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FUNCTIONAL CHARACTERISTICS OF THE CARDIOVASCULAR SYSTEM INVOLVEMENT IN VARIOUS VARIANTS OF ANKYLOSING SPONDYLITIS

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Annatation

Inflammatory and degenerative spinal diseases are one of the pressing problems of modern rheumatology due to the high prevalence, frequent incidence of diseases of young and middle-aged men, frequent lesions of internal organs, early disability of patients, socio-economic damage caused to the patient and society [1].

Since 1892, when V.M.Bekhterev described the main clinical manifestations of the disease and suggested that it should be singled out as a separate nosological form, researchers from the leading countries of the world have achieved certain success in studying its nature, mechanisms of development, as well as treatment and rehabilitation of patients. Nevertheless, ankylosing spondylitis (AC), which is regarded as a disease of the musculoskeletal apparatus, affecting mainly young men, remains one of the leading socio-economic problems of our time, leading to disability in working age.

Keyswords

relative wall thincness, diastolic interventricular septum, eccentric hypertrophy, diastolic pressure, resistance index,linear blood flow velocity.

Introduction

The prevalence of AS in different countries is 0.5-2%. Today, despite the advances in modern rheumatology, 8.3 per cent of all rheumatic patients are disabled, with rheumatoid arthritis (38.2 per cent) and AS (16.8 per cent) accounting for 14 per cent of all persons with AF-related disabilities under 30 years of age. Particularly unfavourable with regard to the rapid onset of disability are the peripheral forms of AS with damage to the large joints. In addition, AS is often characterized by a high rate of progression of the pathological process and early disability of patients - about 10% of patients become disabled within the first two years of the disease [2].

AS develops between the ages of 15-30, but 8.5% of patients, according to A.P. Burdeyny, fall ill at the age of 10-15 years. Due to the inconspicuous onset, course, and difficulty of the X-ray diagnosis of sacroileitis, AS is detected at the stage of a detailed clinical picture [3].

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AS, like other seronegative spondylitis, is based on the interaction of genetic and environmental factors. The predisposing role of genetic factors has been confirmed by family and genetic studies. Back in the early 70s of the twentieth century, the first reports were published on the close association between the histocompatibility antigen HLA-B27 and AS. The detection rate of this antigen reached 80–90% at AS and 30–60% at other spondylarthritis compared with 7–12% in the population.

Even Bekhterev and Strumpell (1894) found that the pathological process for ankylosing spondylitis involves the sacroiliac joints, joints of the spine and peripheral joints, intervertebral discs, vertebral bodies, spinal ligaments at the points of attachment to the vertebral body (enthesopathy). At present, with ankylosing spondylitis, selective lesions of extraarticular tissues have been detected. 25% of patients develop non-granulomatous iritis and iridocyclitis, sometimes with significant scarring and the development of secondary glaucoma [4]. In case of lung damage, obliterating bronchiolitis is observed, which leads to obstructive respiratory failure, bronchocentric granulomatosis, pneumothorax and fibrosis of the apexes of the lungs.

In 20-22% of patients with AS, cardiac and vascular lesions are detected: aortitis with necrosis of the medial layer and its replacement with connective tissue, atrophy of the inner layer, as well as arteritis of the large and medium vessels of the upper half of the body, pericarditis.

Cases of damage to the conduction system of the heart with the development of all degrees of blockade are described.

Insufficient attention is paid to systemic manifestations of AS, they are poorly diagnosed, although they are characterized by a wide range of manifestations. Lung lesions are not observed often.

Some scientists write about involvement in the cardiovascular system. The defeat of the cardiovascular system in AS occurs multilaterally: from the side of the endothelium, from the side of the nervous and humoral regulation, depending on the stage of inflammation.

Jun Fu writes that patients with AS have a higher heart rate, high left ventricular tension and left ventricular diastolic dysfunction [5].

Van H proved that a decrease in the amount of cytokine called vaspin in patients with AS is considered a sign of atherosclerosis of blood vessels, especially coronary and carotid arteries [6].

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In connection with systemic inflammation, the autonomic nervous system is also included in the process, which leads to an increase in heart rate and blood pressure and overstrain of the heart. Toussirot writes [7]

Against the background of clinical symptoms of a musculoskeletal system lesion, cardiovascular syndromes (atherosclerosis, arterial hypertension, left ventricular hypertrophy, arrhythmias, myocarditis, heart defects) remain little noticed, differ in latency, although they sometimes lead to severe heart failure [8].

It is known that the basis of the pathological process in a number of rheumatic diseases is connective tissue changes with the leading role of immune disorders in pathogenesis. We can assume the presence of similar changes with varying degrees of severity in the development of ankylosing spondylitis, in particular in the development of various pathological conditions on the part of the cardiovascular system.

However, additional studies are needed to confirm these.

The above indicates the relevance of the problem being studied and dictates the need for scientific research using new instrumental and laboratory diagnostic methods, especially with the aim of studying the early symptoms of respiratory disorders, their monitoring and ways to correct the revealed changes in patients with AS.

Contraindications for inclusion in the study were seropositive arthropathies (the presence of a rheumatoid or antinuclear factor), the absence of radiologically confirmed signs of sacroileitis and / or ankylosing spondylitis, other arthritis without damage to the joints of the spine and sacroiliac joints, the presence of severe systemic manifestations of the chronic disease, endology obstructive pulmonary disease. Patients with a history of cardiovascular cases (coronary heart disease, cerebrovascular cases, peripheral arterial disease, or heart failure) were excluded. This also applies to type 2 diabetes mellitus or patients with two fasting plasma glucose levels on different days at the time of diagnosis of the disease or for a long observation period> 125 mg / dl, as well as patients with chronic kidney disease (glomerular filtration rate < 60 ml / min), as they are considered as having a high or very high risk of cardiovascular disease in accordance with current recommendations.

A history of pelvic bone lesions, synovitis, enthesitis, extra-articular manifestations (anterior uveitis, psoriasis and inflammatory bowel disease), syndesmophytes, and HLA-B27 status was also evaluated. In addition, data were collected on a hereditary history of early cardiovascular diseases in close relatives, abdominal circumference, body mass index, blood pressure indicators during the

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study and anamnesis of traditional risk factors for cardiovascular diseases (smoking, hypertension, dyslipidemia and obesity) .

The study did not include patients receiving glucocorticoids.

The average age of patients was 35.6 ± 2.3 (of which 49 were men, 6 were women, the average age of men was 35.5 ± 3.1, and 36.6 ± 1.2 in women)

1. To characterize the existing clinical and functional picture of changes in the cardiovascular system.

2. To assess the contractility of the myocardium, to monitor blood circulation in patients with AS, depending on the characteristics of the clinical course of the disease.

3. Compare changes in the cardiovascular system in patients with various variants of ankylosing spondylitis, depending on the primary localization of the process in the spine, degree of activity, form and stage of the disease;

4. Assess the functional state of the heart in patients with AS after 1 year of observation.

For the first time, a comprehensive clinical and functional assessment of the state of the cardiovascular system in patients with ankylosing spondylitis was carried out, echo and ECG parameters were compared with clinical characteristics in patients with various forms of AS (central; rhizomelic and peripheral) depending on gender, age of patients, degree of activity and stage of the disease, duration of the disease and the nature of the treatment, assessment of the functional state of the heart in patients with AS after 1 year of observation.

Systemic diseases of the connective tissue (TSFST) currently occupies one of the leading places among the causes of morbidity, disability and mortality in many countries. In terms of the incidence rate of SZST in adults, they are in third place among all the statistical classes of diseases [Folomeeva O.M et al 2006].

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In accordance with the requirements of these criteria, the confirmation of the diagnosis requires the presence of X-ray revealed sacroiliitis [10], which in itself imposes certain limitations in terms of timely diagnosis of AS. It was found that significant changes in the x-ray of the pelvic bones in 36% of cases appear after 5 years, and in 59% of cases only after 10 or more years from the onset of the disease [7], which, according to D. vanderHeijde and W. Maksymowych [8], is one of the main obstacles to the early diagnosis of AS in most patients.

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Considering that in the absence of structural changes in the sacroiliac joints, active inflammation (osteitis) detected by MRI can be observed, the use of this imaging method is the basis of the Russian version of the modified New York AS criteria [7]. According to the authors, the use of improved criteria for the diagnosis of AS contributes to the earlier detection of the disease at the so-called "pre-radiological" stage, when in the absence of radiologically significant sacroiliitis, subchondral and / or bone marrow edema occurs in the sacroiliac joint region, which in turn allows timely prescribe effective therapy to patients [9].

Inflammatory back pain lasting more than 3 months. (according to the criteria of ASAS experts), it is characterized by 5 signs:

1) the age of onset of pain is up to 40 years;
2) gradual onset;
3) improvement after performing physical exercises;
4) lack of improvement at rest;
5) night pain (with improvement on waking) [8].

In this case, chronic back pain is considered inflammatory in the presence of at least 4 out of 5 signs.

For a general practitioner, it is fundamentally important to know the features of inflammatory pain in the lower back, the ability to differentiate them with mechanical pain in the spine, a number of signs are characteristic of the latter:

1) debut of pain older than 40 years;
2) acute onset;
3) the duration of pain is less than 4 weeks;
4) morning stiffness, usually less than 30 minutes;
5) lack of night pain;
6) exercise can exacerbate pain;
7) restriction of mobility in the lumbar spine only in the sagittal plane;
8) the development of neurological symptoms is possible.

Inflammatory back pain in 75% of cases is considered the first clinical symptom of AS in the onset of the disease [7]. However, it is also necessary to take into account the fact that peripheral arthritis (in 15–25% of cases), enthesitis (less than 3%), dactylitis (less than 1%), uveitis (5%), skin psoriasis (less than 3%), inflammatory bowel disease (less than 3%).

Indications for referring patients with chronic back pain lasting more than 3 months, debuting at the age of 45 years, to a consultation with a rheumatologist for the timely recognition of AS are:

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1) inflammatory back pain according to ASAS criteria (the presence of this clinical syndrome will make it possible to establish a diagnosis of AS in every 7th patient);

2) a good response to non-steroidal anti-inflammatory drugs (NSAIDs), consisting in a clear reduction in back pain after taking these drugs for 24–48 hours and the resumption of pain within the same period of time after they are canceled;

3) the presence of oligo-, monoarthritis, enthesitis (primarily achillobursitis, plantar fasciitis) in young people;

4) an increase in acute phase blood counts (erythrocyte sedimentation rate (ESR), C-reactive protein (CRP));

5) detection of the HLA-B27 antigen (carrying out this test is fraught with a one-time financial cost, but is useful for verifying the AS in every 3rd patient referred to a rheumatologist);

6) the identification of sacroiliitis during x-ray examination of the sacroiliac joints;

7) identification of active sacroiliitis according to MRI of the sacroiliac joints (characterized by high specificity, but it is an expensive research method, which is why it is not recommended for screening AS in routine general medical practice) ([2] with additional S. Erdes, 2013).

The primary goal of treating a patient with AS is to maximize the long-term preservation of the quality of life associated with health by controlling the symptoms of inflammation, preventing the progression of structural damage, preserving the motor function and social status of the patient. This is achieved by the use of non-pharmacological (primarily patient education and regular exercise) and pharmacological treatment of AS.

Medicines that are actively used in the treatment of AS include NSAIDs, analgesics, glucocorticoids (GC), basic anti-inflammatory drugs in the case of peripheral arthritis (sulfasalazine, recently accumulated data on the effectiveness of methotrexate in the treatment of one of the prognostically adverse manifestations of AS - coxitis [23]), inhibitors of tumor necrosis factor (TNF) .

The defeat of the cardiovascular system in AS was first studied in the early twentieth century, first in autopsy material and then in patients. In the study of cardiovascular pathology in AS, two main directions are clearly traced. The first appeared in the early 50s of the twentieth century. - this is a study of lesions of the heart and blood vessels within the framework of systemic AS (aortitis, valvular pathology, conduction disturbance);

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The second direction began to develop relatively recently and is associated with the study of atherosclerosis and the risk of developing coronary heart disease (CHD) in patients with ankylosing spondylitis

According to the anatomical characteristic, the following types of CVC lesions in AS are clinically distinguished [5]:

1. Damage to the aorta and its structures - aortitis, periaortitis, aortic dissection, with the possible need for cardiac surgery.

2. Conductivity disorder involving the atrioventricular (AB) site and the bundle of the bundle with probable subsequent indications for the establishment of a pacemaker.

3. Myocardial involvement with the possible development of left ventricular dysfunction (LV).

4. Valvular defects - aortic insufficiency, mitral regurgitation and stenosis with possible subsequent valve prosthetics.

5. Pericarditis with the threat of cardiac tamponade.

When measured in one-dimensional mode, the measurements were performed via parastern access along the long axis of the left ventricle in accordance with the recommendations of Penn Convention Method [136]. The following parameters of intracardiac hemodynamics were studied: the end diastolic and systolic dımensıons of the left ventricle (EDDLV, ESDLV mm), thickness of the interventricular septum (IVCT mm) and the posterior wall of the left ventricle (PWTlv mm) into the diastole. The indices of end diastolic and end systolic dımensıons of LV (EDD, ESD ml.) were calculated by L.E. formula. Teichholtz et al. [1,3].

LV ejection fraction (EF) was evaluated by the formula:

EF = ((EDD-ESD) / EDD) * 100 (%).

The aortic root (Ao, mm) and cardiac cavities were measured - the left atrium (LA, mm), the right atrium (RA, mm) and the right ventricle (RV, mm). All measurements were carried out for at least three cardiac cycles, and then the average values were determined.

The mass of the myocardium of the left ventricle (LVM, gr.) was calculated according to the formula R. B. Devereux et al. [8]:

LVMM = 1,04 * [(EDD + IVCT + LVPWT) 3-EDD3] -13,6 (gr), where

MLv - the mass of the left ventricular myocardium,

1.04 - density coefficient of the heart muscle,

IVCT - interventricular septum thıckness,

LVPWT – thıckness of left ventrıcular posterıor wall

EDDlv – end dıastolıc dımensıon of left ventrıcle

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In order to correct the effect of overweight, the left ventricular myocardial mass index (LVMI) was determined using the de Simone G formula. et al., 1992.

LVMI = LVMM / BSA,

LVMI - left ventricular myocardial mass index, g / m2;

LVMM - the mass of the left ventricular myocardium, g;

BSA - body surface area, m2.

The body surface area was calculated using a nomogram taking into account height (m2) and weight (kg). The criterion for left ventricular hypertrophy in our study was LVMI> 110 g / m2 in men [138]. According to the value of the end-diastolic volume of the LV and its mass, their ratio of EDD / LVMI was calculated, ml / g.

To assess the geometry of the left ventricle, the relative thickness of the walls of the left ventricle (RWT) was calculated by the formula:

RWT= (IVCd + LVPWd) / EDD LV

Based on the RWT and LVMI indicators, the geometric model of the left ventricle was evaluated.

With LVMI less than 118 g / m2 and RWTlv <0.45, the geometric model was considered normal (NG);

With LVMI ≥118 g / m2, RWT LV <0.45, geometry was evaluated as eccentric LV hypertrophy (EH);

With LVMI> 118 g / m2, RWT LV> 0.45, LV concentric hypertrophy (CH) was determined;

With LVMI <118 g / m2, RWTlv> 0.45, concentric remodeling (CR) was diagnosed [8].

In order to assess the diastolic filling of the left ventricle, a transmitral flow was recorded. The following parameters were considered: peak velocity of early diastolic filling of the left ventricle (velocity E) (m / s); peak speed of late diastolic filling (speed A) (m / s); peak integral of early diastolic filling (integral E) (m); peak velocity integral of late diastolic filling (integral A) (m); the ratio of the integral A to the integral E (integral A / E) (unit); the ratio of the integral E to the general integral of the transmitral flow (integral E / general integral) (units); the ratio of the integral A to the general integral of the transmitral flow (integral A / general integral) (unit); isovolumic relaxation time (IST) (ms); end-diastolic pressure in the LV cavity (EDP) (mm Hg) [7]; end diastolic straın of the LV wall (EDSW) (dyne / cm^2) [10].

In addition, the presence (if any) of areas of local myocardial contractility (dyskinesia, akinesia, etc.) of the myocardium, ınduratıon of IVC, papillary muscle

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dysfunction, mitral valve prolapse, valve changes, the presence of rheumatic nodules, and other changes were determined.

Ultrasound examination of vessels of the extracranial section of the carotid and vertebral arteries, brachial artery was performed on a SoneScapeSSI 5000 duplex apparatus (China) according to the method of D. Celermajer et al. [5, 6] with a linear sensor 7.11 MHz, convex sensor 3.5 MHz, cardiac sensor 2.5-5.0 MHz with determination of the tortuosity of vessels, linear velocity of blood flow, with analysis of the structure of the walls of blood vessels, the thickness of the intima-media complex (TIM), the presence of atherosclerotic plaques (AP) and the degree of stenosis. The normal value was considered to be TIM no more than 0.9 mm. During research, B-mode, color and energy Doppler modes were used.

Estimation of the intima-media complex thickness.

Measurements of the thickness of the intima-media complex (TIMC) and the resistance index (RI) of the common carotid artery (CCA) were carried out in B-mode, using the color duplex scanning method. TIMC was measured 1 cm from the start of carotid bifurcation along the posterior wall of the CCA [9]. The transverse (diastolic) diameter of the CCA was determined with optimal visualization of the near (front) and far (posterior) walls of the CCA 2-3 cm proximal to the carotid bifurcation. The area of the CCA was determined by the formula:

S = 3.14 * (average diameter of the CCA + average TIMC CCA) 2- (mean diameter of the CCA) 2

The linear blood flow velocity (LBFV) of the CCA was determined using a PW doppler at a Doppler angle of 60 degrees 2-3 cm proximal to the carotid bifurcation. The normal values of the intima-media complex of the common carotid artery were less than 1 mm.

Subclinical manifestations of atherosclerotic vascular lesions were detected by ultrasound scanning of the carotid arteries. The presence of atherosclerosis was determined by the thickness of the intima-media complex (IMC) in cases of its increase from 0.9 to 1.2 mm [10] and the presence of atherosclerotic plaques (AP) (local increase in IMC more than 1.2 mm) [11].

The vasomotor function of the endothelium was evaluated by the method of D. Celermajer et al., 1992. The brachial artery was visualized in a longitudinal section 2–5 cm proximal to the elbow, the diameter of the artery was measured in systole and diastole. The diameter was evaluated at rest 10 min of rest. The variability of diameter measurement using this technique, according to various sources, ranges from 2 to 4%. The stimulus causing endothelial dependent dilatation of peripheral arteries was reactive hyperemia created by a cuff

superimposed proximally to the measurement site. At the 5th minute, a pressure of 40-50 mm Hg was created. higher than systolic. The diameter was evaluated after removal of the cuff after 60 s. The reaction to increased blood flow was calculated as the difference in diameter against the background of reactive hyperemia and the initial one. The degree of endothelial dysfunction was determined by a change in the diameter of the brachial artery, expressed as a percentage relative to the initial value: normal endothelial function> 10%, pathological <10%, including vasoconstriction <0.

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