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DIABETIC FOOT AS A MANIFESTATION OF MULTIPLE DIABETES COMPLICATIONS

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Abstract: *Diabetic foot is a complex diabetes complication and it occurs as a result of multiple metabolic disorders and consequential diabetic angiopathy and neuropathy; it is followed by ischemic and inflamatory changes on soft tissues and bones that can put a patient at risk of undergoing amputation at a lower extremity level. The goal is to emphasize the complexity of pathoanatomical changes and most common clinical manifestations of synergic effects of vascular and neurological diabetes complications. Retrospective analysis included 87 hospitally treated patients with diabetic foot manifestations in a period of one year. The analysis of clinical manifestations was carried out in relation to the gender and age of patients and the outcomes of applied treatment were presented. Most of patients were in the age group 50-59 years (29,89%)and a smaller number of them were in the next two decades of age. Out of 87 patients, more than two thirds of them were males – 60 or 68,97%. One half of the patients (49,43%) felt changes in a sense of global ischemia and foot gangrene, while almost one third of patients (28,74%) had gangrene in toes. Only 6,9% of patients had an uncomplicated ulceration, while inflamatory changes such as phlegmon or abscess caused by infection were present by 14,9% patients. Only 16 (21,62%) patients had a positive outcome of medical treatment and their feet healed completely, while the others underwent an amputation. Amputation of individual toes was performed in 33 cases (44,59%), disarticulation at the level of Lisfranc joint was perfor ed in 9 feet (12,60%), while the below-knee amputation was performed in 14 (18,94%) cases. 2 patients (2,70%) underwent an above-knee amputation. Diabetic foot is a manifestation of synergic effect of complex metabolical disorders and their repercussions on peripheral vascular and nervous system. Upon admission to hospital, most of the patients (78,16%) had gangrenous changes of individual foot segments. 57,19% of surgically treated patients underwent a foot amputation and 18,94% of them underwent below-knee amputation.*

Key words*: diabetic foot; infection; gangrene; amputation*

Introduction

Diabetes mellitus was first described in ancient Greece in the fifth century BC as a disease recognized by the sweet taste of the urine of a particularly thirsty patient with an agonal and inevitable death. Only in 1922, with the discovery of insulin by Banting and Best, this disease was brought under control and became a non-fatal chronic metabolic disease, whose main laboratory feature is an increase in the presence of glucose in the blood over 6 mmol/l eight hours after the last meal. Nevertheless, even after 100 years of the modern era of diabetes, we must admit that there are still many unknowns in terms of achieving continuous regulation of blood sugar levels, and especially in terms of prevention and treatment of multiple very serious complications where we still feel defeated [1]. The largest number of complications is the result of pathological changes on the wall of blood vessels, especially on the endothelium and basement membrane of the microcirculation system. There is no complete explanation why these changes are mostly present in the blood vessels of the retina, the glomerular apparatus of the kidneys and the blood vessels of the feet, which is accompanied by a loss of visual acuity and kidney function and ischemic changes in the feet. Coronary blood vessels are also affected by the aforementioned changes, which are most often accompanied by the so-called silent ischemic disease of the myocardium [2]. Due to the threat of the immune system, there are repeated and often fatal local and systemic infections that threaten the life of the patient. Peripheral neuropathy in diabetes is present in about 10% of patients already at the time of diagnosis of the underlying disease, and in the further course of the disease, this percentage increases significantly to about 50% after 25 years of its duration. The presence of peripheral angiopathy, neuropathy and traumatic damage, most often microtraumas that patients do not register, is significant for the occurrence of pathological changes in the soft tissues of the feet, primarily ulcerative changes [3].

Diabetic foot is a complex complication of diabetes, manifested by soft tissue and bone changes that often have a dramatic course with an extremely uncertain outcome. Despite significant progress in the treatment of diabetes, which has been achieved in recent decades, sufferers have a 20 times greater risk of experiencing amputation at the level of the lower extremity compared to people who are not burdened by this disease [4]. It seems that the foot, with its morphological and functional specificities, provided an opportunity for the synergistic action of systemic pathological anatomical changes. On the basis of chronic metabolic complications, there is a disorder of the function of the endothelium and the basal membrane of blood vessels and the resulting microangiopathy, peripheral diabetic neuropathy as well as hematological changes with an altered, weakened immune response [5]. In addition to these, changes occur in the connective tissues that lead to a weakening of the ligamentous apparatus and capsules of the foot joints, which causes sudden deformities that disrupt biomechanical relationships, which contributes to repeated injuries, more often microtraumas that are the basis for the appearance of ulcerous changes followed by soft tissue infections, possible necrosis and gangrenous changes.

The basic functional component of the vascular system is represented by the capillary microcirculation network, including the arteriole with precapillary and venule with

postcapillary sphincter, which play a particularly important role in peripheral regulation. The capillary structure consists of endothelial cells on the foot of the type of continuous capillaries, so that the exchange of substances takes place by the mechanism of pinocytosis. Endothelial cells are surrounded in places by pericytes, i.e. undifferentiated mesenchymal cells whose transformation into fibroblasts, angioblasts or smooth muscle cells is particularly important in the healing process. In addition to the fact that it forms a lumen with smooth walls that are important for smooth blood flow, the endothelium has a great endocrine potential in terms of the release of mediators (prostaglandins, angiotensin, endothelin, nitric oxide) important for the regulation of circulation, reparative processes and the maintenance of coagulation homeostasis so that the endothelium can be considered a special endocrine organ. The basal membrane is a product of endothelial cells and cells of the neighboring tissue, it is made of three layers in which there are practically no cells, and its role is reflected in providing support and connecting the endothelium and cells of the neighboring tissue, and of course, it participates in the circulation of substances [2].

In situations of elevated blood sugar level (BGL), covalent binding of glucose with proteins in endothelial cells occurs, forming glycoprotein molecules. This process of glycosation and its products limit the production of nitric oxide (NO) in endothelial cells, which is a powerful vasodilator, which has an inhibitory effect on the activation of platelets, reduces the adhesiveness of leukocytes and their penetration into the subintimal layer, and reduces the proliferation of smooth muscle cells. In addition to its important role in the regulation of peripheral resistance and influence on arterial pressure, NO can be considered a protector of blood vessels. Prolonged hyperglycemia leads to disruption of glucose metabolism in endothelial cells, which leads to the formation of sorbitol, a simple alcohol that increases the osmolarity of the endothelial cell, leading to its swelling, and the end products of this sorbitol metabolism pathway lead to the release of lactate, which leads to cellular and tissue acidosis. Metabolic processes in conditions of hyperglycemia lead to the thickening of the basal membrane, which makes it difficult for the circulation of substances and the migration of leukocytes into the tissue, while at the same time its changed physical characteristics reduce the possibility of capillary dilatation and a hyperemic inflammatory response in the tissue. (Fig. 1) [2,6].

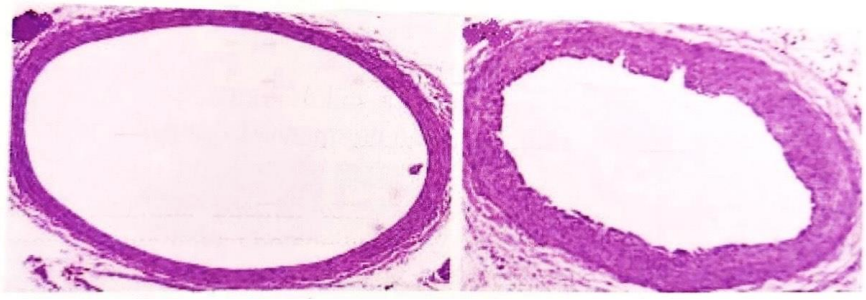

Figure 1. Cross-section of capillaries: A) in a healthy person, B) in a person with diabetes [2, 6]

The aforementioned functional disorders of the endothelium and thickening of the basement membrane lead to irreversible changes in the capillary network in terms

of microcirculatory sclerosis, leading to hyalinization of the membrane with a serious reduction in the transport potential of substances. The capillary lumen becomes irregular and partially narrowed due to the protrusion of the endothelium, which is the initial factor for platelet deposits, so that the capillary network of the diabetic foot becomes prone to thrombosis. Changes in the lumen of the capillaries lead to increased resistance so that, following the laws of fluid mechanics, significant amounts of blood bypass the capillary network and pass through the arteriovenous shunt. Peripheral neuropathy also contributes to this key disorder due to damage to the function of the autonomic nervous system under the control of the precapillary and postcapillary sphincters. In the clinical examination of the feet, we can be mistaken because despite preserved pulsations, good venous filling and preserved local skin temperature, the foot tissue is still in a state of significant ischemia [4].

Atherosclerosis is a chronic occlusive disease of arterial blood vessels that manifests significantly more often in conditions of diabetes and has a significantly faster course. In addition to the reduced release of nitric oxide (NO), hyperglycemia induces the synthesis of endothelin-1, which has a vasoconstrictive effect and simultaneously supports the renin-angiotensin-aldosterone mechanism, which also exerts a strong hypertensive effect. In conditions of hypertension, increased fat metabolism with the release of fatty acids (due to reduced NO) and impaired protective role of the endothelium, leukocytes, monocytes and platelets migrate to the subintimal layer of the blood vessel wall.Monocytes are transformed into macrophages while T-lymphocytes secrete cytokines and lead to a chain inflammatory process that leads to swelling of the formed plaque that often exulses. (Fig. 2) The endothelium releases P-selectin, which is a specific receptor for platelets that, after adhesion to the endothelium, activates thromboxane, thereby enabling the activation of the coagulation cascade, which leads to the thrombotic process and possible embolization.

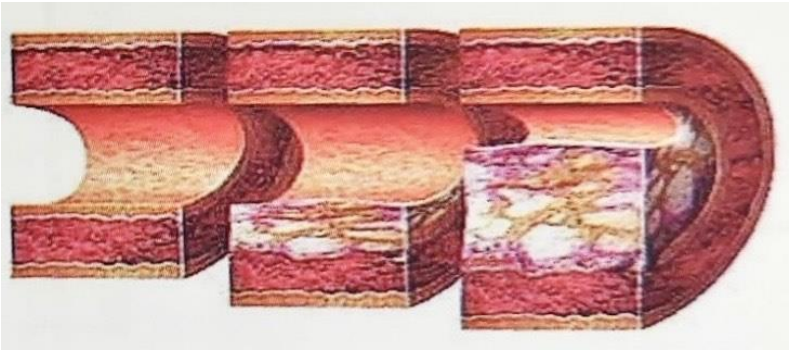

Figure 2. Evolutionary course of atherosclerotic changes [2]

In contrast to non-diabetic atherosclerosis, diabetes-related atherosclerosis manifests itself at a significantly earlier age, does not show gender specificities, and is most often localized in the popliteal and lower leg segments, as well as in the coronary and cerebral arteries. The atherosclerotic occlusive process on the popliteal or popliteal artery is directly responsible for reduced tissue perfusion to which the diabetic foot is particularly sensitive due to microangiopathy. Subjective complaints

of occlusion precede clinical changes in the form of spasmodic ischemic pain distal to the occlusion in the activity phase (functional ischemia), which initiate the need for additional vascular diagnostics and herald clinical manifestation within two years in popliteal and one year in calf occlusion [2,3,7].

Nerve cells do not depend on insulin activity, so glucose passes freely into their cytoplasm, however, the metabolism of excess glucose turns in the direction of the sorbitol pathway, which increases its concentration, reducing intracellular glutathione, which is a powerful antioxidant, and leads to nerve cell hyperhydration. Sorbitol also has a harmful effect on the sodium-potassium ATP-ase pump along the axon fiber, leading to an intra-axonal increase in the concentration of sodium ions and thereby reducing the conductivity of the electrical impulse, leading to a functional disorder of the nerve. (Fig. 3) Microangiopathic changes are also present in the nutritive arteries of nerve fibers (vasa nervorum), which additionally contribute to nerve ischemia and the development of neuropathy, which, due to changes in the autonomic segment of the nerve fiber, results in inadequate innervation of the precapillary sphincters, endangering tissue perfusion [8,9].

Therefore, the diabetic foot is an example of an extraordinary association of vascular and neurological functional disorders entering into an unfortunate vicious circle (circulus vitiosus). Manifestations of peripheral neuropathy are most often the result of sensory dysfunction, which is usually reflected in paresthesias and then anesthesia of the foot and ankle, or the appearance of severe pain that needs to be separated from sudden ischemic pain caused by embolization of an arterial blood vessel on the foot. Motor neuropathy leads to disruption of the innervation of the short muscles of the foot, which have the primary role of local stabilizers of joint structures, manifests itself in faster fatigue, instability and contributes to the appearance of foot deformities. Autonomic neuropathy is manifested by a disturbance of the innervation of the sweat glands, thus dry and chapped skin and trophic changes in the skin adnexa.

Long-term glycosization of connective tissue, primarily of strong plantar ligaments (plantar aponeurosis and long plantar ligament), as well as other joint ligaments leads to their shortening and loss of elasticity, which leads to shortening of the foot with a raised longitudinal arch and tight and shortened extensor tendons. The joint spaces on the foot become narrowed and the joint surfaces suffer pressure, which leads to the lesion of the joint cartilage and the formation of free intra-articular bodies. Due to the action of mechanical forces on the altered structure of the ligamentous structures, their rupture occurs to varying degrees, which leads to the collapse of the foot, which loses its shape. There is plantar prominence of bony structures, subluxation of tarsometatarsal and intertarsal joints, while loss of proprioceptive sensitivity leads to loss of synchronization of muscle activities on the foot, which becomes unstable, which corresponds to the clinical course of development of Charcot's foot [2,4,10].

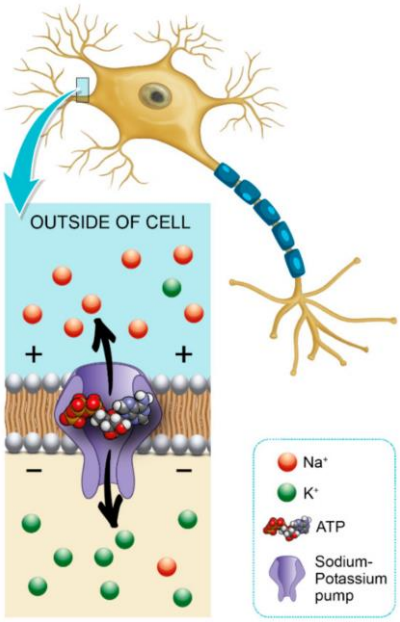

Figure 3. The role of sorbitol in S/P ATP-ase pump dysfunction [8]

Even the most developed countries recognize that the diabetic foot is a significant public health problem, both in terms of treatment costs and the resulting disability and reduction in the quality of life of these patients. Studies show that there is a high percentage of probability (about 50%) for the next amputation on the same side or the remaining lower extremity in the next five years. The five-year survival rate after lower extremity amputation is around 40%, and death is most often a consequence of accompanying cardiovascular disease. (2,4) The National Health Committee in Sweden estimates the five-year survival rate after lower extremity amputation at only 27%, and the probability of contralateral amputation in the next three years about 48%. Most studies suggest that a significant percentage of amputations could have been avoided with more adequate diabetes treatment programs, timely and vigorous treatment of the initial ulcer. In Germany, a system of a more aggressive approach to this problem was developed in such a way that the number of bypass procedures distal to the knee was doubled and thus the number of amputations was significantly reduced, by as much as 40%. However, given the graft patency rate of about two years, this still does not guarantee a prolongation of the five-year survival rate. [2,4] (2,4).

Neuropathic ulcerations are localized on the steady points of the front segment of the foot, namely the plantar side of the head of the I, II and V MT bones, and in the area of the heel tubercle posteriorly or in the area of the arch of the foot in the case of Charcot foot type deformation. In principle, it is a painless change, and the appearance of pain indicates the spread of infection and must always be understood as a serious threat. The wounds are circular, up to 2 cm in diameter, with a hyperkeratotic edge that usually undergoes maceration. Contamination of an ulcer or minimal defect leads to a local inflammatory process with or without a systemic inflammatory response. Cellulitis is the most common form of local infection of the skin and subcutaneous

tissue, poorly limited, which in the case of a rapid course is a prelude to much more serious local and general changes such as phlegmon, abscess, necrotizing fascitis, sepsis, bacterial endocarditis. Phlegmon of the diabetic foot is a diffuse purulent inflammatory process that affects the skin, subcutaneous tissue and connective tissue of deeper structures. The process spreads in depth, leading to collimation necrosis of subcutaneous fat and muscle tissue with the possibility of sepsis. Diabetic foot abscess has an altered configuration due to the specific structure of the foot and it is clinically difficult to differentiate it from phlegmon [11,12]. However, from a surgical point of view, it is most important to recognize the need for timely and high-quality incision and evacuation of necrotic purulent content, which is usually yellowish-gray in color, and bluish-green in pseudomonas infections or yellow-green in coli and enterobacteria infections. Osteomyelitis on the diabetic foot is present in about 20% of all infections and is most often a complication of the ulcer process, but it can also be its precursor in the context of abscesses and phlegmon. This process progresses slowly, usually of a polymicrobial type that quickly adheres to sequestrations, develops a biofilm that protects them from local immune factors and antibiotics, and certainly progresses to the formation of a pathological fracture. Necrotizing fascitis is a fudroaient infection of the subcutaneous tissue, intermuscular septa and muscle fascia with a high mortality rate of about 40%. Given the virulence and destructive power of the causative agent of this inflammation, the picturesque name "flesh eating bacteria" was coined in the circles of British journalists. It is mostly about the synergistic action of beta hemolytic streptococcus, staphylococcus aureus, intestinal escherichia and various anaerobes and aerobes (Bacteroides species, Clostridium...). The clinical picture is dominated by pain, especially on palpation, swelling, blue-red spots and bullous changes. Prominent pain, signs of intoxication and the development of septic shock must be a signal for such a serious inflammatory process [2,13].

Ischemic foot is the result of compromised circulation at the level of the vascular system - tissue, whereby tissue perfusion is compromised to such an extent that certain parts of the tissue die (necrosis) or complete tissue death, i.e. gangrene. From the clinical aspect, we distinguish between functional and manifest ischemia, which can be reversible or irreversible. Depending on the type of blood vessel that is disabled, circumscribed ischemia occurs in which the local capillary network is compromised or global ischemia is the result of insufficiency of flow in the main blood vessel and collateral network, when dry gangrene occurs.

Goal of the article

- To show the age and gender structure of patients treated for pronounced pathological changes in the diabetic foot.
- To show the structure of the clinical manifestation of diabetic foot in treated patients.
- To show the results of applied surgical treatment.

Method

A retrospective analysis was conducted and it included 87 patients treated at the "Dr Mladen Stojanović" Hospital in Prijedor, due to the presence of diabetic foot complications. The approval for this research was obtained from the Ethical commitee of the mentioned institution. Diagnosed changes in the foot, applied surgical treatment and its outcomes were examined. Numeric and percentage representatin of the patients' age and gender structure were presented, as well as the structures of pathological changes on the foot and of the applied surgical treatment.

Results

Table 1. Age and gender structure of treated patients

Age	30-39		40-49		50-59		60-69		70-79		80+		Total	
Gender	No	%	No	%	No	%	No	%	No	%	No	%	No	%
M	1	1,15	8	9,20	20	22,99	17	19,54	13	1,.94	1	1,15	60	68,97
F	0	0,00	1	1,15	6	6,90	7	8,05	10	11,49	3	3,45	27	31,03
Total:	**1**	**1,15**	**9**	**10,4**	**26**	**29,9**	**24**	**27,9**	**23**	**26,4**	**4**	**4,60**	**87**	**100**

Legend: M- male; F-female

The largest number of patients was in the age group of 50 to 59 years, 26 or 29.89% of them, while the representation is slightly lower in the next two decades of life. In terms of gender structure, the number of men is significantly higher, 60 or 68.97% of them.

Table 2. Structure of clinical changes in the diabetic foot

Dg.	Gangrena pedis		Gangrena digitorum		Ishaemio et ulcus pedis		Phlegmona pedis		Total	
Gender	No	%	No	%	No	%	No	%	No	%
M	29	33.33	19	21,84	3	3,45	9	10,34	60	68,97
F	14	16,09	6	6,90	3	3,45	4	4,60	27	31,03
Total:	**43**	**49,43**	**25**	**28,74**	**6**	**6,90**	**13**	**14,94**	**87**	**100**

Legend: M- male; F-female

The largest number of treated patients had the clinical manifestation of gangrenous changes on the foot, 68 (78.17%) out of which a significantly larger number, 43 (49.43%) had global gangrenous changes in the foot, while in 25 cases (28.74 %) one or more toes affected by gangrenous change. Phlegmon of the foot, which includes a possible abscess, was found in 13 patients or 14.94%.

Operative treatment was used in 74 patients or 85.05% of the total treated. In 42 patients or 56.76%, so-called "small" amputations were performed, and in 15 cases (20.27%) amputation of the second finger was performed, in 12 patients (16.22%) thumb amputation was performed with resection of the first MT bone in four cases and in six patients (8.10%) amputation of the fifth toe. Tarsometatarsal amputation was used in nine patients or 12.16%. Valika amputations were performed in 16 patients or 21.62%, and in 14 of them (18.94%) at the level of the lower leg and in

two cases or 2.70% upper leg amputation was applied. Incision and necroctomies were sufficient in 16 treated patients or 21.62%.

Table 3. Outcomes of applied surgical treatment

Surgical treatment	M		F		**Total**	
	isol	with MT	Isol.	with MT	**No**	**%**
Thumb amputation	5	1	3	3	**12**	**16,21**
II toe amputation	10	2	3		**15**	**20,27**
V toe amputation	1	5			**6**	**8,10**
TMT amputation		8		1	**9**	**12,16**
Below-Knee amputation		9		5	**14**	**18,94**
Above-Knee amputation		1		1	**2**	**2,70**
Incision necrectomy		6		10	**16**	**21,62**
Total		48 (64.86%)		26 (35.13%)	**74**	**100,00**

Legend: M-male, F-female, MT-metatarsal, TMT-tarsometatarsal, isol.: isolated

Discussion

Diabetic foot, with its various clinical manifestations, is a very difficult and complex complication of diabetes. For the implementation of prevention measures, early detection and treatment, a team approach, good education and a responsible approach of the patient are needed. Regarding the gender structure of the treated patients, the dominant representation is male, as much as 68.97%, which is in accordance with previously published results. The largest number of patients is between the ages of 50 and 59 (29.89%), although the group of patients between 60 and 69 and 70 to 79 years of age is fairly evenly represented [7]. Gangrenous changes on the foot are the most common clinical manifestation in treated patients in the observed period, 68 or 78.17% of them. The fact that patients arrive at this stage of the disease is certainly a serious warning and dictates the need to review the organization of diagnosis and treatment of patients with diabetes mellitus. Ischemic ulcer changes were verified and treated in six patients or 6.9%, while phlegmonous changes on the foot were in 13 patients or 14.94%. In the structure of applied surgical treatment, 57 patients (77.03%) underwent amputation at a certain level of the lower limb. In 33 patients, a toe was amputated, most often the second - in 15 patients (20.27%), the thumb - in 12 (16.22%), while in six patients the amputation of the fifth toe was performed. Tarsometatarsal amputation was used in 9 patients or 12.16%. The high percentage of amputations at the lower leg level, in 14 patients or 18.94% of the total number of surgically treated patients with diabetic foot, is worrying. Two below-knee amputations were also performed. Due to the resulting complications, one reamputation was performed at the level of the upper leg and one tarsometatarsal amputation after the previous amputation at the distal level [14,15]. Antibiotic therapy was applied in all cases based on the results of microbiological tests and established antibiogram. 42 patients were treated with one antibiotic, 35 with dual antibiotic therapy, while 10 patients were treated with three antibiotics. The average length of

antibiotic therapy is 10.6 days. Hyperbaric oxygen therapy was used in 14 patients. The limitation of this research lies in the fact that the results of the diagnostics of the functional status of arterial blood vessels on the lower limbs were not analysed.

Conclusion

Regarding the age structure, there is an even distribution of treated patients in the age groups of 50-79 years. There is a high percentage of younger patients (40-49 years old), nine of them or 10.34%, out of which eight are men. The total number is also dominated by men, 68.97%.

Gangrenous changes on the foot were the most common clinical manifestation in treated patients in the observed one-year period, 68 or 78.17% of them.The structure of these changes is dominated by extended ischemic gangrene of the foot, in 43 patients or 49.43%, while isolated gangrene of individual fingers in 25 patients or 28.74%.

In the structure of the applied surgical treatment, 57 patients (77.03%) underwent amputation at a certain level of the lower extremity. In 16 patients (21.62%) there was a loss of the lower extremity, 14 lower leg and two upper leg amputations were performed. In 42 patients (57.56%), amputation was performed at a certain level of the foot, nine tarsometatarsal amputations and in 33, amputations of individual toes with or without resection of the associated metatarsal bone.

Diabetic foot, with its various clinical manifestations, is a very difficult and complex complication of diabetes and requires a team approach in terms of diagnosis and treatment, good education and a responsible approach of the patient.

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DIJABETSKO STOPALO KAO MANIFESTACIJA VIŠESTRUKIH KOMPLIKACIJA ŠEĆERNE BOLESTI

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Sažetak: *Dijabetsko stopalo je složena komplikacija šećerne bolesti, nastaje kao rezultat višestrukih metaboličkih poremećaja i posljedične dijabetske angiopatije i neuropatije, manifestuje se mekotkivnim i koštanim ishemijskim i upalnim promjenama koje bolesnika dovode u visok rizik, da doživi neku od amputacija na nivou donjeg ekstremiteta. Cilj je ukazati na složenost patološko anatomskih promjena i najčešće kliničke manifestacije sinergijskog djelovanja vaskularnih i neuroloških komplikacija šećerne bolesti. Retrospektivnom analizom je obrađeno 87 hospitalno liječenih pacijenata sa manifestacijom dijabetskog stopala u periodu od jedne godine. Izvršena je analiza kliničkih manifestacija dijabetskog stopala u odnosu na pol i životnu dob bolesnika te prikazani ishodi primjenjenog liječenja. Najveći broj liječenih je bio u starosnoj dobi od 50 do 59 godina (29,89%) i nešto manje u sljedeće dvije dekade životnog doba. U grupi od 87 liječenih bolesnika, više od dvije trećine su bili muškarci, njih 60 (68,97%). Kod polovine liječenih (49,43%) su utvrđene promjene u smislu globalne ishemije i gangrene stopala dok je gangrena prstiju bila kod skoro jedne trećine liječenih (28,74%). Nekomplikovanu ulceraciju je imalo svega 6,9% bolesnika dok su upalne promjene tipa flegmone ili apscesa uzrokovane infekcijom utvrđene kod 14,9% liječenih. Pozitivan ishod liječenja i potpuno sačuvano stopalo je postignut kod samo 16 bolesnika (21,62%) dok je kod ostalih primjenjena amputaciona hirurgija.*

Amputacija pojedinih prstiju je izvršena kod 33 bolesnika (44,59%), dezartikulacija na nivou Lisfrankovog zgloba kod 9 (12,60%) dok je potkoljena amputacija urađena kod 14 (18,94) i natkoljena kod 2 bolesnika (2,70%). Dijabetsko stopalo je manifestacija sinergijskog djelovanja složenih metaboličkih poremećaja i njihovih reperkusija na periferni vaskularni i nervni sistem. Kod najvećeg broja liječenih (78,16%) su kod prijema na bolničko lječenje utvđene gangrenozne promjene pojedinih segmenata stopala. Kod 57,19% operativno liječenih pacijenata je primjenjena amputacija na nivou stopala a kod 18,94% je urađena potkoljena amputacija.

Ključne riječi: *dijabetsko stopalo, infekcija, gangrena, amputacija.*