Echocardiographic Findings, 24-hour Electrocardiographic Holter Monitoring in Patients with Rheumatoid Arthritis According to Steinbrocker’s Criteria, Functional Index, Value of Waaler–Rose Titre and Duration of Disease

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Abstract: Electrocardiographic (ECG) and echocardiographic examinations and 24-h ECG Holter monitoring were carried out in 100 patients (age <65 years) with rheumatoid arthritis (RA) of stages II–IV according to Steinbrocker’s criteria. One hundred patients with osteoarthrosis, spondyloarthrosis and painful shoulder matched for age, sex and body surface area constituted the control group. All patients with myocardial infarction, hypertension, rheumatic fever or a history of diabetes were excluded. Cardiac involvement, evaluated by echo-Doppler cardiography, 24-h ECG Holter monitoring and an ECG at rest, occurred in 52 (52%) patients with RA and in 23 (23%) control group patients (p <0.0005). In the RA group ECG examination, 1 mm ST depression in at least two consecutive leads was observed more frequently, and occurred statistically more frequently for the highest stage of RA according to Steinbrocker’s criteria, highest level of functional index and longer duration of disease. The 24-h Holter ECG monitoring did not show any differences in frequency of rhythm disorders between the RA group and the control group. However, silent myocardial ischaemia episodes appeared more often in the RA group. An ECG examination revealed more cases of valvular heart disease, especially mitral insufficiency, in RA patients than in the control group. A mitral valve prolapse was noted in 6% of patients and a pericardial effusion in 4% of patients. Patients with RA were noted to have a larger diastolic left ventricular diameter and aortic root diameter, and smaller ejection fraction, mean velocity of circumferential fibre shortening and fractional shortening. The results of the examinations show that RA is associated with cardiac involvement in a significant proportion of cases.

Keywords: Echo-Doppler cardiography; Rheumatoid arthritis; Silent myocardial ischaemia; Valvular heart disease; Ventricular function

Introduction

One of the current issues in rheumatology is the type and extent of pathological changes in the heart in the course of rheumatoid arthritis (RA). However, there is more anatomopathological research than clinical research. A great divergence is noted between the frequency of anatomopathological changes in the myocardium of patients with RA and the clinical picture. At least twice as many changes in the heart are noted after death than are recognised during the patient’s life-time. The problems with diagnosis are due to a very limited number of clinical symptoms showing that cardiac muscle is affected by a disease process and that symptoms do not always appear. Commonly used methods of clinical examination also fail, there are no characteristic auscultatory symptoms, the complaints of

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patients are not typical, non-specific changes are seen on an electrocardiographic (ECG) examination and the chest radiograph is usually normal.

The aim of this study was to search for cardiac abnormalities in patients with RA by means of ECG and echocardiographic examinations and 24-h ECG Holter monitoring and to correlate cardiac abnormalities with the stage of RA according to Steinbrocker's criteria, functional index, value of the Waaler–Rose titre and duration of disease.

**Material and Methods**

**Patients**

A total of 100 consecutive outpatients aged 22–65 years (average age 49.9 ± 11.3 years) with definite or classic RA (ARA criteria) [1] attending the Rheumatologic Outpatient Department of the Central Clinical Hospital in Warsaw were included in the study. In the RA group there were 82 women (average age 49.0 ± 10 years) and 18 men (average age 54.4 ± 12 years). Body surface area (BSA) was 1.72 ± 0.7 m². According to Steinbrocker’s criteria [2], 16 patients were in stage II, 73 in stage III and 11 in stage IV of the disease. The first level of the functional index was seen in 33 patients, the second level in 45, the third level in 20 and the fourth level in two. All the patients were shown radiologically to have geodes and erosions on the joint surfaces and on bones close to the joints. The presence of subcutaneous nodules was observed in 26 patients. The duration of disease ranged from 2 to 38 years (mean 9.4 ± 6.7 years). The disease duration was less than 5 years in 39 patients, between 5 and 10 years in 29 and more than 10 years in 32 patients.

A Waaler–Rose titre below 1:20 was confirmed in 22 seronegative patients. In the remaining 78 seropositive patients the following Waaler–Rose test scores were noted: 1:160 in 33 patients, 1:320 in 24, 1:640 in 14, 1:1280 in six and 1:2560 in one.

Virtually all the RA patients were taking non-steroidal anti-inflammatory drugs (NSAIDs), 29 were taking gold salt, 33 antimalarials, 25 sulphasalazine, three d-penicillamine, and four methotrexate, three azathioprine and one cyclophosphamide. Thirty-six patients were treated with low-dose prednisolone, of whom two were treated only with low-dose prednisolone because of an allergy to other drugs.

Each RA patient was matched with a control for sex, age (±1 years) and BSA (±0.17 m²). The control group comprised 100 patients aged 22–65 years (average age 49.8 ± 11.1 years), there were 82 women (average age 49.0 ± 10.8 years) and 18 men (average age 54.4 ± 12.9 years) who attended the clinic at the same time with osteoarthrosis and spondyloarthrosis (92 patients) or painful shoulder (eight patients).

Patients with a history of myocardial infarction, arterial hypertension, rheumatic fever, type I or II diabetes or general amyloidosis were excluded from the study. All patients agreed to participate in the research and consent was obtained from the deontologic commission.

On the basis of clinical examinations and chest radiographs (postero-anterior and lateral), which were reported by a cardiologist and a radiologist (without clinical data), pulmonary diseases were also excluded.

**Stenocardial Pains and ECG Examination**

In both groups, attention was paid to the occurrence of substernal pain, the criterion being paroxysmal pain which is at the same time substernal, radiating to the left shoulder and down the inside of the left arm, even to the fingers. It may radiate straight through to the back, into the throat, jaws, teeth and, occasionally, even down the right arm, appearing on physical activity and disappearing after 3 min in approximately 97% of cases after the activity has stopped or 0.5–3 min after nitroglycerine has been taken.

In a standard 12-lead electrocardiogram, attention was paid to the appearance of the following changes: characteristic features of myocardial ischaemia, non-specific ECG changes in an ST segment, sinus pauses, supraventricular premature beats, ventricular premature beats, atrial fibrillation, atrioventricular block (degrees I, II or III). His right bundle branch block (RBBB), His left bundle branch block (LBBB), left anterior hemiblock (LAIH), left posterior hemiblock (LPH) and PQ and QT intervals.

The accepted criterion for ischaemia is an ST segment depression of at least 1 mm horizontally or downsloping, measured 80 ms from point J in at least in two consecutive leads. In laboratory examinations, disturbances of ion balance were excluded.

The accepted criterion for non-specific ECG changes in an ST segment is an upsloping or depression of this segment that does not exceed 1 mm and/or a change of T wave, i.e. flattening or a change in its shape (symmetrical inversion excluded).

**24-h ECG Holter Monitoring**

The 24-h ECG Holter monitoring was undertaken with a Hewlett Packard Vectra 386/25 apparatus. During these examinations the patients followed their usual daily routines and activities. The following aspects were analysed: average heart frequency, highest and lowest heart frequency, appearance of supraventricular and ventricular premature beats, presence of bigeminia, trigeminia, runs and episodes of sinus pauses.

According to the Bjertegaard criteria [3], greater than 100 instances of supraventricular premature beats per 24 h in patients aged up to 60 years and greater than 1000 per 24 h in patients over 60 years are accepted as pathological. The pathological number for ventricular