

CASE REPORT

Unusual U wave induced by reconstructed retrosternal esophagus

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Background

ECG abnormalities, especially in the ST segments are caused by many reasons such as genetic diseases, cardiac ischemia, and electrolyte disorders [1]. Aside these internal reasons, direct mechanical compression to the heart can also induce ECG changes such as Brugada-like ECG [2]. As the heart is usually protected in the mediastinum, there are limited case reports for these mechanical compression-induced ECG abnormalities. We describe here a case of a mechanical compression from the right ventricular outflow tract to the right ventricle inducing an abnormal U-wave morphology.

Case Presentation

A 69-year-old woman was referred to our hospital due to ECG abnormality after retrosternal reconstruction surgery for esophageal cancer. ECG before the surgery showed no abnormality (Fig. 1A). At the first visit, ECG showed a prominent unusual shaped U wave in the right precordial leads (V1-V3) despite least change in other leads

Key Clinical Message

The present case shows that a broad compression of the right ventricle by the reconstructed stomach tube after esophagus cancer surgery induced an abnormal U wave. When facing an abnormal ECG, we should keep in mind of the mechanical compression to the heart as a differential diagnosis.

Keywords

Electrography, esophagus surgery, U wave.

(Fig. 1B). Electrolyte levels were all within normal limits and no drug was prescribed. The plain chest CT demonstrated compression of not only the right ventricular outflow tract (RVOT), but also the right ventricle free wall by the reconstructed stomach tube (Fig. 1C). Transthoracic echocardiogram showed the compression of the right ventricle without any abnormal valvular disease and left ventricular wall motion. The U-wave morphology in the precordial leads changed for every visit (Fig. 1D). During the follow-up, the patient had symptomatic sinus bradycardia and a permanent pacemaker was implanted. Though the heart rate increased and the symptom improved, the U wave did not shorten (Fig. 1D). The patient has no symptoms as palpitations or syncope up to now.

Discussion

Mechanical compression of the RVOT is reported to cause a Brugada-like ECG showing an ST segment elevation in the right precordial leads, due to loss of the action potential dome at RVOT sites [3]. In the present

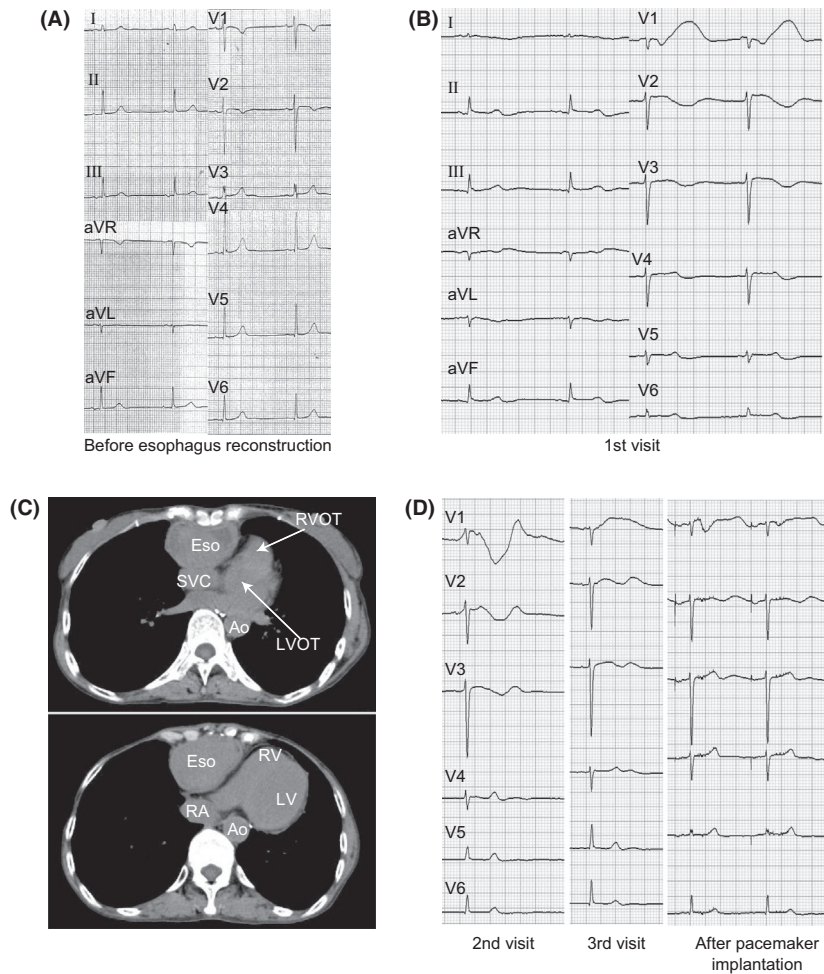


Figure 1. (A), ECG before esophagus reconstruction. (B), ECG of the first visit at our hospital. (C), Plain CT of the chest. The reconstructed stomach tube is compressing the RVOT and RV free wall. (D), Precordial leads of the 12-lead ECG at each visit. Eso, reconstructed stomach tube, SVC, superior vena cava, RVOT, right ventricular outflow tract, LVOT, left ventricular outflow tract, Ao, aorta, RV, right ventricle, RA, right atrium, LV, left ventricle.

case, the ECG had some ST segment elevation in leads V1-V3 though it looks clearly different from Brugada-type ECG, and the loss of dome usually does not induce U wave. As hypothermia is reported to induce repolarization abnormalities, ECG was recorded during the patient taking ice-cold water and no change was found [4]. Bradycardia is also another cause of U wave, but was negated as the U wave was still present after pacemaker implantation [5].

Interpretation of T wave and U wave on ECG is occasionally difficult and there is no absolute definition to distinguish them as in the current case [6]. We therefore defined the unusual wave seen in V1-V3 as a U wave by the assessment proposed by Postema et al. [7]. Briefly, the end of the T wave is the intersection of a tangent to the steepest slope of the last limb of the T wave and the

baseline in lead II or V5. Measured corrected QT interval calculated by Bazett's formula for all ECG was stably around 420 msec.

M cell has the longest action potential duration among the three myocardial layers, hence we speculated that the broad mechanical compression to the broad right ventricle caused the electrical dissociation between the epi- and endocardial layer, and the authentic power of the M cell became visible through the right precordial ECG [8]. The extent of the compression may have made the change for each ECG.

As the heart is usually protected in the mediastinum, the incidence of mechanical compression to the heart inducing ECG abnormality is rare. However, we must be aware of these causes for differential diagnosis for ECG abnormalities as the therapeutic strategy may change.

Conflict of Interest

Nothing to declare.

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