THE STUDY OF THE IMPACT OF NEUROPATHY AND OTHER CHRONIC COMPLICATIONS ON FOOT IN A GROUP OF PATIENTS WITH TYPE 1 DIABETES MELLITUS WITH A DISEASE DURATION OVER 25 YEARS

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Abstract

The diabetic foot is a generic term used for foot problems in patients with diabetes mellitus. The major increase in mortality among patients with diabetes mellitus is due to the development of macro and microvascular complications [1]. Diabetic neuropathy and obliterant diabetic arteriopathy frequently affect the inferior limb in the patient with type 1 diabetes mellitus. Diabetic neuropathy is the most frequent and early microvascular complication met, while diabetic arteriopathy is the most frequent macrovascular complication. Dyslipidaemia and high blood pressure are frequently met in patients with diabetes mellitus over 25 years and they are usually associated with diabetes complications. Overweight and obesity were found in an unexpectedly high percentage in patients with type 1 diabetes mellitus with a disease duration over 25 years. Smoking any form of tobacco causes damage to the small blood. This damage can disrupt the healing process and is a major risk factor for infections and amputations [2].

Key words*: type 1 diabetes mellitus, diabetic neuropathy, diabetic foot, diabetes duration.*

Introduction

The diabetic foot is a generic term used for foot problems in patients with diabetes mellitus. Arterial anomalies and diabetic neuropathy, as well as late healing tendency of diabetic foot wounds, infections and gangrene are quite frequent. The diabetic foot ulceration represents one of the major complications of diabetes mellitus. It may be found in over 15% of diabetes mellitus patients and preceeds 84% of distal foot amputations.

The major increase of mortality among patients with diabetes mellitus is due to the development of macro and microvascular complications, including the lack of wound healing. Wound healing is a natural phenomenon of destroyed tissues, while diabetes mellitus impedes the normal stages of wound healing. Various histopathological studies show an inflammatory stage in diabetic wounds, thus determining the delay of granulation tissue and the reduction of wound elasticity.

Objectives of the study

This study proposed the assessment of the incidence of diabetic neuropathy and other chronic complications of the foot in a group of type 1 diabetes mellitus patients with a disease duration over 25 years.

Material and Method

The studied group was made up of 44 non-selected patients with type 1 diabetes mellitus, with a disease duration over 25 years from the records of the Clinical Center of Diabetes, Nutrition and Metabolic Diseases within the Clinical Emergency Hospital, Craiova. Regarding the work method, we used anamnestic, clinical and paraclinical data: diabetes duration, personal antecedents, anthropometric parameters when the study started (height, weight, body mass index), blood pressure, pulse palpation at the level of pedious, posterior tibial, popliteal, femural arteries; auscultation of neck vessels, glycaemia, total cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides, urea, creatinine, creatinine clearance, estimated by MDRD, uric acid, microalbuminuria, electrocardiography, fundoscopic examination, cardiological examination, ecocardiography and coronarography prescribed by a cardiologist, peripheral vascular and neck vessels Eco Doppler, neurological examination, craniocerebral computer tomography and nuclear magnetic resonance prescribed by a neurologist. Moreover, we analyzed the initial insulin dosis, after 15 years from the diabetes mellitus debut as well as the treatment type, conventional and intensive (classic and modern) followed up by the patients over the whole disease period.

Results and Discussions

Of the 44 patients, 14 (31,81%) were women and 30 (68,19%) men. Regarding their age, 2 patients (4,54%) were between 30-40 years old, 12 patients (27,27%) were between 41-50 years old, 15 patients (34,09%) were between 51-60 years old and 15 patients (34,09%) were over 60 years old.

As far as the duration of diabetes mellitus is concerned, 23 patients (52%) had a duration of diabetes mellitus between 25-30 years, 8 patients (18%) between 31-35 years, 3 patients (7%) between 36-40 years and 10 patients (23%) over 40 years (Figure 1).

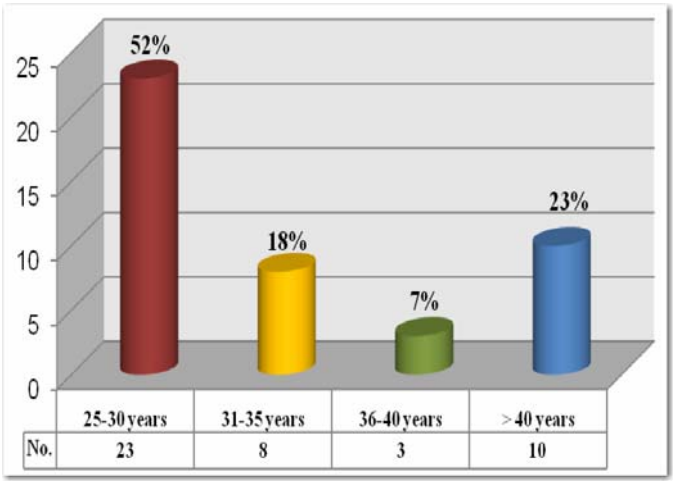

Figure 1. Duration of diabetes mellitus in studied patients

By studying the prevalence of diabetic neuropathy and obliterant arteriopathy and the most frequent chronic complications affecting the foot in the diabetes mellitus patient, we distinguished a high frequency in them: 42 patients (95,45%) presented diabetic neuropathy while 26 patients (59,09%) presented peripheral oclusive disease (POS) (Figure 3,5).

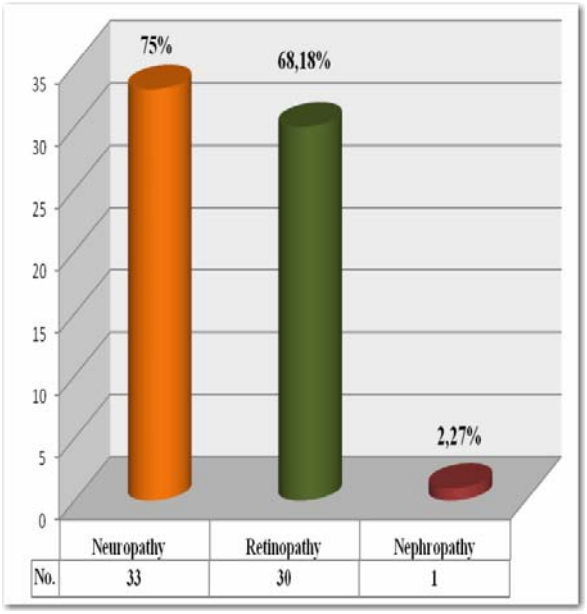

Figure 2. Prevalence of Microvascular Complications After 15 Years from Onset of Disease

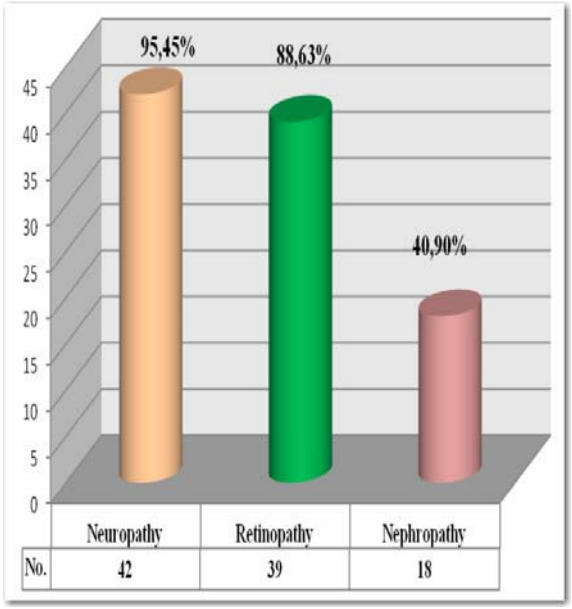

Figure 3. Prevalence of Microvascular Complications After 25 Years of Diabetes Mellitus

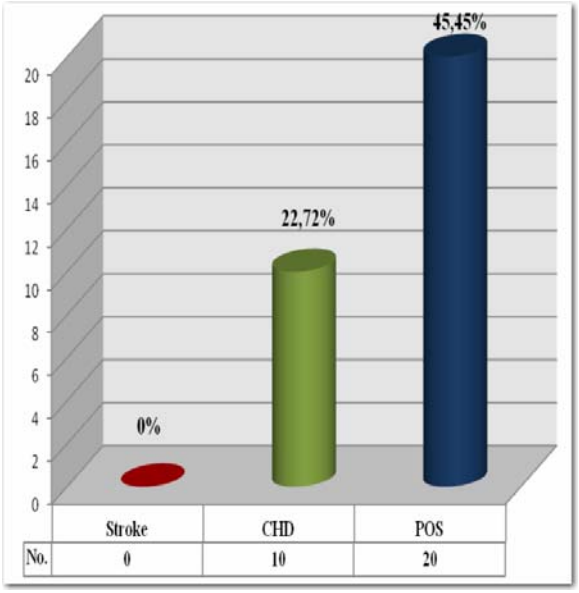

Figure 4. Prevalence of Macrovascular Complications After 15 Years from Onset of Disease

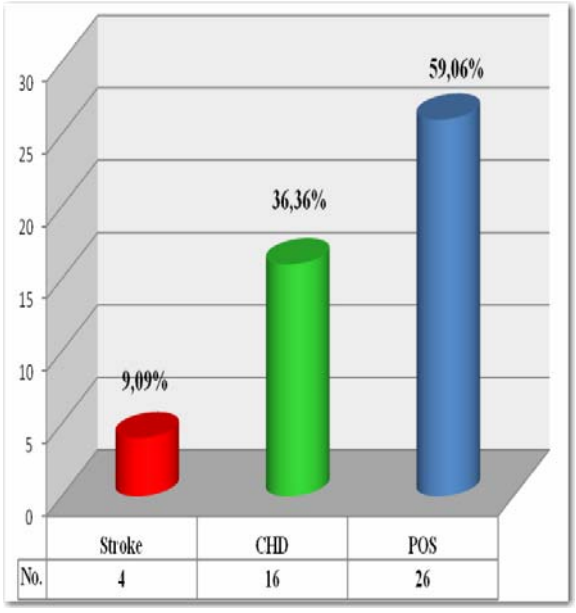

Figure 5. Prevalence of Macrovascular Complications After 25 Years of Diabetes Mellitus

Of the patients with diabetic neuropathy, after a 25 years period of diabetes mellitus, 4,09% developed peripheral neuropathy while 11,36% developed both peripheral and vegetative neuropathy.

The diabetic arteriopathy onset was recorded in 2 patients (7,69%) after less than 5

years of diabetes mellitus, in 2 patients (7,69%) after 5-10 years, in 3 patients (11,53%) after 11-15 years, in 4 patients (15,38%) after 16-20 years, in 5 patients (19,23%) after 21-25 years and in 10 patients (38,46%) after more than 25 years of diabetes mellitus. In those presenting peripheral oclusive disease, there was established that 16 patients (61,53%) were smokers while 10 patients (38,46%) were non-smokers (Figure 6).

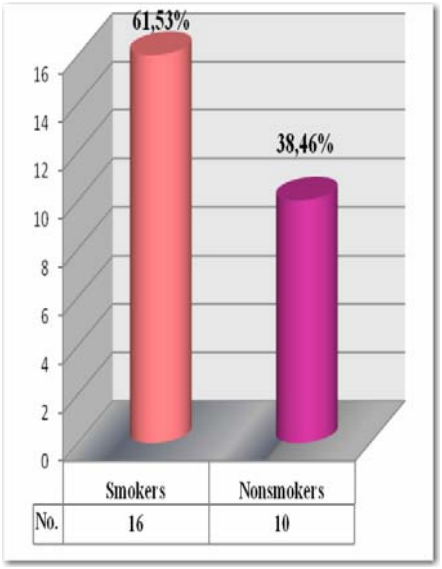

Figure 6. Association of Diabetic Arteriopathy with Smoking

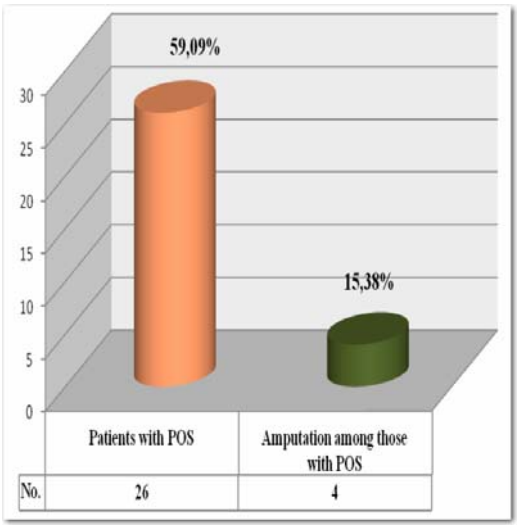

Figure 7. Amputation in Patients with Pheripheral Oclusive Disease

Amputation of inferior limbs at different levels was found in 4 patients (15,38%) with obliterant arteriopathy, who were also heavy smokers (Figure 7).

Diabetic neuropathy and POS were also associated with other chronic complications in patients with type 1 diabetes mellitus, with a disease duration over 25 years. Therefore, we analyzed the incidence of the other microvascular and macrovascular complications, diabetic retinopathy and nephropathy, respectively, as well as high blood pressure, stroke and dyslipidaemia. Diabetic retinopathy was diagnosed in 39 patients (88,63%). Of those with diabetic retinopathy, 50% were in a non-prolipherative stage; 11,36% were in a pre-prolipherative stage and 27,27% in the prolipherative one. In 17,95% of them, cecity was established as a complication of diabetic retinopathy.

Diabetic nephropathy was found in 18 patients (40,90%) with a disease duration over 25 years. Diabetic nephropathy was found in different stages: 33,33% in stage 3; 61,11% in stage 4 and 5,55% in stage 5. In 43,59% of patients, the diabetic retinopathy was associated with nephropathy (Figure 8).

Dyslipidaemia was highlighted in 32 patients (72,72%), while arterial hypertension was found in 36 patients (81,81%).

We mention that there could not be established a correlation between the glycemic balance and microvascular complications, due to the lack of Hb A1c from patients' records over a long period of diabetes mellitus evolution.

After 25 years of evolution disease, a patient (2,27%) presented denutrition, 15 patients (34,09%) normal weight, 20 patients (45,45%) overweight and 8 patients (18,18%)

obesity in different stages. By analyzing the association of nutritional state with macroangiopathic complications, arterial hypertension and dyslipidaemia, we established a progressive increase of their prevalence along with weight, except for peripheral oclusive disease of inferior limbs (Table 1).

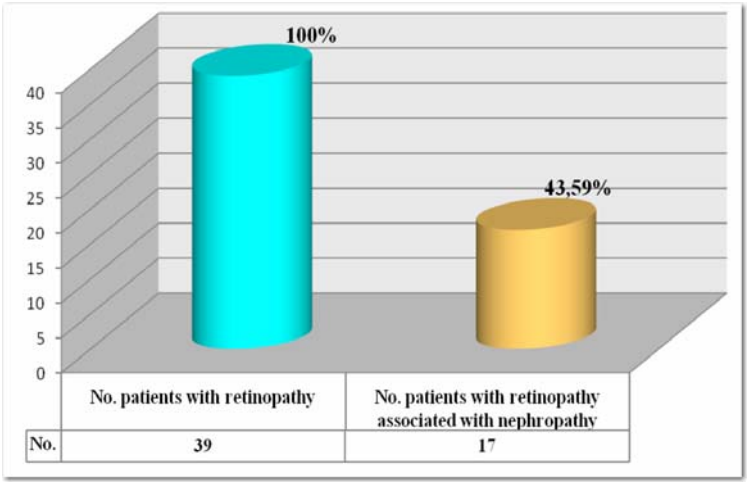

Figure 8. Graphical Representation of Simultaneous Presence of Retinopathy and Diabetic Nephropathy

Table 1. Nutritional State in Studied Patients and Macrovascular Complications

	Artherial hypertension	**Dyslipidaemia**	**Chronic heart disease**	**Stroke**	**Pheripheral oclusive disease**
Denutrition (1 patient)	1 (2,77%)	-	-	-	-
Normal Weight (15 patients)	7 (19,44%)	4 (12,50%)	2 (12,50%)	-	5 (19,23%)
Overweight (20 patients)	12 (33,33%)	9 (28,12%)	5 (31,25%)	2 (50%)	8 (30,76%)
Obesity (8 patients)	16 (44,44%)	19 (59,37%)	9 (56,25%)	2 (50%)	13 (50%)
Total (44 patients)	**36 (81,81%)**	**32 (72,72%)**	**16 (36,36%)**	**4 (9,09%)**	**26 (59,06%)**

Table 2. Evolution of Insulin Doses Over The Disease Evolution Period

	INITIAL	**AFTER 15 YEARS**	**CURRENT**
Under 20 UI	2 (4,54%)	1 (2,27%)	1 (2,27%)
21-40 UI	21 (47,72%)	18 (40,90%)	20 (45,45%)
41-60 UI	20 (45,45%)	17 (38,63%)	15 (34,09%)
Over 60 UI	1 (2,27%)	8 (18,18%)	8 (18,18%)

The calculated average for insulin doses in the moment of onset was of 31,54 UI, after 15 years of diabetes mellitus evolution 45, 86 UI, and in the present it was situated at a rate of 39, 15 UI.

By comparatively analyzing the insulin doses after 15 years of diabetes mellitus evolution, we recorded the following data: in 56,81% of patients the insulin doses increased,

in 22,72% it decreased, while in 20,45% it remained at the same level with the initial one.

Regarding the present insulin doses in comparison to the dose, after 15 years of diabetes mellitus evolution: in 45,45% of patients it was highlighted the increase of insulin doses, in 50%, the doses decreased, while in 4,55% there were no alterations at all. In patients where the present insulin doses decreased, nephropathy was found in a percentage of 59,09%.

There must be pointed out that we could not calculate insulin in UI/body kgs, because in many patients we could not reestablish the weight at debut time nor after 15 years of evolution. Due to the fact that a number of patients were still during the growth period when diabetes mellitus emerged, it is obvious that this fact falsely decreases the initial insulin necessary.

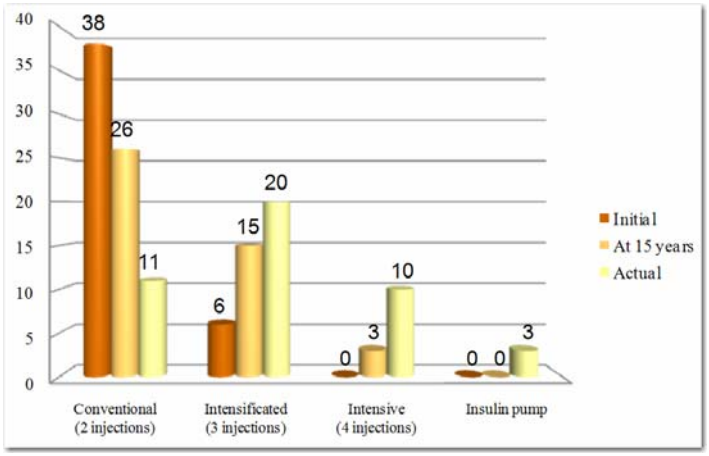

Figure 9. Insulin Therapy Schedules During Diabetes Mellitus Evolution

The insulin therapy schedule represented another studied parameter (Figure 9). Initially, 86,36% of patients were under conventional treatment (2 doses), 13,63% under classical intensive one (3 doses). After 15 years of onset, 59,09% were under conventional treatment, 40,91% under classical intensive treatment. In present, the conventional treatment was found in a percentage of 27,27%, the classical intensive treatment in 68,14% patients, while modern insulin intensive treatment (insulin pump) was found in three patients (6,81%). There may be noticed an increase tendency over time in intensively treated patients.

By correlating insulin with the nutritional state of the patients, there was highlighted a necessary insulin average of 36,06 UI in normal weight patients, 50,25 UI in overweight ones, 58,37 UI in obese ones (Figure 10).

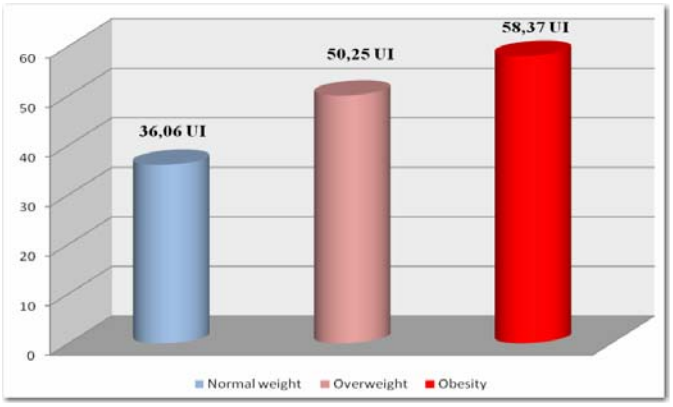

Figure 10. Correlation Between Nutritional State and Insulin Necessary

Hipoglycemic coma was recorded in 18,18% of the patients presently under conventional treatment, 29,54% under intensive treatment (3 doses of insulin/ day), 52,27% under intensive treatment. There was noticed a higher frequency of hipoglycemic comas after 15 years since the onset of diabetes mellitus, a period that coincides with that of diabetic nephropathy emergence. The emergence of hipoglycemic comas imposed the hospitalization of patients and the readjustment of insulin therapy schedule.

Conclusions

It was noticed an alarming frequency among microvascular and macrovascular complications after a period of 25 years of type 1 diabetes mellitus, the prevalence of complications thus increasing at the same time with the duration of diabetes mellitus, irrespective of sex.

Diabetic neuropathy and obliterant diabetic arteriopathy frequently affect the inferior limb in the patient with type 1 diabetes mellitus.

Diabetic neuropathy is the most frequent and early microvascular complication met, while diabetic arteriopathy is the most frequent macrovascular complication.

Diabetic arteriopathy, correlated with smoking, lead to amputation in a relatively high percentage over 25 years of diabetes mellitus evolution. Diabetic arteriopathy is often associated with cardiovascular risk factors: smoking, dyslipidaemia, artherial hypertension and other macrovascular complications of diabetes mellitus: chronic ischemic heart disease, stroke.

Diabetic retinopathy is also frequently met, though quite rare in the first years of evolution. The low degree of correlation between diabetic retinopathy and diabetic nephropathy suggests a possible involvement of individual factors, like genetic factors.

Chronic ischemic heart disease may be identified as a frequent macrovascular complication in comparison to cerebral stroke found in a lower percentage.

Dyslipidaemia and high blood pressure are frequently met in the patient with diabetes mellitus over 25 years and it is usually associated with diabetes complications.

Overweight and obesity were found in an unexpectedly high percentage in patients with diabetes mellitus type 1 with a disease duration over 25 years.

The insulin necessary increases the IMC value.

At present, the conventional treatment is also met in a relatively high percentage in studied patients, for reasons connected mostly to the patient.

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