CASE REPORT

Complete Absence of Precordial R Waves Due to Absence of Left-Sided Pericardium

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Poor R-wave progression (PRWP) in the precordial leads on random ECG is relatively frequent in the general population and includes a broad differential diagnosis. Here, we present for the first time a case of complete absence of precordial R waves associated with a prominent R wave in aVR due to the absence of the left-sided pericardium in a 44-year-old woman who experienced sudden cardiac death.

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Normal progression of the R wave in the precordial ECG leads implies transition between V₂ and V₃. The amplitude of the R wave in lead V₃ is usually greater than 2 mm.¹ A poor R wave progression (PRWP) has been defined as an absolute magnitude of the R wave less than or equal to 3 mm in lead V₃ and an R wave in lead V₂ less than or equal to V₃.^{2,3} While PRWP is a quite frequent finding on random ECGs in the general population,⁴ there is no literature about the complete absence of precordial R waves. Here, we report the first proven case of complete absence of precordial R waves and a prominent positive R wave in lead aVR due to the absence of the left-sided pericardium.

CASE PRESENTATION

A 44-year-old woman was admitted after a witnessed sudden cardiac death at home. At the arrival of the paramedics on the scene, the patient was in ventricular fibrillation, which was successfully terminated by defibrillation. The patient was known for smoking and her medical history was

otherwise unremarkable. The initial ECG after resuscitation showed an atrial ectopic rhythm at 55 beats per minute. There were marked QS complexes and complete absence of R waves in all precordial leads with T-wave inversion without ST elevation or depression (Fig. 1) suggesting an ancient anterior infarction. There was also a prominent positive R wave in lead aVR, which could not be explained by a reversal of the right and left arm leads. An urgent coronarography was realized and demonstrated normal coronary arteries. A bedside echocardiography showed an akinesis of the ventricular septum and hypokinesis of the antero-apical segment.

The further clinical evolution was favorable with a complete neurological recovery and extubation 48 hours after her aborted sudden cardiac death. After several days without any recurrent malignant arrhythmia the patient was transferred to our center for an electrophysiological study and implantation of a cardioverter defibrillator (ICD). No arrhythmia could be induced on electrophysiological testing, but the fluoroscopy demonstrated a very leftward

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Figure 1. Initial ECG after aborted sudden cardiac death. Note complete absence of R waves in all precordial leads with T-wave inversion without ST elevation or depression. There is also a prominent R wave in lead aVR.

displacement of the patient's heart, which had also been observed on the chest x-ray suggesting a pericardial defect. A cardiac magnetic resonance confirmed an almost complete absence of the left-sided pericardium, which resulted in an important leftward displacement of the heart. On the basis of those findings, transient torsion of the great vessels secondary to cardiac hypermobility was considered to be the most likely cause for the patient's ventricular fibrillation. To prevent further episodes, pericardial reconstruction was realized which restored a normal and stable heart position within the thorax. The postoperative ECG showed a normalization of the electrical heart axis. Normal R waves were seen in leads V₄-V₆ with a slow R-wave progression in leads V₁-V₃ and a negative QRS complex in lead aVR (Fig. 2).

DISCUSSION

To our knowledge, this is the first report of complete absence of precordial R waves due to the absence of the left-sided pericardium. Congenital pericardial defects are rare, being found in only 0.044% of patients in surgical series.⁵ In 70–85% of all cases, the defect is partial, whereas complete absence of the left pericardium is only found in 9%.⁶ Pericardial defects have been cited as causes for PRWP,⁷ but so far no other study showed com-

plete absence of precordial R waves secondary to the absence of left-sided pericardium.

According to large ECG screening series, PRWP is the sixth most common ECG anomaly.⁸ The overall prevalence of PRWP in the general population is about 8% with a higher frequency in women (7%) than in men (2.7%) for all age groups.⁹ The ECG of 10% of hospitalized patients and 8% of patients undergoing investigation for coronary artery disease shows PRWP.¹⁰ The differential diagnosis of PRWP is broad including anterior myocardial infarction, left or right ventricular hypertrophy, conduction anomalies such as left bundle branch block, left anterior hemiblock, or Wolf-Parkinson-White syndrome.^{11,12} Other causes are emphysema, left-sided pneumothorax and 7% of normal individuals can present with PRWP.^{11,13,14} Though anterior myocardial infarction is one of the most frequent suspected diagnosis, only 20–39% of PRWP on ECGs can be attributed to coronary artery disease in an unselected population.^{2,4,10} There is little literature about the clinical importance of fortuitous finding of PRWP on a random ECG. A recent study suggested an association between PRWP and cardiovascular risk factors like hypertension or diabetes and found PRWP to be independently associated with a higher all-cause and cardiovascular mortality in women but not in men.⁹ An older study stated that PRWP has no

Figure 2. Postoperative ECG after reconstruction of the pericardium. Normalization of the heart axis with normal R waves in leads V₄-V₆ and a slow R wave progression in leads V₁-V₃. There is now a negative QRS complex in lead aVR.

predictive value in a non-high-risk population.¹⁰ In contrast to PRWP, the incidence of complete absence of precordial R waves is unknown so far. As pericardial defects represent rare cardiac abnormalities and most patients are asymptomatic,⁵ it is impossible to conclude if the ECG findings of our patient would have had a prognostic value if detected randomly in other patients with a similar condition.

Another interesting finding was the prominent R-wave in lead aVR. As aVR does not correspond to a specific myocardial territory and does not correlate with the other leads, its analysis is often somehow neglected. Nevertheless, there are several works documenting the clinical value of aVR abnormalities for different cardiac pathologies.¹⁵ On a normal ECG, lead aVR records a negative QRS complex because its orientation is opposite to the direction of the electrical main vector.¹⁶ Only a few causes for a positive QRS complex in lead aVR have been identified so far including Brugada syndrome, right ventricular overloading or acute intoxication with tricyclic antidepressants.^{15,17,18} In our report, we documented for the first time that congenital absence of the pericardium represents another differential diagnosis of a prominent R wave in lead aVR which is explained by the abnormal intrathoracic heart position.

However, more frequently than a prominent R wave in aVR, PRWP in patients with pericardial defects is associated with the ECG pattern of an incomplete right bundle-branch block, which is explained by the displacement of the heart in the left hemithorax.¹⁹

The aforementioned literature shows that the isolated finding of PRWP alone on an ECG in an asymptomatic patient does not permit to conclude on a specific diagnosis, but rather necessitates a careful clinical evaluation. As complete absence of precordial R waves in association with a prominent R wave in aVR seems to be even less frequent than PRWP, those findings should promptly raise the suspicion of a congenital pericardial defect. In those cases, a chest x-ray can rapidly help to identify an abnormal heart position and to guide further diagnostic tests.

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