

# Pregnancy as a rare cause of electrical alternans on electrocardiography

## Abstract

Electrical alternans is a phenomenon defined as an alternating amplitude or axis of the QRS complexes, ST segment, P or T waves in electrocardiography. It is most commonly associated with a large pericardial effusions causing cardiac tamponade; however, a variety of other clinical scenarios including cardiomyopathies, myocardial ischemia, atrioventricular re-entrant tachycardia, large pleural effusion has been associated with electrical alternans. Here, first in the literature, we present a young patient with term pregnancy who was admitted with electrical alternans in electrocardiography due to excessive respiratory movements mainly by the intercostal and accessory muscles.

**Keywords:** Electrical alternans, electrocardiography, pregnancy, respiration

## Case Report

Volume 11 Issue 1 - 2018

Çağlar Alp,<sup>1</sup> İsmail Ekinözü,<sup>1</sup> Osman Karaarslan,<sup>1</sup> Tolga Doğan,<sup>1</sup> Mucahit Yetim,<sup>1</sup> Lütfü Bekar,<sup>2</sup> Macit Kalcık,<sup>2</sup> Yusuf Karavelioğlu,<sup>2</sup>

<sup>1</sup>Department of Cardiology, Hitit University Çorum Training and Research Hospital, Turkey

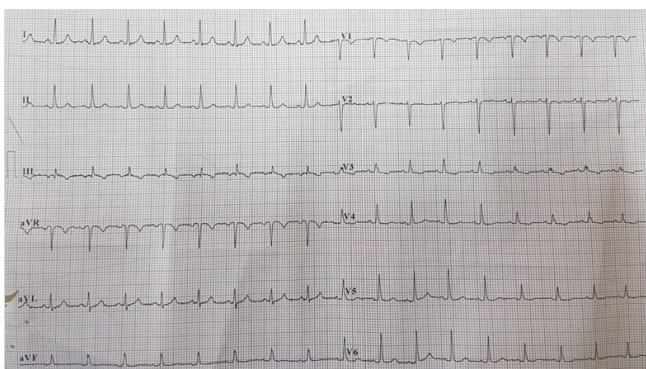
<sup>2</sup>Department of Cardiology, Hitit University Faculty of Medicine, Turkey

**Correspondence:** Macit Kalcık, Hitit University Çorum Training and Research Hospital, Yeni Yol, Çamlık Cad. No:2, Çorum/Turkey, Fax +903642230300, Tel (90)536 4921789, Email macitkalcik@yahoo.com

**Received:** July 22, 2017 | **Published:** February 28, 2018

## Case presentation

A 21-year-old woman with 39-weeks pregnancy was admitted to emergency department with dyspnea and atypical chest pain. Her physical examination and vital signs were in normal ranges. A 12-lead electrocardiography revealed electrical alternans in precordial derivations synchronous with the respiratory movements (Figure 1). The electrical alternans was abolished when the patient held her breath for 3-4 seconds. Keeping in mind that pericardial effusion is the most common cause of electrical alternans in electrocardiography, a transthoracic echocardiography was performed which was revealed normal cardiac functions without any pericardial effusion.



**Figure 1** Electrocardiography revealing electrical alternans in precordial derivations.

Electrical alternans is a phenomenon consisting of an alternating amplitude or axis of the QRS complexes, ST segment, P or T waves in electrocardiography. It has classically been associated with pericardial effusions and tamponade due to a beat-to-beat swinging

motion of her heart in the large pericardial effusion.<sup>1</sup> The extreme pendulous change in the orientation of the heart within the large pericardial effusion explains the alternating QRS vectors on the 12-lead electrocardiogram. A variety of other clinical scenarios including cardiomyopathies,<sup>2</sup> myocardial ischemia,<sup>3</sup> atrioventricular re-entrant tachycardia,<sup>4</sup> large pleural effusion,<sup>5</sup> hyperkalemia<sup>6</sup> and digital intoxication<sup>7</sup> have been associated with electrical alternans in the literature. Surawicz et al.<sup>8</sup> divided the etiologies of electrical alternans into four categories: mechanical, ischemic, electrical, and in association with cardiac motion.<sup>8</sup>

The progressive uterine distension is the major cause of altered thoracic configuration and lung volume changes during pregnancy. The enlarging uterus increases the end-expiratory abdominal pressure, thereby displacing the diaphragm upwards. During pregnancy, chest wall expansion is shifted toward the ribcage because of compensatory role of inspiratory intercostal and accessory muscles.<sup>9</sup> Here, we present a case with electrical alternans in electrocardiography due to excessive respiratory movements mainly by the intercostal and accessory muscles in pregnancy. To the best of our knowledge, this is the first reported case of pregnancy causing electrical alternans in electrocardiography and demonstrates that the differential diagnosis of electrical alternans should include pregnancy.

## Data sharing

No additional data.

## Contributorship

All of the authors contributed planning, conduct, and reporting of the work. All contributors are responsible for the overall content as guarantors.

## Funding

No funding.

## Competing interests

All of the authors have no conflict of interest.

## References

1. Denargone D. ECG Manifestations: noncoronary heart disease. *Emerg Med Clin North Am.* 2006;24(1):113-31.
2. Arif R, Hussain A, Dhillon S. Electrophysiological Twisting: Electrical Alternans in Congenital Dilated Cardiomyopathy. *Circ Arrhythm Electrophysiol.* 2017;10(2).
3. Cheng TC. Electrical alternans. An association with coronary artery spasm. *Arch Intern Med.* 1983;143:1052Y1053.
4. Lam HD, Stroobandt R, Knight BP. Supraventricular tachycardia with alternating cycle length: what is the mechanism? *J Cardiovasc Electrophysiol.* 2001;12(11):1329e1330.
5. Shepard BM, Peckler BF, Duggal S. Electrical alternans in a patient with pleural effusions. *Am J Emerg Med.* 2006;24(6):717-20.
6. Tanawuttiwata T, Harindhanavudhi T, Bhan A, et al. Hyperkalemia-induced Brugada pattern: An unusual manifestation. *J Cardiovasc Med.* 2010;11:285–28.
7. Chung EK. Digitalis-induced double atrioventricular nodal rhythm associated with electrical alternans. *Jpn Heart J.* 1968;9:504Y508.
8. Surawicz B, Fisch C. Cardiac alternans: diverse mechanisms and clinical manifestations. *J Am Coll Cardiol.* 1992;20:483Y499.
9. LoMauro A, Aliverti A. Respiratory physiology of pregnancy: Physiology masterclass. *Breathe (Sheff).* 2015;11(4):297-301.