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Laboratory And Thermographic Features Of Articular Syndrome In Combination With Metabolic Syndromes.

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ABSTRACT

Metabolic syndrome is a wide spread condition in the modern world and leads to burdering of concomitant diseases. In the article features of laboratory parameters in patients with combined metabolic and articular syndromes are considered. The study was revealed that higher levels of total cholesterol level and blood erythrocyte sedimentation rate are obtained in a group of combined pathology. Based on the gradient data of the temperature difference of knee joints obtained by infrared temperature, radial temperature difference in knee joints in patients with degenerative - dystrophic diseases and concomitant metabolic syndrome is significantly higher ($p \leq 0.05$) and is 1.31° C than in the group of isolated osteoarthritis of the knee joints, in which the gradient of the difference is 1.16 ° C. There is a tendency to higher indices of the temperature difference gradient of the affected joints in patients with inflammatory diseases in the group of combined pathologies. These data confirm that the metabolic syndrome aggravates the current rheumatic disease and intensifies the inflammatory process.

Keywords: Metabolic syndrome, rheumatic diseases, infrared thermography, gradient of difference.

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INTRODUCTION

Frequency of metabolic syndrome (MS) occurrence in the world today is steadily increased at an average frequency of occurrence of 10 to 60% [11, 12] . In Russia, according to a national study of the risk of cardiovascular complications, the metabolic syndrome occurs in population in 18 % - 20%, and in older age group (≥ 50 years) in 43% [6]. MS can aggravate the concurrent chronic and acute diseases, contributes to the development of new pathologies and complications [10].

Articular syndrome (AS) is equally common in the world. After cardiovascular and oncological pathology, osteoplastic diseases are the third most common in the classes of diseases and tend to grow steadily. In Russia about 15 million people suffer from various rheumatological diseases, and 60% of patients have some manifestation of joint syndrome [1, 3, 4, 7, 9].

Now a day this problem is not only a medical, but socio-economic also. According to the results of epidemiological and medical studies of the last 10 years, an increase comorbidity of MS and AS has been revealed. Mutual complication of these syndromes contributes to a decrease in social, physical, psychological functions, disability and increased mortality [13, 14, 15].

There are some similar pathophysiological processes, associated with MS and AS, such as oxidative stress, chronic inflammation; metabolic disturbances [15]. It creates obstacles in diagnosis, adequate drug therapy, early diagnosis and prevention [11, 16].

Purpose of the study was to investigate laboratory features of metabolic syndrome in combination with degenerative-dystrophic and inflammatory diseases of the knee, and to assess the clinical significance of the method of infrared thermography in the diagnosis of these pathologies.

OBJECT AND METHODS OF STUDY

164 patients were included into this study (90 men and 74 women). The following groups were formed. Group I - 92 people - patients with MS and AS. This group included two subgroups of rheumatic diseases: noninflammatory diseases of the knee joints (Ia) and inflammatory diseases of knee joints (Ib: rheumatoid arthritis, psoriatic arthritis, gouty arthritis). Group II - 72 people - subjects who have only joint diseases. This group was divided into two subgroups for rheumatic diseases - inflammatory (IIa) and non-inflammatory (IIb).

Criteria for including patients in the study:

1. Age from 18 to 70 years
2. Presence of MS (criteria of the Russian Cardiological Society from 2013).
3. The presence of rheumatic disease, which affected knee joints (gonarthrosis (except IV degree), gouty arthritis, rheumatoid arthritis, psoriatic arthritis) in remission
4. Absence of any DMARDs for 6 months before enrollment
5. Lack of NSAIDs intake for one week before the study
6. Absence of intra-articular injections of glucocorticosteroids for 1 month prior to enrollment
7. Informed consent to participate in the study

Exclusion criteria from the study:

1. The presence of diseases such as diabetes mellitus and endocrinopathies leading to MS; arrhythmias of different genesis; infectious diseases; obliterating atherosclerosis of vessels; oncology.
2. Articular syndrome, associated with other rheumatic diseases; undifferentiated joint syndrome; congenital pathology of the musculoskeletal system and traumatic lesions of the knee joints .
3. Pregnancy and lactation.
4. Mental disorders.

Methods of investigation included: general blood test (leukocytes, erythrocytes, platelets, hemoglobin, granulocytes, monocytes, lymphocytes, eosinophils, ESR); urine analysis (pH, sugar, protein , microscopy of urine sediment); biochemical blood test (total protein, creatinine , urea, bilirubin, ALT, AST, uric acid, CRP, seromucoid , cholesterol, LDL cholesterol, HDL cholesterol, TG, β- lipoproteins). Evaluation of carbohydrate metabolism disorders was performed by determining of fasting hyperglycaemia, the level of glycated hemoglobin (HbA1C) was determined. Insulin resistance was calculated by determining the ratio of TG to HDL cholesterol (normally less than 1.32 [15, 17]) . Instrumental: a radiographic study of knee joints in two projections; infrared thermography study of knee joints.

THE FINDINGS AND THERE DISCUSSION

According to our results ESR in group Ia is significantly higher than in group IIa (25.1 [5; 34] and 22.1 [2, 34], p≤0.05). ESR is a nonspecific indicator of the inflammatory process.

The status of carbohydrate metabolism was determined by determining the level of glucose in venous fasting blood, glycosylated hemoglobin (HbA1C), determining the presence of insulin resistance. By the average blood glucose level for the last 3 months and, accordingly, by the insulin resistance index, a trend higher indicators in the group of combined pathology was found. This phenomenon can be explained by the fact that insulin resistance increases glycemia, glycogen synthesis is broken, fatty acids are formed and deposited in adipocytes, more cytokines are formed and lead to development of inflammatory phenomena in the joints and vice versa. A vicious circle is formed, which can explain the higher rates of carbohydrate metabolism in the comorbid group.

Changes in lipid metabolism were compared by analyzing such indicators as: total cholesterol, LDL, HDL, TG, KA. In a comparative analysis of the lipid spectrum of blood in patients with metabolic and articular syndrome, significant differences in blood cholesterol were obtained. Blood cholesterol in group I b was higher than in group IIb: 6.13 [5.32; 6.78] and 3.8 [4.2, 5.4], p≤0.05. The high-density lipoprotein cholesterol and triglycerides in the patients of the groups were within the norm and did not differ significantly.

Examined patients from group I showed an excess of the upper limit of the norm for blood cholesterol indicators, the coefficient of atherogenicity, LDL cholesterol. These results were expected because elevated levels of cholesterol and LDL are included in the criteria for the diagnosis of metabolic syndrome.

Purine metabolism was assessed by uric acid level, and assessment of the presence of inflammatory process - by determining CRP level.

CRP is a nonspecific marker of inflammation, and given the proven inflammatory nature of AS and MS, in our study, a trend in higher mean values of CRP was higher in the group of comorbid pathology, and in group I a 7.83 [0; 14], and in II b 4.26 [2.26; 8.7], in group I a 5.41 [0; 9.1], in group II b 6.3 [1; 11]. There were no deviations from the norm according to the average parameters of uric acid.

The functioning of the hepatobiliary tract and kidneys in the compared groups was indirectly assessed through the indices of bilirubin, ALT, AST, urea, creatinine. Mean values of transaminases in serum in all three groups were normal.

When considering the performance of serum creatinine, despite the valid indicators, attention is drawn to the tendency to its increase in the group of combined pathology and isolated group of MS, in contrast with isolated AS. The data obtained may indicate on adverse effect of arterial hypertension to renal function.

During the thermographic study, patients were divided into two groups. The first group consisted of patients with gonarthritis in combination with MS (group Ia - 40 persons) and patients with isolated gonarthritis (group Ib - 24 persons); the second group included patients with knee joint damage in gouty arthritis, rheumatoid arthritis, psoriatic arthritis in combination with MS (group IIa - 48 persons) and without MS (group IIb - 48 persons).

As a normal thermography picture of the knee joints was taken:

1. Amplification of infrared radiation along the antero- inner contour of the joint and oval hypothermia zone along the central region of the joint.
2. The presence of one or two hyperthermia zones of triangular shape in the upper-inner and lower-internal joint quadrants, the remaining part of the joint is hypothermic.

The magnitude of skin radiation in each person is individual and depends on skin moisture, blood filling, subcutaneous fat, body condition in general, its physiological characteristics. The temperature difference gradient (dTºC) was compared. Patients with obesity III degree and with gonarthritis IV stages were excluded from a thermographic study.

The thermal imaging picture of gonarthrosis was revealed due to the pathogenesis of the disease, which includes a hemodynamic disorder with venous congestion and tissue hypoxia in articular cartilage. These disorders can lead to increased intraosseous pressure and degenerative-dystrophic changes occur.

During investigation of knee joints, we obtained 4 types of thermograms, which are typical for patients with isolated gonarthrosis, and with concomitant MS.

I type of thermogram was characterized by increased thermal radiation along the whole knee joint .

II type of thermogram is characterized by increased infrared radiation in lateral regions of the knee joints, while the IR-radiation foci have clear, even contours.

III type of thermogram is characterized by foci IR radiation with uneven fuzzy contours, also located along the medial and lateral surfaces of knee joints.

Type IV of thermograms izuetsya plural character of IR radiation.

All the above-described thermograms were typical for both isolated gonarthrosis and comorbid patients for MS, however, differences in the temperature gradient were found depending on the stage of gonarthrosis and the presence of MS. The tendency towards higher figures in the group of gonarthrosis and concomitant MS was found. When considering all patients with different stages of gonarthrosis, we obtained reliable differences in the temperature gradient.

According to the literature, the first three types of thermal imaging patterns occur at the initial stages of gonarthrosis , while the fourth type is typical for visible joint deformities in later stages of gonarthrosis. Based on our data we can suggest negative effect of MS on gonarthrosis progression. That's why we see type IV of thermograms in patients with III stage of gonarthrosis.

In inflammatory diseases of knee joints the size of hyperthermia zones depends on the severity and extent of the inflammatory process.

Thermographic features of knee joints investigation in patients with inflammatory diseases of knee joints: during thermography of patients with inflammatory diseases of the joints, we compared the temperature gradient, which was measured with the upper third tibia (dTºC). There is a tendency to higher rates in the group with concomitant MS but this difference is not significant. In patients with rheumatoid arthritis, synovitis is an early sign, thereby increasing metabolic processes in the joint area, increasing heat transfer in the area of inflammation. In patients with rheumatoid arthritis, we identified 4 degrees of temperature change. Grade I - the difference between the hyperthermic region and the hypothermic zone is 1.5 to 2.0 ° C, Grade II - the difference is 2.5 to 3.5 ° C, at the third degree –3.5 to 5.0 ° C. Grade IV is characterized by a zone of hypothermia and is associated with a decrease in metabolic processes.

CONCLUSION

Combination of MS with degenerative-dystrophic diseases of the knee joints is characterised by significantly higher levels of total blood cholesterol than in group of isolated course of arthrosterosis. In patients with combination of MS and inflammatory diseases of the knee joints, the ESR is significantly higher

than in groups of the isolated course of diseases (p≤ 0.05).The gradient of temperature difference in the knee joints in patients with degenerative - dystrophic diseases and the accompanying MS is significantly higher (p ≤ 0.05) and is 1.31˚C than in the group of isolated course of gonarthrosis, in which the difference gradient is 1.16˚C. When considering the gradient of the temperature difference of the affected joints in patients with inflammatory diseases, there is a tendency to higher gradient of the temperature difference of the affected joints in patients with inflammatory diseases in group of combined pathologies.

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