BG Pulse Journal USA
ISSN:1947-2536 http://www.bgpulseusa.com/index.php/bg
BG PULSE JOURNAL

# CLINICAL SIGNIFICANCE OF DIABETIC POLYNEUROPATHY AND FOOT COMPLICATIONS IN TYPE 2 DIABETES MELLITUS

**Ergasheva Gulshan Tokhirovna**

Assistant of the Department of Clinical Sciences

Asian International University, Bukhara, Uzbekistan

E-mail: ergashevagulshantoxirovna@oxu.uz

**Abstract**

This article analyzes diabetic polyneuropathy developing in the context of type 2 diabetes mellitus, its clinical course, the importance of early detection, and severe complications such as diabetic foot ulcers, risk of amputation, and autonomic neuropathy. Long-term hyperglycemia in diabetes leads to microvascular injury, impaired nerve fiber function, and loss of protective sensation. Since diabetic peripheral neuropathy may often progress without obvious symptoms, regular screening, including the 10 g monofilament test, assessment of vibration sensation, and evaluation of temperature sensitivity, is of great clinical importance. The article also highlights the role of glycemic control, blood pressure management, lipid regulation, body weight optimization, and proper foot care in reducing the risk of diabetes-related complications.

**Keywords:** type 2 diabetes mellitus, diabetic polyneuropathy, peripheral neuropathy, diabetic foot, hyperglycemia, monofilament test, amputation, foot ulcer.

## Introduction

Type 2 diabetes mellitus is currently regarded not only as an endocrine disorder but also as a complex metabolic condition that affects the cardiovascular system, kidneys, eyes, peripheral nervous system, and lower extremity tissues. The main pathogenetic basis of this disease includes chronic hyperglycemia, insulin resistance, lipid metabolism disorders, endothelial dysfunction, and low-grade chronic inflammation. In particular, prolonged hyperglycemia is one of the leading factors in the development of microvascular complications such as diabetic retinopathy, nephropathy, and neuropathy. According to the ADA Standards of Care in Diabetes 2026, hyperglycemia in diabetes is directly associated with microvascular complications, and optimization of glycemic control may help delay or slow the progression of these complications.

Diabetic polyneuropathy is one of the most common but often late-diagnosed complications of type 2 diabetes. In this condition, peripheral nerve fibers, especially sensory and autonomic fibers in the lower limbs, are damaged. At the early stages of the disease, patients may experience burning, tingling, numbness, abnormal perception of cold or heat, and night pain. However, in some patients, neuropathy may remain clinically silent for a long time. Therefore, even when the patient has no active complaints, neurological assessment should be planned from the time diabetes is diagnosed.

Pathogenetic Basis of Diabetic Polyneuropathy

Diabetic polyneuropathy develops as a result of metabolic and ischemic damage to nerve fibers. Long-term hyperglycemia causes protein glycation, oxidative stress, impaired capillary circulation, activation of inflammatory mediators, and energy deficiency in nerve cells. As a result, small sensory fibers are usually affected first, followed by damage to large nerve fibers.

When small fibers are damaged, the patient may complain of burning pain, stabbing sensations, unpleasant skin sensitivity, and impaired temperature perception. Large-fiber involvement leads to reduced vibration sensation, weakened reflexes, balance disorders, gait instability, and an increased risk of falls. Loss of protective sensation is considered one of the most dangerous stages of diabetic foot syndrome because the patient may not notice minor trauma, pressure from footwear, calluses, or skin cracks.

According to ADA standards, diabetic peripheral neuropathy should be considered a diagnosis of exclusion, because neuropathies of non-diabetic origin may also occur in people with diabetes. For example, vitamin B12 deficiency, especially in patients taking metformin, alcohol exposure, kidney disease, hypothyroidism, certain medications, infections, and inflammatory demyelinating diseases may also cause peripheral nerve damage.

Clinical Manifestations

In type 2 diabetes mellitus, diabetic polyneuropathy most commonly presents as distal symmetric polyneuropathy. The pathological process usually begins in the toes and feet and gradually progresses upward. Clinically, patients may complain of numbness in the feet, a crawling sensation, burning, night pain, coldness, or, conversely, a feeling of heat and burning.

In the painful form of the disease, the patient's sleep quality worsens, daily activity becomes limited, and anxiety or depressive symptoms may develop. The painless or minimally symptomatic form is even more dangerous, because the patient may not realize that sensation in the feet has decreased and may seek medical help too late. As a consequence, foot ulcers, infection, tissue necrosis, and severe complications requiring amputation may develop.

Diabetic autonomic neuropathy is also an important clinical problem in type 2 diabetes. It affects the cardiovascular, gastrointestinal, genitourinary, and sudomotor systems. In cardiovascular autonomic neuropathy, resting tachycardia, orthostatic hypotension, and reduced heart rate variability may be observed. In severe cases, this condition may increase the risk of heart failure, sudden cardiac death, and overall mortality. Gastrointestinal autonomic neuropathy may manifest as gastroparesis, constipation, diarrhea, and fecal incontinence. When the genitourinary system is affected, bladder dysfunction, frequent urination, urinary incontinence, or sexual dysfunction may occur.

Screening and Diagnosis

In patients diagnosed with type 2 diabetes mellitus, screening for diabetic peripheral neuropathy should begin at the time of diagnosis and should be repeated at least once a year. This approach makes it possible to detect dangerous changes even during the asymptomatic stage of the disease. According to ADA recommendations, all patients with type 2 diabetes should be assessed for diabetic peripheral neuropathy from the time of diagnosis and then regularly every year.

Clinical assessment includes patient history, complaints, condition of the skin of the feet, reflexes, vibration sensation, temperature sensitivity, pinprick sensation, and protective sensation. The 10 g monofilament test plays an important role in evaluating protective sensation. This test helps determine whether sensation is preserved or lost by applying light pressure with a special monofilament to specific points on the foot. Vibration sensation may be assessed using a 128 Hz tuning fork, while temperature sensation may be evaluated using cold and warm stimuli.

In typical forms of neuropathy, electromyography or nerve conduction studies are not always necessary. These investigations are usually recommended when clinical signs are atypical, the process is asymmetric, motor weakness predominates, the disease begins acutely, or another neurological disorder is suspected.

Diabetic Foot Syndrome and Its Complications

One of the most serious consequences of diabetic polyneuropathy is diabetic foot syndrome. Loss of protective sensation, peripheral arterial disease, foot deformities, calluses, dry skin, inappropriate footwear, and minor injuries may together lead to the development of foot ulcers. Foot ulcers may become infected, deepen, cause osteomyelitis, and eventually increase the risk of amputation.

The uploaded article emphasizes that diabetic foot ulcers may lead to deterioration of functional status, reduced independence in daily activities, decreased quality of life, increased treatment costs, infection, hospitalization, lower-extremity amputation, and death. Therefore, diabetic foot should not be considered merely as a local wound, but rather as a severe clinical syndrome affecting the whole organism.

Peripheral sensory neuropathy is one of the main risk factors for the development of foot ulcers. Since the patient does not feel pain properly, pressure, friction, cuts, or burns may not be noticed in time. If impaired blood circulation is added to this condition, wound healing becomes slower. Infection may spread rapidly in a neuroischemic foot. Therefore, simple preventive measures such as daily inspection of the feet, moisturizing dry skin, avoiding tight shoes, not walking barefoot, and not cutting calluses or ingrown nails independently have great clinical importance.

Treatment and Preventive Approaches

The main goal in diabetic polyneuropathy is not to completely reverse nerve damage, but to slow disease progression, reduce pain, relieve autonomic symptoms, and prevent foot ulcers and amputation. According to current clinical understanding, there is no specific treatment that fully restores diabetic nerve damage. Therefore, treatment should be carried out through a comprehensive approach.

First of all, improvement of glycemic control is essential. In type 2 diabetes, stabilization of blood glucose levels may slow the progression of neuropathy, although it does not fully restore already existing nerve loss. At the same time, weight reduction, blood pressure control, correction of dyslipidemia, and smoking cessation also reduce the risk of complications. ADA standards state that improved glucose control in type 2 diabetes may slow the progression of neuropathy, while management of body weight, blood pressure, and lipids is important in reducing the risk of diabetic neuropathy.

In painful diabetic polyneuropathy, medications are used mainly for symptomatic treatment. Modern recommendations include gabapentinoids, serotonin-norepinephrine reuptake inhibitors, tricyclic antidepressants, and sodium channel blockers as initial pharmacological treatment options. However, opioid medications, including tramadol and tapentadol, are not recommended for routine treatment because of the risk of adverse effects and should be considered only in rare circumstances.

Foot care is an essential part of preventing diabetic polyneuropathy-related complications. Every patient should undergo a complete foot examination at least once a year. The examination should include assessment of skin condition, deformities, calluses, pulses, capillary refill, and sensation. Patients with loss of protective sensation, previous ulcers or amputations, or peripheral arterial disease belong to the high-risk group, and their feet should be examined at every medical visit. Such patients require a multidisciplinary approach involving an endocrinologist, podiatrist, surgeon, neurologist, and nursing staff.

**Conclusion**

Diabetic polyneuropathy in type 2 diabetes mellitus is one of the most important and severe complications of the disease, directly affecting the patient's mobility, quality of life, and overall prognosis. Since polyneuropathy often begins gradually and without obvious symptoms, regular screening is necessary from the time of diagnosis. In particular, the 10 g monofilament test, assessment of vibration sensation, and evaluation of temperature and pain sensitivity are of great clinical value in the early detection of diabetic foot risk.

Effective management of the disease requires more than simple control of blood glucose levels. Blood pressure, lipid levels, body weight, smoking, foot hygiene, footwear selection, and the patient's self-care skills must also be monitored. Regular foot examination, patient education, identification of high-risk groups, and multidisciplinary medical care play a key role in preventing diabetic foot ulcers and reducing the risk of amputation. Thus, an early, systematic, and preventive approach to diabetic polyneuropathy is one of the most important strategies for reducing severe complications in patients living with type 2 diabetes mellitus.

**Reference**

1. American Diabetes Association Professional Practice Committee for Diabetes. (2026). Retinopathy, Neuropathy, and Foot Care: Standards of Care in Diabetes—2026. *Diabetes Care, 49*(Supplement 1), S261–S276.
2. Marso, S. P., et al. (2016). Liraglutide and cardiovascular outcomes in type 2 diabetes. New England Journal of Medicine.
3. Neal, B., et al. (2017). Canagliflozin and cardiovascular and renal events in type 2 diabetes. NEJM.
4. ERGASHEVA, G. T. (2024). OBESITY AND OVARIAN INSUFFICIENCY. *Valeology: International Journal of Medical Anthropology and Bioethics*, *2*(09), 106-111.
5. Ergasheva, G. T. (2024). Modern Methods in the Diagnosis of Autoimmune Thyroiditis. *American Journal of Bioscience and Clinical Integrity*, *1*(10), 43-50.
6. Tokhirovna, E. G. (2024). COEXISTENCE OF CARDIOVASCULAR DISEASES IN PATIENTS WITH TYPE 2 DIABETES. *TADQIQOTLAR. UZ*, *40*(3), 55-62.
7. Toxirovna, E. G. (2024). DETERMINATION AND STUDY OF GLYCEMIA IN PATIENTS WITH TYPE 2 DIABETES MELLITUS WITH COMORBID DISEASES. *TADQIQOTLAR. UZ*, *40*(3), 71-77.
8. Toxirovna, E. G. (2024). XOMILADORLIKDA QANDLI DIABET KELTIRIB CHIQARUVCHI XAVF OMILLARINI ERTA ANIQLASH USULLARI. *TADQIQOTLAR. UZ*, *40*(3), 63-70.
9. Toxirovna, E. G. (2024). QANDLI DIABET 2-TIP VA KOMORBID KASALLIKLARI BO'LGAN BEMORLARDA GLIKEMIK NAZORAT. *TADQIQOTLAR. UZ*, *40*(3), 48-54.

10. Tokhirovna, E. G. (2024). MECHANISM OF ACTION OF METFORMIN (BIGUANIDE) IN TYPE 2 DIABETES. *JOURNAL OF HEALTHCARE AND LIFE-SCIENCE RESEARCH*, *3*(5), 210-216.
11. Tokhirovna, E. G. (2024). THE ROLE OF METFORMIN (GLIFORMIN) IN THE TREATMENT OF PATIENTS WITH TYPE 2 DIABETES MELLITUS. *EUROPEAN JOURNAL OF MODERN MEDICINE AND PRACTICE*, *4*(4), 171-177.
12. Эргашева, Г. Т. (2024). Эффект Применения Бигуанида При Сахарным Диабетом 2 Типа И Covid-19. *Research Journal of Trauma and Disability Studies*, *3*(3), 55-61.
13. Toxirovna, E. G. (2024). QANDLI DIABET 2 TUR VA YURAK QON TOMIR KASALLIKLARINING BEMOLARDA BIRGALIKDA KECHISHI. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *38*(7), 202-209.
14. Эргашева, Г. Т. (2024). СОСУЩЕСТВОВАНИЕ ДИАБЕТА 2 ТИПА И СЕРДЕЧНО-СОСУДИСТЫХ ЗАБОЛЕВАНИЙ У ПАЦИЕНТОВ. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *38*(7), 219-226.