



OPTIMIZATION OF METHODS OF COMPLEX SURGICAL TREATMENT OF PURULENT-NECROTIC COMPLICATIONS OF DIABETIC FOOT SYNDROME

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ABSTRACT

Using L-arginine in the comprehensive treatment of diabetic foot syndrome with lower limb ischemia significantly decreased disease progression and foot ischemia. Only 10.2% experienced these complications in patients receiving L-arginine compared to 30.7% in patients without this treatment.

Moreover, the mortality rate in patients treated with L-arginine was 4.54%, contrasting with 13.18% in the non-treated group. These findings highlight the promising role of L-arginine in improving clinical outcomes for patients with diabetic foot syndrome.

Incorporating L-arginine in the treatment regimen offers a potential avenue for managing diabetic foot syndrome complications, providing patients with better quality of life and reducing disease progression. Its positive impact warrants further investigation and dissemination to benefit patients globally.

KEYWORDS: purulent-necrotic process, diabetic foot syndrome, lower limb ischemia.

DOI: 10.48047/ecb/2023.12.8.675

INTRODUCTION

Despite the success in treating patients with lower limb ischemia (LLI), his problem remains relevant (3,16). In patients suffering from diabetes mellitus (DM), LLI occurs about five times more often, and diabetic foot syndrome develops in more than 10% of patients. Purulent-necrotic complications of diabetic foot syndrome (SDS) accompanied by LLI [4,15] are particularly severe. According to researchers, patients with diabetes mellitus develop LLI 40 times more often than those without DM [10,11,26,28,30,32,34,36,38].

Purulent-necrotic process on the background of diabetes mellitus, accompanied by lower limb ischemia (LLI), lead to an unfavorable outcome of both the course of the wound process and the disease itself [9,12,13,14,17].

Endothelial dysfunction is a key link in the pathogenesis of lower limb ischemia (LLI). The problem of endothelial dysfunction is currently attracting many researchers, since it is one of the predictors of morphological changes in the vascular wall in atherosclerosis, hypertension, diabetes mellitus, lower limb ischemia (LLI) (9). Endothelial dysfunction in this case, as a rule, is systemic and is found not only in large vessels, but also in the microcirculatory bed [8,27,29,31].

Despite numerous attempts at complex treatment of this category of patients, improvements in surgical treatment methods, the outcome of the disease in most cases is unfavorable, that is, patients lose a limb [16,23,33,35], in which postoperative purulent-necrotic complications and mortality are high, and the surviving patients are considered a success of surgeons [5,8,15,20,21,22,24,25]. With

the development of science and technology, combined methods of treatment with the use of antihypoxic drugs (L-arginine) began to be used in the treatment of purulent-inflammatory diseases (PID) in the pathogenesis of which lies local tissue hypoxia against the background of ischemia. As is known, L-arginine has antihypoxic, cytoprotective, antioxidant, detoxification, membrane stabilizing properties.

Researchers have proved that L-arginine plays an important role in the processes of neutralizing ammonia and stimulating its excretion from the body. As a donor of nitric oxide, L-arginine participates in the processes of energy supply of the body, reduces the activation and adhesion of leukocytes and platelets to the vascular endothelium, preventing the formation and development of atherosclerotic plaques, is involved in the processes of fibrinogenesis. The drug has a moderate anabolic effect, stimulates the activity of the thymus gland, promotes the synthesis of insulin and regulates blood glucose during exercise, contributes to the correction of acid-base balance. It is used in the complex therapy of lower limb ischemia, peripheral vascular atherosclerosis, diabetic angiopathy [1,5,37,39].

The available literature data on the positive results of the use of L-arginine in lower limb ischemia with pronounced signs of endothelial vascular dysfunction of the lower extremities with purulent-necrotic complications of diabetic foot syndrome do not fully reflect all the points associated with the study of the course of the wound process. At the same time, there are no clear recommendations for the most optimal scheme of complex treatment of patients with this pathology accompanied by endothelial dysfunction. The solution of the above tasks would have an active impact on treating this contingent of patients.

The aim of the study: To develop an optimal method of using L-arginine in the treatment of purulent-necrotic complications of diabetic foot syndrome with endothelial vascular dysfunction accompanied by lower limb ischemia.

MATERIAL AND METHODS:

The work is based on data based on the study of the results of surgical treatment of 272 patients with purulent-necrotic lesions of the lower extremities on the background of diabetes mellitus with pronounced signs of vascular endothelial dysfunction, which was accompanied by limb ischemia treated in the department of purulent surgery of the Bukhara Multidisciplinary Medical Center for the period from 2017 to 2022. We used the method of stratified randomization of patients. In accordance with the objectives of the study, all patients are conditionally divided into 3 groups: (I – control and II a, II b-main). Among the patients, there was a predominance of men (69.5%). Most of the patients were aged from 38 to 83 years. The first control group consisted of 91 (33.4%) patients with purulent-necrotic lesions of the lower extremities, who underwent a complex of therapeutic measures, including surgical placement, antibacterial therapy, infusion, detoxification therapy, drugs that improve microcirculation - angioprotectors, correction of the level of glycemia and symptomatic treatment of concomitant diseases. Local treatment was carried out in the traditional way (ointments on a water-soluble polyethylene glycol (PEG) base - oflomelid). Group II included 93 (34.2%) patients who, in addition to traditional measures (antibacterial, therapy, anticoagulants, local treatment (ointments based on water-soluble PEG - oflomelid), had intravenous infusions of L-arginine once a day to improve microcirculation, reduce endothelial dysfunction of the vessels of the lower extremities, given that this drug it has antihypoxic and antioxidant properties.

Group II b included 88 (32.4%) patients who, in addition to traditional measures (antibacterial, therapy, anticoagulants, local treatment (ointments based on water-soluble PEG - oflomelid), underwent femoral artery catheterization for long intraarterial infusions of L-arginine for 24-48 hours using a dispenser “aitecs® 2016”.

In the examined 272 patients, the revealed foot changes were represented by the following forms: focal tissue necrosis – 35; purulent-necrotic ulcers of the toes – 39; purulent-necrotic phlegmon of the foot – 51; gangrene of the toes (dry and wet) – 46; gangrene of the distal parts of the foot (dry and wet) – 73;. Useful putrefactive phlegmons of the foot, supraorbital space and lower leg-28.

If possible, the surgical stage was performed against the background of a complete examination of the patient in combination with adequate conservative treatment and unloading of the affected limb. At the heart of surgical treatment, we adhered to the principle of maximum preservation of tissues and functions of the foot. During surgical treatment of a purulent-necrotic focus, wide access to the purulent-necrotic focus was provided, its adequate drainage was performed, necrotic tissues supporting infection were removed, combined with the use of water-soluble ointment dressings on a multicomponent water-soluble polyethylene glycol (PEG) base.

With deep phlegmon of the suprapubic space, we performed excision of all connective tissue structures, fascia, thickened peremysium, infected tendons, up to the Achilles tendon. Atypical, guillotine amputations of the foot and lower leg were also performed within healthy tissues.

The examination of patients included general clinical methods, laboratory methods, instrumental methods for examining the arterial bed of the lower extremities (Dopplerography, angiography), as well as assessment of endothelial dysfunction by examining immunological parameters – endothelin 1 (ET-1), NO-nitric oxide, VEGF A (Vascular endothelial growth factor), TGF β (ransforming growth factor beta - Transforming growth factor beta). All examined patients underwent bacteriological examination of wound exudate.

The dynamics of general and local manifestations of the wound process were assessed according to subjective criteria (the nature of the wound discharge, infiltration resorption, features of granulation tissue development and epithelialization) and objective indicators (body temperature, general clinical blood test, leukocyte intoxication index, the level of procalcitonin (PCT) and C-reactive protein - CRP).

RESULTS AND DISCUSSION

91 patients included in the I control group, after the implementation of the basic principles of surgical treatment and antibiotic therapy, taking into account the sensitivity of flora, local application of dressings with a water-soluble ointment based on polyethylene glycol (PEG) (oflomelid) was carried out.

The general condition of patients in most cases at admission was of moderate severity or severe. All of them complained of general weakness, malaise, pain in the pathological process of the lower extremities, an increase in body temperature to 37.8 ° – 40.2 ° C, dry mouth, sleep disturbance and lack of appetite. Of the local symptoms, moderate or pronounced hyperemia of the skin around the pathological process on the foot and swelling of tissues were noted. Painful infiltration was determined by palpation, the foot was hypothermic to the touch in all cases without exception, pulsation on the arteries of the foot was sharply weakened or not determined at all. Most of the patients were admitted to us within 3 to 21 days after the onset of the disease and the first phase of the wound course.

Analysis of the study of the species composition of the microflora of the wound contents in patients of the study group showed that in most cases, representatives of the aerobic microflora in the wound exudate were staphylococci, E. coli and proteus, and among the seeded anaerobes, Pr.melaninogenica and Bacteroidesspp were more common. At the same time, the initial level of microbial contamination of wounds in group I patients showed that it averaged 10¹⁰⁻¹¹mt/g. After surgical treatment of the wound with the application of an ointment dressing, microbial contamination was 10⁶mt/g, on the next day it increased to 10⁷⁻⁸ mt/g, 6-7 days of complex treatment in these patients, the degree of microbial contamination began to decrease significantly and averaged 10⁵⁻⁶mt/g, and only by 10-12 days of treatment it became below the critical level and amounted to 10³ microbial bodies per 1g of tissue.

The study of the indicators of intoxication of the body showed that on the first day of treatment, the body temperature in patients was on average 38,6 \pm 1,1°C. The content of leukocytes in the blood at the same time averaged 13,6 \pm 2,5x10⁹ /l.

There was an increase in the indicators of leukocyte intoxication index (LII) and erythrocyte sedimentation rate (ESR) to $4,7 \pm 1,30$ and $40,2 \pm 1,6$ respectively, the indicators of PCT and CRP were $1,2 \pm 0,2$ ng/ml and $16,5 \pm 2,1$ mg/l, respectively. On the third day of treatment, there was a slight decrease in body temperature (from $38,6 \pm 1,1^\circ\text{C}$ to $37,9 \pm 0,5^\circ\text{C}$), the content of leukocytes in the blood decreased to an average of $11,0 \pm 0,5 \cdot 10^9/l$. Changes in LII indicators on the third day of treatment tended to decrease from $4,7 \pm 1,30$ to $3,4 \pm 0,18$ units, while ESR decreased on average to $34,7 \pm 2,2$ mm/h. The indicators of PCT and CRP in these days were $0,8 \pm 0,1$ ng/ml and $12,1 \pm 1,4$ mg/l, respectively. By the 7-9 days of treatment, the examined patients of the control group had a slight subfebrility ($37,0 \pm 0,4^\circ\text{C}$). At the same time, there was a further decrease in the indicators of intoxication of the body: L, LII, ESR, PCT and CRP in the blood, that is, there was a tendency to normalization. So by 12-14 days of treatment, all analyzed indicators of intoxication, except ESR, were normalized.

The results of studies of the dynamics of endothelin 1, NO and growth factors VEGF-A and TGF- β in blood serum showed that in patients of the control group on the day of admission, the initial level of endothelin 1 and NO was equal to $9,22 \pm 0,64$ pg/ml and $16,32 \pm 1,12$ mmol/L, VEGF-A was equal to $1042,25 \pm 5$ pg/ml, TGF- β $187,74 \pm 2,5$ pg/ml. Against the background of conventional therapy, by day 3, endothelin 1 was equal to $7,82 \pm 0,57$ pg/ml, NO $18,64 \pm 1,44$ mmol/l, and VEGF-A indicators were equal to $1154,27 \pm 5$ pg/ml, TGF- β $192,78 \pm 2,5$ pg/ml, by day 7-9 they (endothelin 1, NO, VEGF-A and TGF- β) were $6,94 \pm 0,44$ pg/ml, $20,62 \pm 1,24$ mmol/l, $1019,5 \pm 5$ pg/ml and $192,78 \pm 2,5$ pg/ml, respectively. Even by 12-14 days of treatment, the indicators of a endothelin 1, NO, VEGF-A and TGF- β were still above normal values and amounted to $5,62 \pm 0,25$ pg/ml and $21,48 \pm 1,31$ mmol/l, $609,5 \pm 5$ pg/ml and $172,54 \pm 2,5$ pg/ml, respectively (Table 1).

Table 1.

Dynamics of indicators of endothelin 1, NO, VEGF-A and TGF- β in blood serum in the examined patients of the control (I) group

Indicators	Day from the beginning of treatment			
	1 (day of admission)	3rd	7-9th	12-14th
ET-1, pg/ml	$8,22 \pm 0,64$	$7,82 \pm 0,57$	$6,94 \pm 0,44$	$5,62 \pm 0,25$
NO, mmol/l	$16,32 \pm 1,12$	$18,64 \pm 1,44$	$20,62 \pm 1,24$	$21,48 \pm 1,31$
VEGF-A, pg/ml	$1042,25 \pm 5$	$1154,27 \pm 5$	$1019,5 \pm 5$	$609,5 \pm 5$
TGF- β , pg/ml	$192,78 \pm 2,5$	$192,78 \pm 2,5$	$192,78 \pm 2,5$	$172,54 \pm 2,5$

Note where * $P < 0,05$ is a confidence indicator in relation to the previous days of treatment.

At the same time, in patients of the control group, wound cleansing from infection occurred on average by 12.0-1.5 days. By the 7th-9th day, the infiltrate resorption around the wound was noted. The beginning of the appearance of granulations was noted by 12-14 days, and the beginning of epithelization only by 17-19 days of treatment. At the same time, the duration of inpatient treatment was $21,5 \pm 2,5$ bed days.

Against the background of the complex of measures carried out in 28 (30.7%) patients of the control group, the progression of the pathological process and signs of INC was noted, in which, according to vital indications, 19 (20.8%) patients underwent amputation of the lower limb at the level of the upper third of the lower leg, and 10 (11%) cases due to involvement in the pathological process lower legs and arterial occlusion in the femoral and iliac segments, were forced to resort to high amputations at the level of the middle and upper thirds of the thigh. In 7 (7.69%) patients who underwent minor surgical interventions at the foot level, there was a progression of concomitant diseases that could not be corrected, and therefore there were: acute violation of cardiovascular activity in 3 patients, systemic inflammatory reaction syndrome with the development of septic shock

in 2 patients and renal failure on the background of diabetic nephropathy in 2 patients with fatal outcome. Postoperative mortality in patients of the control group who underwent high amputations at the hip and lower leg level was observed in 5 (5.5%) patients. The analysis of the structure of postoperative mortality showed that against the background of the anesthetic aid, 2 patients had uncontrolled hypotension with profound violations of vital functions of the body, 2 patients had pulmonary embolism and 1 patient had progression of signs of multiple organ failure with a fatal outcome. The total mortality in this group was 12 (13.18%) cases.

As noted above, the II main group was divided into 2 subgroups (IIa and IIb). Group II a consisted of 93 patients who, in addition to traditional measures, received intravenous infusions of L-arginine once a day, and group II b consisted of 88 patients who underwent catheterization of the femoral artery for prolonged intra-arterial infusions of L-arginine. In patients of the main group, surgical interventions comparable in volume and nature were performed as in patients of the control group. A mandatory procedure in the course of treatment, in addition to standard examinations, was the study of ET-1, NO, VEGF-A and TGF- β in blood serum to determine endothelial dysfunction.

The study of microbial contamination of wound tissues in wound exudate in patients of the main group showed that the initial level of microbial contamination of wounds as in patients of the control group was 10^{9-10} mt/g. After surgical treatment of the wound and the beginning of intravenous infusion of L arginine, there was a relatively decrease in microbial contamination of wounds than in the control group. In group IIb, in which intraarterial perfusions of L arginine were performed, there was a significant decrease in microbial contamination of wounds and by the 3rd day of treatment it averaged 10^{5-6} mt/g, and by 7-9 days of treatment, microbial contamination in the wound on average decreased to 10^3 microbial bodies per 1g of tissue and lower.

The analysis of the degree of endotoxemia in patients with IIA and IIB group showed that by the third day of treatment was a decrease in body temperature (in IIA from $38,8 \pm 1,1^\circ\text{C}$ to $38,1 \pm 0,7^\circ\text{C}$, IIB from $39,2 \pm 1,1^\circ\text{C}$ to $37,4 \pm 0,3^\circ\text{C}$), the content of leukocytes in the blood decreased on average in IIA group to $12,5 \pm 1,0 \cdot 10^9/l$, and IIB $8,7 \pm 1,0 \cdot 10^9/l$. Change indicators LEAH on the third day was in IIA from $4,8 \pm 1,30$ to $4,4 \pm 0,22$ un., IIB $4,4 \pm 0,22$ to $3,2 \pm 0,24$ un while erythrocyte sedimentation rate declined on average in both groups to $31,5 \pm 1,8$ mm/h and $22,2 \pm 1,5$ mm/h, respectively. And indicators PCT and CRP decreased in group IIA of $1,25 \pm 0,24$ ng/ml to $1,02 \pm 0,2$ ng/ml and from $15,9 \pm 2,1$ mg/l to $13,2 \pm 1,1$ mg/l, IIB group of $1,26 \pm 0,23$ ng/ml to $0,52 \pm 0,2$ ng/ml and $15,4 \pm 2,2$ mg/l to $9,4 \pm 1,1$ mg/l, respectively. By 7-9 days of treatment, the examined patients of group IIa had higher than normal indicators of intoxication of the body: T-body, L, LII, ESR, PCT and CRP of blood, in group IIb there was an earlier tendency to normalization than in patients of group I and IIa.

The results of studies of the dynamics of ET-1, NO and growth factors VEGF-A and TGF- β in blood serum showed that in patients of group IIa on the day of admission, the initial level of ET-1 was equal to $8,94 \pm 0,44$ pg/ml, NO $16,32 \pm 1,12$ mmol/L, VEGF-A was equal to $1054,27 \pm 5$ pg/ml, TGF- β $190,56 \pm 2,5$ pg/ml. After the start of intravenous infusion of L-arginine, there was a slight improvement in ET-1, NO, VEGF-A and TGF- β compared to the control group. Against the background of complex treatment with intravenous L-arginine by 3 days, ET-1 was equal to $7,82 \pm 0,38$ pg/ml, NO $18,64 \pm 1,44$ mmol/l, VEGF-A $922,20 \pm 5$ pg/ml, TGF- β $165,44 \pm 2,5$ pg/ml, by 7-9 days they were $5,80 \pm 0,42$ pg/ml, $21,66 \pm 1,22$ mmol/l, $504,5 \pm 5$ pg/ml and $130,57 \pm 2,5$ pg/ml, respectively. And by 12-14 days of treatment, the indicators of these markers were almost within the normal range (Table 2).

Table 2.

Dynamics of indicators of endothelin 1, NO, VEGF-A and TGF- β in blood serum in the examined patients of group IIa

Indicators	Days			
	Arrival Day	3	7-9	12-14
ET-1, pg/ml	$8,94 \pm 0,44$	$7,82 \pm 0,38$	$5,80 \pm 0,42$	$4,24 \pm 0,25$
NO, mmol/l	$16,32 \pm 1,12$	$18,64 \pm 1,44$	$21,66 \pm 1,22$	$25,84 \pm 1,33$

VEGF-A, pg/ml	1054,27 ± 5	922,20±5	504,5±5	340,45±5
TGF-β, pg/ml	190,56 ± 2,5	165,44±2,5	130,57 ± 2,5	118,78± 2,5

Note where * P<0.05 is a confidence indicator in relation to the previous days of treatment.

And the results of studies of the IIb group of patients who had an intraarterial catheter installed for long-term perfusion of L-arginine showed a rapid improvement in the indicators of ET-1, NO, VEGF-A and TGF-β. Against the background of complex treatment with intra-arterial perfusion of L-arginine by 3 days ET-1, NO was equal to 7.04+0.36 pg/ml, 19.62+1.44 mmol/L, and VEGF-A was equal to 842.24±5pg/ml, TGF-β 160.44±2.5pg/ml, by 7-9 days they were 4.87+0.48pg/ml, 24.88+1.28 mmol/l, 524.5±5pg/ml and 124.72±2.5pg/ml, respectively. And by 12-14 days of treatment, the indicators of ET-1, NO, VEGF-A and TGF-β were normal (Table 3).

Table 3.

Dynamics of indicators of endothelin 1, NO, VEGF-A and TGF-β in blood serum in the examined patients of group IIb

Indicators	Days			
	Arrival Day	3	7-9	12-14
ET-1, pg/ml	9,24+0,35	7,04+0,36	4,87+0,48	3,22+0,22
NO, mmol/l	16,33+1,10	19,62+1,44	24,88+1,28	27,94+1,66
VEGF-A, pg/ml	1066,27±5	842,24±5	524,5±5	240,45±5
TGF-β, pg/ml	194,23±2,5	160,44±2,5	124,72±2,5	98,78±2,5

Note where * P<0.05 is a confidence indicator in relation to the previous days of treatment.

In patients of the analyzed groups (IIa and IIb), wound cleansing from infection occurred on average by 9.0±1.0 and 5.0±1.0 days, respectively, in parallel with this, infiltration resorption around the wound was noted. The beginning of the appearance of granulations was noted in the III group by the 10th-11th day, and in the Ib group by the 7th-8th day. The onset of epithelialization in group Ia is 14-15, in group III 10-11 days of treatment. At the same time, the duration of inpatient treatment was 16.5±1.5 and 11.5±1.5 bed days, respectively.

Against the background of the complex of measures carried out due to the depth of purulent-necrotic limb lesion in 16 (17.2%) patients of group IIa, there was a progression of the pathological process and signs of INC, in which, according to vital indications, 9 (9.67%) patients underwent amputation of the lower limb at the level of the upper third of the lower leg, and 7 (7.53% in some cases, they were forced to resort to high amputations at the level of the middle and upper thirds of the thigh. In 5 (5.37%) patients who underwent minor surgical interventions at the foot level, there was a progression of multiple organ failure that ended with a fatal outcome. Postoperative mortality in patients of group II a who underwent high amputations at the hip and lower leg level was 4 (4.3%), the cause of which in one case was pulmonary embolism, and in the other acute cardiovascular insufficiency. The total mortality in this group was 9 (9.67%) cases.

Due to the depth of purulent-necrotic limb lesion in group IIb, 9 (10.2%) patients showed progression of the pathological process and signs of INC, in which, according to vital indications, 5 (5.68%) patients underwent amputation of the lower limb at the level of the upper third of the lower leg, and 4 (4.54%) cases were forced to will perform a high amputation at the level of the middle and upper thirds of the thigh. In 2 (2.27%) patients who underwent minor surgical interventions at the foot level, there was a progression of multiple organ failure that ended with a fatal outcome. Postoperative mortality in patients of group II b who underwent high amputations at the hip and lower leg level was 2 (2.27%), the cause of which in both cases was pulmonary embolism. The total mortality in this group was 4 (4.54%) cases.

A comparative analysis of the complex treatment of patients of the control, IIa and IIb groups showed that if microbial contamination of wounds persisted in patients of the control and IIa groups for a fairly long period of time and only by the 10th and 9th days of treatment, respectively, this indicator fell below the critical level, while in patients receiving intra-arterial infusions in the complex of treatment L-arginine by 7-9 days of treatment, microbial contamination in the wound on average decreased to 10^3 microbial bodies per 1 g of tissue and below. In patients of the control group, even by 12-14 days of treatment, significant normalization of ET-1, NO (nitric oxide), VEGF-A and TGF- β was not observed (5.62 ± 0.25 pg/ml and 21.48 ± 1.31 mmol/l, 609.5 ± 5 pg/ml and 172.54 ± 2.5 pg/ml, respectively), while in patients of the main IIb group, the normalization of indicators is higher than the specified factors.

The use of intra-arterial infusions of L-arginine in the complex treatment of patients with purulent-necrotic lesions of the lower extremities against the background of diabetes mellitus and INC contributed to the complete cleansing of the wound from infection already on the 4th-5th day of treatment. By this time, active resorption of the infiltrate around the wound was observed, granulations began to appear by the 7th-8th day of treatment, and epithelization began by the 10th-11th day. Studies have revealed a significant advance of these indicators in group IIb by 4-5 days, compared with groups I and IIa. At the same time, the average duration of treatment decreased from 21.5 ± 2.5 to 11.5 ± 1.5 bed days. The use of intra-arterial infusions of L-arginine in the complex treatment of patients of the main group IIb led to a sharp decrease in the number of cases of progression of the pathological process and ischemia, which was observed only in 9 (10.2%) patients, while in the control group I and group IIa they were an order of magnitude higher and amounted to 28 (30.7%), 16 (17.2%), respectively, in which a high amputation of the lower limb was performed at the level of the upper third of the lower leg and thigh. Despite the complex of therapeutic measures, mortality in patients of the control group was 13.18%, in group IIa 9 (9.67%), while in patients of the main group there was a sharp decrease in the number of deaths, which amounted to 4 (4.54%) of the total number of treated patients.

The obtained data allow us to propose the optimal method of using L-arginine in the treatment of ischemia in patients with diabetic foot syndrome. The proposed method of complex treatment with the use of prolonged intra-arterial infusions of L-arginine makes it possible to eliminate signs of lower limb ischemia in a short time, reduces the progression of the pathological process on the foot, reduces the performance of forced amputations and deaths from this pathology. All of the above points to an improvement in the results of treatment with an increase in the quality of life, as well as the return to normal work of these patients.

CONCLUSIONS

1. With traditional methods of treating diabetic foot syndrome with ischemia of the lower extremities, cleansing the wound from infection, the healing processes and restoration of normal indicators of ET-1, NO (nitric oxide), VEGF-A and TGF- β are not fast enough. The duration of inpatient treatment is 21.5 ± 2.5 bed days.
2. Complex treatment should include targeted measures that correct pronounced endothelial dysfunction of the vessels of the lower extremities accompanied by hypoxia and ischemia of the affected lower limb.
3. The use of long-term intra-arterial therapy with L-arginine perfusion for 24-48 hours in the complex treatment of diabetic foot syndrome with limb ischemia contributes to the resolution of endothelial vascular dysfunction with improvement of reparative processes in the tissues of the affected lower extremities
4. Perfusion of L-arginine accelerates the time of wound healing from infection by 4-5 days, reduces the progression of purulent-necrotic processes of the lower extremities, which in turn leads to a decrease in the number of forced high amputations from 11% to 4.54% and mortality from 13.18% to 4.54% of cases.
5. Indications for the use of L-arginine are the presence of pronounced signs of lower limb ischemia,

while reliable criteria for assessing the severity of vascular endothelial dysfunction are ET-1, NO (nitric oxide), VEGF-A and TGF- β .

6. The proposed method of using L-arginine in the treatment of diabetic foot syndrome has a high social significance, which consists in improving the results of treatment, improving the quality of life and early recovery of this category of patients.

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