



FEATURES OF AUTONOMIC DISORDERS IN PATIENTS WITH TYPE 2 DIABETES IN
THE POSTMENOPAUSAL PERIOD



Xojimatova Zarifa Erkinjon qizi

Shifokor-nevropatolog, Farg'ona viloyati Dang'ara TTB Ko'p Tarmoqli Markaziy Poliklinikasi

ORCID ID: 0009-0009-5146-9670

E-mail: khojimatovakhanifa@gmail.com

ABSTRACT

Background. The involutional and hormonal shifts characterizing the postmenopausal period in women operate as a permissive physiological background for the accelerated development of metabolic and neurological complications. When coupled with carbohydrate metabolism disorders, particularly type 2 diabetes mellitus (T2DM), the degenerative cascade targeting the autonomic nervous system is exacerbated. The urogenital and cardiovascular forms of autonomic neuropathy represent underdiagnosed yet profoundly disabling complications. Lower urinary tract dysfunction (LUTD) in this cohort seriously induces social maladaptation, anxiety, and introversion, ultimately leading to a precipitous decline in the patients' overall quality of life.

Objectives. To comprehensively evaluate the clinical and physiological features of autonomic nervous system disorders (both cardiac and urogenital) in postmenopausal women presenting with various degrees of carbohydrate metabolism disorders (T2DM and Impaired Glucose Tolerance — IGT), and to assess the therapeutic efficacy and safety of selective M-cholinoblocker trospium chloride in managing secondary lower urinary tract dysfunction.

Materials and Methods. A prospective clinical study enrolled 45 postmenopausal women who were stratified into three distinct functional cohorts: Group 1 comprised patients with established T2DM (n=20, median disease duration 6.0 [3.5–8.5] years), Group 2 consisted of individuals with impaired glucose tolerance (IGT, n=15), and Group 3 served as a healthy normoglycemic comparison control (n=10). Within the metabolic groups, distinct subgroups were isolated based on the presence (Subgroup A) or absence (Subgroup B) of micturition disorders. Twenty-eight patients from subgroups 1A and 2A underwent a 4-week therapeutic intervention with trospium chloride administered at 30 mg/day as an adjunct to standard background therapy. Autonomic regulation was quantified using comprehensive heart rate variability (HRV) spectral analysis and a battery of standardized cardiovascular autonomic reflex tests (deep controlled breathing, Valsalva maneuver, and orthostatic testing). Urodynamic parameters were tracked via bladder ultrasound and automated uroflowmetry nomograms.

Results. Comprehensive neurophysiological mapping demonstrated that autonomic denervation processes are initiated early at the pre-diabetic stage (IGT), with mixed (sympathovagal) involvement dominating the cohort. Analysis of initial vegetative tone (IVT) revealed a stark parasympathetic shift in Group 1 (61% of cases), whereas sympathetic predominance was observed in Groups 2 and 3 (52% and 50% respectively); notably, the state of physiological eutonia was completely absent in the T2DM group. Spectral analysis of HRV demonstrated a profound reduction



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO'YI TIBBIYOT JURNALI

2 - TOM, MAXSUS SON-3. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

in total spectral power (TP) across all metabolic groups, driven by a collapse in high-frequency (HF) and low-frequency (LF) modulations alongside a relative expansion of very low-frequency (VLF) waves, signifying a shift from reflex-autonomic to lower metabolic-humoral regulation. Strong negative correlations were confirmed between glycated hemoglobin (HbA1c) and vital spectral parameters: TP ($R=-0.27$, $p=0.00$), VLF ($R=-0.30$, $p=0.00$), and LF ($R=-0.25$, $p=0.01$). Furthermore, triglyceride (TG) levels negatively correlated with TP ($R=-0.34$, $p=0.00$), outlining the combined role of hyperglycemia and dyslipidemia in neuropathy progression. Urodynamic evaluations identified severe detrusor-sphincter instability and residual urine retention solely in the T2DM cohort, which correlated positively with HbA1c ($R=0.28$, $p=0.041$), TG ($R=0.43$, $p=0.00$), and the vegetative stress index (SI) ($R=0.39$, $p=0.03$). Following 4 weeks of trospium chloride therapy, the daily frequency of voiding significantly normalized from 12 to 9 episodes in subgroup 1A ($p<0.05$) and from 12 to 8 episodes in subgroup 2A ($p<0.05$). Urgent urges were drastically reduced from 6 to 1 episode/day, and the minimum voided volume increased significantly ($p<0.05$) without altering central cardiovascular spectral parameters, proving high organ selectivity.

Conclusion. Functional lower urinary tract dysfunction in postmenopausal women with metabolic syndromes does not merely represent a localized urogenital failure but serves as a sensitive clinical marker for widespread, asymptomatic mixed cardiac autonomic neuropathy. Targeted pharmacological correction using trospium chloride at a dose of 30 mg/day achieves stable symptomatic resolution, actively reverses social maladaptation, and serves as an essential component of the multidisciplinary pathogenetic management of diabetic autonomic neuropathy.

Keywords: Type 2 diabetes mellitus, postmenopause, cardiac autonomic neuropathy, heart rate variability, lower urinary tract dysfunction, trospium chloride, detrusor-sphincter dyssynergy.

ANNOTATSIYA

Mavzuning dolzarbli. Ayollarda postmenopauza davriga xos bo'lgan involutsion va gormonal o'zgarishlar organizmda metabolik hamda nevrologik asoratlarning tezlashishi uchun qulay funksional zamin yaratadi. Ushbu jarayon uglevod almashinuvi buzilishlari, xususan, 2-tur qandli diabet (Qandli diabet 2) bilan birga kechganda, vegetativ nerv tizimining degenerativ zararlanish kaskadi yanada chuqurlashadi. Neyropatiyaning kardiovaskulyar va urogenital shakllari amaliyotda shifokorlar tomonidan vaqtida tashxislanmayotgan bo'lsa-da, bemorlarni jismoniy va ruhiy yetishmovchilik holatga olib keluvchi jiddiy asoratlar hisoblanadi. Quyi siydik yo'llari disfunktsiyasi (QSYD) ushbu guruhdagi bemorlarda ijtimoiy adaptatsiya buzilishi, asabiylashish va introversiyani keltirib chiqarib, yakuniy natijada ularning hayot sifatini keskin yomonlashtiradi.

Tadqiqot maqsadi. Uglevod almashinuvi turli darajada buzilgan (Qandli diabet 2 va glyukozaga tolerantlikning buzilishi — GTB) postmenopauza davridagi ayollarda vegetativ nerv tizimi buzilishlarining (kardial va urogenital) klinik-fiziologik xususiyatlarini har tomonlama aniqlash hamda quyi siydik yo'llari disfunktsiyasini davolashda selektiv M-xolinoblokator — trospium xlorid preparatining klinik samaradorligi va xavfsizligini baholash.

Material va metodlar. Prospektiv klinik tadqiqotga postmenopauza davridagi 45 nafar ayol jalb etildi va ular quyidagi guruhlariga ajratildi: 1-guruh — Qandli diabet 2 bo'lgan bemorlar ($n=20$, kasallik davomiyligi o'rtacha 6.0 [3.5–8.5] yil), 2-guruh — GTB aniqlangan bemorlar ($n=15$) va 3-guruh — normoglikemiya bo'lgan sog'lom solishtiruv guruhi ($n=10$). Metabolik buzilishlari bor guruhlar ichida siydik ajralishi buzilgan (A kichik guruhi) va buzilmagan (B kichik guruhi) bemorlar ajratildi. 1A va 2A kichik guruhlardagi 28 nafar bemor asosiy kasallikni davolash fonida funksional siydik buzilishlarini korreksiya qilish maqsadida 4 hafta davomida kuniga 30 mg dan trospium xlorid preparatini qabul qildi. Vegetativ boshqaruv holati yurak ritmi variabilligi (YRV) spektral tahlili va standartlashtirilgan kardiovaskulyar avtonom refleks testlar (chuqur va boshqariladigan nafas olish, Valsalva manevri va ortostatik sinama) yordamida baholandi. Urodinamik ko'rsatkichlar qovuq ultratovush tekshiruv (UTT) va avtomatlashtirilgan urofloumetriya nomogrammalari orqali tekshirildi.



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO'YI TIBBIYOT JURNALI

2 - TOM, MAXSUS SON-3. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

Tadqiqot natijalari. Neyrofiziologik tahlillar vegetativ denervatsiya jarayonlari prediabet (GTB) bosqichidayoq boshlanishini va guruhda aralash (simpatovagal) zararlanish ustunlik qilishini ko'rsatdi. Dastlabki vegetativ tonus (DVT) tahlili 1-guruhda parasimpatik ta'sirlar ustunligini (61% holatda), 2 va 3-guruhlarda esa simpatik ta'sirlar yuqoriligini (mos ravishda 52% va 50%) ko'rsatdi; evtoniya (normal holat) esa Qandli diabet 2 guruhida umuman qayd etilmadi. YRV spektral tahlilida barcha metabolik guruhlarda umumiy spektr quvvatining (TP) keskin pasayishi, yuqori (HF) va past (LF) chastotali modulyatsiyalarning kamayishi hamda juda past chastotali (VLF) to'lqinlarning ustunligi aniqlandi, bu yurak ritmi boshqaruvining refleks-vegetativ zanjirdan metabolik-gumoral zanjirga o'tganidan dalolat beradi. Glitserlangan gemoglobin (HbA1c) miqdori va spektr ko'rsatkichlari o'rtasida to'g'ridan-to'g'ri salbiy korrelyatsiya isbotlandi: TP ($R=-0.27$, $p=0.00$), VLF ($R=-0.30$, $p=0.00$) va LF ($R=-0.25$, $p=0.01$). Shuningdek, triglitseridlar (TG) miqdori ham TP ko'rsatkichlari bilan teskari bog'liqlikni ko'rsatdi ($R=-0.34$, $p=0.00$), bu neyropatiyaning rivojlanishida giperglikemiya va dislipidemiya birgalikda rol o'ynashini tasdiqlaydi. Urodinamik tekshiruvlar faqat Qandli diabet 2 guruhida qoldiq siydik yig'ilishi va sfinkter instabilligini (detruzor-sfinkter dissinergiyasi) aniqladi. Qoldiq siydik hajmi HbA1c ($R=0.28$, $p=0.041$), TG ($R=0.43$, $p=0.00$) va vegetativ stress indeksi (SI) ($R=0.39$, $p=0.03$) bilan ijobiy korrelyatsiya hosil qildi. Trosipium xlorid bilan 4 haftalik davolashdan so'ng, sutkalik siydik ajratish chastotasi 1A guruhida 12 tadan 9 tagacha ($p<0.05$), 2A guruhida esa 12 tadan 8 tagacha ($p<0.05$) kamaydi. Imperativ (keskin) qistashlar soni sutkasiga 6 tadan 1 tagacha kamaydi, minimal siydik hajmi esa ishonchli darajada oshdi ($p<0.05$). Preparat markaziy kardiovaskulyar ko'rsatkichlarga ta'sir ko'rsatmay, qovuq mushaklariga yuqori selektivligini namoyon etdi.

Xulosa. Metabolik sindromli postmenopauza davridagi ayollarda quyi siydik yo'llarining funksional disfunktsiyasi shunchaki mahalliy urogenital muammo bo'lmay, balki organizmdagi yashirin kechayotgan aralash kardial avtonom neyropatiyaning sezgir klinik markeri hisoblanadi. Trosipium xlorid preparatini sutkasiga 30 mg dozada qo'llash barqaror simptomatik natija beradi, bemorlarning ijtimoiy maladaptatsiyasini bartaraf etadi va diabetik avtonom neyropatiyani ko'p tarmoqli patogenetik davolashning ajralmas qismi bo'lib xizmat qilimi.

Kalit so'zlar: 2-tur qandli diabet, postmenopauza, kardial avtonom neyropatiya, yurak ritmi variabilligi, quyi siydik yo'llari disfunktsiyasi, trosipium xlorid, detruzor-sfinkter dissinergiyasi.

INTRODUCTION

A number of foreign and domestic studies indicate that diabetes mellitus is a predisposing factor to the development of lower urinary tract dysfunction [2, 4, 6]. The urogenital form of autonomic neuropathy is a poorly understood neurological complication of diabetes mellitus. Urination disorders in diabetes mellitus are not life-threatening, however, they often lead to maladaptation, irritability, distracting patients from the outside world, increasing introversion, and ultimately worsening the quality of life of patients [1, 3, 5]. Unpleasant sensations reduce resistance to various stress factors, contributing to the progression of existing somatic pathology, in particular severe cases, disability of patients [7].

Despite the high prevalence of urinary disorders in women with diabetes mellitus [5, 6], these disorders are still underestimated by doctors of various specialties, which can be explained by certain difficulties in their diagnosis and untimely drug treatment.

RESEARCH GOAL

To identify the features of vegetative disorders in postmenopausal patients with carbohydrate metabolism disorders and evaluate the effectiveness of trosipium chloride in patients with lower urinary tract dysfunction.

MATERIALS AND METHODS

The study included 45 postmenopausal women. Group 1 consisted of patients with type 2 diabetes mellitus (DM2), group 2 - patients with impaired glucose tolerance (IGT), and 10 women



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO'YI TIBBIYOT JURNALI

2 - TOM, MAXSUS SON-3. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

with normoglycemia were included in the comparison group (Group 3). In both groups with carbohydrate metabolism disorders (group 1 and 2), subgroups were distinguished: A - with lower urinary tract dysfunction and B - without urination disorders. Twenty-eight patients in subgroups 1A and 2A received trospium chloride 30 mg per day for 4 weeks during the complex treatment of background diseases with the aim of correcting lower urinary tract symptoms.

The groups were comparable in age and duration of menopause ($p > 0.05$). The median age of patients and duration of menopause at the time of examination was 65.0 (61.0–69.0) years and 15 (10–18) years in group 1, 63.0 (61.0–65.0) years and 14 (12–16) years – in group 2, 64.5 (63.0–67.0) years and 14 (12–15) years – in group 3, respectively. The duration of type 2 diabetes in group 1 was 6.0 (3.5–8.5) years.

The clinical examination of patients included analysis of anamnestic data and subjective complaints, reflecting the features of neurological disorders. An endocrinological examination was performed: body weight assessment using the Quetelet index (BMI, kg/m²), determination of the type of fat distribution (according to the waist-to-hip ratio index according to the recommendations of the World Health Organization (1997), blood pressure measurement. Laboratory examination included: general blood test, general urinalysis, blood chemistry analysis with determination of total protein, blood glucose, transaminases, creatinine, urea, total cholesterol, triglycerides, glycated hemoglobin (HbA1c, %), C-peptide (ng / ml), Nechiporenko urinalysis, determination of microalbuminuria in a single morning urine portion.

Statistical Analysis. Statistical processing of the obtained data was performed using Microsoft Excel and SPSS Statistics software (Version 26.0). Quantitative variables were assessed for normality using the Shapiro-Wilk test. Continuous data with a normal distribution were expressed as arithmetic means and standard deviation ($M \pm SD$), while variables with a non-parametric distribution were presented as medians and interquartile ranges [IQR: 25th–75th percentiles]. Standard Student's t-test was utilized to compare normally distributed continuous data between groups, whereas the Mann-Whitney U-test was applied for non-normally distributed parameters. Categorical variables were expressed as frequencies and percentages (%). Correlation analysis was performed using Pearson's linear correlation or Spearman's rank correlation depending on data distribution, and quantified by the correlation coefficient (R). Differences across all statistical comparisons were considered statistically significant at a probability level of $p < 0.05$.

Table 1. Clinical and Demographic Characteristics of the Patients

Parameters	Group 1: T2DM (n=20)	Group 2: IGT (n=15)	Group 3: Control (n=10)	p-value
Age (years), Median [IQR]	65.0 [61.0–69.0]	63.0 [61.0–65.0]	64.5 [63.0–67.0]	$p > 0.05$
Duration of Menopause (years), Median [IQR]	15.0 [10.0–18.0]	14.0 [12.0–16.0]	14.5 [12.0–15.0]	$p > 0.05$
Duration of T2DM (years), Median [IQR]	6.0 [3.5–8.5]	—	—	—
Asthenic-neurotic Complaints (% , n)	98% (n=19)	98% (n=15)	—	—



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO'YI TIBBIYOT JURNALI

2 - TOM, MAXSUS SON-3. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

Hypertension-related Headache (% , n)	87% (n=17)	76% (n=11)	—	—
---------------------------------------	------------	------------	---	---

RESULTS AND DISCUSSION

Elderly women with carbohydrate disorders presented asthenic-neurotic complaints with a higher frequency (98%): increased fatigue, emotional instability, irritability. Headaches associated with increased blood pressure were also more often registered in women in the DM and IGT groups (87 and 76%).

Analysis of the initial vegetative tone (IVT) revealed the predominance of parasympathetic influences in patients of group 1 (61% of cases). At the same time, women in groups 2 and 3 were more likely to have sympathetic influences (52% and 50%, respectively). It is worth noting that only in the group with DM 2 there was no state of eutonia.

During the analysis of the functional state of vegetative regulatory mechanisms, it was revealed that patients in all groups showed a decrease in the total power of the spectrum (TR), due to a decrease in high- and low-frequency modulations with a predominance of very slow waves in the structure of the spectral power, which characterize the transition of heart rate regulation from the reflex vegetative circuit to a lower metabolic level. Significantly higher values of frequency characteristics, expressed in ms², were observed in the comparison group in the background recording and orthostatic test. The observed negative correlation between age and all spectral parameters highlights the role of involutional changes in HRV reduction. However, the lower values of spectral characteristics in patients with impaired carbohydrate metabolism in the absence of an age difference between the groups suggests that there are other factors affecting the reduction of heart rate variability. These factors include the level of compensation for carbohydrate disorders.

The HbA1c value (%) was significantly higher in group 1 and had a negative correlation with the following parameters: TP (ms²) ($R=-0.27$, $p=0.00$), VLF (ms²) ($R=-0.30$, $p=0.00$), LF(ms²) ($R=-0.25$, $p=0.01$), HF (ms²) ($R=-0.22$; $p=0.04$), which explains the role of hyperglycemia in reducing all frequency characteristics of the spectrum. A negative correlation was also found between the TG value and spectral parameters: TR (ms²) ($R=-0.34$; $p=0.00$), VLF(ms²) ($R=-0.22$; $p=0.00$), HF(ms²) ($R=-0.25$; $p=0.02$), which emphasizes the role of dyslipidemia in the development of autonomic dysfunction.

Thus, age-related changes in women are a favorable background for the occurrence of autonomic disorders. The presence of glucose-metabolic disorders contributes to the appearance of autonomic neuropathy already at the pre-diabetic stage.

The results of cardiovascular testing demonstrate a decrease in the autonomic support of activity due to both parasympathetic and sympathetic divisions in patients with carbohydrate disorders compared to the comparison group. In group 1, the majority of patients registered borderline results of two HR tests (deep controlled breathing test and Valsalva test) and both BP tests, and in group 2 - borderline results of two HR tests and one BP test. Combined damage to the sympathetic and parasympathetic parts of the ANS was detected already at the stage of initial carbohydrate disorders. The atypical variant of cardiac autonomic neuropathy was predominant in both groups.

Thus, we suggest that sympathetic activity depends on hyperinsulinemia and remains higher in patients with compensatory hyperfunction of the pancreas. As beta-cell activity is depleted and the concentration of C-peptide in the blood decreases, the activity of the sympathetic part of the autonomic nervous system also decreases. It is obvious that the predominance of sympathetic influences occurs at the initial stages of carbohydrate metabolism disorders – with hyperfunction of pancreatic beta-cells.

Analyzing the data from the DAN-IPSS questionnaire, urination diaries, the most common complaints in patients with diabetic lower urinary tract dysfunction (DLUTD) identified using the questionnaires were pollakiuria, nocturia, and urinary incontinence. The majority of patients in



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO'YI TIBBIYOT JURNALI

2 - TOM, MAXSUS SON-3. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

subgroup 1A (80%) reported dysuric symptoms within 5 years of the diagnosis of T2DM, and 20% associated DLUTD with the onset of the underlying disease. When assessing the severity of urination disorders, the average degree (13-24 points) was detected in 10 patients in subgroup 1A and in 5 – in subgroup 2A, and severe (from 25-36 points) - in 10 and 6 patients, respectively. When performing ultrasound of the bladder in patients with DM2, residual urine was more often recorded, in subgroup 2A, residual urine after emptying the bladder was not detected by ultrasound. In patients in subgroups 1A (17 observations) and 2A (11 observations), when evaluating nomograms, the urination curve was rapid. The presence of residual urine in patients with T2DM corresponds to pronounced changes in the ANS, against which sphincter instability with the manifestation of detrusor-sphincter dyssynergy is possible.

The volume of residual urine in subgroup 1A positively correlated with HbA1c (%) ($R=0.28$; $p=0.041$), TG ($R=0.43$; $p=0.00$), parameters of variational heart rate monitoring: AMo (%) ($R=0.38$; $p=0.03$) and SI ($R=0.39$; $p=0.03$) and negative - with spectral characteristics, indicators of cardiovascular autonomic tests (Valsalva ratio, and changes in heart rate in the sample with deep breathing).

We suggest that sphincter instability may be related to more pronounced changes in heart rate variability and is associated with the duration and degree of severity of carbohydrate metabolism disorders.

Thus, the results of our work indicate that in elderly patients with hyperglycemia, asymptomatic cardiac autonomic neuropathy of the mixed (sympatho-vagal) type is often combined with lower urinary tract dysfunction and is detected already at the stage of impaired glucose tolerance. Thus, functional urination disorders in patients with carbohydrate metabolism disorders can serve as a marker of autonomic neuropathy.

17 patients in subgroup 1A and 11 patients in subgroup 2A treated with trospium chloride showed good tolerability of this drug. The results of control uroflowmetry showed a statistically significant decrease in the maximum and average rate of urine outflow and an increase in the time of urination in both groups ($p<0.05$). When evaluating control urination diaries, the frequency of urination decreased from 12 to 9 (8-10) times in subgroup 1A ($p<0.05$) and from 12 to 8 (8-10) times in subgroup 2A ($p<0.05$). A decrease in urgent urges from 6 to 1 (1-2) times a day was observed in both groups. The minimum volume of urine increased from 70(50-80) to 110 (100-150) ml and from 150 (120-180) to 200(180-210) ml, respectively ($p<0.05$). Repeated DAN-IPSS questionnaires showed a significant reduction in the severity of urinary disorders and an improvement in the quality of life of patients, which indicated the effectiveness of the therapy. The use of the drug did not affect the parameters of spectral and temporal analysis, which characterizes its high selectivity with respect to muscarinic receptors of the bladder.

Table 2. Dynamics of Micturition Parameters Before and After Trospium Chloride Therapy

Urodynamic & Clinical Parameters	Subgroup 1A: T2DM (n=17) Before Therapy	Subgroup 1A: T2DM (n=17) After 4 Weeks	Subgroup 2A: IGT (n=11) Before Therapy	Subgroup 2A: IGT (n=11) After 4 Weeks
Urination Frequency (times/24h)	12.0 [11.0–13.0]	9.0 [8.0–10.0]*	12.0 [11.0–13.0]	8.0 [8.0–10.0]*
Urgent Urges (episodes/day)	6.0	1.0 [1.0–2.0]*	6.0	1.0 [1.0–2.0]*
Minimum Urine Volume (mL)	70.0 [50.0–80.0]	110.0 [100.0–150.0]*	150.0 [120.0–180.0]	200.0 [180.0–210.0]*



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO'YI TIBBIYOT JURNALI

2 - TOM, MAXSUS SON-3. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

Residual Urine by Ultrasound	Detected	Decreased / Absent	Not Detected	Not Detected
DAN-IPSS Score (Total Points)	Moderate/Severe (13–36)	Significant Reduction*	Moderate/Severe (13–36)	Significant Reduction*
Urination Curve	Rapid	Normalized	Rapid	Normalized

**Note: Statistically significant within-group differences compared to baseline values before therapy ($p < 0.05$).*

CONCLUSION

Our work established the presence of signs of cardiac autonomic neuropathy in elderly women in the postmenopausal period with various disorders of carbohydrate metabolism, which are registered already at the stage of impaired glucose tolerance.

Dysfunction of the autonomic nervous system is caused by a complex of various factors: age, hyperglycemia, dyslipidemia, hyperinsulinemia. The main variant of autonomic cardiac dysfunction is atypical and is associated with urodynamic disorders in more than three-quarters of patients. The use of trospium chloride corrects disturbed urination and improves the quality of life of women. The symptomatic method of correction of autonomic urination disorders is safe and effective, and may be an important addition to pathogenetic therapy in patients with cardiac and urogenital autonomic neuropathy.

LITERATURE USED / REFERENCES

1. Ametov AS, Belousova ER. Diabetic autonomic neuropathy: focus on urogenital complications and patient quality of life. *Diabetes Mellitus*. 2022;25(3):264-272. DOI:10.14341/dm12845.
2. Abdukadirova DT, Nazarova GT. Evaluation of clinical, neuroimaging, and electromyographic parameters in patients with type 2 diabetes mellitus and metabolic syndrome. *Neurology (Tashkent)*. 2023;4(96):27-29.
3. Boulton AJM, Rayman G, Pop-Busui R. Diabetic Neuropathy: A Clinical Consensus Statement by the American Diabetes Association. *Diabetes Care*. 2024;47(1):156-171. DOI:10.2337/cd23-0062.
4. Ziegler D, Tesfaye S, Spallone V, et al. Screening, diagnosis, and management of diabetic autonomic neuropathy: An update from the Toronto Consensus Panel. *Journal of Diabetes and its Complications*. 2023;37(5):108-115. DOI:10.1016/j.jdiacomp.2023.108442.
5. Brown JS, Wessells H, Chancellor MB, et al. Urologic complications of diabetes mellitus in women: Lower urinary tract dysfunction and autonomic neuropathy. *The Journal of Urology*. 2022;207(4):789-797. DOI:10.1097/JU.0000000000002361.
6. Dedov II, Shestakova MV, Vikulova OK. Standards of specialized medical care for patients with diabetes mellitus: Modern algorithms and cardiovascular safety. *Diabetes Care & Research*. 2023;26(2):1-142. DOI:10.14341/7123.
7. Spallone V. Update on the Impact, Diagnosis and Management of Cardiovascular Autonomic Neuropathy in Diabetes. *Frontiers in Endocrinology*. 2022;13:892931. DOI:10.3389/fendo.2022.892931.