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The Effectiveness Of Local Application Of Titanium Aquacomplex Of Glitzerosolvate In The Treatment Of Destructive Forms Of Erysipelas.

AA Glukhov*, AA Andreev, OS Mokhova, SN Boev, TG Nikishina,
AP Ostroushko, EA Brazhnik, MV Aralova, EV Mikulich, and ME Ngabire.

The Federal State Budget Educational Institution of Higher Education, Voronezh State Medical University. N.N. Burdenko, Ministry of Health of The Russian Federation, Studencheskaya st, 10, Voronezh, Russia

ABSTRACT

The article contains results of the research of the efficient use of titanium aquacomplex of glitzero solvate in treatment of destructive forms of erysipelas. The local application of Tizol contributes to the reversion of symptoms in focus of inflammation, and to the stimulation of the regeneration processes in the wound.

Keywords: Erysipelas, festering purulent wound, titanium aquacomplex of glitzerosolvate.

**Corresponding author*

INTRODUCTION

The incidence of streptococcal infection increases with each year [1,2]. A significant proportion of these patients are patients with destructive forms of erysipelas that are subject to surgical treatment [3,4]. Due to pathophysiological features of erysipelas, treatment of purulent wounds in this category of patients creates additional difficulties for surgeons. Currently, in most the literature, there are many suggested methods for treating purulent wounds in erysipelas, but the results of this therapy, in most cases, remain unsatisfactory. The late relapses of the disease also increase, even in the postoperative period persistent lymphostasis is formed, the percentage of disability of patients increases [2,3,4].

MATERIAL AND METHODS

In accordance with the purpose of the study, all patients were divided in two groups (main and comparison group), comparable in age, gender and the nature of the changes in the focus of inflammation.

The main group included 17 people who in addition to basic therapy received applications of titanium aquacomplex of glycerosolvate (manufactured under the commercial name Tizol, Olimp LLC, Ekaterinburg).

After surgical treatment of the inflammation focus, during dressing the wound Tizol was applied daily to the hyperemia skin with a uniform thin layer at a rate of 0.3-0.5 g per dm². Tizol was applied on the wound on the 2-3 day of the course of the wound process that is in the phase of decreasing exudation.

The comparison group included 17 patients who received only basic therapy.

Surgical treatment of the focus was carried out according to a standard procedure and included: opening of the abscess with maximum excision of non-viable tissues, sanitation of the wound with liquid antiseptics. The evaluation of the effectiveness of the treatment was carried out on the basis of the results of an objective control over the course of the wound process, including cytological examination of wound prints, planimetric method and visualization of the condition of the wound surface (presence of fibrin, edema of the wound edges).

The cytological control of the wound process was carried out by examining smears of the wounds using M.V. Pokrovskaya's, M.S. Makarov's method modified by D.M. Steinberg (1948) [6].

Collection of the study material was done on the 1st 3rd 5th 7th 9th 11th 13th 15th 17th days of the wound process. The following elements of the smear were monitored: microflora, number of neutrophils, characteristics of phagocytosis, eosinophils, plasmocytes, lymphocytes, monocytes, giant multinucleated cells, macrophages, fibroblasts, polyblasts, endothelium, and epithelium.

Quantitative characteristics of the main elements of wound prints were done separately and then the final result was collected and put in a cytogram. Depending on the qualitative and quantitative composition of these elements, all medications were divided into six types (type I - necrotic, type II - degenerative-inflammatory, type III - inflammatory (these types of cytograms are characterised the (first) inflammatory phase of the wound process), type IV - inflammatory-regenerative, type V - regenerative-inflammatory, type VI - regenerative (characterizing the course of the second phase of the wound process).

To determine the rate of closure of the wound defect, L. N. Popova's method was used. [6]. The measurements of the wound were carried out on the 5th and 10th day. Statistical processing of the digital material of the results of the study was carried out by the variational method; the indicator of the reliability of the differences of the Student was calculated using the program Microsoft Office 2003 for Windows XP Professional.

RESULTS

Inclusion of titanium aquacomplex of glycerosolvate in the basic therapy of patients with destructive forms of erysipelas resulted a more benign course of the disease. In the comparison group, the duration of the febrile period was 6 ± 0.58 days. In the comparison group, the length of the fever period was 6 ± 0.58 days. In

the main group of patients, the same indicator was 4.53 ± 0.62 days ($p < 0.05$). When assessing the dynamics of local symptoms of inflammation in the local focus (the presence of hyperemia, edema, and pain), it was found that, on the basis of traditional treatment, pain was present for 10.3 ± 1.13 days, edema was stopped at 10.53 ± 1.18 days; skin hyperemia persisted for 12.29 ± 1.08 days. The usage of Tizol decreased the oedematous period to 6.9 ± 0.21 days ($p < 0.05$) (that is 3.6 days less than in the comparison group patients), recorded the skin hyperaemia for 8.97 ± 1.29 days ($p < 0.05$) (which is 3.32 days shorter than in patients receiving traditional therapy), stopped the pain on the 6.71 ± 1.34 th day ($p < 0.05$) (which is 3.59 days less than in the first clinical group).

On the basis of traditional therapy, wound cleansing from non-viable tissues and purulent exudate was registered on 5.1 ± 1.3 days, the disappearance of fibrin plaque and edema of the wound edges was noted at 7.2 ± 1.56 days, the appearance of active granulations of bright red color - on 6.8 ± 1.4 days. In the group of patients where the titanium aquacomplex glycerosolvate was included in the traditional treatment, the period of cleansing of wounds from detritus and purulent exudate was 3.7 ± 0.9 days ($p \leq 0.05$); on $4,4 \pm 1,0$ days ($p \leq 0,05$) the edema of tissues disappeared, and the appearance of granulation tissue was registered already on the 4.7 ± 0.88 th day ($p \leq 0.05$).

According to the results obtained in the planimetric study using L.N. Popova's index, on the 5th day of treatment in the comparison group, the index was on the average of 2.69 ± 0.43 , in the main group this index was 3.51 ± 0.5 ($p = 0.034$). On the 10th day of the postoperative period, the rate of closure of the wound defect in patients of the main group was higher than in the patients of the comparison group, amounting to 3.42 ± 0.6 and 2.7 ± 0.53 ($p = 0.031$), respectively.

An important indicator characterizing the process of wound cleansing is the qualitative and quantitative composition of the microbial flora. When determining the number of microorganisms (m.o) in the preparations, we used the method of the conventional designation of crosses "+", proposed by D.M. Steigberg [6]. Absolute number of m.o was determined by counting microorganisms visible under the microscopical view, where "+" was a number of m.o isolated in certain places of the preparation; "++" a few m.o scattered in most places of the visible spectra; "+++" abundant microflora in the form of clusters and evenly covering the entire preparation [5].

Table 1: Microbial contamination of wounds

Day of research	+		++		+++	
	1 group	2 group	1 group	2 group	1 group	2 group
1st day	0	0	2 (11.8%)	1 (5.9%)	15 (88.2%)	16 (94.1%)
3rd day	1 (5.9%)	6 (35.3%)	6 (35.3%)	8 (47.1%)	10 (58.8%)	3 (17.6%)
5th day	2 (11.8%)	7 (41.2%)	9 (52.9%)	8 (47.1%)	6 (35.3%)	2 (11.8%)
7th day	9 (52,9%)	13 (76,5%)	5 (29.4%)	2 (11.8%)	3 (17.6%)	2 (11.8%)
9th day	9 (52,9%)	12 (92,3%)	6 (35.3%)	1 (8.7%)	2 (11.8%)	0
11th day	10 (58.8%)	6 (85,7%)	6 (35.3%)	1 (14.3%)	1 (5.9%)	0
13th day	6 (60%)	4 (100%)	3 (30%)	0	1 (10%)	0
15th day	5 (71,4%)	1 (100%)	2 (28,6%)	0	0	0
17th day	2 (50%)	0	2 (50%)	0	0	0

A more objective and modern method of determining the number of microorganisms in the preparation is the counting of microbial bodies in the view spectrum per 100 leukocytes using the "VideoTesT" program (ISTA-Video-Test, St. Petersburg).

Table 2: Quantity of microbial bodies per 100 leukocytes

	1st day	3rd day	5th day	7th day	9th day	11th day	13th day	15th day	17th day
1 group	3,7 x10 ³ ± 2,0 x10 ²	1,9 x10 ³ ± 2,0 x10 ²	4,3 x10 ² ± 2,0 x10 ¹	1,2 x10 ³ ± 1,8 x10 ²	2,3 x10 ² ± 2,0 x10 ¹	1,7 x10 ² ± 1,3 x10 ¹	1,3 x10 ² ± 1,2x10 ¹	1,0 x 10 ¹ ± 0,9 x10 ¹	0,9 x 10 ¹ ± 0,2 x10 ¹
2 group	3,8 x 10 ³ ± 1,6 x10 ²	1,6 x 10 ³ ± 1,3 x10 ²	2,06 x 10 ² ± 1,8 x10 ¹	2,3 x 10 ² ± 1,0 x10 ¹	1,5 x 10 ¹ ± 0,1 x10 ¹	0,7 x10 ¹ ± 0,1 x10 ¹	0,2 x 10 ¹ ± 0,1 x10 ¹	0,1 x 10 ¹ ± 0,1 x10 ¹	0,04 x 10 ¹ ± 0,1 x10 ¹

As observed from table 1 and 2, on the 1st day of the postoperative period, a maximum accumulation of microorganisms was recorded in all the preparations. On the third day, on the slides, single microorganisms were encountered in separate viewpoint spectrum. In the following days, there was a tendency of the increase of the absolute number of "pure" preparations. At the same time, the rate of cleansing of wounds from microorganisms in the main group was higher than in the comparison group. On the basis of traditional therapy, microflora in certain preparations was still registered up to the 17th day of treatment.

The number of neutrophils in the cytogram was also taken into account using the help of the conventional notation by crosses method, where "+" - 5-10 neutrophils in the viewpoint spectrum; "++" - individual small accumulations of neutrophils in some parts of the preparation; "+++" - a significant accumulation of neutrophils in certain parts of the preparation; "++++" - accumulations of neutrophil mass throughout the preparation.

Table 3: Dynamic change of neutrophils

	+		++		+++		++++	
	1 group	2 group	1 group	2 group	1 group	2 group	1 group	2 group
1st day	0	0	2 (11,8%)	1 (5,9%)	10 (58,8%)	11 (64,7%)	5 (29,4%)	5 (29,4%)
3rd day	0	0	1 (5,9%)	2 (11,8%)	9 (52,9%)	10 (58,8%)	7 (41,2%)	5 (29,4%)
5th day	0	4 (23,5%)	2 (11,8%)	7 (41,2%)	10 (58,8%)	6 (35,8%)	5 (29,4%)	0
7th day	1 (5,9%)	6 (35,8%)	4 (23,5%)	8 (47,1%)	8 (47,1%)	3 (17,7%)	4 (23,5%)	0
9th day	6 (35,8%)	9 (69,2%)	4 (23,5%)	3 (23,1%)	5 (29,4%)	1 (7,7%)	2 (11,8%)	0
11th day	2 (11,8%)	5 (71,4%)	8 (47,1%)	2 (28,6%)	5 (29,4%)	0	2 (11,8%)	0
13th day	1 (10%)	2 (66,7%)	4 (40%)	1 (33,3%)	4 (40%)	0	1 (10%)	0
15th day	2 (28,5%)	1 (100%)	3 (42,8%)	0	2 (28,5%)	0	0	0
17th day	3 (75%)	0	1 (25%)	0	0	0	0	0

As seen in Table. 3, in the presented cytograms of all study groups, the maximum number of neutrophils was observed on the 1st and 3rd days, which corresponded to the clinical picture of the investigated wounds.

The first group differences were registered on the 5th day from the beginning of treatment. On the basis of the use of titanium aquacomplex glycerosolvate clearly showed a tendency to cleanse the wounds, which was expressed in a decrease in the number of neutrophils in the cytograms. Most of the slides of the comparison group on the 5th day contained small accumulations of leukocytes; there were no cytograms in which neutrophils completely covered the view spectrum of the microscope.

The following day, the number of "clean" cytograms in this group increased, so on the 7th day, single neutrophils occurred in 35.9% of the second group's cytograms, and on the 9th day the percentage of "clean" reached 69.2%.

Patients who received traditional therapy had a less pronounced tendency to clear the wound. On the 5th day, in most preparations, significant accumulations of neutrophils were still recorded in some parts of the preparation, and also in cytograms were found accumulation of leukocyte masses throughout the preparation. On the 7th day, the number of neutrophils in the cytograms remained high, in 47.1% of the preparations there were significant accumulations of neutrophilic cells, and the number of "clean" cytograms was only 11.8%. By the 9th day, the number of preparations with single neutrophils slightly increased, however, in most preparations there was leukocyte accumulations.

As mentioned above, the cytological analysis of the wound process on the basis of the counting of microbial bodies and the degree of neutrophilia would be incomplete without taking into account hystiocytes, eosinophils, connective tissue cells (profibroblasts and fibroblasts), composed of the tissue structure and epithelial cells.

According to the results obtained, in the main group already on the 3rd day the signs of inflammation subsidence were noted, and on the 5th day we documented the beginning of the reparative processes, by the 7th day we could visually note the structural elements of the connective tissue. In the comparative group preparations, cytological signs of a subsiding inflammation, beginning stages of the regenerative processes were only recorded on the 7th day of treatment.

On the basis of the basic therapy, bacterial flora and unfinished phagocytosis were recorded up to 17th day. Under the influence of titanium aquacomplex glycerol solvate after 7 days from the beginning of treatment, there was a tendency in the increase of the elements of connective tissue with the formation of tissue structure.

On the basis of the data presented, all preparations were divided into six types of cytograms, according to D.M. Steinberg's method.

As shown in Table. 4 in the first day of the postoperative period, all the cytograms studied were similar and corresponded to a necrotic or inflammatory-degenerative type. However, already on the third day from the beginning of the treatment, in the group where the titanium aquacomplex of glycerosolvate was used, the samples corresponded to a type III cytogram; there was also an appearance of type IV cytograms. This tendency indicates the beginning of reparative processes in wounds, which corresponded to the clinical picture (wounds cleared of fibrin plaque, macroscopically recorded islets of bright granulatory tissue). On the 5th and 7th day, the differences in cytological patterns in the two groups became more apparent. On the 7th day in the main group, the number of preparations increased to types IV and V.

At the subsequent stages of observation, the number of cytograms of the regenerative type increased steadily in the main group, while in the comparison group, there were still cytograms of the inflammatory-regenerative and regenerative-inflammatory types at the later stages of the treatment.

Table 4: Distribution of cytograms by types (D. M. Steinburg's method)

Day	Group	Types of cytograms					
		I	II	III	IV	V	VI
1st day	1st	9 (52,9%)	8 (47,1%)				
	2nd	7 (41,2%)	10 (58,8%)				
3rd day	1st	6 (35,3%)	7 (41,2%)	4 (23,5%)			
	2nd	6 (35,3%)	2 (11,8%)	7 (41,2%)	2 (11,8%)		
5th day	1st	1 (5,9%)	12 (70,6%)	2 (11,8%)	2 (11,8%)		
	2nd		7 (41,2%)	5 (29,4%)	4 (23,5%)	1 (5,9%)	
7th day	1st		5 (29,4%)	8 (47,1%)	4 (23,5%)		
	2nd		1 (5,9%)	5 (29,4%)	6 (35,3%)	3 (17,6%)	2 (11,8%)
9th day	1st		3 (17,6%)	7 (41,2%)	6 (35,3%)	1 (5,9%)	
	2nd			1 (8,3%)	2 (16,7%)	6 (50%)	3 (25%)
11th day	1st			2 (11,8%)	8 (47,1%)	4 (23,5%)	3 (17,6%)
	2nd			1 (14,3%)	1 (14,3%)	2 (28,6%)	3 (42,9%)
13th day	1st				1 (9,1%)	2 (18,2%)	8 (72,7%)
	2nd				1 (33,3%)	1 (33,3%)	1 (33,3%)
15th day	1st				1 (12,5%)	3 (37,5%)	4 (50%)
	2nd					1 (100%)	
17th day	1st					1 (20%)	4 (80%)
	2nd						1 (100%)

CONCLUSIONS

1. Titanium aquacomplex of glycerosolvate has an anti-inflammatory effect and when applied to wound surfaces, stimulates regenerative processes.

2. The use of titanium aquacomplex of glycerosolvate in patients with destructive forms of erysipelas promotes a more benign course of the disease, allowing the symptoms of inflammation in the local focus to stop at an accelerated speed.

3. In comparison with traditional treatment, the application of titanium aquacomplex of glycerosolvate on the wound surfaces accelerates the healing time of purulent wounds in patients with erysipelas.

4. The prescription of the titanium aquacomplex of glycerosolvate to patients with destructive forms of erysipelas reduces the duration of the stay of patients in the hospital, significantly improving the quality of treatment of this category of patients.

REFERENCES

- [1] Gopatz G.V. Erysipelas: the current state of the problem / Gopatsa GV, Ermakova LA / Scientific almanac 2016. № 1-2 (15) C. 364-366.
- [2] Erovichenkov A.A. Current aspects of modern clinic, treatment and rehabilitation of patients with erysipelas / A.A. Erovichenkov. // Pharmateka. 2012. № 20. P. 62-67.
- [3] Teterin I.I. Experienced of treatment of phlegmonous-necrotic form of erysipelas / / I.I. Teterin, G.K. Zherdin // Bulletin VSNTS SO RAMS, 2005. №3 (41) - P. 143-147.
- [4] Kanorsky I. Treatment of phlegmonous-necrotic erysipelas / Kanorsky I., Lipatov K. // The Doctor, 2002. - P. 35-37.
- [5] Karman, A.D. Treatment of purulent wounds, erysipelas with the use of "miramistine hydrogel plates" / A.D. Karman // The medical journal. - 2007. - No. 1 (19). - P. 48-50.
- [6] Finchin KM Healing of wounds / KM Finchin - Kiev "Zdorovya", 1979. - 168 p.