous tissue, which leads to an extension of the treatment period for patients with this pathology.

Results and its discussion

Based on the research results, we conducted a comparative analysis in both groups, and at the same time it (the analysis) showed that the severity of the wound process in both groups was the same. There were no patients with mild severity of the wound process in the studied groups; there were more patients with moderate and severe severity in the main group (Table 6).

Table 6. **Severity of the wound process in both groups**

Heaviness	Qty				Point	
	Control group		Main group		Test group	Main group
	abs	%	abs	%		
Light	0	0	0	0.0		
Average	29	64.4	35	60.3	12±0.4	12± 0.8
Heavy	16	35.6	23	39.7	26±1.3	27 ± 1.2
Total	45	100.0	58	100.0		

A study of the dynamics of changes in clinical and biochemical parameters in both groups showed that, with initially identical indicators, intoxication phenomena in the main group progressively decreased during treatment and were already close to normal values by the 3rd day of treatment. Thus, LII in the main group was 3.7 ±0.3, while in the control group it remained high, amounting to 4.0 ±0.5. By the 14th day of treatment, in the main group it was within the normal range of 1.4

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

±0.2 , and in the control group 1.8 ±0.4 . One of the important diagnostic criteria for the course of the pathological process is the temperature reaction, which on day 1 was high in patients of both the main and control groups and amounted to 39.1 ±0.8 °C and 39.2 ±0.6 °C, respectively. This indicator decreased evenly in both groups during treatment, but in the control group by the 3rd day of treatment it was 3 7.8 ±0.4 ° C , which indicates the persistence of inflammatory phenomena in the area of the pathological process. Only on the 7th day is there a normalization of the temperature reaction, which was also observed on the 14th day .

A comparative analysis of microbial contamination of purulent wounds among aerobes and anaerobes on the day of admission showed that their content in the study groups was the same. Thus, the concentration of anaerobes in the control group was 7.6±0.6 lgCFU/ml, and in the main group 8.4±0.3 lgCFU/ml. Microbial contamination of anaerobes on the day of admission was 8.4±0.5 lgCFU/ml in the control group and 8.1±0.4 lgCFU/ml in the main group. Against the background of the treatment, in both groups, by the 3rd day of treatment, a significant decrease was noted, amounting to 5.0 ± 0.3 lgCFU/ml for aerobes in the main group, and 6.0 ± 0.4 lgCFU/ml in the control group. The concentration of anaerobes at this time was almost the same (5.1±0.3lgCFU/ml and 5.2±0.4lgCFU/ml). A significant decrease was observed on day 7, when the level of aerobes in the main group reached 3.2±0.2 lgCFU/ml, which is a concentration indicator below the critical level, while in the control group this indicator remained at 4.3±0.3 lgCFU/ml. The picture of anaerobic contamination was 3.0±0.2 lgCFU/ml for aerobes in the main group, and 4.0±0.3 lgCFU/ml in the control group. The above indicates a pronounced antibacterial effect provided by topical application of the drug FarGALS, in comparison with Levomekol ointment .

The results of treatment of both groups showed that good results prevailed in patients of the main group, which were observed in 26 patients, in comparison with the control group, where this indicator was observed in 12 patients. Among the satisfactory treatment results in the control group, they were noted among 53.3%, in the main group it was 48.3%.

According to unsatisfactory treatment results, when the necrotic process persisted in the wound, in the control group it was detected in 9 patients, whereas in the main group this indicator was noted only in 7% of patients. There were no lethal outcomes in the study groups (Table 7).

Table 7.

The result of treatment of patients

Result	Control group		Main group	
	n	%	n	%
Good	12	26.7	26	44.8
Satisfactory	24	53.3	28	48.3
Unsatisfactory	9	20.0	4	6.9
Mortality	-	-	-	-
Total	45	100	58	100

A comparative assessment of the timing of wound cleansing in the study groups showed a significant reduction in the duration of phases I and II of the course of the wound process, while the duration of phase I of the purulent-inflammatory process was reduced by 2.2 ± 0.6 days, phase II by 1.2 ± 0.4 days, compared to the control (Table 8).

Table 8.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Wound healing time

Groups	Qty	Average terms				
		Phase I	II phase	III phase	Bed day	Amb-no
Test	45	5.8 ±1.1	7.1 ±1.2	10.6 ±0.4	12.5±2.1	24.2±0.3
Main	58	2.6 ±0.5**	5.9±0.3	9.1±0.6*	10.3±0.7	24.3±0.6

Note: * - differences relative to the control group data are significant (* - P <0.05, ** - P <0.01)

Thus, the differentiated use of FarGALS in patients of the main group makes it possible to reduce the duration of the wound process, due to the relief of the inflammatory process in the deep layers of lesions, with the creation of dry necrosis and rapid cleansing of the wound.

Conclusion

1. The use of FarGALs in patients with purulent-inflammatory diseases associated with diabetes can reduce microbial contamination by the 7th day of treatment to 3.2 ± 0.2 lgCFU/ml for aerobes and 3.0 ± 0.4 lgCFU/ml for anaerobes. By this time, clinical and biochemical parameters are normalized, with phase I stopping by 2.6 ± 0.5, phase II by 5.9 ± 0.3 and phase III by 9.1 ± 0.6 days of treatment, respectively;
2. A comparative analysis of the effectiveness of the FarGALS drug and Levomekol ointment revealed by day 7 a significant decrease in the concentration of aerobes by 1.1±0.4lgCFU/ml and anaerobes by 1.2±0.3lgCFU/ml. At the same time, the duration of phase I of the purulent-inflammatory process was reduced by 2.2 ± 0.6 days, phase II by 1.2 ± 0.4 days, compared with the control.

REFERENCES:

1. A. V. Filatova, *Study of the wound-healing properties of hydrophilic gel* **,** No. 3, 4 - 36, Universum, Moscow (2020); doi: 10.32743/UniChem.2020.69. /3-1/.
2. A. S. Turaev, Patent IAP 20100248 (2010).
3. AR Bobabekov, UK Qosimov, SS Atakov, QX Boboev, DU Kasimova. Specificity of soft tissue surgical infection in diabetes. Turkish Journal of Physiotherapy and Rehabilitation/ 32(2) P.4127-4136 / ISSN 2651-4451 | e-ISSN 2651-446X.
4. Alekseev A.A., Yakovlev V.P., Krutikov M.G., Bobrovnikov A.E., Paltsyn A.A., Grishina I.A. Antibiotic prophylaxis of postoperative infectious complications in patients with thermal injuries // Annals of Surgery. - 2000. - No. 6. – P. 50-55.
5. Antsiferov M.B., Galstyan G.R., Tokmakova A.Yu. Fundamentals of organizing specialized therapeutic care for patients with diabetic foot syndrome // Standards of diagnosis and treatment in purulent surgery: Materials of scientific and practical work. conf. – M., 2018. – P. 73-80.
6. Berg S. Curiosity in the treatment of wounds: curiosin solution // Richter News, 1996. - No. 4. - P. 5.
7. Bubnova K.S. Suprun M.A. Treatment of diabetic foot syndrome in a multidisciplinary hospital // Vestn. St. Petersburg University - Ser. 11. Medicine. – 2008. – Issue. 4. – pp. 119-124.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

8. Vasilyeva I.A. Features of the quality of life of patients with chronic renal failure during hemodialysis treatment // News of the Russian State Pedagogical University named after. A.I. Herzen. - 2008. - No. 57. - P. 75-86.
9. The influence of negative pressure therapy on reparative processes in the soft tissues of the lower extremities in patients with neuropathic and neuroischemic forms of diabetic foot syndrome / E.L. Zaitseva, L.P. Doronina, R.V. Molchkov et al. // Diabetes mellitus. – 2014. – No. 3. – pp. 113-116.
10. Datsenko B. M. Theory and practice of local treatment of purulent wounds in diabetes mellitus. – Kyiv: Health. – 2005. – 382 S.
11. Ignatovich I.N., Kondratenko G.G., Nikulin D.D. Justification of the optimal method of treating patients with the neuroischemic form of diabetic foot syndrome based on a comparison of long-term results of using various methods // News of surgery. – 2013. – T. 21, No. 2. – pp. 69-75.
12. Matmurotov K.Zh., Otajonov Zh.Kh., Atazhanov T.Sh. Amputation of the lower leg in diabetic gangrene of the lower extremities // Introduction of high technologies in vascular surgery: Sat. abstract 35th Conf. – St. Petersburg, 2019. – pp. 135-136.
13. N. P. Chesnokova, *Inflammation: etiology*, *pathogenesis*, *pathogenetic basis for the principles of therapy*, Saratov Medical University, Saratov (2008).
14. Rozhkov M. S., Novoseltsev A. V., Lapunova T. Ya., Kiselevskaya N. I. Local multilevel monitoring of the resistance of pathogens of surgical infection // Bulletin of Surgery named after. I. I. Grekova. – 2006. – Volume 165, No. 3. – P. 89-92.
15. Simbirtsev S. A., Konychev A. V., Kokorev O. V., Rutenburg D. G., Ivanenko A. B. Clinical and immunological features of complicated purulent-inflammatory diseases of the fingers // Medical academic journal. - 2009. - No. 3. - P. 62-65.
16. Ergashev U.Yu., Mominov A.T., Malikov N.M., Yakubov D.R. Impaired foot integrity in patients with diabetic foot syndrome (literature review). // Volume–7 17_Issue-1_November_2022 7-17 st.
17. Yanov Yu. K., Eryukhin I. A., Novikov A. G., Mironenko A. N. Current problems of epidemiology and prevention of postoperative infections // Bulletin of surgery. - 2007. - No. 3. – P. 106-109.
18. Hodges AM, Agaba S. Wound infection in a rural hospital // Trop Doct. - 2002. - No. 3. – R. 174-175.
19. Lizan-Garcia M., Garcia-Caballero J., Asensio-Vegas A. Risk factors for surgical-wound infection in general surgery: a prospective study. Infect Control Hosp Epidemiol. - 2002. - No. 5. – R. 310-315.
20. Sylaidis P., Wood S., Murray DS Postoperative infection following clean facial surgery // Ann Plast Surg. - 2002. - No. 4. – R. 342-346 .
21. The presence of biofilm structures in atherosclerotic plaques of arteries from legs amputated as a complication of diabetic foot ulcers / DE Snow, J. Ever-ett, G. Mayer [et al.] // J. Wound Care. – 2016. – Vol. 25, No. 2. – P. S16-22.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5