International Journal of Gynecology and Obstetrics 106 (2009) 19–22

Contents lists available at ScienceDirect

International Journal of Gynecology and Obstetrics

journal homepage: www.elsevier.com/locate/ijgo

CLINICAL ARTICLE

Doppler velocimetry of fetal pericardial fluid

Orapun Aoekkasit, Boonchai Uerpairojkit *

Department of Obstetrics and Gynecology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

ARTICLE INFO

Article history:
Received 29 December 2008
Received in revised form 27 January 2009
Accepted 20 February 2009

Keywords:
Doppler velocimetry
Fetal echocardiography
Pericardial fluid
Waveform

ABSTRACT

Objective: To investigate the flow of normal fetal pericardial fluid (PF) with increasing gestational age using Doppler velocimetry. *Method:* Ninety-five fetuses between 18 and 37 weeks of gestation with PF within the normal range were studied. PF was measured in 4-chamber view using M-mode or real-time ultrasound. Color Doppler was used to display and guide the pulse wave assessment of PF flow. PF waveforms as well as systolic and diastolic velocities were recorded and correlated with gestational age. *Results:* PF was detected in all of the fetuses. The mean thickness of the PF rim was 0.95 ± 0.45 mm. PF flowed toward the cardiac apex during systole and toward the atrium during diastole. PF waveforms showed bidirectional flow in all fetuses. The flow velocity PF was positively correlated with gestational age in both systole and diastole. *Conclusion:* Flow velocity of fetal PF increases linearly in both systole and diastole with gestational age. This might indirectly indicate a maturational change in myocardial performance as myocardial velocity is increased.
© 2009 International Federation of Gynecology and Obstetrics. Published by Elsevier Ireland Ltd. All rights reserved.

1. Introduction

A thin layer of serous fluid is typically present in the pericardial space to minimize friction during cardiac motion. Echocardiography has shown that pericardial fluid (PF) is present in an echolucent space between the pericardium and the epicardium. Small amounts of PF are found in fetuses, and PF may be visible especially during ventricular systole [1,2]. An abnormal increase in PF, a pericardial effusion, could be a sign of an underlying pathologic cardiac or extracardiac condition, which might hamper cardiac function [3,4]. Jeanty et al. [2] observed fetal PF using real-time or M-mode ultrasound and suggested that an echo-poor rim of less than 2 mm should be regarded as normal. DeVore and Horenstein [5] used color Doppler ultrasound to detect abnormal PF in the fetal heart. However, they could not demonstrate PF color flow in fetuses with PF within the normal range. In contrast, Yoo et al. [6] identified normal PF in 51% and 81% of fetuses using real-time and color Doppler ultrasound, respectively. They obtained spectral waveforms in 9 out of 21 fetuses, which confirmed the bidirectional flow pattern. However, they did not quantify the spectral waveforms of the PF.

The aims of the present study were to investigate fetal PF flow using Doppler velocimetry during the cardiac cycle to determine any correlation with increasing gestational age, and to describe the velocity waveform in fetuses with normal PF.

2. Materials and methods

The study was approved by the Chulalongkorn University Ethical Committee. Pregnant women who attended for prenatal care at the Department of Obstetrics and Gynecology, Chulalongkorn University, between March and September 2008 were enrolled. Written informed consent was obtained from all patients. Entry criteria were women with a normal singleton fetus between 18 and 37 weeks of gestation, where gestational age had been determined using a reliable date of the last menstrual period and confirmed by ultrasound in the first or early second trimester. Exclusion criteria were fetal PF of 2 mm or greater, maternal medical complications such as pregnancy-induced hypertension or gestational hypertension, inability to obtain a fetal PF waveform, fetal growth restriction or malformation, and loss to follow-up. All pregnancies were followed until delivery, and neonatal outcomes were assessed for growth and structural abnormality. Ultrasound examination was performed once only in each patient by one of the authors (O.A.) using a Voluson 730 Expert or a Voluson E8 machine (GE Medical Systems, Waukesha, WI, USA) with a 2–7 MHz curvilinear transducer.

The sample size was determined from a pilot study of 23 pregnant women and was calculated using Cohen's method for comparing single correlation coefficients [7]. We estimated that 20% of patients would be lost to follow-up, and therefore at least 75 pregnant women were needed for the study.

The fetal PF was first assessed using real-time ultrasound in 4-chamber view. The hypoechoic rim surrounding the myocardium was traced to the cardiac apex to ensure that there was no continuation to the interventricular septum. M-mode was used to measure PF at ventricular systole if we could align the ultrasound beam perpendicularly to the interventricular septum. When this

* Corresponding author. Department of Obstetrics and Gynecology, Faculty of Medicine, Chulalongkorn University, Praram four Road, Pratumwan, Bangkok 10330, Thailand. Tel.: +66 2 2564824; fax: +66 2 2564825.
E-mail address: boonchaiu@hotmail.com (B. Uerpairojkit).

0020-7292/$ – see front matter © 2009 International Federation of Gynecology and Obstetrics. Published by Elsevier Ireland Ltd. All rights reserved.
doi:10.1016/j.ijgo.2009.02.015

alignment was not possible, we used two-dimensional real-time echocardiography with cine-loop capability to measure the maximal distance of the hypoechoic rim. Color Doppler evaluation was then performed by adjusting the transducer to arrange the ultrasound beam as parallel as possible to the interventricular septum. The color box was always aligned at the right side of the ventricular wall at the level of the atrioventricular ring to avoid variability and inconsistency of the results, which might arise from different positioning and placing of the Doppler signal. Maximum temporal and spatial resolution was achieved by keeping the color box to the minimum size to cover only the cardiac contour. The gray scale gain was minimized to increase the color sensitivity. A low pulse repetitive frequency was used to aid detection of the low velocity flow signal of PF movement. Cine-loop was used to evaluate the direction of PF flow. Pulse wave Doppler was activated to obtain the PF flow velocity waveform guided by the color signal. The low-cut filter was always set to minimum. The characteristics of the waveform and the systolic and diastolic flow velocities with angle correction were recorded. Three measurements were usually obtained during fetal apnea, and the mean of the 3 measurements was recorded for analysis.

Values are presented as mean ± SD. The systolic and diastolic velocities of the PF flow for each fetus were plotted against gestational age and the correlation coefficients *(r)* were determined using Pearson correlation. $P<0.05$ was considered significant. Intraclass correlation coefficient (Intra-CC) was used to calculate intra-observer variability; paired readings obtained on 3 separate occasions were compared.

3. Results

Ultrasound evaluation and measurements of the Doppler velocity of PF were attempted for 108 fetuses. Measurements were not possible in 10 fetuses owing to suboptimal position of the fetus or maternal habitus. Three fetuses were excluded because the PF was 2 mm or greater, leaving 95 fetuses with PF within the normal range for analysis. Mean maternal age of the 95 women was 31 ± 6.3 years (range, 24.7–37.3 years). The majority (54%) of the women were nulliparous. Mean gestational age at delivery was 37.9 ± 2.3 weeks (range, 35.6–40.2 weeks), and the mean birth weight was 3007.3 ± 551.1 g (range, 2456.2–3558.4 g). All neonates showed normal growth and there were no structural abnormalities. PF was observed with real-time ultrasound in all 95 fetuses. The mean PF thickness was 0.95 ± 0.45 mm (range, 0.5–1.4 mm). The mean fetal heart rate at the time of measurement was 148 ± 7 beats per minute (bpm) (range, 141–155 bpm).

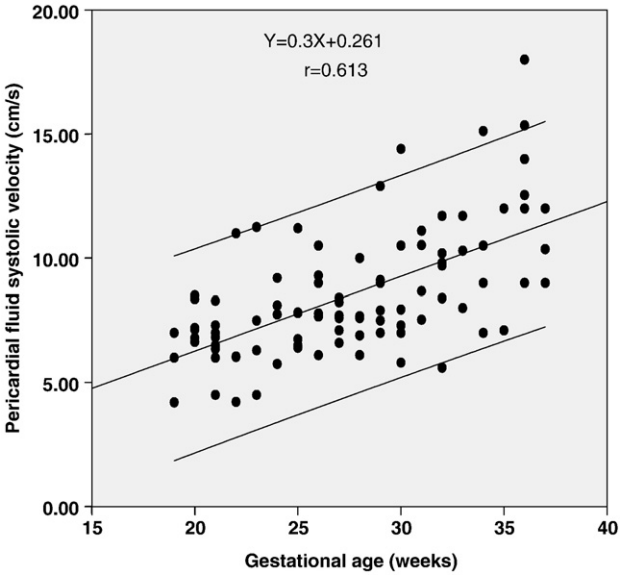

Fig. 2. Scatter plots of pericardial fluid systolic velocity in fetuses from 18 to 37 weeks of gestation.

Color Doppler flow of PF was demonstrated in the 95 fetuses and flow was bidirectional in all cases. The direction of the flow was toward the ventricular apex during ventricular systole and toward the atrium during ventricular diastole in each fetus. The Doppler waveform of PF flow was bidirectional in each fetus (Fig. 1). The PF diastolic velocity was higher than the PF systolic velocity (PS) in all but 3 fetuses. In all but 4 fetuses, the spectral waveforms were biphasic during diastole and monophasic at systole. A smaller diastolic wave representing a PF early diastolic velocity (PE) was observed before a larger wave representing PF late diastolic velocity (PA). A monophasic diastolic waveform was noted in 4 fetuses, 2 at 20 weeks of gestation and 2 at 22 weeks of gestation.

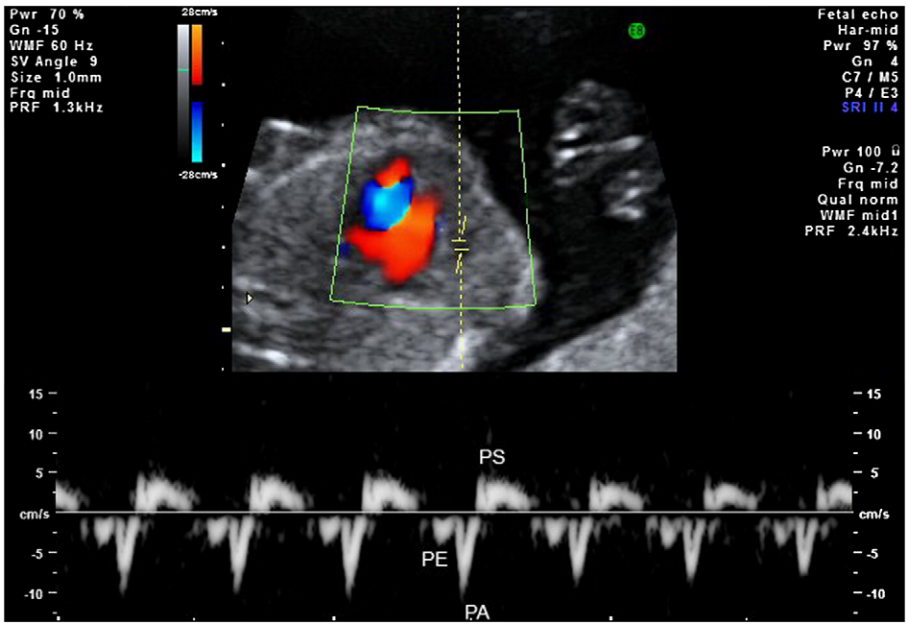

Fig. 1. Doppler waveform of pericardial fluid showing bidirectional flow. Key: PS, systolic velocity; PE, early diastolic velocity; PA, late diastolic velocity.

Download English Version:

https://daneshyari.com/en/article/3954875

Download Persian Version:

https://daneshyari.com/article/3954875

Daneshyari.com