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**ТИББИЁТДА ЯНГИ КУН
НОВЫЙ ДЕНЬ В МЕДИЦИНЕ
NEW DAY IN MEDICINE**

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CHARACTERISTICS OF BIOCHEMICAL PARAMETERS OF PATIENTS WITH CHRONIC PROSTATITIS DEPENDING ON AGE

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✓ Resume

The article examines clinical and biochemical features of chronic prostatitis combined with metabolic syndrome in different age groups. A comparative analysis of lipid profiles, glycated hemoglobin levels, homocysteine, vitamin D, and antioxidant activity revealed pronounced age-related changes. The data confirm the progression of metabolic and inflammatory processes with age, requiring a personalized approach to diagnosis and treatment.

Keywords: chronic prostatitis, metabolic syndrome, lipid profile, homocysteine, vitamin D, antioxidants.

ХАРАКТЕРИСТИКА БИОХИМИЧЕСКИХ ПОКАЗАТЕЛЕЙ БОЛЬНЫХ ХРОНИЧЕСКИМ ПРОСТАТИТОМ В ЗАВИСИМОСТИ ОТ ВОЗРАСТА

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✓ Резюме

В статье рассматриваются клинико-биохимические особенности хронического простатита в сочетании с метаболическим синдромом в разных возрастных группах. Проведён сравнительный анализ липидного спектра, уровня гликированного гемоглобина, гомоцистеина, витамина D и антиоксидантной активности, что позволило выявить выраженные возрастные изменения. Полученные данные подтверждают прогрессирование метаболических и воспалительных процессов с возрастом, требующих персонализированного подхода к диагностике и терапии.

Ключевые слова: хронический простатит, метаболический синдром, липидный спектр, гомоцистеин, витамин D, антиоксиданты.

YOSH KESIMIDA SURUNKALI PROSTATITI BO‘LGAN BEMORLAR BIOKIMYOVIY KO‘RSATKICHLARINING XUSUSIYATLARI

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✓ Rezyume

Maqolada surunkali prostatit va metabolik sindrom kombinatsiyasining turli yosh guruhlaridagi klinik va biokimyoviy xususiyatlari ko‘rib chiqilgan. Lipid spektri, glikozillangan gemoglobin, gomosistein, D vitamini va antioksidant faollikning taqqoslash tahlili yoshga bog‘liq o‘zgarishlarni aniqladi. Ma‘lumotlar yallig‘lanish va metabolik jarayonlarning yosh o‘tishi bilan kuchayishini tasdiqlab, diagnostika va davolashda shaxsiy yondashuv zarurligini ko‘rsatdi.

Kalit so‘zlar: surunkali prostatit, metabolik sindrom, lipid spektri, gomosistein, D vitamini, antioksidantlar.

Relevance

Chronic prostatitis (CP) combined with metabolic syndrome (MS) is a serious medical and social problem in modern urology, especially in young people. These conditions are characterized by high prevalence, impaired quality of life of patients and a significant risk of complications [2, 6, 12, 15]. In terms of prevalence, prostatitis is second only to benign prostatic hyperplasia and prostate cancer, ranking third among diseases of this organ [1, 3, 7, 15]. According to global data, about 8.2% of men face this disease, and every second man in his life experiences pain caused by prostatitis [3, 4, 10, 13]. The combined effect of CP and MS leads to a decrease in reproductive function, sexual dysfunction and an increased risk of cardiovascular complications, which makes this problem extremely relevant [5, 8, 9, 11, 14].

Purpose of the study: to study the clinical and biochemical features of chronic prostatitis in combination with metabolic syndrome in a comparative aspect at different ages.

Materials and methods of research

To carry out this research work, 111 men with chronic prostatitis who applied to the urology department of the Bukhara Regional Multidisciplinary Medical Center were examined in the period from 2023 to 2024. The diagnosis was established based on clinical and functional data in accordance with the international consensus on the diagnosis and treatment of urological diseases (ICD-10). The diagnoses were verified based on a thorough collection of anamnesis, clinical, laboratory (general blood test, urine test), biochemical blood test, instrumental (ultrasound, CT, MRI). Particular attention was paid to the duration of the pathological process, past and concomitant diseases.

SOD, homocysteine, CRP, SOD, vitamin D were determined in blood serum using the solid-phase enzyme immunoassay method, according to the attached instructions. The set uses a "sandwich" version of the solid-phase enzyme immunoassay. The test set "Protein Contour" (St. Petersburg, Russia) was used.

Research results and their discussion

Analysis of data on the distribution of patients with chronic prostatitis shows that the largest proportion of patients (40.5%) are young men under 44 years of age. This indicates a pronounced tendency for the pathology to become younger, which is probably due to the modern lifestyle, including sedentary lifestyle, chronic stress, changes in sexual behavior and exposure to infectious factors. Young patients are becoming a new key risk group, which requires special attention from doctors and researchers.

According to the World Health Organization (WHO), the classification of people's ages is divided into three groups: Young age: 18-44. Middle age: 45-59. Elderly people: 60-74. Based on the data obtained during the analysis of age composition, the following groups were formed:

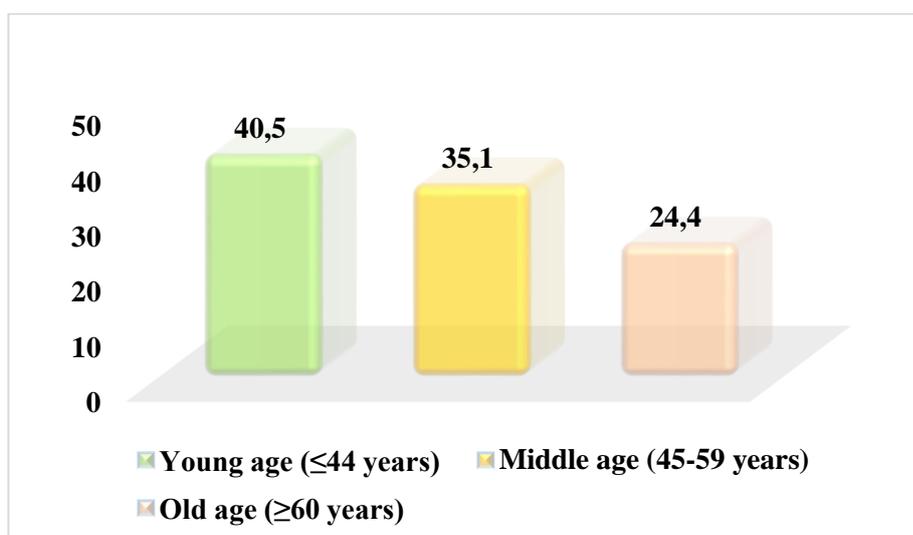


Fig. 1. Age of examined patients with chronic prostatitis (%), ($P \leq 0.05$)

- 1st young age group - 45 men with chronic pancreatitis (40.5%).
- 2nd group average age – 39 men with CP (35.1%).
- 3rd group elderly - 27 men (24.4%).
- comparison group - 20 healthy men appropriate age.

In the age group of 45–59 years, chronic prostatitis is diagnosed in 37.9% of patients, which confirms the relevance of the problem for middle age. The consistently high incidence rate in this group may be associated with the accumulation of risk factors, such as hormonal changes, chronic inflammatory processes.

In elderly men over 60 years of age, the proportion of patients with chronic prostatitis is significantly lower and amounts to 16.5%. (Fig. 1).

Analysis of anthropometric parameters in patients with chronic prostatitis shows that the body mass index (BMI) increases from normal in young patients (24.6 ± 0.31) to overweight in middle age (28.1 ± 0.39) and remains at a high level in the elderly (27.5 ± 0.42).

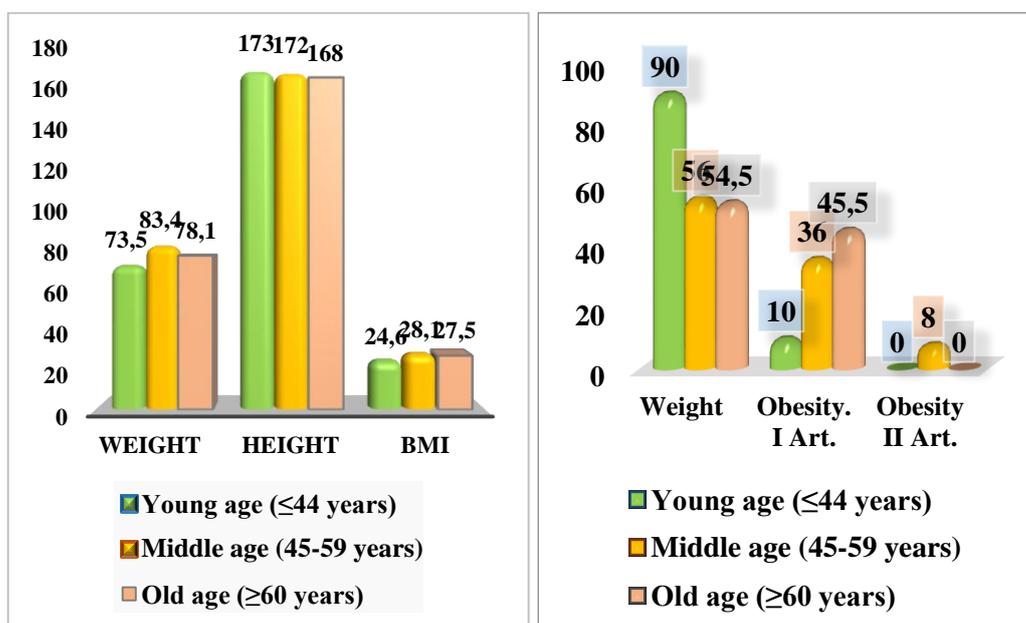


Fig. 2. Anthropometric data in patients with chronic prostatitis

Obesity and overweight observed in middle-aged and elderly patients are an important component of metabolic syndrome, which is associated with an increased risk of cardiovascular diseases and diabetes (Fig. 2). These changes are associated with an age-related decrease in metabolism, a decrease in physical activity, and a redistribution of fat mass. Control of body weight and physical activity is especially important for middle-aged and elderly patients to reduce the risk of complications of chronic prostatitis and associated diseases.

Analysis of body weight distribution data in patients with chronic prostatitis shows that overweight is most common in young patients (90%), while grade I obesity predominates in middle-aged (36%) and elderly (45.5%) patients. Grade II obesity is observed only in middle-aged men (8%), which may be due to the peak load of metabolic disorders in this group. With age, the proportion of overweight decreases, but the frequency of grade I obesity increases, indicating the progression of metabolic disorders with age.

In the next step, we divided each age group into two subgroups depending on the presence of metabolic syndrome and conducted a comparative analysis of biochemical parameters.

In the first group, metabolic syndrome was detected in 20 patients, in the second group in 25, and in the third in 15 patients with chronic prostatitis.

Patients with chronic prostatitis and metabolic syndrome have significant lipid metabolism disorders, which manifest themselves in all age groups. The level of total cholesterol (TC) in these patients significantly exceeds the norm in the control group (4.36 ± 0.05 mmol/l) and is 6.92 ± 0.06 mmol/l in young patients (≤ 44 years), 6.51 ± 0.06 mmol/l in middle-aged patients (45–59 years), and

7.5±0.07 mmol/l in elderly patients (≥60 years). Low-density lipoproteins (LDL), which contribute to the development of atherosclerosis, are also elevated: their level increases with age from 3.94±0.03 mmol/l in young patients to 4.93±0.02 mmol/l in elderly patients, which reflects the progression of atherogenic processes.

At the same time, a decrease in the level of high-density lipoproteins (HDL), which provide anti-atherogenic protection, is noted. In young patients, it is 0.82±0.01 mmol/l, in middle-aged patients — 0.86±0.01 mmol/l, and in the elderly — 0.73±0.004 mmol/l, which is significantly lower than the control group norm (1.36±0.1 mmol/l). A decrease in HDL indicates a deterioration in the mechanisms of protection against atherosclerosis and a high risk of cardiovascular complications (Fig. 3).

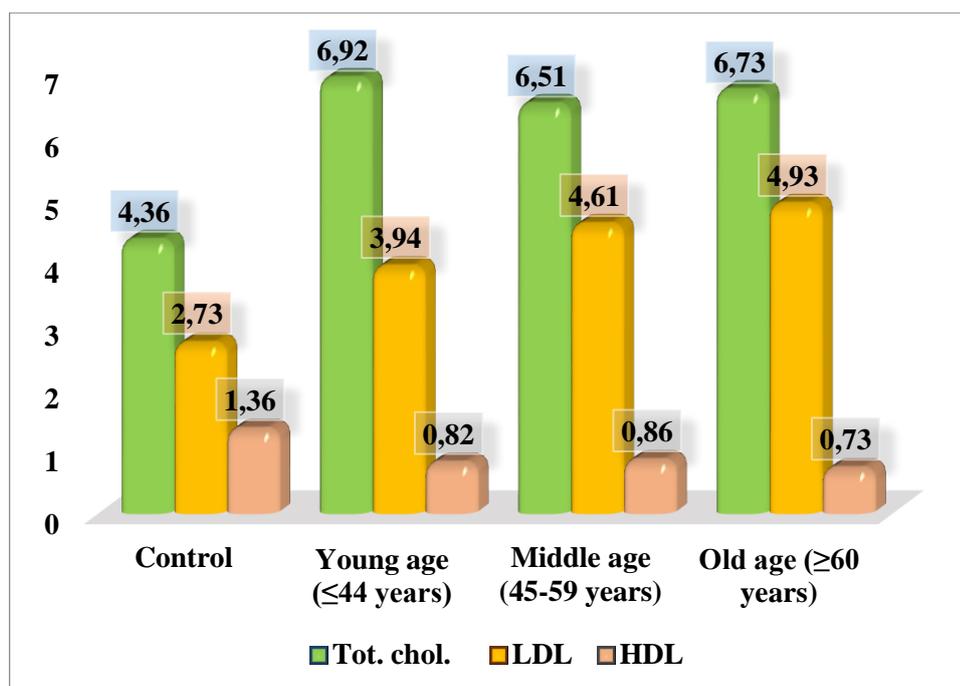


Fig. 3. Lipid spectrum in patients with chronic prostatitis (mmol/l)

Thus, lipid spectrum disorders in patients with chronic prostatitis and metabolic syndrome are characterized by an increase in the level of TC and LDL with a simultaneous decrease in HDL, which increases with age. These changes require active correction aimed at normalizing lipid metabolism, including diet therapy, increased physical activity and the administration of lipid-lowering drugs. A comprehensive approach to the treatment of metabolic syndrome is important for reducing the risk of cardiovascular complications and improving the quality of life of patients.

When analyzing glucose levels, it was found that in middle-aged patients it was elevated in 11.1%, and in elderly patients 29.6%. However, no increase in glucose levels was found among young patients.

The level of glycated hemoglobin (HbA1c) in patients with chronic prostatitis and metabolic syndrome demonstrates pronounced disorders of carbohydrate metabolism in all age groups, significantly exceeding the indicators of the control group (5.82%). In young patients (≤44 years), the HbA1c level is 10.8%, indicating early signs of insulin resistance characteristic of metabolic syndrome. In the middle-aged group (45–59 years), the indicator decreases to 9.82%, which may be associated with the preservation of compensatory mechanisms characteristic of this age group. However, it still remains significantly higher than normal, reflecting the ongoing impact of metabolic disorders.

In elderly patients (≥60 years), the level of glycated hemoglobin reaches its maximum value of 11.7%, which indicates the most pronounced disorders of carbohydrate metabolism and a decrease in the adaptive capacity of the body. Comparison of groups shows that in young patients the level of HbA1c is higher than in middle-aged men (10.8% versus 9.82%), but lower than in the elderly

(11.7%). This indicates that early disorders of carbohydrate metabolism increase with age, reaching a maximum in elderly patients. (Fig. 4)

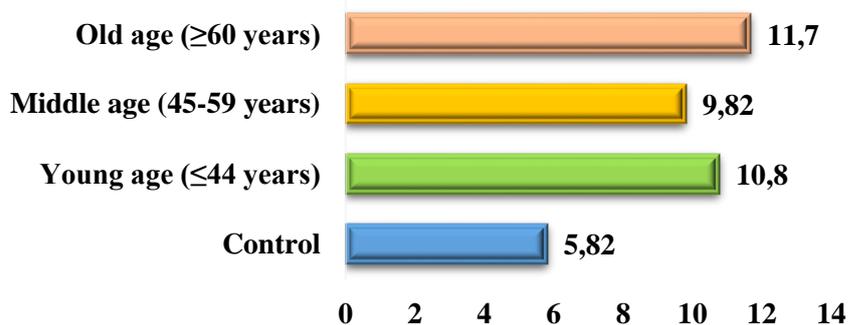


Fig. 4. Analysis of the level of glycated hemoglobin in the examined subjects (%)

Thus, all patients with chronic prostatitis and metabolic syndrome have significant disorders of carbohydrate metabolism, which progress with age. The most pronounced indicators are observed in the elderly group, which requires special attention to the prevention and treatment of these disorders, including dietary correction, physical activity. Comparison of age groups emphasizes the need for an age-specific approach to managing metabolic syndrome.

Homocysteine is a sulfur-containing amino acid that is formed in the body as a result of methionine metabolism. Under normal conditions, homocysteine levels are strictly regulated by enzymes and B vitamins, ensuring its conversion into non-toxic compounds. However, under pathological conditions, the concentration of homocysteine in the blood and tissues can increase significantly, which is associated with its effect on inflammatory processes and oxidative stress. Homocysteine levels in patients with chronic prostatitis and metabolic syndrome significantly exceed the control group ($6.25 \pm 0.15 \mu\text{mol/l}$), indicating severe metabolic and inflammatory disorders. Young patients (≤ 44 years) have the highest homocysteine levels of $16.5 \pm 0.11 \mu\text{mol/l}$, which is associated with a deficiency of B vitamins (B6, B12 and folic acid), active inflammation and metabolic changes characteristic of metabolic syndrome. In middle-aged men (45–59 years), the homocysteine level decreases slightly to $12.7 \pm 0.06 \mu\text{mol/l}$, which may be associated with partial stabilization of metabolic processes, although it still remains significantly higher than normal (Fig. 5).

In elderly patients (≥ 60 years), homocysteine levels are $9.57 \pm 0.06 \mu\text{mol/L}$, which is higher than the control values but lower than in younger groups. This decrease may be due to a decrease in metabolic activity and hormonal changes that accompany aging, despite persistent inflammation and chronicity.

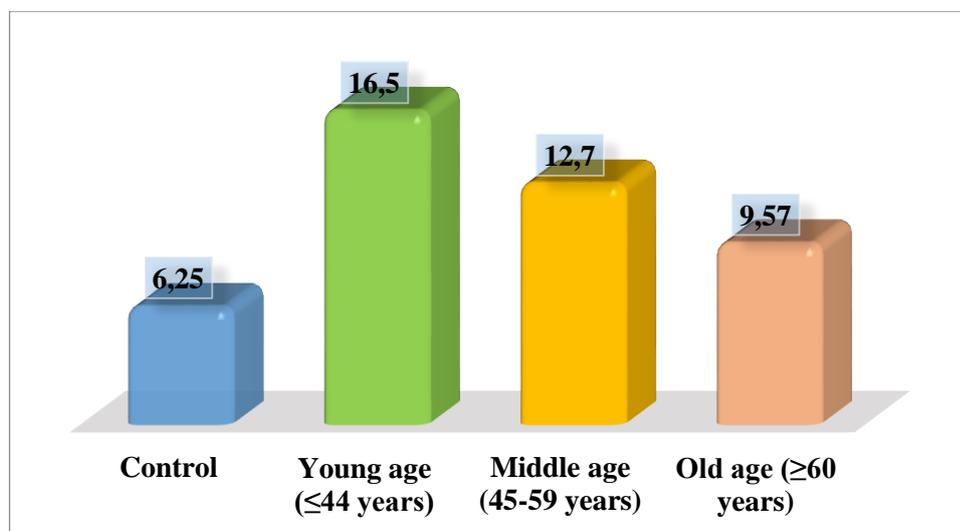


Fig. 5. Homocysteine level in those examined (μmol/l)

Thus, the most pronounced metabolic disorders are observed in young patients, which emphasizes the importance of early diagnosis and correction. Homocysteine levels remain elevated in all age groups, which requires a comprehensive approach to treatment, including the elimination of B vitamin deficiency, dietary modification, and control of inflammatory processes. These measures are necessary to reduce the risk of complications, such as cardiovascular diseases associated with elevated homocysteine.

The percentage level of C-reactive protein (CRP) demonstrates age-related changes in the severity of the inflammatory process in patients with chronic prostatitis. The highest level of CRP (36.9%) is observed in young patients (≤ 44 years), indicating an active phase of inflammation. In middle age (45–59 years), CRP decreases to 23.7%, reflecting a decrease in the activity of the inflammatory process and its transition to a chronic form. In elderly patients (≥ 60 years), the CRP level reaches a minimum value of 16.7%, which is associated with an age-related decrease in the immune response. These data emphasize the importance of an age-related approach to the treatment of chronic prostatitis, given the intensity of inflammatory processes in different age groups.

The concentration of vitamin D (25(OH)D), which plays an important role in the regulation of the immune system and anti-inflammatory processes, shows minor age differences in patients with chronic prostatitis. Analysis of vitamin D levels in patients with chronic prostatitis shows its deficiency in all age groups. In young patients (≤ 44 years), the vitamin D level is 18.1 ± 0.12 ng/ml, in middle-aged people (45–59 years) – 20.6 ± 0.17 ng/ml, and in the elderly (≥ 60 years) - 17.8 ± 0.11 ng/ml (Table 1).

Table 1.

Vitamin D level in examined patients ng/ml			
	Young age (≤ 44 years)	Middle age (45-59 years)	Old age (≥ 60 years)
25(OH)D	18.1 ± 0.12	20.6 ± 0.17	17.8 ± 0.11

Despite minor differences between the groups, all patients have vitamin D deficiency, which can worsen inflammatory processes and reduce the effectiveness of the immune response. In elderly patients, low vitamin D levels are also associated with an increased risk of osteoporosis and other age-related complications. These data emphasize the need to correct vitamin D levels in all age groups, especially in the elderly, in order to improve the general condition and control the inflammatory process in chronic prostatitis.

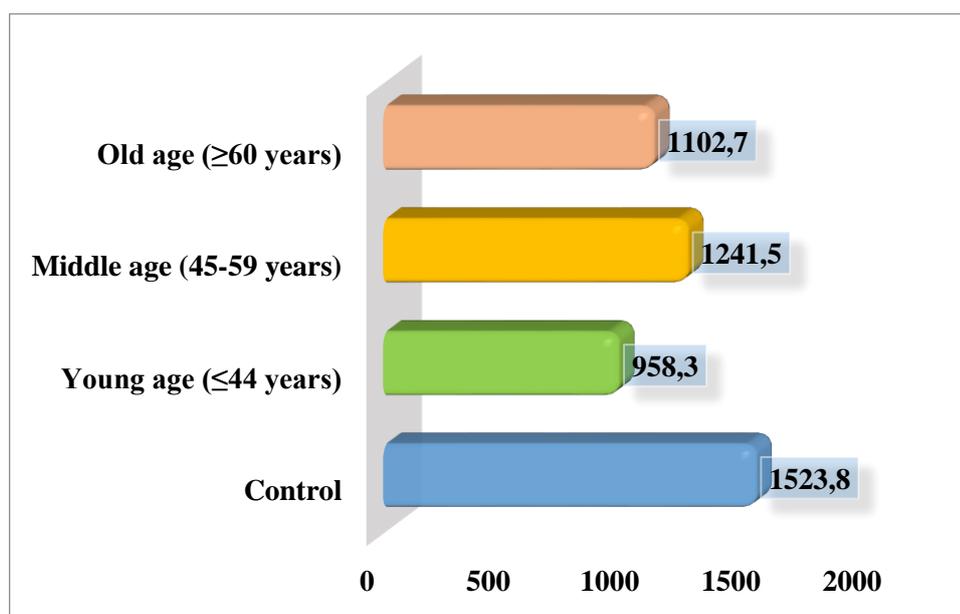


Fig. 5. Superoxide dismutase level in examined patients

Superoxide dismutase (SOD) is a key enzyme of the antioxidant system that neutralizes superoxide radicals and protects cells from damage caused by oxidative stress. In chronic prostatitis, especially in combination with metabolic syndrome, the SOD level decreases, which reflects an imbalance between the formation of reactive oxygen species (ROS) and their neutralization. This imbalance increases the inflammatory process and damage to prostate tissue.

In young patients (≤ 44 years), the SOD level is minimal (958.3 ± 2.82 pg/ml), indicating high oxidative stress against the background of active inflammation. In middle-aged men (45–59 years), the SOD level increases to 1241.5 ± 5.09 pg/ml, which may be associated with the adaptation of the antioxidant system and a decrease in inflammatory activity. In elderly patients (≥ 60 years), the SOD level decreases to 1102.7 ± 5.01 pg/ml due to age-related depletion of the antioxidant system and long-term chronic inflammation (Fig. 5). These changes confirm that oxidative stress increases at a young age and persists in the elderly, despite a decrease in inflammatory activity.

SOD deficiency in chronic prostatitis and metabolic syndrome plays a key role in the progression of the pathology. Reduced antioxidant protection increases inflammation, damage to prostate cells and the development of fibrous changes. This is also aggravated by metabolic disorders such as insulin resistance and dyslipidemia.

Thus, the data analysis showed that patients with chronic prostatitis have significant age-related changes in the condition of the prostate gland, metabolic parameters and general condition of the body. In young patients, inflammatory changes, infectious processes and normal BMI prevail, which requires early intervention to prevent disease progression. Middle-aged men have a peak of metabolic disorders (overweight, obesity of I and II degrees), deterioration of spermogram parameters and the first fibrous changes requiring complex therapy. In elderly patients, fibrous processes, decreased functional activity of the gland and obesity of I degree predominate, which requires an individual approach to maintaining the quality of life. The SOD level serves not only as an indicator of oxidative stress, but also an important therapeutic target for improving clinical outcomes in patients. Determination of biochemical parameters in young patients is of key importance, since this age group is characterized by early and most pronounced changes associated with chronic inflammation and metabolic syndrome. Elevated levels of homocysteine, glycated hemoglobin, low superoxide dismutase activity, decreased vitamin D levels and dyslipidemia indicate the importance of early detection and correction of these indicators in young patients, which helps slow down the development of complications, prevent the transition to hyperplastic processes and improve the functional state of the prostate gland.

Conclusions

1. Middle-aged men have a peak of metabolic disorders (overweight, obesity of I and II degrees), deterioration of spermogram parameters and the first fibrous changes requiring complex therapy. In elderly patients, fibrous processes, decreased functional activity of the gland and obesity of I degree predominate, which requires an individual approach to maintaining the quality of life.

2. The SOD level serves not only as an indicator of oxidative stress, but also an important therapeutic target for improving clinical outcomes in patients. Determination of biochemical parameters in young patients is of key importance, since this age group is characterized by early and most pronounced changes associated with chronic inflammation and metabolic syndrome. Elevated levels of homocysteine, glycated hemoglobin, low superoxide dismutase activity, decreased vitamin D levels and dyslipidemia indicate the importance of early detection and correction of these indicators in young patients, which helps slow down the development of complications, prevent the transition to hyperplastic processes and improve the functional state of the prostate gland.

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