doi: 10.13241/j.cnki.pmb.2017.31.039

多切面法联合彩色多普勒超声在胎儿先天性心脏病诊断中的应用

师晓娟 张 昕 张 鑫 高 洁 段世玲

（延安大学附属医院超声医学科 陕西 延安 716000）

摘要 目的:探讨多切面法联合彩色多普勒超声在胎儿先天性心脏病(congenital heart diseases,CHD)诊断中的应用价值。**方法:**采用多切面法联合彩色多普勒超声对2015年5月~2016年7月300例胎儿进行CHD筛查,并与随访的产后超声或尸解结果作对照。**结果:**300例胎儿经产前超声联合多切面法检出CHD胎儿20例,检出率为6.7%,经产后超声或尸解确诊14例:三尖瓣下移畸形1例,室间隔完整型完全性大动脉转位1例,完全性房室间隔缺损1例,室间隔完整型肺动脉瓣闭锁1例,双流入型单心室1例,共同动脉干Ⅰ型2例,单纯室间隔缺损2例,法洛氏四联症2例,主动脉弓缩窄1例,肺动脉瓣轻度狭窄1例,二尖瓣闭锁并共同动脉干1例;误诊为单纯室间隔缺损1例,误诊为法洛氏四联症1例,病例流失4例。产前超声联合多切面法对有、无高危因素的检出率分别为3.79%、13.48%,比较有统计学意义(P<0.05)。产前超声联合多切面法诊断CHD的灵敏度为100%、特异度为99.66%、阳性预测值为80.00%、阴性预测值为100%。**结论:**多切面法联合彩色多普勒超声在胎儿CHD诊断中具有较高的应用价值。

关键词:彩色多普勒超声;多切面;胎儿;先天性心脏病

中图分类号:R541.1;R445.1 **文献标识码:**A **文章编号:**1673-6273(2017)31-6167-03

Application of Multi Slice Combined with Color Doppler Ultrasonography in the Diagnosis of Fetal Congenital Heart Disease

SHI Xiao-juan, ZHANG Xin, ZHANG Xin, GAO Jie, DUAN Shi-ling

(Ultrasound Medicine Department, Yanan University Affiliated Hospital, Yan'an, Shaanxi, 716000, China)

ABSTRACT Objective: To explore the application value of Multi slice combined with color Doppler ultrasonography in the diagnosis of fetal congenital heart disease (congenital heart diseases, CHD). **Methods:** 300 fetuses with CHD were detected by multi slice combined with color Doppler ultrasound to screen CHD, and the results were compared with those of postpartum ultrasound or autopsy. **Results:** 20 cases of CHD were detected with multi slice combined with color Doppler ultrasound in 300 fetuses, the detection rate was 6.7%, 14 cases were diagnosed by ultrasound or autopsy, including 1 case of Ebstein's anomaly, 1 case of complete transposition of the great arteries with intact ventricular septum,1 case of complete atrioventricular septal defect, 1 case of pulmonary atresia with intact ventricular septum, 1 case of double inlet type single ventricle, 2 cases of common truncus arteriosus type I, 2 cases of simple ventricular septal defect, 2 cases of tetralogy of fallot,1 case ofcoarctation of Aorta,1case of mild pulmonary stenosis and 1 case of mitral atresia with common truncus arteriosus.1 case was diagnosised simple ventricular septal defect. Prenatal ultrasound combined with multi section method for the detection of high risk factors were respectively 3.79% and 13.48% (P < 0.05). The sensitivity of prenatal ultrasound combined with multi section method in the diagnosis of CHD was 100%, the specificity was 99.66%, the positive predictive value was 80%, the negative predictive value was 100%. **Conclusions:** Multi slice combined with color Doppler ultrasound in the diagnosis of fetal CHD showed high value.

Key words: Color Doppler ultrasonography; Multi slice; Fetal; Congenital heart disease

Chinese Library Classification(CLC): R541.1; R445.1 Document code: A

Article ID: 1673-6273(2017)31-6167-03

前言

先天性心脏病(congenital heart diseases,CHD)是一种常见的胎儿畸形疾病，在活产新生儿中的发病率约为0.6%~1.3%[1,2],主要是因胎儿时期心脏血管异常发育而导致局部解剖结构不正常或出生后理应闭合的通道不闭合,是导致婴幼儿死亡或残疾的重要原因。有效的产前检查对提示CHD新生儿围生期的干预治疗有积极作用,彩色多普勒超声心动图常用四腔心切面,诊断典型的心脏畸形不成问题,但对不典型的心脏畸形、不典型法洛四联症、肺静脉异位引流等容易漏诊或误诊、所以业内人士开始将目光投向五切面、六切面、七切面甚至八切面[3,4]。本研究先进行五切面法检查,再对可疑异常酌情增加主动脉弓长轴切面、大动脉短轴切面、肺动脉分支切面、三血管切面、三血管-气管切面、动脉导管弓长轴切面等10个切面叠加彩色多普勒检查(即多切面法)[5],探讨了该检查方法对胎儿CHD的诊断价值,报道如下。

作者简介:师晓娟(1982-),女,本科,主治医师,研究方向:超声诊断,电话:15929060333,E-mail:shixiaojuan_198203@medpap360.net

(收稿日期:2017-03-03 接受日期:2017-03-30)

1 资料与方法

1.1 一般资料

选择 2015 年 5 月 ~2016 年 7 月产前超声检查 300 例孕妇,年龄 20～37 岁,平均(24.77± 5.03)岁;孕周 18-26 周,平均(24.26± 1.09)周,部分特殊病例需要动态观察时可以将孕周适当的延后 (个别病例因为发现胎儿心脏有问题时已经足月);筛查高危因素,如基因、染色体异常、高龄、不良生育史、孕期营养不良、有害物质暴露、糖尿病、妊娠高血压、孕期精神刺激、用药等,有高危因素 89 例,无高危因素 211 例。

1.2 治疗方法

1.2.1 检查方法 使用 Voluson-E8 彩色多普勒超声诊断仪,频率 C1-5-D 及 RAB4-8-DMHz, 将参数调整为胎儿心脏检查条件。孕妇取仰卧位或侧卧位,常规产科检查及测量,明确胎方位和胎儿左右,先采用五切面法:腹部横切面,明确腹腔脏器、腹主动脉、下腔静脉、脊柱的排列,判断心房的位置;四腔心切面,明确房室大小、心室位置及心房和心室的连接;左、右室流出道切面,明确心室和大动脉的关系;三血管气管切面,明确大动脉排列及发育情况,再对可疑异常酌情增加主动脉弓长轴切面、大动脉短轴切面、肺动脉分支切面、三血管切面、动脉导管弓长轴切面、上下腔静脉切面、降主动脉上段冠状切面、气管与支气管冠状切面、无名静脉切面等至不少于 10 个切面叠加彩色多普勒检查,按心脏三节段分析法原则判断畸形的部位及类型。

1.2.2 随访 产前超声检查确诊心脏异常的胎儿,副高以上超声医师在进行产前产后一体化评估后,向孕妇及家属做充分详实的解释,使其了解原委后由其自行决定终止妊娠与否,决定终止妊娠的孕妇及家属签署引产、尸解同意书,决定不终止妊娠者在新生儿时期进行心脏超声检查。产前超声检查无心脏异常胎儿在新生儿时期进行心脏超声检查。以尸解或产后超声检查结果为金标准判断产前超声检查的可靠性。

1.3 统计学分析

采用 SPSS18.0 统计软件分析处理数据, 计数资料以率表示,行 x^2 检验;计量资料以($\bar{x}$± s)表示,行 t 检验,以 P<0.05 表示有明显差异。

2 结果

2.1 产前超声联合多切面法对 CHD 的诊断结果

300 例胎儿经产前超声检出 CHD 胎儿 20 例, 检出率为 6.7%,经产后超声或尸解确诊 14 例,误诊为单纯室间隔缺损 1 例,误诊为法洛氏四联症 1 例,病例流失 4 例。CHD 类型包括:三尖瓣下移畸形 1 例, 室间隔完整型完全性大动脉转位 1 例,完全性房室间隔缺损 1 例, 室间隔完整型肺动脉瓣闭锁 1 例,双流入型单心室 1 例, 共同动脉干 I 型 2 例均经尸检证实,单纯室间隔缺损 2 例,1 例经产后超声心动图检查证实为室缺,1 例经产后超声检查证实无室缺;法洛氏四联症 2 例,主动脉弓缩窄 1 例,肺动脉瓣轻度狭窄 1 例,二尖瓣闭锁并共同动脉干 1 例经产后证实。

2.2 产前超声联合多切面法对有无 CHD 高危因素胎儿的诊断情况

211 例筛查无高危因素的胎儿中, 产前超声检出 CHD 8 例,检出率为 3.79%;在 89 例筛查有高危因素的胎儿中,产前超声检出 CHD 12 例,检出率为 13.48%,两者比较差异有统计学意义(P=0.012)。

2.3 产前超声联合多切面法对 CHD 的诊断价值

产前超声诊断出 20 例 CHD 胎儿,其中假阳性 1 例,灵敏度为 100%(4/4), 特异度为 99.66%(295/296), 阳性预测值为 80.00%(4/5),阴性预测值为 100%(295/295)。

3 讨论

胎儿心脏异常包括结构畸形和心律异常,结构畸形的结构复杂,类型多样,而且受胎儿的心率、血液动力学、体位及有限透声窗等因素的影响,CHD 的诊断难度很大。产前超声检查被认为是目前诊断 CHD 的首选方法,属于非侵入性操作,灵敏度和特异度较高[5,6]。根据 2012 年中国《产前超声检查指南 - 胎儿超声心动图检查指南》的推荐,CHD 的筛查可从孕 16 周开始,最佳时期为孕 20~24 周[7]。胎儿心脏畸形筛查安排在适宜的孕周进行,有利于显示心脏大血管结构的异常情况[8]。

彩色多普勒是在二维声像图的基础上依靠彩色血流与多普勒频谱分析诊断心脏有无异常,能够提供二维实时超声不能反映的心脏血流动力学, 通过对异常血流的分析帮助判断 CHD 的类型和程度,能提示分娩时机和干预治疗[9,10]。报道显示胎儿心脏超声检查采用四腔心切面的敏感度(60.3%)和特异度(39.0%)较低,即使联合左、右心室流出切面也仅可达到 65.5%、57.0%,对诊断复杂性 CHD 的难度更大[11]。Foy PM 研究显示联合多切面法对 CHD 的诊断有一定的提高[12]。

切面的获取与切面的认知是产前诊断先天性心脏畸形的重难点, 不同类型 CHD 在不同切面的表现需要达成正确的认知,一旦对切面的认知不足则十分容易出现漏、误诊[13,14]。本次产前超声诊断共检出 CHD20 例, 其中 14 例确诊,2 例误诊,4 例病例遗失, 检出率为 6.7%。孕 18~24 周可以说是进行胎儿 CHD 超声筛查的有利时期, 因为此时胎儿心脏结构已相对清晰,畸形心脏基本已形成,同时羊水量较多,所以能够较好地透声窗观察胎儿的心脏发育情况。本组中 1 例被误诊为单纯室间隔缺损,分析原因可能为四腔心和左、右室流出道切面,室间隔连接处的膜组织比较薄弱, 所以易显示为 " 假性室间隔缺损 " 征象[15,16]。另 1 例右室双出口被误诊为法洛氏四联症,分析原因可能是因为骑跨率估算不足导致的。鉴别法洛氏四联症与右室双出口的难度较大,因为二者的病理均是由于圆锥动脉干段发育不正常而造成圆锥间隔发育不良,与肌部室间隔的衔接不好有关[17,18],可通过看大动脉短轴切面对二者进行鉴别。法洛四联症的大动脉起始部存在交叉排列关系,主动脉在右后,主动脉与二尖瓣纤维连续,无主动脉圆锥,肺动脉瓣在左前[19];而右心室双出口是 2 个半月瓣齐平,主动脉基本出自右心室,与二尖瓣无纤维连续,有圆锥,同时肺动脉也有圆锥[20]。另外,要根据卵圆孔的形态、直径、孔瓣大小及血流动力学等进行谨慎诊断,对三血管 - 气管切面、冠状切面和主动脉弓矢状长轴有全面的检查和认知[21,22]。对缩窄的主动脉弓,二维超声在三血管气管切面无法观察到缩窄的主动脉弓,而彩色多普勒超声能显示动脉弓内的血流方向,但彩色多普勒超声也可能对主动脉弓的显示有困难,从而误诊为主动脉弓离断,联合降主动脉上段冠状切

面可减小误判[23,24]。降主动脉和主动脉弓、动脉导管弓的结构呈"Y"形，若观察到"Y"结构不复存在则可诊断为主动脉弓离断[25]。本次正是采用了降主动脉上段冠状切面，1例主动脉弓缩窄未被误诊。

研究显示近九成的CHD胎儿是由遗传与环境共同引起，所以具有CHD高危因素的胎儿不在少数，目前对高危因素的掌握并不完全充分，目前研究显示家族、孕妇及胎儿自身是高危因素的主要来源，但仍有很多的CHD的发生原因不明[27]。CHD家族史是CHD发病的重要基础，早孕期有物理性、化学性、生物性物质等致畸物接触史、染色体异常、胎儿早期NT值高、羊水量异常、不良妊娠史、心外畸形、孕妇伴有糖尿病或结缔组织病等也是CHD的独立危险因素，通过对这些危险因素的认识对胎儿CHD筛查具有很大的帮助[26]。本研究根据有无高危因素分析，结果显示产前超声检查对有高危因素的检出率明显高于无高危因素，说明胎儿CHD的超声筛查与高危因素筛查的结果是一致的。根据诊断的可靠性分析，产前超声检查的敏感度为100%、特异度为99.66%、阳性预测值为80.00%、阴性预测值为100%，与研究大致接近，证明该检查方法的鉴别诊断的价值高[27-30]。

综上所述，多切面法联合彩色多普勒超声在胎儿CHD诊断领域中显示出了较高的价值，但胎儿CHD的临床诊疗要求高，绝非是掌握单纯某一个学科即可胜任的，超声科医生应不断扩宽自身知识面，提高技能素质，重视产前超声检查，加强多学科协助，这对降低缺陷出生率有积极的作用。

参 考 文 献(References)

[1] Han W, Xie M, Cheng T O, et al. The vital role the ductus arteriosus plays in the fetal diagnosis of congenital heart disease: Evaluation by fetal echocardiography in combination with an innovative cardiovascular cast technology [J]. International Journal of Cardiology, 2015, 202: 90-96

[2] Arpit Agarwal, Shanassa Roen-Padilla, Jyotsana Khemani, et al. Fetal echo cardiography Arecent four year experience from a single urban center[J].Progressin Pediatric Cardiology, 2016, 392(13): 2049-2063

[3] Gandhi R. Color Doppler-ultra sonography in oral squamous cell carcinoma: Making ultrasonography more meaningful [J]. Advanced Biomedical Research, 2016, 05(05): 595-567

[4] Watanabe N, Yanagita Y, Matsuura H, et al. Unroofed coronary sinus detected by 2D/3D echocardiography in a patient referred to catheter ablation for atrial fibrillation [J]. Journal of Cardiology Cases, 2016, 14(4): 111-114

[5] Kim M J. Verdurmen, Noortje B. Eijsvoogel, Carlijn Lempersz, et al. Asystem aticre view of prenatal screening for congenital heart disease by fetale lector cardiography [J]. International Journal of Gynecology and Obstetrics, 2016, 31(43): 1022-1027

[6] Randall P, Brealey S, Hahn S, et al. Accuracy of fetal echocardiography in the routine detection of congenital heart disease among unselected and low risk populations: a system atic review[J]. BJOG, 2015, 1121(23): 2020-2023

[7] Cecchetto A, Rampazzo A, Angelini A, et al. From molecular mechanisms of cardiac development to genetic substrate of congenital heart diseases[J]. Future Cardiology, 2017, 06(03): 373-393

[8] Wright L, Stauffer N, Samai C, et al. Who should be referred? An evaluation of referr al indications for fetal echocardiography in the detection of structural congeniatl heart disease [J]. Pediatr Cardiol, 2015, 35(06): 928-933

[9] Foy PM, Wheller JJ, Samuels P, et al. Evaluation of the fetalheart at 14 to 18 weeks' gestation in fetuses with a screening nuchal translucency greater than or equal to the 95th percentile [J]. J Ultrasound Med, 2015, 32 (01): 1713-1719

[11] Zidere V, Pushparajah K, Allan LD, et al. Three-dimensional fetal echocardiography for prediction of postnatal surgical approach in double outlet right ventricle: a pilot study [J]. Ultrasound Obster Gynecol, 2016, 42(04): 421-425

[12] Malekzadeh-Milani S, Ladouceur M, Iserin L, et al. 0489: Incidence and outcomes of right sided endocarditis in patients with congenital heart diseases with surgical or transcatheter pulmonary valve implantation [J]. Archives of Cardiovascular Diseases Supplements, 2015, 07(01): 94-94

[13] Egbe A, Uppu S, Stroustrup A, et al. Incidences and sociodemographics of specific congenital heart diseases in the United States of America: an evaluation of hospital discharge diagnoses.[J]. Pediatric Cardiology, 2015, 35(06): 975-982

[14] Yong-Kang L I, Huang J B, Radiology D O. Clinical application value of color Doppler ultrasound in screening of fetal congenital heart diseases [J]. Maternal & Child Health Care of China, 2015, 93 (02): 1202-1027

[15] Jian H U, Qing-Xiu A I, Liu L, et al. Application Value Analysis of the Four-dimensional Color Doppler Ultrasound Technique in Screening for Fetal Congenital Heart Disease [J]. Progress in Modern Biomedicine, 2015, 21(14): 229-233

[16] Liu X, Yang L. An Analysis of Color Doppler Ultrasound Screening for Fetal Heart Malformations in 6160 Pregnant Women[J]. Journal of Yangtze University, 2016, 24(20): 122-126

[17] Zhang X, Ultrasound D O. Application Value of Color Doppler Ultrasound in Congenital Muscular Torticollis [J]. Journal of Dali University, 2016, 28(03): 303-306

[18] ElMekkawi, Sherif F, Bahaa, et al. Three-dimensional power Doppler ultrasound with a three-dimensional multislice view: is it a new modality in endometrial evaluation in women with postmenopausal bleeding? [J]. Journal of Evidence-Based Women's Health Journal Society, 2015, 05(03): 143-149

[19] Zhu J, Di L I, Ultrasound D O. High Frequency Color Doppler Ultrasound Combined with Multi-Slice Spiral CT in the Diagnosis of Thyroid Carcinoma[J]. Medical Recapitulate, 2015, 39(13): 405-409

[20] Wang X H, Peng G E, Hou M W. Investigation of the Display Abilities of Color Doppler Ultrasound and Multi-slice Computed Tomography on Thyroid Nodules: A Comparative Study [J]. Medical Recapitulate, 2015, 124(06): 317-320

[21] Cantisani V, David E, Ferrari D, et al. Color-Doppler ultrasound with Superb Microvascular Imaging (SMI) compared to Contrast Enhanced Ultrasound (CEUS) and CT angiography to identify and classify endoleaks in patients undergoing EVAR [J]. Annals of Vascular Surgery, 2016,14(07): 557-560

（下转第6102页）

Zeitschrift Der Deutschen Ophthalmologischen Gesellschaft, 2010, 107(6): 525-528

[19] Tekin N F, Kaynak S, Saatci A O, et al. Preserved amniotic membrane transplantation in the treatment of primary pterygium [J]. Ophthalmic Surgery & Lasers, 2001, 32(6): 464-469

[20] Eze B I, Maduka-Okafor F C, Okoye O I, et al. Pterygium: A review of clinical features and surgical treatment [J].Nigerian Journal of Medicine Journal of the National Association of Resident Doctors of Nigeria, 2011, 20(1): 7-14

[21] Kocabora S M, Fazil K, Ozsutcu M, et al. Subconjunctival bevacizumab injection in the surgery of primary pterygium: comparison with intraoperative mitomycin-C [J]. Bulletin de la Société belge d'ophtalmologie, 2013, (322): 7

[22] Wang X, Chen J. Long-term Efficacy and Ocular Surface of Pterygium Excision Combined with Autologous Corneal Limbal Stem Cell Transplantation in Treatment of Pterygium[J]. Eye Sci, 2015: 101-105

[23] Rama P, Bonini S, Lambiase A, et al. Autologous fibrin-cultured limbal stem cells permanently restore the corneal surface of patients with total limbal stem cell deficiency [J]. Transplantation, 2001, 72(9): 1478-1485

[24] Yang Q, Ophthalmology D O. Analysis of the reasons on corneoscleral limbus ulcer after excision of pterygium combineded with autologous corneal limbal stem cell transplantation[J]. Chinese Community Doctors, 2015

[25] Kim SW, Park S, Im CY, et al. Prediction of mean corneal power change after pterygium excision[J]. Cornea, 2014, 33(2): 148-153

[26] Farid M, Pirnazar J R. Pterygium recurrence after excision with conjunctival autograft: a comparison of fibrin tissue adhesive to absorbable sutures[J]. Cornea, 2009, 28(1): 43-45

[27] Ozsutcu M, Ayintap E, Akkan J C, et al. Repeated bevacizumab injections versus mitomycin C in rotational conjunctival flap for prevention of pterygium recurrence[J]. Indian Journal of Ophthalmology, 2013, 62(4): 407-411

[28] Leippi S, Grehn F, Geerling G. Antiangiogenic therapy for pterygium recurrence [J]. Der Ophthalmologe Zeitschrift Der Deutschen Ophthalmologischen Gesellschaft, 2009, 106(5): 413-419

[29] Jaworski C J, Aryankalayiljohn M, Campos M M, et al. Expression analysis of human pterygium shows a predominance of conjunctival and limbal markers and genes associated with cell migration [J]. Molecular vision, 2009, 15(256-59): 2421-2434

[30] Mahar P S, Manzar N. Pterygium recurrence related to its size and corneal involvement [J]. J Coll Physicians Surg Pak, 2013, 23(2): 120-123

（上接第 6169 页）

[22] Zhang W. Explore Neck Vessels Carotid Artery Color Doppler Ultrasound in Diagnosis of Ischemic Cerebrovascular Disease Significance of Vascular Lesions [J]. China Continuing Medical Education, 2015, 44(13): 1570-1575

[23] Valero-Rosa J, Campos-Hernández J P, Carrasco-Valiente J, et al. Prognostic value of penile color Doppler ultrasonography for recovering erectile function after radical prostatectomy [J]. Actas Urológicas Españolas, 2016, 40(08): 507-512

[24] Stryczyński Ł, Kostka-Jeziorny K, Juszkat R, et al. Aortic coarctation disclosed in a middle-aged hypertensive patient by tardus parvus waveform in renal Doppler ultrasonography [J]. Kardiologia Polska, 2016, 74(11): 1355-1359

[25] MlGD RM, Ferreira DAEBV, Machado DAT, et al. Liver hemodynamic patterns in nonalcoholic steatosis: Doppler ultrasonography and histological evaluation[J]. Minerva Gastroenterologica E Dietologica, 2016, 62(17): 1902-1904

[26] Zhu J, Di L I, Ultrasound D O. High Frequency Color Doppler Ultrasound Combined with Multi-Slice Spiral CT in the Diagnosis of Thyroid Carcinoma[J]. Medical Recapitulate, 2015, 34(33): 707-782

[27] Wang X H, Peng G E, Hou M W. Investigation of the Display Abilities of Color Doppler Ultrasound and Multi-slice Computed Tomography on Thyroid Nodules: A Comparative Study [J]. Medical Recapitulate, 2015, 03(34): 1229-1302

[28] Abdel-Gawad M, Kadasne R D, Elsobky E, et al. A Prospective Comparative Study between Color Doppler Ultrasound with Twinkling and Non-Contrast Computed Tomography in the Evaluation of Acute Renal Colic[J]. Journal of Urology, 2016, 196(3): 757-762

[29] Jin Z Q, He W, Wu D F, et al. Color Doppler Ultrasound in Diagnosis and Assessment of Carotid Body Tumors: Comparison with Computed Tomography Angiography.[J]. Ultrasound in Medicine & Biology, 2016, 42(9): 2106-2113

[30] Cignini P, Laganà A S, Retto A, et al. Knotting on heaven's door: 3D color Doppler ultrasound imaging of a true cord knot [J]. Archives of Gynecology and Obstetrics, 2016, 293(6): 1-2