

COMPARATIVE ANALYSIS OF AMPUTATION OF LOWER LIMBS IN CRITICAL ISCHEMIA IN PATIENTS WITH DIABETES MELLITUS (DM)

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RESUME

A retrospective analysis was made of the case histories of 58 patients with diabetes who underwent abdominal amputation in the surgical department on the basis of the "General Surgery" department of the Bukhara State Medical Institute during 2014-2017. Depending on the surgical tactic, all patients are divided into 2 groups: in the first (n = 31) performed a high amputation, in the 2 nd group (n = 27) amputation at the level of the shank by Mitisha. An analysis of the results showed that amputation at the tibia at Mitish is a more effective method, while the mortality rate is reduced to 5%, the disability is up to 44%.

Keywords: critical ischemia, diabetes mellitus, diabetic foot syndrome, methods of amputation of an extremity.

АНАЛИЗ РЕЗУЛЬТАТОВ ЛЕЧЕНИЯ АМПУТАЦИЙ НА УРОВНЕ ГОЛЕНИ ПРИ КРИТИЧЕСКИХ ИШЕМИЯХ У БОЛЬНЫХ С САХАРНЫМ ДИАБЕТОМ(СД)

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РЕЗЮМЕ

Проведен ретроспективный анализ историй болезни 78 больных СД перенесших ампутацию голени в хирургическом отделении на базе кафедры «общей хирургии», Бухарского Государственного медицинского института на протяжении 2014-2017гг. В зависимости от хирургической тактики все больные разделены на 2 группы: в 1-ой (n=31) выполнили ампутацию голени по Митиш, во 2-й группе(n=47) по методу клиники. Анализ полученных результатов выявил, что модифицированный способ ампутации голени и применение с целью профилактики гнойных осложнений в этапах удаления камбаловидной мышцы и после, поэтапная санация камбаловидной мышцы и окружающей ткани является более эффективным способом. При этом снижается летальность до 5 % процент, инвалидность до 44 %.

Ключевые слова: критическая ишемия, сахарный диабет, синдром диабетической стопы, ампутация конечности.

QANDLI DIABET (DM) BILAN OG'RIGAN BEMORLAR OYOQLARI KRITIK ISHEMIYASIDA BOLDIR AMPUTATSIYASINI QIYOSIY TAHLILI

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REZYUME

2014-2017-yillarda Buxoro davlat tibbiyot institutining "Umumiy jarrohlik" kafedrasida jarrohlik bo'limida 58 nafar qandli diabet bilan og'rigan bemorlarning boldir amputatsiya qilingan bemorning kasallik tarixi retrospektiv tahlil qilindi. Jarrohlik taktikasiga qarab, barcha bemorlar 2 guruhga bo'linadi: birinchisida (n = 31) Mitish bo'yicha boldir amputatsiya, 2-guruhda (n = 27) takomillashtirilgan usulda amputatsiya qilingan. Natijalarning tahlili shuni ko'rsatdiki, Mitishni takomillashtirilgan amputatsiya usuli yanada samarali usul bo'lib, o'lim darajasi 5% gacha, nogironlik esa 44% gacha kamayadi.

Kalit so'zlar: kritik ishemiya, diabetes mellitus, diabetik oyoq sindromi, ekstremita amputatsiyasi usullari.

RELEVANCE

The second half of the 20th and the beginning of the 21st century are characterized by a high increase in the number of cardiovascular diseases. Peripheral arterial disease is a common manifestation of systemic atherosclerosis associated with a high risk of cardiovascular complications and deaths and leading to a significant limitation of the physical activity of patients and a decrease in their quality of life [Moler E.R., 2010]. Diabetes mellitus (DM) is a risk factor for the development of peripheral arterial disease (PAD). Patients with DM are at a higher risk of developing peripheral arterial disease than the general population. According to epidemiological studies, the prevalence of PAD in the group of patients with diabetes reaches from 8 to 40%. The progression of diseases of stenosing lesions of the arteries of the lower extremities leads to the development of critical ischemia and is associated with a high risk of amputation and mortality [1].

The prevalence of CILL is 500-1000 cases per 1 million population per year (about 150 thousand cases per year) [3]. The risk of developing CILL in patients with DM is 10-20 times higher than in patients without diabetes [2]. Peripheral arterial disease among DM patients with PAD is characterized by earlier onset, more aggressive course, and multisegmental nature of the lesion of the vascular bed, affecting mainly the distal arteries of medium caliber (shin arteries), the presence of mediocalcinosis. Also, 70% of PADs are asymptomatic due to the presence of diabetic polyneuropathy [4].

Timely and comprehensive diagnosis of lesions of the arteries of the lower extremities, taking into account the peculiarities of the course of CILL in patients with DM, is a decisive factor in preventing amputation and mortality in this category of patients. Morphological features of lesions of the arteries of the lower extremities in patients with DM complicate the diagnosis and treatment CILL.

Unfortunately, the frequency of amputations in critical ischemia of the lower extremities does not tend to decrease and is performed in 25% patients with obliterating vascular diseases

[Zoloev G.K., 2004, Stone R.A. et al., 2001, Wrobel J.S. et al., 2003]. The need for high amputation reaches the level of 52-95% within 3 years from the onset of CILL [Biamino G. et al., 2004] and is accompanied by a total mortality of 10-40% to 71% [Ouriel K., 2001] within the next 2–3 years. According to a number of authors, mortality in the perioperative period after amputations ranges from 15 to 43.7%, and in some age categories exceeds 50% [Barbarash JI.C. et al., 2010, TASC II, 2007]. A high percentage of mortality is primarily due to purulent-necrotic and cardiovascular complications that occur after amputations [Burleva E.P., 2002, Ray R.L., 2000]. Thus, the number of postoperative purulent-necrotic complications from the amputation stump of a limb reaches alarming proportions - 20–65% [Abyshov N.S., 2005, Aulivola B. et al., 2004, Hasanadka R. et al., 2011]. Even a high amputation at the level of the upper third or middle third of the thigh is accompanied by an extremely high level of purulent-necrotic complications, which, in turn, significantly increase postoperative mortality, the duration of inpatient and subsequent outpatient treatment, and the associated material costs [Aragón-Sánchez J. et al., 2010, Hasanadka R. et al., 2011].

Currently, there is no single effective system for predicting the clinical course of the postoperative period in patients who have undergone lower limb amputations [Gaibov A.D., 2009, Kalmykov E.L., 2011, Tkachenko A.N., 2011].

All the above data indicate the unresolved nature of this problem and the expediency of further development of new tactical approaches to the treatment of this category of patients in order to reduce the incidence of disability and mortality.

The aim of the study was to improve the results of surgical treatment of patients with critical lower limb ischemia in DM by using an improved method of lower leg amputation and timely elimination of the source of infection of secondary wound healing.

MATERIALS AND METHODS

78 patients with critical ischemia of the lower extremities with diabetes mellitus were examined in the surgical department at the department of "general surgery", Bukhara State Medical Institute during 2014-2017. Taking into account the performed method of operation, all examined patients were conditionally divided into 2 groups. In the first group, 31 (39.7%) patients with DFS underwent surgery at the level of the lower leg using the Mitish method. The second group consisted of 47 (60.3%) patients with DFS who underwent surgery at the level of the lower leg according to the clinical method.

Of the 31 (39.7%) patients in the first group, there were 19 (24.4%) men and 12 (15.3%) women. Of the 47 (60.3%) patients in the second group, there were 28 (35.9%) men and 19 (24.4%) women.

By sex, age, duration of DM and SDS of the first and second groups of patients were synchronous. (Table 1)

Table 1. Groups of patients depending on the types of surgical treatment

Index	From the total (n=78)	First group (n=31)	Second group (n=47)
% Men	60,3	61,3	59,6
% Women	39,7	38,7	40,4
Average age	50±9,0	54,0±5,0	46,0±9,0
Duration of diabetes mellitus (year)	9,1±1.2	9,4±0,9	8,8±1.1
Duration of diabetic foot syndrome (year)	2,3±0 8	2,5±09	2,4±0,8

For the homogeneity of the groups in the study, patients were selected for whom it was impossible to carry out reconstructive surgical interventions on the arteries of the lower extremities (due to the peculiarities of the distribution of the occlusive-stenotic process, as well as the depth of the lesion of the purulent-necrotic process). The degree of damage to the lower limb was determined according to the classification of Wagner (1979). It should be noted that all patients were admitted to the clinic with IV-V degree of limb damage. Anatomical localizations of purulent-necrotic lesions of the extremities examined are given in Table. 2.

Table 2. Local changes on the feet.

Local changes	Number of patients	%
Gangrene of one or more fingers	37	47,4
Gangrene of the distal foot	19	24,4
Gangrene of the lower third of the leg	22	28,2
Total	78	100

In the first group of patients, according to the indication, the lower leg was amputated according to the Mitish method. This method of myoplastic amputation of the lower leg was developed at the Institute of Surgery. A.V. Vishnevsky RAMS for patients with chronic critical ischemia of the lower extremities in 1997. The essence of this method lies in the fact that during the amputation of the lower leg, the soleus muscle is completely removed, and if necessary, the muscles of the anterior and outer groups are also removed and the stump of the lower leg is formed due to the gastrocnemius musculoskeletal flap.

In the second group of patients, amputation of the lower leg according to the clinic method. The essence of the modified method is as follows. After dissection of the distal leg of the posterior soft tissue complex (with intersection of the gastrocnemius tendon) and formation of the posterior calf musculoskeletal flap, transperiosteal osteotomy of the fibula and tibia is performed. then the upper part of the soleus muscle is isolated and cut off from the proximal points of attachment, due to which the neurovascular bundle in the upper third of the leg is widely exposed, which in turn allows the most atraumatic treatment of the neurovascular bundle on the necessary level.

The examination used generally accepted clinical, laboratory and instrumental methods. When patients were admitted, much attention was paid to the collection of anamnesis. Information about the pain syndrome, the duration of the existence of intermittent claudication, the nature

and localization of pain when walking, the distance of pain-free walking, pain at rest, their intensity, increase or decrease in pain in a horizontal position and when lowering the leg from the bed were clarified. When examining the patient, the color of the skin and the presence of visible trophic disorders were visually assessed: thinning of the skin, tuberosity and porosity of the nail plates, the presence of trophic ulcers or necrosis. Objective examination included: palpation determination of the pulsation of the arteries of the lower extremities at typical points, auscultation of the aorta of the iliac and femoral arteries. All patients underwent ultrasound dopplerography with measurement of blood pressure in the anterior and posterior tibial arteries, and the first toe. Ankle-brachial index was calculated to determine critical limb ischemia. To determine endogenous intoxication, the leukocyte index of intoxication was calculated by V.K. Ostrovsky (1983).

Angiographic examination of patients revealed a multilevel lesion of the arterial system of the limb with occlusive-stenotic lesions, including the femoral (general, superficial and deep), popliteal, leg arteries (anterior and posterior tibial, interosseous). Based on the clinical examination, further treatment tactics were determined, depending on vascularization. Surgical intervention was decided for all of them: amputation of the lower limb.

Operations were performed under spinal-67 (85.9%) and intravenous-11 (14.1%) (the reason for this was pronounced osteochondrosis of the lumbar vertebrae) anesthesia. In addition to surgeons, specialists involved in the treatment process are endocrinologist, cardiologist and resuscitator. A complex pathogenetically substantiated drug, symptomatic therapy was carried out, including the correction of carbohydrate metabolism disorders, the administration of antibiotics according to the sensitivity of the microflora from wound surfaces, the administration of drugs aimed at improving peripheral blood flow and metabolism in the tissues of the foot.

RESULTS AND CONSIDERATION

For a comparative evaluation of the results of the study of the first and second groups, the following criteria were identified:

- Duration of surgery and anesthesia.
- Length of stay in hospital.
- The presence of complications in the early postoperative period.
- Recovery time indicators of intoxication.
- Postoperative complications

The results obtained are shown in Table 3.

Table 3. Comparative characteristics of the results of the study of group I-II.

Comparison criteria	First group n= 31	Second group n=47
Operation time (minutes)	58 ± 8,2	38± 7,5
Length of stay in hospital (day)	10± 1,4	7,8 ± 0,9
Suppuration of the stump	5 (16,1%)	2(4,3%)
Necrosis of the stump	1(3,2%)	0
Phlegmon of the stump of the lower leg	2(6,5%)	1(2,1%)
Fatal outcome	1(3,2%)	0

As can be seen when comparing the data in Table 3, the average duration of operations performed in the first group of patients averaged 58 minutes; in the second group, the duration of operations decreased to 38 minutes. In our opinion, this is due to the simplified access to the soleus muscle during mobilization and resection, which significantly affected the time of the operation, as well as the minimization of the invasiveness of the operation, which contributed to the reduction of postoperative complications. From Table 3, it should be noted suppuration of the stump with the traditional method of operation was noted in 16.1% of patients. Necrosis of the stump in the postoperative period in the control group of patients occurred in 3.2% of cases, phlegmon of the stump with the traditional method of surgery was observed in 6.5% of the main group only in 2.1% of cases. The only lethal outcome in the control group. The cause of death in one patient was postoperative myocardial infarction.

Table 4. Dynamics of the comparative assessment of intoxication indicators Group I patients

Comparison criteria	1- day	3- day	5- day	7- day	9- day
	Body temperature	37,7±1,1	37,4±0,8	37,2±0,6	37,0±0,5
Pulse	92,0±8,0	88,0±7,5	86,0±5,5	82±4,5	76±4,0
Leukocytes	14,7±3,8	12,5±4,4	10,4±3,1	8,7±1,2	8,4±1,0
ESR	22,5±3,2	21,2±3,3	20,1±3,5	18,5±3,7	15,8±1,8
Lymphocytes	32,1±5,2	30,5±4,7	28,7±3,7	25,5±4,2	23,1±2,6
Molecule of average mass ($\lambda = 254 \text{ nm}$) arb. Unit	0,84±0,02	0,72±0,02	0,61±0,01	0,49±0,04	0,35±0,02
Leukocyte index of intoxication	7,7±1,2	6,8±1,3	5,5±1,1	4,1±0,5	2,7±0,9.

Table 5. Dynamics of the comparative assessment of intoxication parameters II group of patients

Comparison criteria	1- day	3- day	5- day	7- day	9- day
	Body temperature	92,0±8,0	88,0±6,5	84,0±6,0	80±2,5
Pulse	37,7±1,1	37,0±0,8	36,7±0,7	36,5±0,4	36,5±0,2
Leukocytes	14,7±3,8	11,5±3,2	9,2±2,5	6,7±1,3	5,1±1,1
ESR	22,5±3,2	20,7±2,8	15,5±3,2	9,5±1,7	8,5±1,2
Lymphocytes	32,1±5,2	29,1±5,0	26,3±3,5	21,5±3,2	21,1±3,2
Molecule of average mass ($\lambda = 254 \text{ nm}$) arb. Unit	0,84±0,02	0,66±0,02	0,41±0,01	0,30±0,04	0,24±0,02
Leukocyte index of intoxication	7,7±1,2	6,4±1,4	5,1±0,82	3,2±0,7	2,1±0,8.

Table 4-5 shows the dynamics of indicators of intoxication of groups I-II of patients, from which it can be seen that in the first group upon admission, the pulse rate was on average 92 beats.

per minute, the body temperature averaged 37.70C after the surgical and conservative treatment, the indicators began to decrease, becoming equal to the norm (8-9-10 days). The remaining laboratory parameters, reflecting the body's response to inflammatory and necrotic processes, leveled off to normal by 9-11 days after hospitalization of patients in a hospital. In the second group, all these indicators returned to normal on the 6-9th day after hospitalization. Thus, our study showed that amputation at the level of the lower leg is a more effective method, the advantage of which is low trauma, reduction in the duration of the operation (40-50%), reduction of anesthetic risk, postoperative somatic complications and mortality up to 3.2%.

CONCLUSIONS

1. In case of amputations of the lower extremities, the preservation of the knee joint increases the efficiency of rehabilitation and the quality of life of patients with post-amputation limb defects.
2. In case of critical ischemia of the lower extremities, amputation at the level of the lower leg according to the modified Mitish method is the optimal method. This reduces mortality to 3.2%.
3. In case of critical ischemia of the lower extremity with a severe degree of damage, amputation at the level of the lower leg according to the modified Mitish method is a pathogenetically substantiated modern surgical method of treatment.
4. For the purpose of prevention in the stages of removal of the soleus muscle and after, it is necessary to carry out a phased sanitation of the soleus muscle and surrounding tissues.

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