Tilted ECG - An unusual tilt test response

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A B S T R A C T

Tilt testing is a commonly used diagnostic tool to evaluate syncope of undetermined etiology. We hereby describe a twelve year old male child who developed presyncope during provocative head up tilt testing along with ST segment elevation in cardiac monitor during presyncope. Patient underwent repeat head up tilt testing along with holter monitoring which showed a left bundle branch block escape rhythm. Hence development of ST elevation was due to the improper filter application in single lead ECG monitor. This case highlights the importance of filters in electrocardiographic monitoring.

1. Introduction

Diagnosis of vasovagal syncope can be made after a suggestive history and positive tilt table testing [1]. Patient with vasovagal syncope usually develop bradycardia along with hypotension during head up tilt table testing (HUTT). In this case report we have discussed an unusual response to HUTT due to improper filter application in cardiac monitor.

2. Case

A twelve-year old male, who was operated for ventricular septal defect closure and right ventricular outflow tract resection 5 years back, presented to us with two episodes of presyncope. His baseline ECG showed right bundle branch block (RBBB). His 24-h holter monitoring was normal. His baseline head up tilt test (HUTT) was uneventful but after provocation with sublingual nitroglycerine spray he developed presyncope. Single channel recording during the episode is shown in Fig. 1. ST elevation in the single lead II ECG during the episode prompted us to repeat HUTT with 12 lead holter monitoring.

During repeat HUTT, patient developed similar ECG changes in the single lead monitor along with presyncope. However, Holter analysis showed left bundle branch block (LBBB) escape rhythm during the episode (Fig. 2).

3. Discussion

There are two important lessons to be learnt. First, that single lead monitors, generally used for rhythm monitoring can be highly misleading for ST segment evaluation. The ECG pattern recorded on monitor was LBBB with reciprocal ST elevation. However due to improper filter application in the monitor settings, ST elevation was exaggerated. Appropriate filtering is done in 12 lead ECG machines to avoid unwanted noises, interference and signals. Low frequency interference contributes to baseline wander in ECG. High pass filters are applied in the standard ECG machines to eliminate low frequency signals (such as movement of patient or breathings) which causes baseline wander. As per guidelines, low frequency filter cut off of 0.05 Hz is advised for non-linear filters to minimize the distortion of ST segment in real time display such as cardiac monitors [2]. Improper filter applications can even simulate myocardial infarction. Burri H et al. showed that at 0.5 and 1.0 Hz high pass filter settings 60% and 100% of ECGs were suggestive of anteroseptal myocardial infarction, respectively, with maximum changes noticed in Lead V2 [3].

Secondly, patient developed hypotension with blood pressure of 56/19 mm Hg leading to presyncope. Patient had sinus rhythm with RBBB at baseline. In single channel monitoring there seems to be sinus arrest or sinus pauses, with a wide QRS escape, probably a fascicular or ventricular rhythm. It cannot be a “junctional” rhythm, since the QRS complex during the escape is very different from the QRS complex during sinus conduction. There are brief periods of sinus activity, conducted QRS complexes now look different from baseline. Varying QRS complexes would suggest changing infra-His conduction. On holter monitoring patient developed fusion beat to LBBB during episode of presyncope (Fig. 2). To conclude we have

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described an unusual response to HUTT due to improper application of filter settings in single lead cardiac monitor.

**Conflict of interest**

Authors report no conflict of interest.

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