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超声心动图联合心电图对妊娠中期心脏畸形胎儿的诊断价值*

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摘要 目的:探讨超声心动图联合心电图对妊娠中期心脏畸形胎儿的诊断价值。**方法:**回顾性分析我院 2019 年 1 月到 2021 年 1 月出生后确诊与尸检确诊为心脏畸形的 80 例胎儿的临床相关指标, 分析 80 例胎儿超声心动图检查与胎儿心电图检查结果, 并分析超声心动图联合心电图对妊娠中期心脏畸形胎儿的诊断价值。**结果:**80 例胎儿有 56 例出现不同程度的心电图异常现象, 其中胎心早搏 3 例、FQRS 振幅增高 12 例、ST 段改变 15 例、FQRS 时限增宽 3 例、胎心不齐 4 例、胎心过缓 3 例、胎心过速 16 例; 80 例胎儿通过尸检和出生后随访最终确定左心发育不良综合征(HLHS)4 例, 单心室 6 例, 完全性心内膜垫缺损(ECD)8 例, 法洛四联症(TOF)14 例, 卵圆孔直径大于 6 mm 17 例, 室间隔缺损(VSD)31 例, 与超声心动图诊断结果对比无显著差异($P>0.05$), 超声心动图有 7 例漏诊; 联合诊断与超声心动图和心电图对左心发育不良综合征、单心室、完全性心内膜垫缺损胎儿的诊断对比无明显差异($P>0.05$), 对法洛四联症、卵圆孔直径大于 6 mm、室间隔缺损和心脏畸形诊断总数方面联合诊断优于超声心动图和心电图单一诊断($P<0.05$); 通过不同检查的检测价值对比发现, 超声心动图联合心电图检查的准确度、敏感度、特异度、阳性预测值和阴性预测值明显高于超声心动图与心电图单一检查。**结论:**超声心动图和心电图对于妊娠中期心脏畸形胎儿的诊断均具有重要价值。心脏畸形胎儿在妊娠中期进行心电图检查会出现异常现象, 但是并不能确诊为心脏畸形, 还需后续继续应用超声心动图进行检查, 最终确诊胎儿是否存在心脏畸形现象。

关键词:超声心动图; 心电图; 妊娠中期; 心脏畸形; 诊断价值

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Diagnostic Value of Echocardiography Combined with Electrocardiography for Fetal Heart Malformation in the Second Trimester of Pregnancy*

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ABSTRACT Objective: To explore the diagnostic value of echocardiography combined with electrocardiogram in the second trimester of pregnancy. **Methods:** The clinical related indicators of 80 foeti, who were diagnosed as heart malformation after birth and autopsy in the Second Affiliated Hospital of Shaanxi University of Traditional Chinese Medicine from January 2019 to January 2021, were retrospectively analysed. The echocardiography and fetal ECG examination results of 80 foeti were analysed, and the value of echocardiography combined with ECG in the diagnosis of fetal heart malformation in the second trimester of pregnancy was analysed. **Results:** In the 80 fet, there were 56 cases of ECG abnormalities of varying degrees, including 3 cases of premature fetal heart beats, 12 cases of increased FQRS amplitude, 15 cases of ST segment changes, 3 cases of FQRS time limit widening, 4 cases of fetal heartbeat, 4 cases of fetal heartbeat 3 cases of fetal bradycardia, and 16 cases of fetal tachycardia. In the 80 fet, through autopsy and post-natal follow-up, there were 4 cases of left heart dysplasia syndrome (HLHS), 6 cases of single atrium, 8 cases of complete endocardial cushion defect (ECD), and 14 cases of tetralogy of Fallot (TOF), 17 cases of the diameter of the foramen ovale being greater than 6 mm, and 31 cases of ventricular septal defect (VSD). There was no significant difference compared with the diagnosis result of echocardiography($P>0.05$). There were 7 cases of missed diagnosis in echocardiography. There was no significant difference between combined diagnosis and echocardiography and electrocardiogram in the diagnosis of left heart dysplasia syndrome, single ventricle, and total endocardial cushion defect in fet ($P>0.05$). For tetralogy of Fallot, greater than 6 mm of diameter of foramen ovale, ventricular septal defect, and cardiac malformation, the combined diagnosis is superior to the single diagnosis of echocardiography and electrocardiography ($P<0.05$). Through the comparison of the detection value of different examinations, it was found that the accuracy, sensitivity, specificity, positive predictive value and negative predictive value of echocardiography combined with ECG were significantly higher than that of echocardiography and ECG alone. **Conclusion:** Echocardiography and electrocardiography are of great value in the diagnosis of fetal heart malformations in the second trimester of pregnancy. For cardiac malformation fetus in the second trimester of pregnancy, ECG examination shows abnormal phe-

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nomenon, but can not be diagnosed as cardiac malformation, still needs further to use echocardiography to diagnose whether or not there is fetal cardiac malformation in the second trimester of pregnancy.

Key words: Echocardiography; Electrocardiogram; Second trimester of pregnancy; Cardiac malformation; Diagnostic value

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前言

心脏畸形是新生儿常见的先天性疾病。由于环境因素、遗传因素等影响,会造成胎儿基因的非正常表达,从而导致胎儿发育畸形的现象,如果影响到胎儿的心血管方面可能还会引起心脏或者大血管异常,也就是先天性心脏病。先天性心脏病胎儿在所有新生儿畸形中占有很高的致死率与发病率,心脏畸形导致先天性心脏病的胎儿有 25%会死于儿童期,有 15%会死于围产期^[1,2]。当前,所有孕妇在孕中期会通过超声的形式来筛查心脏畸形现象,但是超声只能够作为初步筛查,对于初步筛查怀疑心脏畸形的胎儿,应用超声心动图进行检查。相关研究显示^[4],超声心动图对于先天性心脏病的诊断率较高。此外,还有相关报道显示^[3],超声心动图对于胎儿心律失常的检查诊断率较低,因此推荐应用两种检查方式对妊娠中期孕妇进行胎儿心脏畸形联合筛查,从而提升胎儿心脏畸形的诊断准确率。因此本文回顾性分析我院 2019 年 1 月到 2021 年 1 月出生后确诊与尸检确诊为心脏畸形的 80 例胎儿的临床相关指标,探讨超声心动图联合心电图对妊娠中期心脏畸形胎儿的诊断价值,具体报告如下。

1 资料与方法

1.1 一般资料

回顾性分析我院 2019 年 1 月到 2021 年 1 月出生后确诊与尸检确诊为心脏畸形的 80 例胎儿的临床相关指标,并分析孕妇就诊期间的胎儿心电图与超声心动图检查结果,纳入标准:胎儿通过尸检与产后随访确诊为心脏畸形;所有孕妇对本研究知情并签署同意书;本研究经我院伦理委员会批准。排除标准:胎儿羊水过少者;孕妇腹壁过厚者;不配合研究者;胎儿位置固定者。所有孕妇年龄为 20~29 岁,平均(26.54±2.31)岁,检查时孕周(25.2±1.1)周,其中初产产妇 29 例,经产产妇 51 例。

1.2 方法

超声心动图:应用美国 GE Voluson E8、GE Voluson E10、GE Voluson730 型多普勒彩色超声诊断仪,将探头频率设置为 2.5~5.5 赫兹。让孕妇保持仰卧位,上述超声检查已经明确了胎儿的形态、大小与位置,因此在上述基础上需要对胎儿的心脏情况进行评价,其中主要包含三血管气管、四腔心、右室流出道、主动脉弓、动脉导管弓切面以及左室流出道切面进行检查,观察上述切面有无异常,并观察胎儿有无发育异常和血流异常等^[5]。

胎儿心电图:受检者需要在检查之前将膀胱排空,并安静的平卧在床上,并在贴电极的皮肤处应用 75 %的酒精棉球擦拭,将红色胸导电极 V 电极放置于母亲胸 V5 导联处,黑色接地电极放置于宫底与右腋中线平齐位置,将绿色公共电极放置

在宫底部,将橙色腹导电极中放置于耻骨上方,将棕色腹导电极左放置在左横位或左耻骨联合处,将蓝色腹导电极右放置在右横位或右边耻骨联合处。如果图形不满意可以对绿色、黑色和红色电极的高低进行调整,并可以适当左右调整腹导电极的位置。最终调整到胎儿心电图的基线比较平稳,母体波与胎儿波连续清晰可见,采集 2~5 min,部分病例采集可以延长到 20 min 以上,并选取能够说明胎儿心电图特点的分段进行分析^[6]。胎儿心电图诊断标准依照第三届胎儿心电图全国学术学会相关标准,正常胎儿的心电图胎心率为 120~160 次/分,FST 段上移和下移位不超过 5 μ V,FQRS 综合波振幅 10~30 μ V,FQRS 时限 0.02~0.05 s。胎儿心电图异常可以分为:(1)胎心早搏,心电图 FQRS 综合波提前出现,之后出现代偿间歇;(2)FQRS 振幅增高,大于 30 μ V;(3)ST 段改变;(4)FQRS 时限增宽,大于 0.06 s;(5)心律不齐,胎心率范围正常,但变化大于 30 次/分;(6)心动过缓或过速,胎心率小于 120 次/分或者胎心率大于 160 次/分。

1.3 统计学方法

本研究数据采取统计学软件 SPSS 23.0 进行数据分析,计数资料以例数/百分比(n/%)表示,进行 χ^2 检验;计量资料以符合正态分布则用均数±标准差($\bar{x} \pm s$)表示,组间比较采用 t 检验;以 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 胎儿心电图异常结果分析

80 例胎儿有 56 例出现不同程度的心电图异常现象,其中胎心早搏 3 例、FQRS 振幅增高 12 例、ST 段改变 15 例、FQRS 时限增宽 3 例、胎心不齐 4 例、胎心过缓 3 例、胎心过速 16 例,如表 1 所示。

2.2 80 例胎儿超声心动图诊断结果与最终结局对比

80 例胎儿通过尸检和出生后随访最终确定左心发育不良综合征(HLHS)4 例,单心室 6 例,完全性心内膜垫缺损(ECD)8 例,法洛四联症(TOF)14 例,卵圆孔直径大于 6 mm 17 例,室间隔缺损(VSD)31 例,与超声心动图诊断结果对比差异显著($P < 0.05$),超声心动图漏诊 7 例,如表 2 所示。

2.3 80 例胎儿心律失常不同检查的诊断结果对比

联合诊断与超声心动图和心电图对左心发育不良综合征、单心室、全性心内膜垫缺损胎儿的诊断对比无明显差异($P > 0.05$),对法洛四联症、卵圆孔直径大于 6 mm、室间隔缺损和心脏畸形诊断总数方面联合诊断优于超声心动图和心电图单一诊断($P < 0.05$),如表 3 所示。

2.4 超声心动图联合心电图对妊娠中期心脏畸形胎儿的诊断价值分析

通过不同检查的检测价值对比发现,超声心动图联合心电图检查的准确度、敏感度、特异度、阳性预测值和阴性预测值明显高于超声心动图与心电图单一检查,如表 4 所示。

表 1 80 例胎儿心电图异常结果分析

Table 1 Analysis of abnormal results of fetal electrocardiogram of 80 feti

Types of anomalies	Number(n)	proportion(%)
Premature beat of fetal heart	3	3.75
FQRS Amplitude increase	12	18.75
ST segment changes	15	22.50
FQRS time limit widened	3	3.75
Fetal arrhythmia	4	6.25
Bradycardia	3	5.00
Fetal tachycardia	16	21.25

表 2 80 例胎儿超声心动图诊断结果与最终结局对比(例,%)

Table 2 Comparison of echocardiographic diagnosis results and final outcome among 80 feti (n,%)

Diagnosis results	Number	HLHS	single ventricle	Complete ECD	TOF	Foramen ovale diameter>6 mm	VSD	Total
Echocardiography	80	4	6	8	12	15	28	73*
The end result	80	4	6	8	14	17	31	80

Note: comeare with the end result, * $P<0.05$.

表 3 80 例胎儿心律失常不同检查的诊断结果对比(例,%)

Table 3 Comparison of diagnosis results of different examinations of arrhythmia among 80 feti (n,%)

Cardiac malformation	Number	Electrocardiogram	Echocardiography	Combined diagnosis	χ^2	P
HLHS	4	3	4	4	2.180	0.336
single ventricle	6	4	6	6	4.500	0.105
Complete ECD	8	6	8	8	4.360	0.113
TOF	14	8	12	14	9.346	<0.001
Foramen ovale diameter>6 mm	17	10	15	17	11.263	<0.001
VSD	31	25	28	30	13.350	<0.001
Total	80	56(70.00%)	73(71.25%)	79(98.75%)	74.320	<0.001

表 4 超声心动图联合心电图对妊娠中期心脏畸形胎儿的诊断价值分析

Table 4 Analysis of value of echocardiography combined with ECG in diagnosis of fetal heart malformation in the middle of pregnancy

Groups	Accuracy	Specificity	Sensitivity	Positive predictive value	Negative predictive value
Echocardiography	91.25%(73/80)	71.43%(5/7)	93.15%(68/73)	97.14%(68/70)	50.00%(5/10)
Electrocardiogram	70.00%(56/80)	42.86%(3/7)	72.60%(53/73)	92.98%(53/57)	13.04%(3/23)
Joint inspection	98.75%(79/80)	85.71%(6/7)	100.00%(73/73)	98.65%(73/74)	100.00%(6/6)

3 讨论

心脏对于人体是非常重要的,因为心脏能够确保人体重要血管内部的血液循环,对于一些患有先天性心脏病的患者来说,由于出生之前心脏结构就出现了异常情况,因此会影响到患者正常的血流动力学,从而导致患者出现缺血或者缺氧等问题,增加了心脏负担,加深了心律失常风险^[7-9]。随着当前临床医学的高速发展,很多先天性心脏病患者都能够被治愈了,然而

对于不同类型和不同严重程度的先天性心脏病患者的治疗预后情况也不同^[10-12]。因此对胎儿进行心脏畸形筛查,并结合实际超声报告进行经皮穿刺技术治疗,而且也可以在胎儿出生后,利用针对性的治疗方法持续治疗。对于一些通过超声检查,发现心脏畸形不严重的胎儿,可以进行保守治疗^[13]。所以,对于胎儿进行心脏畸形检测,能够对胎儿进行早期的筛查与诊断,从而及时采取有效的干预措施,提升新生儿的出生质量。

本研究结果,80 例胎儿有 56 例出现不同程度的心电图异

常现象,其中胎心早搏3例、FQRS振幅增高12例、ST段改变15例、FQRS时限增宽3例、胎心不齐4例、胎心过缓3例、胎心过速16例。本研究结果与Collaco JM等^[14]结果相同,Collaco JM研究认为心电图只适合应用在胎儿心脏畸形的初步筛查中。这是因为,胎儿心脏传导系统在孕12周发育完善,即可进行胎儿心电图监护和诊断。所以孕妇在孕3-5个月之间或之后出现R-R间期延长的现象,并且胎儿的心率减慢,出现FQRS波增宽持续,可以考虑胎儿存在心肌肥厚、心脏扩大、心脏传导阻滞或者先天性心脏病等,这个时候可以通过超声心动图对胎儿的心脏结构进行进一步诊断^[15]。本研究结果与Saraste A等^[16]研究不同,该学者通过对胎儿进行心电图检查发现,健康胎儿也可能出现心电图异常现象,因此,本研究还需后续加入与健康胎儿的对比,进行深入研究。本研究结果,80例胎儿通过尸检和出生后随访最终确定左心发育不良综合征(HLHS)4例,单心室6例,完全性心内膜垫缺损(ECD)8例,法洛四联症(TOF)14例,卵圆孔直径大于6 mm 17例,室间隔缺损(VSD)31例,与超声心动图诊断结果对比无显著差异,超声心动图有7例漏诊,多普勒超声心动图是临床诊断与筛查先天性心脏病的有效方式之一,具有特异性高、敏感性高、操作便捷以及无创安全等特点,随着影像学技术的发展,超声心动图技术越来越完善,对于胎儿心脏畸形的诊断率提升,对于胎儿心脏畸形诊断有着重要价值^[17-19]。联合诊断与超声心动图和心电图对左心发育不良综合征、单心室、完全性心内膜垫缺损胎儿的诊断对比无明显差异,对法洛四联症、卵圆孔直径大于6 mm、室间隔缺损和心脏畸形诊断总数方面联合诊断优于超声心动图和心电图单一诊断,与相关研究类似^[20,21]。心电图对于胎儿房早心律失常的诊断率比较高,只适合做早期筛查。这是因为,对于胎儿应用超声心动图进行心脏畸形筛查准确率较高,因为通过超声心动图可以从三血管气管、四腔心、右室流出道、主动脉弓、动脉导管弓切面以及室流出道等不同切面对心脏进行筛查,能够使大部分的心脏畸形在产前就得到准确的诊断^[22-24]。而应用常规超声与心电图只能够对先天性心脏病进行最基本的筛查,想要更准确的筛查还需要进行多切面诊断与联合诊断,与本研究相符^[25];通过不同检查的检测价值对比发现,超声心动图联合心电图检查的准确度、敏感度、特异度、阳性预测值和阴性预测值明显高于超声心动图与心电图单一检查,由此证明,超声心动图联合心电图能够有效检出胎儿心脏结构异常与心律失常情况,而且准确率较高^[26-28]。颜雪梅^[29]等学者的研究与本研究类似,探究联合应用胎儿心电图与超声心动图检测,以提高胎儿期前收缩的诊断率,胎儿心电图发现期前收缩占胎儿心律失常36.8%,胎儿超声心动图发现期前收缩占胎儿心律失常35.5%,两种检测方法的一致性为0.972;胎儿心电图联合胎儿超声心动图判断室上性期前收缩的灵敏度和特异度分别为95.95%、89.17%,判断室性期前收缩灵敏度和特异度分别为93.55%、96.50%,说明采用胎儿心电图联合胎儿超声心动图检测可弥补其相互不足,提高胎儿期前收缩判断准确度。相关研究显示^[30,31],心脏异常的胎儿同时会存在心律失常和心脏结构异常现象。其中以复杂性心脏结构异常以及缓慢性心律失常为主。本研究主要针对了心脏结构异常进行的相关分析,缺乏对心律失常的细致分析,因此还需要日后增加病例数进行更深入的研究,

为妊娠中期心脏畸形胎儿的诊断提供参考价值。

综上所述,超声心动图和心电图对于妊娠中期心脏畸形胎儿的诊断均具有重要价值。心脏畸形胎儿在妊娠中期进行心电图检查会出现异常现象,但是并不能确诊为心脏畸形,还需后续继续应用超声心动图进行检查,最终确诊胎儿是否存在心脏畸形现象。

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