

doi: 10.13241/j.cnki.pmb.2020.16.015

彩色多普勒超声用于评估妊娠高血压缺氧程度的临床价值*

韩红芳¹ 乞艳华² 郑转梅² 屈秋慧¹ 赵 静^{3Δ}

(1 西安交通大学第二附属医院妇产科 陕西 西安 710004; 2 西安交通大学第二附属医院超声科 陕西 西安 710004;

3 西安新长安国际妇产医院超声科 陕西 西安 710000)

摘要 目的:探讨彩色多普勒超声用于评估妊娠高血压缺氧程度的临床价值。**方法:**将我院自 2017 年 6 月至 2019 年 6 月收治的妊娠高血压患者 106 例作为研究组及同期产检正常孕妇 103 例作为对照组,采用彩色多普勒超声检查仪监测两组孕妇的子宫动脉血流动力学情况,并分析新生儿的缺氧程度。**结果:**研究组孕妇脐血流搏动指数(pulsatility index, PI)、脐血流阻力指数(resistance index, RI)和脐动脉血流收缩期/舒张期(S/D)水平均明显高于对照组($P<0.05$),舒张早期切迹发生率为 47.17%,亦明显高于对照组 8.74%($P<0.05$)。研究组孕妇平均孕周、新生儿体重和体重指数均明显少于对照组($P<0.05$),其早产率为 19.81%、剖宫产率为 64.15%、胎儿窘迫发生率为 15.09%,均明显高于对照组(5.83%、19.42%、4.85%, $P<0.05$)。研究组中切迹组孕周、新生儿体重均明显小于非切迹组($P<0.05$)。研究组羊水异常发生率为 16.00%,早产率为 40.00%,新生儿窒息率为 14.00%,胎儿窘迫发生率为 26.00%,均明显高于对照组(5.36%、1.79%、1.79%、5.38%, $P<0.05$)。**结论:**采用彩色多普勒超声仪检测孕妇子宫动脉血流频谱可作为了解子宫-胎盘-胎儿循环的检查方式,评估妊娠并发症的发生风险,监测胎儿宫内生长发育。

关键词:妊娠高血压;彩色多普勒超声;新生儿;缺氧

中图分类号:R714.246;R445.1 文献标识码:A 文章编号:1673-6273(2020)16-3074-04

Clinical Value of Color Doppler Ultrasound in Assessing the Degree of Hypoxia in Pregnancy-induced Hypertension*

HAN Hong-fang¹, QI Yan-hua², ZHENG Zhuan-me², QU Qiu-hui¹, ZHAO Jing^{3Δ}

(1 Department of Gynaecology and Obstetrics, Second Affiliated Hospital, Xi'an Jiaotong University, Xi'an, Shaanxi, 710004, China;

2 Department of Ultrasonography, Second Affiliated Hospital, Xi'an Jiaotong University, Xi'an, Shaanxi, 710004, China;

3 Department of Ultrasound, Xi'an New Chang'an International Maternity Hospital, Xi'an, Shaanxi, 710000, China)

ABSTRACT Objective: To explore the clinical value of color Doppler ultrasound in assessing the degree of hypoxia in pregnancy-induced hypertension. **Methods:** A total of 106 pregnancy-induced hypertensive admitted to our hospital from June 2017 to June 2019 were enrolled in the study group, and 103 normal pregnant women in the same period as the control group, and the two groups were monitored by color Doppler ultrasonography. The uterine artery hemodynamics of the two groups of pregnant women were monitored by color Doppler ultrasonography, and the degree of hypoxia in neonates was analyzed. **Results:** The RI, PI and S/D levels of the pregnant women in the study group were significantly higher than those in the control group ($P<0.05$). The early diastolic sinus rate was 47.17%, which was significantly higher than the control group (8.74%, $P<0.05$). The average gestational age, neonatal weight and body mass index of the pregnant women in the study group were significantly lower than those in the control group ($P<0.05$), and the premature rate was 19.81%, the cesarean section rate was 64.15%, and the fetal distress rate was 15.09%, which was significantly higher than the control group (5.83%, 19.42%, and 4.85%, $P<0.05$). The gestational age and neonatal weight of the incision group in the study group were significantly lower than those in the non-incision group ($P<0.05$). The incidence of amniotic fluid abnormality in the study group was 16.00%, the premature birth rate was 40.00%, the neonatal asphyxia rate was 14.00%, and the incidence of fetal distress was 26.00%, which was significantly higher than the control group (5.36%, 1.79%, 1.79%, 5.38%, $P<0.05$). **Conclusion:** Using color Doppler ultrasound to detect the uterine artery blood flow spectrum of pregnant women can be used as a way to understand the uterus-placenta-fetal circulation, assess the risk of pregnancy complications, and monitor the intrauterine growth and development.

Key words: Pregnancy hypertension; Color Doppler ultrasound; Neonatal; Hypoxia

Chinese Library Classification(CLC): R714.246; R445.1 **Document code:** A

Article ID: 1673-6273(2020)16-3074-04

* 基金项目:陕西省社发攻关项目(S2015YFSF0310)

作者简介:韩红芳(1972-),女,硕士研究生,主治医师,研究方向:妇产科超声方面,电话:13759890175, E-mail: hhf137598@163.com

Δ 通讯作者:赵静(1982-),女,本科,主治医师,研究方向:妇产科超声,电话:15029055482, E-mail: xw99188@163.com

(收稿日期:2019-11-23 接受日期:2019-12-18)

前言

妊娠高血压疾病 (Primary hypertension coincidental pregnancy, HDGP) 又称为妊高症, 是一种妊娠期独有的疾病, 多发于妊娠 20 周龄以上的孕妇, 对其自身脏器造成严重损伤或出现功能性衰竭, 患者发病可能与胎盘形成不良或出现明显的氧化应激有关^[1,2]。多数患者发病后全身小血管会出现明显痉挛, 心输出量会变小, 子宫胎盘血流量降低, 造成胎儿缺氧、缺血、宫内发育迟缓等不良并发症发生, 严重者致使胎儿死亡^[3,4]。研究表明妊高症孕妇出现明显的血流动力学改变的情况^[5,6], 本研究将我院近两年收治的妊高症孕妇和正常孕妇作为研究对象, 分别给予彩色多普勒超声检查子宫动脉血流动力学指标, 探讨了其评价新生儿缺氧程度的临床价值, 现将研究结果报告如下。

1 资料与方法

1.1 一般资料

将我院自 2017 年 6 月至 2019 年 6 月收治的妊娠高血压患者 106 例作为研究组及同期产检正常孕妇 103 例作为对照组。研究组年龄 22~36 岁, 平均年龄 28.81 ± 3.29 岁, 胎龄 28~36 周, 平均 33.45 ± 1.08 周, 初产妇 86 例, 经产妇 20 例; 对照组年龄 21~35 岁, 平均年龄 28.63 ± 3.36 岁, 胎龄 28~37 周, 平均 33.52 ± 1.10 周, 初产妇 81 例, 经产妇 22 例, 两组一般资料比较差异均无统计学意义 ($P > 0.05$), 具有可比性。

1.2 纳入和排除标准

纳入标准: 单胎且孕周 > 28 周, 研究组妊高症患者临床诊断妇科《妇产科学》中制定的诊断标准, 血压 $\geq 140/90$ mmHg,

所有孕妇建立个人信息库并随访至妊娠结束^[7,8]。获得我院伦理委员会同意, 孕妇均愿意参与。

排除标准: 存在认知功能障碍、孕前曾有高血压病史、原发性肝肾疾病孕妇, 胎儿畸形、合并染色体异常的孕妇。

1.3 仪器和方法

仪器: 美国 Acuson 公司生产的 Sequoia512 超声多普勒血流检测仪, 探头频率为 25~60 MHz。

方法: 孕妇取侧卧位或仰卧位, 经躺 5 min 后在双侧子宫动脉呈十字交叉通过髂外动脉 1 cm, 超声显示双侧子宫动脉, 调整超声入射角度使其与子宫动脉夹角尽可能小, 获得较为典型的连续 4 个心动周期的频谱后, 监测血流动力学参数。

1.4 观察指标

监测两组孕妇血流动力学参数阻力指数 (Resistance Index, RI)、搏动指数 (Pulsatility Index, PI)、收缩 - 舒张流速比值 (S/D) 等指标, 测量孕妇产前子宫动脉 (Uterine tilt angle, UtA) 有无舒张早期切迹^[9]。对比观察两组孕妇的妊娠结局。

1.5 统计学方法

使用统计学软件 SPSS21.0, 计数资料用 % 表示, 行 χ^2 检验, 计量资料用 ($\bar{x} \pm s$) 表示, 行 t 检验, 以 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 两组孕妇产前子宫动脉血流动力学指标比较

研究组孕妇 RI、PI 和 S/D 水平均明显高于对照组, 舒张早期切迹发生率为 47.17%, 明显高于对照组 8.74% ($P < 0.05$), 见表 1。

表 1 两组孕妇产前子宫动脉血流动力学指标比较

Table 1 Comparison of the uterine arterial hemodynamics between two groups of pregnant women

Groups	Cases	RI	PI	S/D	Early diastolic
Research group	106	$0.58 \pm 0.09^*$	$0.98 \pm 0.30^*$	$2.48 \pm 0.60^*$	50(47.17)*
Control group	103	0.50 ± 0.04	0.73 ± 0.15	2.03 ± 0.38	9(8.74)

Note: Compare with the control group, * $P < 0.05$.

2.2 两组孕妇妊娠结局比较

研究组孕妇平均孕周、新生儿体重和体重指数均明显少于对照组, 早产率为 19.81%、剖宫产率为 64.15%、胎儿窘迫发生

率为 15.09%, 均明显高于对照组 (5.83%、19.42%、4.85%, $P < 0.05$), 见表 2。

表 2 两组孕妇妊娠结局比较

Table 2 Comparison of the pregnancy outcomes between the two groups of pregnant women

Groups	Cases	Gestational week (W)	Newborn weight (Kg)	BMI (kg/m^2)	Premature rate	Caesarean section rate	Fetal distress
Research group	106	$34.13 \pm 4.58^*$	$2.68 \pm 0.69^*$	$29.62 \pm 4.51^*$	21(19.81)*	68(64.15)*	16(15.09)*
Control group	103	38.21 ± 2.65	3.15 ± 0.36	25.47 ± 2.34	6(5.83)	20(19.42)	5(4.85)

Note: Compare with the control group, * $P < 0.05$.

2.3 研究组切迹和无切迹妊娠结局比较

切迹组孕周、新生儿体重均明显小于非切迹组, 切迹组羊水异常发生率为 16.00%, 早产率为 40.00%, 新生儿窒息率为 14.00%, 胎儿窘迫发生率为 26.00%, 均明显高于对照组 (5.36%、1.79%、1.79%、5.38%, $P < 0.05$), 见表 3。

3 讨论

孕妇随着妊娠时间延长, 左右滋养细胞会扩张至子宫肌层和蜕膜的交界处, 甚至螺旋动脉子宫肌段^[10-12], 穿透血管壁使螺旋动脉和静脉形成短路并开放进入胎盘绒毛间腔内, 使子宫动

脉血流增加,以适应妊娠^[13,14]。妊高症是妊娠期特有病,孕妇产前螺旋动脉重塑障碍,滋养细胞的侵入功能异常,从而使胎盘功能受到损伤^[15,16]。子宫动脉为髂内动脉前干分支,沿着骨盆侧壁向前内下行至阔韧带基部,在腹膜间向内行,越过输尿管前方至子宫侧缘分为上下两支^[17,18]。在子宫下段和宫颈交界水

平两侧显示出子宫动脉静脉明亮的血流信号,记录子宫动脉血流频谱^[19],使用多普勒超声仪检测收缩期高速血流、舒张期驼峰样正向血流频率^[20,21]。当孕妇发生妊高症时螺旋动脉重铸的数量明显减少,仅次于蜕膜段,保留管壁的肌层仍具弹性时会造成血管阻力下降^[22]。

表 3 研究组切迹和无切迹妊娠结局的比较

Table 3 Comparison of the pregnancy outcome between notch and no-cut in the study group

Groups	Cases	Gestational week (W)	Newborn weight (Kg)	Abnormal amniotic fluid	Premature rate	Caesarean section rate	Fetal distress
Notch group	50	31.38± 3.29*	2.23± 0.39*	8(16.00)*	20(40.00)*	7(14.00)*	13(26.00)*
Non-incision group	56	37.02± 3.01	3.08± 0.27	3(5.36)	1(1.79)	1(1.79)	3(5.38)

Note: Compare with the non-incision group, * $P < 0.05$.

随着影像学检查技术不断进步和发展,彩色多普勒超声检查能够很好的反映血管阻力的变化情况^[23,24]。有研究资料显示子宫动脉血流的参数指标能够很好的预测妊高症的发生、评价胎儿宫内缺氧状况的发生,甚至可以预测胎儿的妊娠结局^[25,26],本研究结果显示妊高症孕妇的 RI、PI、S/D、舒张早期切迹发生率均明显高于对照组,孕周、新生儿体重和体重指数均明显少于对照组,早产率、剖宫产率、胎儿窘迫率高于对照组,表明当妊高症孕妇产前-胎盘-胎儿循环发生改变,胎儿生物学指标尚未出现异常时,血流动力学指标已经发生异常改变,而当孕妇产前 RI、PI、S/D 阻力值发生变化时,胎儿失代偿期发生不利妊娠结局的比率也相对增高^[27,28]。再者,妊高症患者研究组切迹组羊水异常率、早产率、新生儿窒息率、胎儿窘迫率均高于对照组,说明子宫动脉血流阻力增加、出现舒张早期切迹,导致胎盘血流灌注减少,影响胎儿正常生长,可将其作为预测妊高症发生和评价病情严重程度监测指标,异常的子宫动脉频谱也可预测严重不良围生期结局的发生^[29,30]。

综上所述,彩色多普勒超声仪检测妊高症孕妇产前子宫动脉血流频谱分析可作为了解子宫-胎盘-胎儿循环的新的检查方式,用于评估妊高症血流参数异常患者妊娠并发症的风险,监测胎儿宫内生长发育,对高风险者可给予适当的干预和治疗,提高围产期监护水平以达到改善母婴预后的目的。

参考文献(References)

- [1] Sharma S, Sohan Singh, Uma Gujral, et al. Uterine Artery Notching on Color Doppler Ultrasound and Roll over Test in Prediction of Pregnancy Induced Hypertension[J]. J Obstet Gynaecol India, 2011, 61(6): 649-651
- [2] Tsioufis C, Andrikou, Ioannis, et al. Should renal color Doppler ultrasonography be a routine test in newly diagnosed hypertensive patient? [J]. J Hypertens, 2017, 36(1): 16-22
- [3] Makhija P, Wilson, Christopher, Garimella, Sudha. Utility of Doppler sonography for renal artery stenosis screening in obese children with hypertension[J]. J Clin Hypertens (Greenwich), 2018, 20(2): 139-141
- [4] Jiang L, Zhao Y. The value of color Doppler ultrasound in the diagnosis of lower extremity vascular disease in type 2 diabetes and analysis of related factors[J]. Minerva Endocrinol, 2017, 42(3): 223-227
- [5] Chen Q, Li S, Lv G, et al. Application of Transcranial Color Doppler

- Ultrasonography for Assessing Middle Cerebral Arteries in Rheumatoid Arthritis[J]. Ultrasound Q, 2017, 33(4): 281-283
- [6] Lan Y, Rao L, Yang Z, et al. Expressions of HIF-1 α and HSP70 in placenta tissue of patients with pregnancy-induced hypertension syndrome and their significances[J]. Journal of Jilin University, 2018, 44(2): 346-349
- [7] Faundez E, Vega N, Vera E, et al. Clinical and color Doppler ultrasound evaluation of polyacrylamide injection in HIV patients with severe facial lipoatrophy secondary to antiretroviral therapy[J]. Skin Res Technol, 2017, 23(2): 243-248
- [8] Ma S, Liu J, Zhang Y, et al. Application of color Doppler ultrasound combined with Doppler imaging artifacts in the diagnosis and estimate of congenital hypertrophic pyloric stenosis [J]. Sci Reports, 2017, 7(1): 9527-9535
- [9] Lobos N, Wortsman X, Valenzuela F, et al. Color Doppler Ultrasound Assessment of Activity in Keloids [J]. Dermatol Surg, 2017, 43(6): 817-825
- [10] Behrens I, Basit S, Melbye M, et al. Risk of post-pregnancy hypertension in women with a history of hypertensive disorders of pregnancy: nationwide cohort study[J]. BMJ, 2017, 358(sup2): j3078
- [11] Mounier-Vehier C, Amar J, Boivin JM, et al. Hypertension and pregnancy Expert consensus statement from the French Society of Hypertension, an affiliate of the French Society of Cardiology [J]. Fundam Clin Pharmacol, 2017, 31(1): 83-103
- [12] Pohlabein H, Rach S, De Henauw S, et al. Further evidence for the role of pregnancy-induced hypertension and other early life influences in the development of ADHD: results from the IDEFICS study[J]. Eur Child Adolesc Psychiatry, 2017, 26(8): 957-967
- [13] Ishimitsu, Toshihiko. Starting the new review series: Pregnancy-Induced Hypertension[J]. Hypertens Res, 2017, 40(1): 3-4
- [14] Xu SZ, Hu XY, Zhao F. Effect of pregnancy-induced hypertension syndrome on complications in very low birth weight preterm infants [J]. Zhongguo Dang Dai Er Ke Za Zhi, 2017, 19(4): 402-404
- [15] Neily Z, Ter H LF, Bos JH, et al. Antidepressant use during pregnancy and the risk of developing gestational hypertension: a retrospective cohort study[J]. BMC Pregnancy Childbirth, 2018, 18(1): 187-188
- [16] Altortay, A, Suranyi A, akó, M, et al. Correlation between placental vascularisation indices and histological findings of placentas in preg-

- nancy hypertension [J]. *Ultrasound Obstet Gynecol*, 2017, 50(20): 166-166
- [17] Behrens I, Basit S, Melbye M, et al. Risk of post-pregnancy hypertension in women with a history of hypertensive disorders of pregnancy: nationwide cohort study[J]. *BMJ*, 2017, 358(2): j3078
- [18] Alsnes IV, Vatten LJ, Fraser A, et al. Hypertension in Pregnancy and Offspring Cardiovascular Risk in Young Adulthood: Novelty and Significance[J]. *Hypertension*, 2017, 69(4): 591-598
- [19] Lei F, Liu D, Shen Y, et al. Study on the influence of pregnancy-induced hypertension on neonatal birth weight[J]. *J Investig Med*, 2018, 66(6): 1008-1014
- [20] Scantlebury DC, Kattah AG, Weissgerber TL, et al. Impact of a History of Hypertension in Pregnancy on Later Diagnosis of Atrial Fibrillation[J]. *J Am Heart Assoc*, 2018, 7(10): e007584
- [21] Sharma K, Singh R, Kumar M, et al. First-Trimester Inflammatory Markers for Risk Evaluation of Pregnancy Hypertension[J]. *Journal of Obstetrics & Gynecology of India*, 2018, 68(4): 1-6
- [22] Niraula A, Lamsal M, Majhi S, et al. Significance of Serum Uric Acid in Pregnancy Induced Hypertension [J]. *J Natl Med Assoc*, 2017, 109(3): 198-202
- [23] Ukah UV, Payne B, Lee T, et al. External Validation of the fullPIERS Model for Predicting Adverse Maternal Outcomes in Pregnancy Hypertension in Low-and Middle-Income Countries: Novelty and Significance[J]. *Hypertension*, 2017, 69(4): 705-711
- [24] Chen S, Li N, Mei Z, et al. Micronutrient supplementation during pregnancy and the risk of pregnancy-induced hypertension: A randomized clinical trial[J]. *Clin Nutr*, 2018, 38(1): 146-151
- [25] Sharma S, Sohan Singh, Uma Gujral, et al. Uterine Artery Notching on Color Doppler Ultrasound and Roll over Test in Prediction of Pregnancy Induced Hypertension [J]. *J Obstet Gynaecol India*, 2011, 61(6): 649-651
- [26] Ganesh T, Estrada, Marvin, et al. A non-invasive magnetic resonance imaging approach for assessment of real-time microcirculation dynamics[J]. *Sci Rep*, 2017, 7(1): 7468-7482
- [27] Walton SL, Bielefeldt-Ohmann H, Singh RR, et al. Prenatal hypoxia leads to hypertension, renal renin-angiotensin system activation and exacerbates salt-induced pathology in a sex-specific manner [J]. *Sci Rep*, 2017, 7(1): 8241-8255
- [28] Oliveira AC, Sharma Ravindra K, Aquino Victor, et al. Involvement of Microglial Cells in Hypoxia-induced Pulmonary Hypertension[J]. *Am J Respir Cell Mol Biol*, 2018, 59(2): 271-273
- [29] Lu W, Kang J, Hu K, et al. The role of the Nox4-derived ROS-mediated RhoA/Rho kinase pathway in rat hypertension induced by chronic intermittent hypoxia[J]. *Sleep Breath*, 2017, 21(3): 667-677
- [30] Eslamian ZL, Zarean E, Moshfeghi M, et al. Evaluation of the predictive value of fetal Doppler ultrasound for neonatal outcome from the 36 th week of pregnancy[J]. *J Res Med Sci*, 2018, 23(1): 13-21

(上接第 3155 页)

- [23] Sarda P, Butt D, Elnikety S, et al. Does Hyaluronan improve pain or function following Arthroscopic Subacromial decompression (ASD) surgery of Shoulder? Results of a level 1 RCT [J]. *Indian J Orthop*, 2019, 53(5): 595-601
- [24] Sahu GK, Meena DS, Saini S, et al. Comparison of Two Different Volumes of Ropivacaine Used in Nerve Stimulator Guided Interscalene Block for Arthroscopic Shoulder Surgery - A Randomized Controlled Trial[J]. *Anesth Essays Res*, 2018, 12(4): 786-791
- [25] 朱志慧, 邢文龙, 陆可可, 等. 创伤后应激障碍患者皮质醇水平与临床症状的相关性研究[J]. *中国全科医学*, 2019, 22(11): 1297-1301
- [26] Mejía-Terrazas GE, Ruiz-Suárez M, Vadillo-Ortega F, et al. Effect of interscalene nerve block on the inflammatory response in shoulder surgery: a randomized trial [J]. *J Shoulder Elbow Surg*, 2019, 28(9): e291-e303
- [27] Godbole MR, Karhade SS, Parihar PP. A Prospective Study of Comparison of Analgesic Efficacy of Dexamethasone as an Adjuvant in Supraclavicular Block with Intravenous Dexamethasone after Supraclavicular Block in Patients Undergoing Forearm Surgeries[J]. *Anesth Essays Res*, 2019, 13(1): 31-35
- [28] Kataria S, Mitra S, Saroa R, et al. A Randomized Double Blinded Trial Comparing Dexmedetomidine With Dexamethasone as an Adjuvant to Ropivacaine in Ultrasound Guided Interscalene Block for Arthroscopic Shoulder Surgery [J]. *Asian J Anesthesiol*, 2019, 57(1): 10-18
- [29] Demir U, Yayik AM, Köse M, et al. Does the Serratus Plane Block Added to the Interscalene Block Improve the Quality of Anesthesia in Arthroscopic Shoulder Surgery? A Prospective Randomized Study[J]. *Cureus*, 2020, 12(4): e7648
- [30] Özkan D, Cemaloğlu S, Catma FM, et al. Effects of suprascapular and axillary nerve block on postoperative pain relief sevoflurane consumption and visual clarity in arthroscopic shoulder surgery [J]. *Agri*, 2020, 32(1): 1-7