



CORPUS PUBLISHERS

Corpus Journal of Case Reports (CJCR)

Volume 2 Issue 1, 2021

Article Information

Received date : August 23, 2020

Published date: November 4, 2021

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Key words

Electrocardiogram; Breast implants;
Chest Pain; Voltage

Abbreviations

ECG: Electrocardiogram

BIs: Breast implants

DOI: 10.54026/CJCR/1009

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Case Report

Breast Implants in a Woman Associated With Low-Voltage Electrocardiogram (ECG)

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Abstract

Breast Implants (BIs) in women are associated with several Electrocardiogram (ECG) modifications. However, the association between BIs and low-voltage ECG has not been reported yet. A 44-year-old woman with a history of breast implant surgery visited our outpatient cardiology clinic complaining of atypical chest pain. A standard ECG showed low voltage in all precordial and most of the limb leads. Physical examination and echocardiography showed no pathology. Nothing other than BIs was found as a cause of low-voltage ECG in the woman. Breast implant-induced ECG modification can mislead clinicians resulting in diagnostic challenges and unnecessary tests. Low-voltage ECG is one of the modifications associated with BIs, which has not been reported before. A large prospective study is required to investigate the impacts of BIs on ECG thoroughly.

Introduction

The low-voltage Electrocardiogram (ECG) can be associated with either the problems of voltage generated by the heart or other non-cardiac conditions such as the problems of voltage transmission and electrode placement and equipment issues [1]. In recent years, Breast Implants (BIs) in women have been shown to cause ECG modifications [2]. However, the impacts of BIs on ECG modification have not been studied thoroughly in a large-scale prospective study. Although the absence of R wave progression from precordial leads was reported in women with BIs, no case in the literature showed low QRS voltages in both precordial and limb leads associated with BIs.

Case Report

A 44-year-old woman visited our outpatient cardiology clinic with a history of two-day atypical chest pain characterized by a local, sharp, knife-like stabbing pain. Her functional capacity was good and the pain was not related to exercise. She denied coughing and swallowing problems. Regarding medical history, she reported no chronic medical conditions. She revealed that she underwent breast implant surgery over four months ago for an aesthetic purpose and recovered from a mild Covid-19 infection over two weeks ago. Except for smoking, she denied any substance use. Her height was 165 cm and weight was 66 kg. The heart sounds were normal, and no murmurs or rubbings were heard on cardiac auscultation. Lung auscultation revealed normal breath sounds and no rales or rhonchi. Peripheral edema was not inspected. No pain was raised by compressing the costochondral joints. Blood pressure from the right and left arms were 114/72 and 118/74 mmHg respectively, and pulse per minute was 56. Echocardiography revealed normal heart structure and functions. The ECG showed sinus rhythm, normal aks, low QRS voltage in all precordial leads, and most of the limb leads including D2, D3, aVF, aVL. In addition, T wave inversion was detected in precordial leads from V3 to V6 (Figure 1).

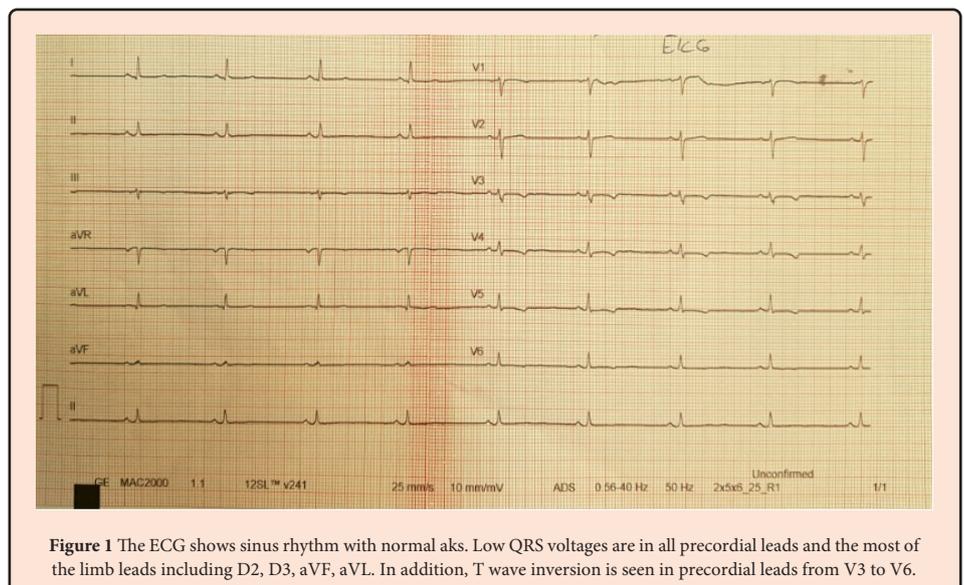


Figure 1 The ECG shows sinus rhythm with normal aks. Low QRS voltages are in all precordial leads and the most of the limb leads including D2, D3, aVF, aVL. In addition, T wave inversion is seen in precordial leads from V3 to V6.

Discussion

To the best of our knowledge, this is the first time the low QRS voltage in both precordial and limb derivations of ECG was reported in a woman with BIs. In a recent study, 42% to 46% of ECG modifications were reported in women with BIs [2]. These modifications include negative T waves, ST depression, absence of R wave progression from V1 to V4, left ventricular



hypertrophy, long QT, early repolarization, short PR. Since the vast majority of participants did not have preoperative ECG, the abnormalities on the ECGs could not be attributed to the BIs for certain. However, the prevalence of ECG abnormalities reported in this study was significantly higher than a study including a large population of non-athlete young female subjects, in which mainly QT abnormalities were detected [2, 3]. Although the absence of R wave progression from V1 to V4 was reported in some individuals in the previous study, there is no report regarding low QRS voltage in both precordial and limb derivations in a woman with BIs.

Low-voltage ECG is classically defined as peak-to-peak QRS amplitude of 5 mm (0.5 mV) or less in all of the limb leads and 10 mm (1.0 mV) or less in all of the precordial leads [1,4]. Conditions of low-voltage generation include decreased active myocardial muscle mass, presence of scar tissue, infiltrative and storage diseases [1,5-7]. In addition, myocarditis can result in low voltage [1,8]. The conditions related to decreased voltage transmission include cardiac tamponade, chronic obstructive pulmonary disease, pneumothorax, pleural effusion, peripheral edema, and subcutaneous emphysema, obesity, hypoalbuminemia, and increased hematocrit levels [1,5]. Except for breast implant, none of the clinical and echocardiographic findings of our case could justify the presence of low QRS voltage. Low QRS voltage in the ECG can result from electrical malfunction of the recorder or cable connections, or it can be related to electrode misplacement and cable transposition [1]. Our ECG machine was functioning well, and the individuals who took ECG before and after our case did not show a low voltage. In addition, the second ECG recorded from our case under the supervision of a senior nurse displayed the same result.

Besides low QRS voltages, inverted T waves were detected from V3 to V6 in the ECG of our case. Blood Troponin I level was within normal range. Although inverted T waves in leads other than V1 to V3 may imply an underlying cardiac pathology [9], it also can be the result of benign conditions such as the postprandial state, respiration, or minor anxiety [10]. Since our case did not reveal any cardiac symptoms and echocardiography showed no structural pathologies, we considered the T wave changes as nonspecific.

Conclusion

In conclusion, besides a variety of ECG modifications reported to be associated with BIs, low-voltage ECG can also be attributed to the BIs. The ECG modifications induced by

BIs can mislead clinicians causing diagnostic challenges and ordering unnecessary tests. A large prospective study comparing pre-and postoperative ECGs is required to provide a certain association between ECG modifications and BIs.

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