

Diagnostic Value of Fetal Echocardiography for Fetal Pericardial Effusion

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ABSTRACT Objective: To investigate the diagnostic value of examining pericardial effusion on fetal by echocardiography. **Methods:** 473 fetuses with high risk factors, aged from 20~40 gestational weeks, were examined by echocardiography with Philips ultrasound diagnostic apparatus. 472 fetuses without high risk factors, aged from 20~40 gestational weeks were enrolled as control group. Echocardiographic results were compared with necropsy specimens of the fetal heart after termination of pregnancy and postnatal echocardiography. **Results:** 72 fetus with pericardial effusion were detected in the high risk group and the detection rate was 12.5%. 13 fetus with pericardial effusion were detected in the control group and the detection rate was 3%. There was significant difference the two groups ($\chi^2=39.57$, $P<0.05$); 85 patients with PEs were identified from 1005 fetal echocardiograms, including 28 cases with PEs, 44 cases with other malformations; **Conclusions:** Echocardiography is sensitive in detecting fetal pericardial effusion. Some fetuses with pericardial effusion should have some further examinations. PE size itself is not important, other associated malformations determined prognosis .

Key words: Echocardiography; Fetal heart; pericardial effusion

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Introduction

Since the 80s of last century, there has been the first application of echocardiography, the use of fetal echocardiography to prenatal diagnose is rapidly becoming the standard of care in most large hospital^[1]. With the rapid development of ultrasound technology and the improvement of two-dimensional image and application of doppler and colour-flow, more and more pericardial effusions (PEs) in fetuses were found. However, there are few studies evaluating the importance of PEs in fetuses. The significance of PEs and the influence of PEs size are unclear. This study is to establish the characteristics and outcomes of fetuses with PEs and to explore the diagnostic value.

1 Materials and Methods

1.1 Materials

Between 2007 and 2010, 473 women with high risk factors were offered a detailed fetal echocardiography examination routinely, the mean age was 30 ± 2.8 years (range 23 to 38), and the mean gestational age at the time of study was 26 ± 3.5 weeks (range 20 to 40). 472 cases with no risk factor were enrolled as control group, the mean maternal age was 27 ± 2.5 years (range 23 to 33), and the mean gestational age at the time of study was 26 ± 3.8 weeks (range 20 to 40); Specific factors that increase the risk of carrying a fetus for mothers have been identified: family history of congenital heart disease, maternal age older than 35 years, coexisting maternal disease (eg, diabetes mellitus, collagen vascular disease, or phenylketonuria), exposure to teratogen, rubella infection,

polyhydramnios or oligohydramnios, fetal arrhythmia, IUGR and so on.

1.2 Experimental methods

All fetuses were studied by an Philips Sonos 7500 and iu22 with transducer frequency 2-5MHZ (Philips Medical Systems US-A). The procedure includes the standard 4-chamber view, left and right ventricle outflow-tract views, plus aortic arch view, ductus arteriosus view, additional doppler, M-mode were investigated. In cases of unfavourable fetal position or maternal obesity the examination was repeated at the same day or 1 week later. The fetal heart could be viewed adequately in all cases. The mean duration of the heart examination for normal cases with good visibility was 5-15 min.

Fetal echocardiograms were evaluated for size of the PEs, and PEs was detected at their maximum dimension in end-diastole. PEs < 3 mm were categorized as mPEs, PEs was 3-5 mm were categorized as small, and those PEs > 5 mm were categorized as large. Echocardiographic results were compared with necropsy specimens of the fetal heart after termination of pregnancy or postnatal echocardiography.

1.3 Statistical analysis

Data were analyzed by a commercially available software package (SPSS for Windows, version 17.0, SPSS). Detection rate were analyzed by χ^2 exact test. A p value of < 0.05 was considered statistically significant for all comparisons.

2 Results

2.1 Detection rate of PE

In the high risk- group: 72 fetuses with PEs were detected and the detection rate is 12.5%, of which 28 cases were with isolated PEs, 44 cases were accompanied with other malformations. In the control group: 13 fetuses with PEs were detected and the detection rate was 3%, of which 10 cases were with isolated PEs, and 3 cas-

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es were companied with other other malformations. Difference was found between the two groups($\chi^2=39.57, P<0.05$) (Table 1).

Table 1 Detection Results					
Groups	Total patients of detected	patients with PEs	Patients with isolated PEs	Patients with malformations	the detection rate
the high risk- group	473	72	28	44	12.5%
the control group	472	13	10	3	3%

2.2 Outcomes with isolated PEs and comparison with PE size

In the high- risk group, there were 20 patients having mPEs and 8 patients having small PEs of the 28 fetuses with isolated PEs. On follow-up fetal echocardiography, 28 with isolated PEs

had disappeared completely. In the control group: there were 8 patients having mPEs and with 2 patients having small PEs(Fig 1) of the 10 fetuses with isolated PEs, ,and 10 with isolated PEs had all disappeared completely.

Table 2 Types of companied with malformations and Outcomes of fetuses with PEs and comparison with PE size in high-risk group							
Type	patients	mPEs	Small PEs	Large PEs	termination of pregnancy	Disappear	Change large PEs
ventricular septal defect	10	6	3	1	3	7	0
hypoplastic left-heart syndrome	5	2	3	0	5	0	0
transposition of the great arteries	4	3	1	0	4	0	0
tetralogy of Fallot	5	2	2(Fig 3)	1	4	0	1
pulmonary stenosis	1	0	0	1	0	0	1
aortic stenosis	2	1	1	0	2	0	0
ventricular and atrial septal defects	5	0	3	2(Fig 2)	4	0	1
ebstein's anomaly	2	1	1	0	1	1	0
double-outlet right ventricles	2	1	1	0	2	0	0
Down's syndrome	4	0	3	1	4	0	0
hydrops fetalis	2	0	1	1	1	0	1
hydrocephalus	2	0	1	1	2	0	0
total	44	16	20	8	32	8	4

2.3 Types of companied with malformations and Outcomes of fetuses with PEs and comparison with PE size

There was one with ventricular septal defect, one with Down's syndrome and one with left renal dysplasia in the control

group, and the 3 patients all have small PEs, and 2 cases chose termination of pregnancy,1 with ventricular septal defect had disappeared completely after delivery. (Table 2)

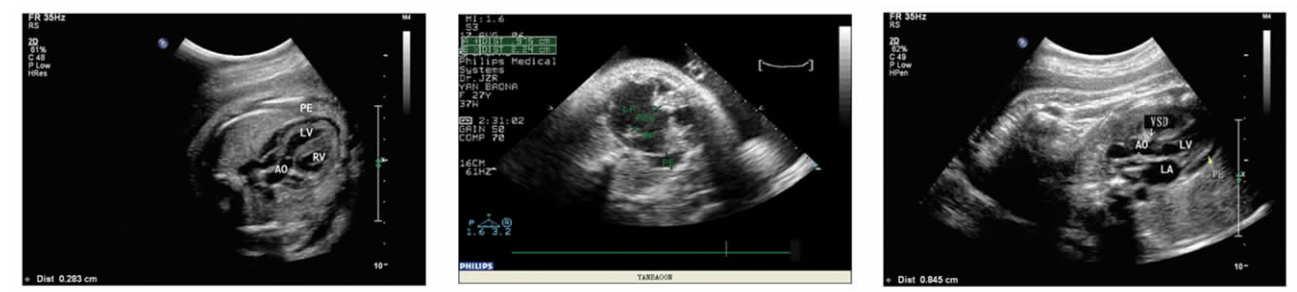


Fig 1 The normal fetus with isolated PE(small PEs)

Fig 2 The fetus with ventricular and atrial septal defects(large PEs)

Fig 3 The fetus with with tetralogy of Fallot (Small PEs)

3 Discussion

The normal pericardial fluid is similar with the ultrafiltrate of plasma, which is the pericardium exudate^[2]. When something causes the change of the osmotic pressure, PEs would occur. PEs may arise from a variety of causes during fetal development^[3], and fetal PEs are with fetal congestive heart failure, sometimes along with hydrops fetalis, and may be associated with chromosomal abnormalities, other parts malformations, infectious processes, or a variety of other causes. However, PEs may also be present in otherwise normal, healthy fetuses^[4]. So the outcomes of fetuses with PEs and the characteristics of PEs are very important.

85 patients with PEs were identified from 1005 total fetal echocardiograms during the study. 72 fetuses with PEs were detected in the high risk group and the detection rate was 12.5%. 13 fetuses with PEs were detected in the control group and the detection rate was 3%. This study demonstrated that echocardiography was sensitive in detecting fetal pericardial effusion. It was also found that there were 40 fetuses with PEs in the high-risk group associated with congenital heart disease which was one of the control group. Associated with high-risk group, the incidence of cardiac malformations was 7%. This data was consistent with previous reports^[5]. So it can be concluded that when there was fetal PEs, an further examination should be done especially in the high risk patients, sometimes it is necessary to have a fetal systemic echocardiography or a full-scale detailed fetal examination^[6].

In this study, 38 fetuses with isolated PEs had disappeared completely on follow-up fetal echocardiography. But the study from Sharland had shown that 854 cases with isolated PEs, with 265 fetuses having Down's syndrome (31% has chromosomal abnormalities)^[7]. Perhaps it was because of limitation of sample size. However, there was no association between isolated PE and chromosomal abnormalities in our study.

Structural heart disease in fetuses does not typically result in PEs, however, other studies had shown that when there were PEs in structural heart disease, the mortality rates was as high as 88%.^[8] In this study, of the fetuses with PEs associated with congenital heart disease, PE sizes ranged from 2 to 10 mm, with 20 patients (45%) having small and 8 patients (18%) having large PEs, the PEs were more likely to be larger than in those without other malformations. But PE size alone is not a reliable predictor of prognosis

, because the study showed that 4 patients which had earlier studies showing small PEs had progressed into the large range after delivered and some patients choosing termination of pregnancy did not have large PEs, but have serious heart diseases or other abnormalities. So it was suggested that when there was PEs in structural heart disease or other abnormalities, the prognosis should be careful. It was thought that PE size itself was not important, but other associated factors, such as the presence of structural heart disease or other parts malformations determined outcome.

Echocardiography is sensitive to the detection of fetal PE. As a non-invasive examination methods it was convenient and could repeatedly checked for early diagnosis. When PE was found, whether the patient was accompanied by other malformations should be checked systematically. And this would provide a reliable scientific basis for clinical diagnosis and treatment. It also play an active role in improving the population quality and optimizing the quality of the population. It is of great significance for promoting perinatal medicine, prenatal and postnatal care and carrying out family planning.

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超声心动图检测胎儿心包积液的临床价值

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摘要 目的:探讨超声心动图检测胎儿心包积液的临床意义。**方法:**2007-2010 年在我院检查行超声心动图检查的高危孕妇 473 例,同时设对照组,检测孕龄在 20-40 周无明显高危妊娠因素的孕妇 472 例,并将产前超声检查结果和胎儿尸检或分娩后超声心动图检查结果进行对照。**结果:**1.高危组检出 72 例心包积液,检出率 12.5%,对照组检出 13 例心包积液,检出率 3%,两组胎儿心包积液检出率间差别有统计学意义($\chi^2=39.57, P<0.05$)。2.85 例心包积液中,孤立性心包积液 38 例,伴其他心脏畸形或者其他系统畸形 47 例,其中孤立性心包积液预后良好。**结论:**超声心动图能够敏感地检出胎儿心包积液;心包积液程度并不是最重要的,其伴随心脏畸形或者其他畸形决定预后。

关键词:超声心动图; 心包积液 ;胎心

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