

ST SEGMENT DEPRESSION IN ASYMPTOMATIC MALE PATIENT WITH NORMAL CORONARY ARTERIES

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ST SEGMENT DEPRESSION IN ASYMPTOMATIC MALE PATIENT WITH NORMAL CORONARY ARTERIES (Abstract): ST segment depression and T waves inversion are electrocardiographic (ECG) repolarization abnormalities often encountered in clinical medical practice that have been proved to predict future cardiovascular events. We present the case of a 62-year-old male patient, asymptomatic, with ST segment depression and inverted T waves discovered incidentally on resting ECG. Echocardiographic and laboratory examinations ruled out multiple causes of ECG abnormalities. Suspecting a silent myocardial ischemia, an ECG exercise stress test was performed; it revealed pseudo normalization of T waves during exercise and early recovery phase. Being inconclusive, a coronary CT was the final election test; it showed normal coronary arteries with no stenosis, the patient being scheduled for regular follow-up. The possible causes of ST segment depression are reviewed since it is important that early cardiovascular signs especially in asymptomatic patients to be prevented and detected. **Keywords:** ST SEGMENT DEPRESSION, INVERTED T WAVE, ASYMPTOMATIC, NORMAL CORONARY ARTERIES.

ST segment depression and T wave inversion have been identified as markers of future cardiovascular events in patients with or without coronary artery disease (CAD). Most of the ST segment and T wave changes are represented by primary repolarization abnormalities while secondary changes belong to abnormalities of depolarization (1). Theoretically, ST segment displacement should be measured at 40 or 80 ms after the J point in three consecutive beats with a non-modified baseline (2). Our aim is to present a comprehensive evaluation of different causes of ST segment depression in an asymptomatic male patient.

CASE REPORT

We present the case of a 62-year-old male patient, occasional smoker, totally asymptomatic, who was admitted to our department for evaluation of electrocardiographic (ECG) changes discovered incidentally three months earlier when the patient underwent surgery for a lumbar herniated disc.

Patient's case history was short: surgery treatment for herniated disc L4-L5, L5-S1 and recent diagnosis of benign prostatic hyperplasia. The highest known systolic blood pressure (BP) was 140 mm Hg with no other cardiovascular diseases. The patient did not follow any chronic medical

treatment.

Clinical evaluation revealed an overweight patient (body mass index 27 kg/m²), with normal pulmonary and cardiovascular examination findings, resting BP 120/80 mmHg and heart rate (HR) 70 bpm.

Laboratory results showed normal full blood count with no inflammatory syndrome, normal glucose, hepatic and renal parameters. The patient presented borderline values of total cholesterol and LDL-cholesterol (209 mg/dl and 124 mg/dl, respectively) while HDL-cholesterol and triglycerides levels were normal. Potassium and uric acid levels were unaltered.

ECG at rest revealed sinus rhythm, 70 bpm, intermediate axis, ST segment depression (maximum 2 mm) with inverted T waves in precordial leads V3-V6 (fig. 1). Even though R waves in V5 and V6 leads were of moderate amplitude, the patient did not meet any criteria for a diagnosis of left

ventricular hypertrophy (LVH) (3).

Taking into consideration the ECG modifications, we performed a 2D Doppler trans thoracic echocardiography that revealed normal left ventricular wall sizes with normal kinetic movement and preserved LV ejection fraction. Thus, the diagnosis of LVH (LV mass index = 96 g/m²) and obstructive hypertrophic cardiomyopathy were ruled out as possible causes of ST segment depression.

As the patient approved to participate in a study assessing subclinical atherosclerosis in patients with no prior diagnosis of cardiovascular or metabolic diseases, we performed the carotid ultrasound and found a moderately increased intima-media thickness (1 mm) with a small calcified plaque on the right carotid bulb. Arterial stiffness was also within the normal range, (aortic pulse wave velocity - 6.9 m/s). Ankle-brachial index was within the normal range.

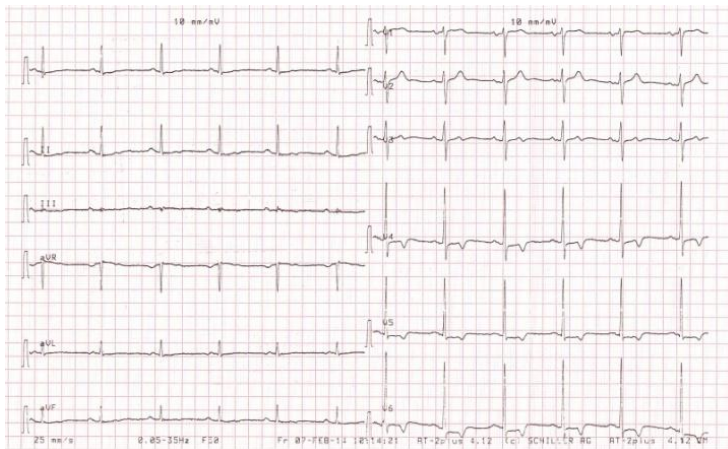


Fig. 1. ECG at rest: sinus rhythm, 70 bpm, ST segment depression and inverted T waves in leads V3-V6

At that moment, we suspected a silent myocardial ischemia. Analyzing the latest guidelines for stable coronary artery disease, the patient presented a 44% interme-

diante pre-test probability of CAD (4). For intermediate pre-test probability, exercise ECG is the most feasible initial diagnostic test. Thus, an exercise stress testing on

ST segment depression in asymptomatic male patient with normal coronary arteries

cycloergometer was performed: the patient reached maximum HR (161 bpm, 101% of age-predicted HR), with a work-load of 125 W and 6.5 METs. The patient did not complain of any chest pain or other clinical symptoms. Compared to the resting ECG, T waves were positive in leads V4-V6 and remained positive 6-7 minutes during the recovery phase (fig. 2, 3).

Exercise ECG being inconclusive for making a diagnosis of CAD, we resorted to a more accurate method, the coronary computed tomography angiography (coronary

CT) for several reasons. It has a sensitivity of almost 95-99%, being the test with the highest negative predictive value; it is considered an alternative to other stress tests for ruling out CAD in intermediate pre-test probability patients; it is considered in intermediate pre-test probability patients after an inconclusive exercise ECG (4). Our patient meeting all the above mentioned criteria, a coronary CT was performed; it revealed permeable coronary arteries with no stenosis and with Agatston calcium score equal to 0.

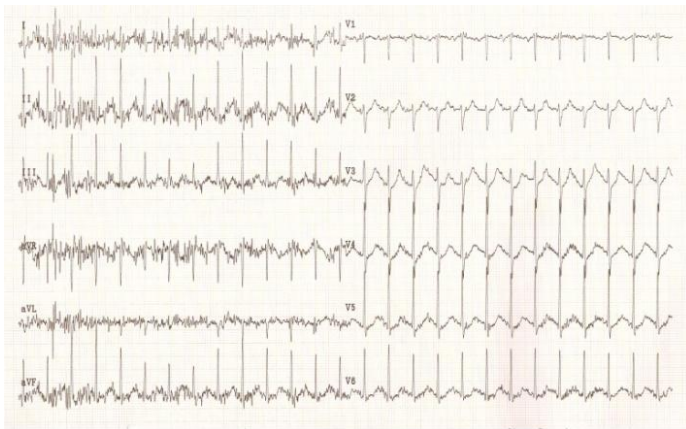


Fig. 2. Exercise ECG – at maximum HR: pseudo normalization of T waves

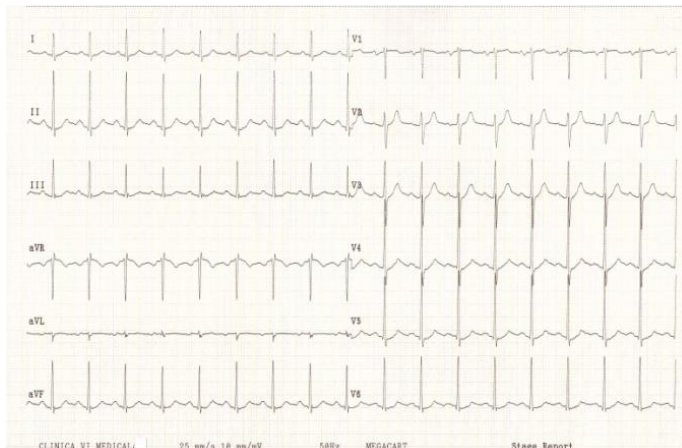


Fig. 3. Recovery phase (5'): still positive T waves with mild ST segment depression

Thus, we excluded all possible causes of ECG ST segment depression. The patient is currently under no chronic treatment and is scheduled for regular follow-up visits in our clinic.

DISCUSSION

ST segment depression and negative T waves are common electrocardiographic changes often seen in medical practice. They need an accurate approach in order to differentiate the possible causes both in acute and in chronic situations.

We will make a summary and comprehensive review of the multiple causes of ST segment depression and T wave inversion based on the above presented clinical case.

When encountering such resting ECG incidentally and not in acute situation, the first diagnostic hypotheses are represented by LVH and myocardial ischemia. Our patient did not meet any of the *left ventricular hypertrophy* ECG criteria (3). However, we performed an echocardiography taking into consideration the poor correlation between ECG and echocardiographic diagnosis of LVH and the result was negative as well. The normotensive status of the patient was another argument in favor of the absence of LVH. On the ECG, the patient did not present *left bundle branch block* and the cardiac ultrasound ruled out the *obstructive hypertrophic cardiomyopathy* as other possible causes of ECG abnormalities.

Another possible cause of ST segment depression could be *Wellens syndrome* which is characterized by two patterns. 75% of cases consist in symmetrically and deeply inverted T waves in leads V2-V4. In 25% of cases, T waves have positive-negative biphasic morphology in leads V2-V4 and the patient usually presents a 90% proximal left

anterior descending stenosis (1). However, our patient has no coronary lesions and his ECG findings were different.

There were no *acute causes* that could lead to ST segment depression such as myocardial infarction or pulmonary embolism and by using laboratory results we excluded *hypokalemia*. The patient's medical history ruled out the *digitalis toxicity* as other possible cause.

After interpreting all the results, our main concern was represented by *silent myocardial ischemia*. Asymptomatic myocardial ischemia is present in up to 24% of apparently healthy individuals while in diabetic population the prevalence varies between 12% and 33%. In subjects without prior diagnosis of coronary disease, ST segment depression can predict adverse cardiovascular events and its detection by ambulatory electrocardiogram is a more powerful predictor of mortality than age, exercise duration, hypertension or diabetes (5).

As our patient had an intermediate pre-test probability of having CAD, we performed an exercise ECG stress test that showed pseudo normalization of T waves during exercise and within the first minutes of the recovery phase. Nowadays, transient conversion of T waves is considered a non-specific finding in individuals without prior myocardial infarction and the diagnosis of certainty should be made by using other tests (2).

Finally, the patient having a normal CT coronary angiogram, there were two major hypotheses to explain the ECG abnormalities: an incipient LVH or an atypical *microvascular angina*.

Coronary micro vascular dysfunction is usually associated with advanced age, hypertension, dyslipidemia and diabetes, but

also with chronic inflammation (high levels of C-reactive protein). Our patient had some of these risk factors, but at lower levels (62 years, arterial hypertension grade I, mild hypercholesterolemia). On the other hand, this specific type of angina is more prevalent in women than in men. However, our patient presented no clinical symptoms at rest or during stress-induced angina. Currently, the gold standard for a certain diagnosis is represented by invasive coronary vasomotor testing using intracoronary injection of acetylcholine (6).

Even if the patient did not meet electrocardiographic or echocardiographic criteria for LVH, this possible diagnosis should be maintained and a regular follow-up should be scheduled. It has been proved that LVH is associated with markers of subclinical atherosclerosis e.g. carotid-intima thickness and carotid plaques as it is the case in our patient (7, 8). However, arterial stiffness was not pronounced and the ankle-brachial index was normal.

It is worth mentioning the research of Kansal et al. who performed a study in which they correlated the presence of resting ST segment depression with coronary angiography in 37 patients free of recent coronary events and with no other cause of ST segment abnormality. Of 37 subjects, 9 had normal coronary angiograms, but 8 of them were females and had a relatively low mean age (43.8 years). The same study reported a double risk for occlusive CAD

in men compared to women (9). Another study conducted only on male population pointed out those patients with resting ST segment depression and no prior myocardial infarction had a higher prevalence of severe CAD. After a 4.4-year follow-up, individuals with ST segment depression at rest (with or without prior myocardial infarction) had lower rates of survival compared to general population (10).

CONCLUSIONS

This case report presents a comprehensive management of an asymptomatic male patient, with a moderate cardiovascular risk, that presents with a resting ECG pattern of ST segment depression and inverted T waves in leads V3-V6. By multiple echographic, laboratory and stress tests we ruled out the possible causes of the ECG abnormalities. Using coronary CT, the end result (normal coronary arteries) was surprising so that the exact cause could not be determined and a certain diagnosis made. Thus, it is very important to closely follow-up such patients in order to prevent and promptly diagnose future cardiovascular changes and events.

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NEWS

ANTIOXIDANT ACTIVITY OF PHENOLICS IN RED WINE

It is known that health benefits of red wine have been linked to the presence of phenolic antioxidants. Thus, a group of researchers developed a high performance thin layer chromatographic (HPTLC) method combined with high resolution digital plate images. They visually compared multiple wine samples simultaneously on a single chromatographic plate and quantified levels of four representative classes of phenolics found in wines: gallic acid, caffeic acid, resveratrol and rutin. They also investigated the contribution of these phenolic compounds to the total polyphenolic content (TPC) and total antioxidant capacity (TAC) of the wine samples. The average concentrations of caffeic acid, gallic acid, resveratrol, and rutin in the red wines were 2.15, 30.17, 0.59 and 2.47 mg/L respectively with their concentration below limit of quantification in the white wine samples. The highest concentration of resveratrol and rutin is found in the Cabernet and Shiraz wine samples. The amounts of gallic acid are correlated with TPC ($r = 0.58$). Italian wines have the highest correlation between TPC and TAC ($r = 0.99$) although they do not contain detectable amounts of resveratrol, they contain significant amount of rutin. Researchers concluded that antioxidant properties might be associated with the presence of flavanols in wines. The antioxidant activity of phenols is also related to their chemical structure, especially with the number and arrangement of free hydroxyl groups of polyphenol skeleton (Agatonovic-Kustrin S, Hettiarachchi CG, Morton DW et al. Analysis of phenolics in wine by high performance thin-layer chromatography with gradient elution and high resolution plate imaging. *J Pharmaceut Biomed* 2015; 102: 93-99).

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