

A case report of atrial enlargement and transitory electrocardiographic changes during labour

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Abstract

During pregnancy some aspecific physiological electrocardiographic changes are described in literature. We report a case of a young pregnant aged 32 who showed, during labour at 39 weeks, electrocardiogram signs of biatrial enlargement resolved post-partum. The cardiovascular system is subject to a reversible series of structural and functional adaptations during pregnancy. Emergency physicians, gynecologists and obstetricians should be aware of these physiological electrocardiographic changes during pregnancy in order to obtain a correct and an appropriate diagnosis in emergency room.

KEY WORDS: Atrial enlargement; electrocardiogram; pregnancy.

Riassunto

Alcune alterazioni elettrocardiografiche sono descritte durante la gravidanza. Riportiamo il caso di una giovane donna osservata durante il travaglio che mostrava all'elettrocardiogramma segni di impegno biatriale con risoluzione di questi segni dopo l'espletamento del parto.

Il sistema cardiovascolare è soggetto a una serie reversibile di adattamenti strutturali e funzionali durante la gravidanza. I medici di pronto soccorso, i ginecologi e gli ostetrici dovrebbero conoscere queste alterazioni elettrocardiografiche fisiologiche della gravidanza così da ottenere una diagnosi corretta e adeguata.

TAKE-HOME MESSAGE

In this case report, we showed physiological electrocardiogram signs of biatrial enlargement that occurred in a 39-weeks pregnant during labour, resolved post-partum. Emergency physicians, gynecologists and obstetricians should be aware of these signs to obtain a correct and appropriate diagnosis.

Competing interests - none declared.

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INTRODUCTION

During pregnancy the cardiovascular system undergoes many alterations [1–3] and some of these can be expressed in electrocardiographic changes [4, 5]. We report a case of a young woman who presented to the emergency department during active labour at 39 weeks, because she showed electrocardiographic changes of unequivocal interpretation, resolved post-partum.

CASE REPORT

A 32-years-old woman was admitted to the Emergency Department of *Macedonio Melloni* Hospital in Milan, in active labour at 39 weeks' gestation. She had a history of hypothyroidism treated with thyroid hormone. On physical examination, the patient was asymptomatic, eupnoic, with blood pressure 132/70 mmHg, pulse 120 beats/min, respiratory rate 16/min, temperature 36°C, SaO₂ (Oxygen Saturation) 100%. Chest auscultation was normal. A routine electrocardiogram was obtained and showed sinus tachycardia, right axial deviation and biatrial enlargement (Figure 1). The patient denied any history of cardiovascular pathology; she denied palpitations, chest pain, shortness of breath or dizziness and she told us that an electrocardiogram performed about two years before was described as normal. Blood examination was normal. We calculated Wells and simplified revised Geneva pre-test predictor rules for pulmonary embolism [6]: their values belonged to low-probability category (respectively, 1.5 and 2). Due to organizational problems, the patient was transferred to a birth center and the delivery was carried out without complications. Some hours after giving the birth, an electrocardiographic control showed a complete regression of electrocardiographic abnormalities (Figure 2).

DISCUSSION

Our case report showed a physiological situation that can underlie a cardiovascular emergency. Tachycardia, right axial deviation and signs of atrial enlargement could be, for instance, electrocardiographic parameters related to pulmonary embolism. However, in this case, the clinical picture, vital signs and pre-test pre-

dictor rules [6] have allowed us to rule out this alternative diagnosis. The imminent delivery no allowed us to perform any other investigation, especially an echocardiogram. However, after delivery a new electrocardiogram showed a regression of the recorded changes.

The cardiovascular system is subject to some reversible structural and functional adaptations during pregnancy [1–3]. Some studies reported right atrial and ventricular enlargement and pulmonary artery dilatation during pregnancy [1, 2, 7], along with an increase in the cross-sectional areas of the mitral, pulmonic, and tricuspid valves [8].

During pregnancy, there is a physiological dilatation of both atria due to an increase in the effective circulating blood volume. Some studies found an increase in left atrial volumes by approximately 30% to 55% during the third trimester [2, 8–11].

Typical transthoracic echocardiographic findings in a normal pregnancy include mild 4-chamber dilatation (changes in the right atrium and ventricle are typically greater than the ones in the left atrium and ventricle) with transient, trivial mitral regurgitation and physiological tricuspid and pulmonary regurgitation [1].

Melchiorre et al. [3] found that by the end of pregnancy, significant chamber diastolic dysfunction and impaired myocardial relaxation were evident in 18% and 24% of their patients, respectively, whereas myocardial contractility was preserved.

Pregnancy is characterized by a high-volume and low-resistance state, during which systemic vasodilation occurs [1]. The plasma volume starts to increase at six to eight weeks and continues to rise until 28 to 30 weeks of gestation. This increase is mediated by complex changes in the endocrine system that lead to hyponatraemic hypervolemia [7]. These changes in blood volume cause heart adaptation in terms of a mild four-chamber dilatation and a progressive increase in cardiac output due to an early increase in stroke volume and subsequent increase in heart rate [7, 12]. During normal gestation, heart rate increases progressively reaching a maximum in the third trimester. The

overall change in heart rate represents a 20% to 25% increase over baseline [13–16].

During a normal pregnancy, vasomotor sympathetic activity is enhanced [17]; the high level of circulating catecholamines, associated with the pain of uterine contractions and the autotransfusion of 300 to 500 mL blood from the uterus into the systemic circulation immediately after each contraction, could be considered cofactors to explain the hemodynamic state during the labour [1]. These morphological changes do not affect the course of

pregnancy and labour [2]; they coexist with physiological cardiac remodeling during pregnancy, and in the post-partum period. These physiologic adaptations undergo reversal to the pre-pregnancy state, mostly occurring immediately after delivery [7, 18].

In conclusion, our case report indicates that emergency physicians, gynecologists and obstetricians should be aware of these physiological electrocardiographic changes during pregnancy in order to obtain a correct and an appropriate diagnosis in emergency room.

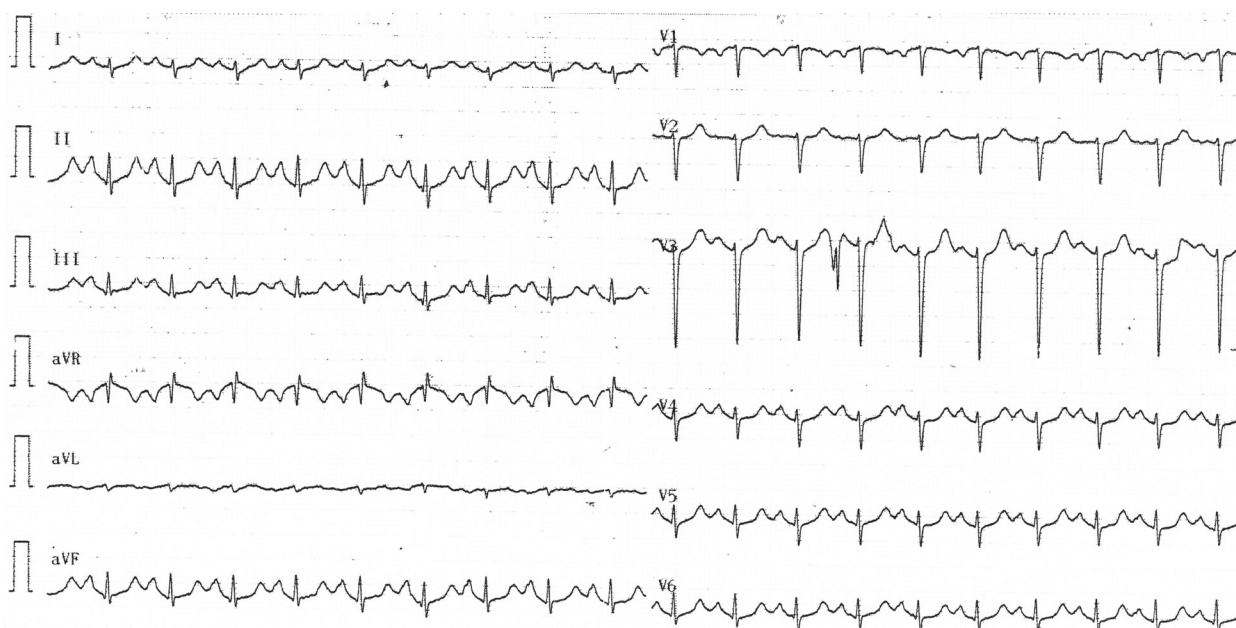


Figure 1. ECG on arrival showed: sinus tachycardia, right axial deviation and biatrial enlargement.

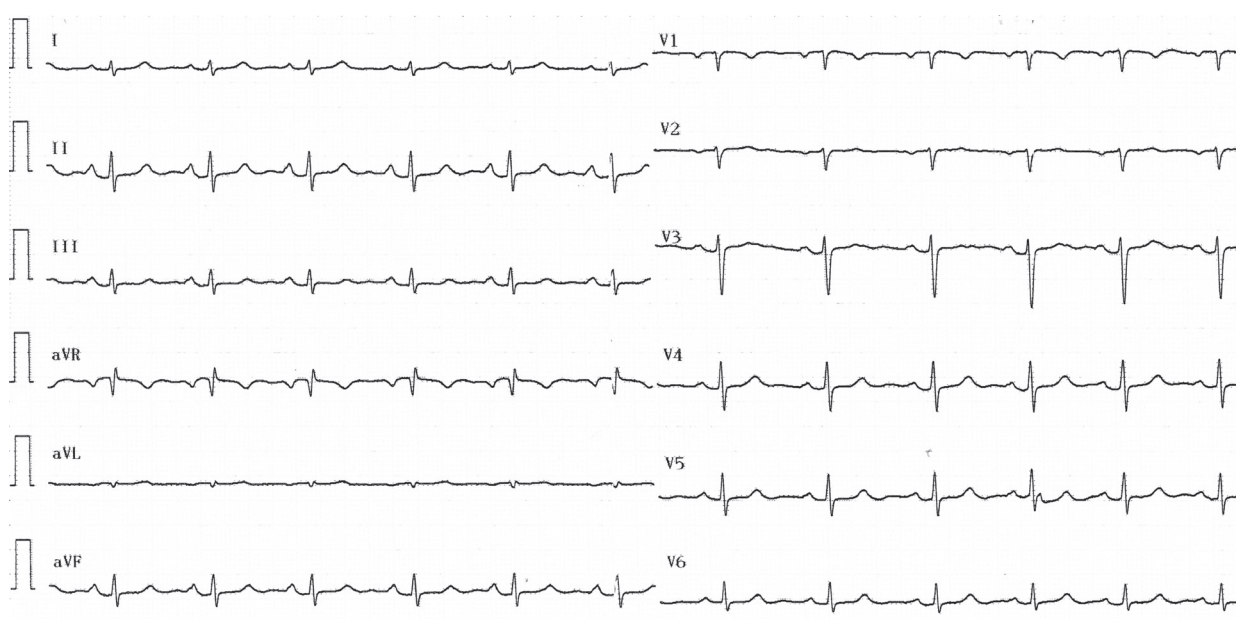


Figure 2. ECG control after delivery showed: normofrequent sinus rhythm, regression of signs of biatrial enlargement.

References

1. Sanghavi M, Rutherford JD. Cardiovascular physiology of pregnancy. *Circulation*. 2014;130(12):1003–1008. doi: 10.1161/CIRCULATIONAHA.114.009029.
2. Ducas RA, Elliott JE, Melnyk SF, Premecz S, daSilva M, Cleverly K, et al. Cardiovascular magnetic resonance in pregnancy: insight from the cardiac hemodynamic imaging and remodeling in pregnancy (CHIRP) study. *J Cardiovasc Magn Reson*. 2014;16:1–9. doi: 10.1186/1532-429X-16-1.
3. Melchiorre K, Sharma R, Khalil A, Thilaganathan B. Maternal cardiovascular function in normal pregnancy: evidence of maladaptation to chronic volume overload. *Hypertension*. 2016;67(4):754–762. doi: 10.1161/HYPERTENSIONAHA.115.06667.
4. Tanindi A, Akgun N, Pabuccu EG, Gursoy AY, Yüce E, Tore HF, et al. Electrocardiographic P-wave duration, QT interval, T peak to end interval and Tp-e/QT ratio in pregnancy with respect to trimesters. *Ann Noninvasive Electrocardiol*. 2016;21(2):169–174. doi: 10.1111/anec.12285.
5. Morton A, Teasdale S. Review article: investigations and the pregnant woman in the emergency department – part 2: point-of-care ultrasound, electrocardiography, respiratory function tests and radiology. *Emerg Med Australas*. 2018;30(6):749–753. doi: 10.1111/1742-6723.12956.
6. Konstantinides SV, Meyer G, Becattini C, Bueno H, Geersing GJ, Harjola VP, et al. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS). *Eur Heart J*. 2020;41(4):543–603. doi: 10.1093/eurheartj/ehz405.
7. Golińska-Grzybala K, Wiecheć M, Goliński B, Rostoff P, Furman-Niedziejko A, Gackowski A, et al. Pulmonary artery dilatation during normal pregnancy. *Kardiologia Pol*. 2018;76(11):1542–1550. doi: 10.5603/KP.a2018.0153.
8. Campos O. Doppler echocardiography during pregnancy: physiological and abnormal findings. *Echocardiography*. 1996;13(2):135–146.
9. Kametas NA, McAuliffe F, Cook B, Nicolaides KH, Chambers J. Maternal left ventricular transverse and long-axis systolic function during pregnancy. *Ultrasound Obstet Gynecol*. 2001;18 (5):467–474.
10. Desai DK, Moodley J, Naidoo DP. Echocardiographic assessment of cardiovascular hemodynamics in normal pregnancy. *Obstet Gynecol*. 2004;104(1):20–29.
11. Yosefy C, Shenhav S, Feldman V, Sagi Y, Katz A, Anteby E. Left atrial function during pregnancy: a three-dimensional echocardiographic study. *Echocardiography*. 2012;29(9):1096–1101. doi: 10.1111/j.1540-8175.2012.01745.x.
12. Savu O, Jurcut R, Giușcă S, van Mieghem I, Gussi I, Popescu BA, et al. Morphological and functional adaptation of the maternal heart during pregnancy. *Circ Cardiovasc Imaging*. 2012;5(3): 289–297. doi: 10.1161/CIRCIMAGING.111.970012.
13. Carruth JE, Mivis SB, Brogan DR, Wenger NK. The electrocardiogram in normal pregnancy. *Am Heart J*. 1981;102(6Pt 1):1075–1078.
14. Clapp JF 3rd, Capeless E. Cardiovascular function before, during, and after the first and subsequent pregnancies. *Am J Cardiol*. 1997;80(11):1469–1473.
15. Grindheim G, Estensen ME, Langesaeter E, Rosseland LA, Toska K. Changes in blood pressure during healthy pregnancy: a longitudinal cohort study. *J Hypertens*. 2012;30(2):342–350. doi: 10.1097/HJH.0b013e32834f0b1c.
16. Mahendru AA, Everett TR, Wilkinson IB, Lees CC, McEniery CM. A longitudinal study of maternal cardiovascular function from preconception to the postpartum period. *J Hypertens*. 2014; 32(4):849–856. doi:10.1097/HJH.0000000000000090.
17. Greenwood JP, Scott EM, Stoker JB, Walker JJ, Mary DA. Sympathetic neural mechanisms in normal and hypertensive pregnancy in humans. *Circulation*. 2001;104(18):2200–2204.
18. Robson SC, Dunlop W, Moore M, Hunter S. Combined Doppler and echocardiographic measurement of cardiac output: theory and application in pregnancy. *Br J Obstet Gynecol*. 1987;94(11):1014–1027.

