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孕晚期产妇生殖道 B 族链球菌感染与胎膜早破及新生儿结局的相关性

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[摘　要]　**目的：**探讨孕晚期产妇生殖道B族链球菌(group B *Streptococcus*，GBS)感染与胎膜早破及新生儿结局的相关性。**方法：**搜集2017年5月至2019年8月首都医科大学附属北京世纪坛医院产科门诊的2 100例孕妇，选取其中122例孕晚期胎膜早破产妇作为观察组，另选取120例同期健康孕晚期产妇作为健康对照组，比较两组GBS感染率，依据观察组患者是否合并GBS感染，将其分为GBS阴性组与GBS阳性组，采用单因素和多因素logistic回归分析影响胎膜早破孕妇GBS感染的危险因素，观察不同组别不良妊娠情况及新生儿结局。**结果：**健康对照组GBS感染率显著低于观察组($P<0.05$)；两组孕妇胎位异常、双胎或多胎妊娠和巨大儿发生率比较差异具有统计学意义($P<0.05$)；经多因素logistic回归模型分析结果显示胎位异常、双胎或多胎妊娠和巨大儿为影响胎膜早破孕妇GBS感染的危险因素($P<0.05$)。GBS阴性组早产、产后出血和宫内感染率均显著低于GBS阳性组($P<0.05$)；GBS阳性组新生儿窒息和新生儿肺炎感染发生率均高于GBS阴性组($P<0.05$)；两组新生儿感染率比较，差异无统计学意义($P>0.05$)。**结论：**胎位异常、双胎或多胎妊娠和巨大儿均可影响孕晚期胎膜早破产妇GBS感染，GBS感染可致新生儿窒息、新生儿感染和新生儿肺炎的发生，同时引起早产、产后出血和宫内感染等不良妊娠结局的发生。临床需要对孕晚期产妇生殖道GBS感染进行及时监测和处理，以降低其不良母婴结局的发生率。

[关键词]　产妇；生殖道B族链球菌；胎膜早破

Correlations between group B *Streptococcus* infection of the genital tract of pregnant women in the third trimester and premature rupture of membranes and neonatal outcomes

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Abstract　**Objective:** To explore the correlations between group B *Streptococcus* (GBS) infection of the genital tract of pregnant women in the third trimester and premature rupture of membranes and neonatal outcomes. **Methods:** A total of

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2 100 pregnant women in obstetric clinics from May 2017 to August 2019 were collected. Among them, 122 pregnant women with premature rupture of membranes in the third trimester were selected as an observation group, and 120 healthy pregnant women in the third trimester during the same period were selected as a healthy control group. GBS infection rates were compared between the 2 groups. According to whether the patients in the observation group were combined with GBS infection, they were divided into a GBS negative group and a GBS positive group. Single factor and multivariate logistic regression were used to analyze the risk factors of GBS infection in pregnant women with premature rupture of membranes, and to observe the adverse pregnancy conditions and neonatal outcomes in different groups. **Results:** The incidence of GBS infection in the healthy control group was lower than that in the observation group (P<0.05). There was a statistically significant difference in the incidence of abnormal fetal position, gemellary or multiple pregnancy and fetal macrosomia between the two groups (P<0.05). The results of multivariate logistic regression model analysis showed that abnormal fetal position, gemellary or multiple pregnancy and fetal macrosomia were the risk factors for GBS infection in pregnant women with premature rupture of membranes (P<0.05). The incidences of premature delivery, postpartum hemorrhage, and intrauterine infection in the GBS negative group were significantly lower than those in the GBS positive group (P<0.05). The incidences of neonatal asphyxia and neonatal pneumonia infection in the GBS positive group were higher than those in the GBS negative group (P<0.05). There was no significant difference in the incidence of neonatal infection between the 2 groups (P>0.05). **Conclusion:** Abnormal fetal position, gemellary or multiple pregnancy and fetal macrosomia can affect GBS infection in pregnant women with premature rupture of membranes in the third trimester. GBS infection can cause neonatal asphyxia, neonatal infection, and neonatal pneumonia, as well as adverse pregnancy outcomes such as premature birth, postpartum hemorrhage, and pneumonia infection, etc. In clinic, it is necessary to monitor and deal with the GBS infection of the genital tract of pregnant women in the third trimester in order to reduce the incidence of adverse maternal and infant outcomes.

Keywords pregnant women; group B *Streptococcus* of genital tract; premature rupture of membranes

胎膜早破即在临产前胎膜自然破裂，可分为足月胎膜早破和未足月胎膜早破[1]。胎膜早破可导致不良母婴结局，包括新生儿感染、新生儿肺炎、产后出血和Apgar评分低等[2]。目前胎膜早破的病因及发病机制尚未完全明确，研究[3]显示：感染是胎膜早破的重要致病因素，同时也是胎膜早破的并发症，两者相互作用，相互促进。在感染的病原体中，B组溶血性链球菌(group B *Streptococcus*，GBS)穿透力最强，致病率最高，成为当前研究的重点[4]。早期对孕晚期产妇生殖道GBS感染进行干预尤为重要[5-6]，故本研究主要分析孕晚期产妇生殖道GBS感染情况，并探究其与胎膜早破及新生儿结局的相关性。

1 对象与方法

1.1 对象

纳入2017年5月至2019年8月首都医科大学附属北京世纪坛医院产科门诊的2 100例孕妇，选取其中122例孕晚期胎膜早破产妇的临床资料作为观察组，纳入标准：1)所有孕妇符合妇科学中胎膜早破诊断标准[7]；2)无妊娠高血压或糖尿病；3)无自身免疫性疾病；4)本研究已通过本院医学伦理委员会批准，患者或家属均签署知情同意书。排除标准：1)凝血功能障碍者；2)甲亢和肾功能不全者；3)存在血液系统疾病者；4)合并其他严重感染疾病(包括肺部感染、泌尿系统感染、肠道感染等)者。根据GBS感染情况将观察组分为阴性组与阳性组，其中阴性组98例，阳性组24例。

同时选取120例同期健康孕晚期产妇的临床资料作为健康对照组。健康对照组年龄20~42(28.42±4.15)岁，观察组年龄21~43(27.60±4.14)岁。两组患者年龄等一般资料比较差异无统计学意义(P>0.05，表1)，具有可比性。

1.2 方法

对比观察组与健康对照组GBS感染情况，观察GBS阴性组与GBS阳性组孕妇相关不良妊娠结局以及新生儿结局，其中孕不良妊娠结局包括早产、产后出血和宫内感染，新生儿结局包括新生儿肺

炎和新生儿感染。

1.3 检查方法

采集标本：擦拭阴道分泌物，阴道内插入1个无菌棉拭子旋转1周；之后拭子插入肛门，取得直肠样本，送检。采用核酸检测试剂盒(中国普泰生物科学有限公司)和CFX 96实时荧光定量PCR仪检测仪(美国Bio-Rad公司)进行GBS检测，操作步骤严格按说明书进行。

1.4 统计学处理

采用SPSS 22.0统计学软件进行数据分析。计量资料以均数±标准差($\bar{x}\pm s$)表示，采用t检验；计数资料以例(%)进行描述，采用卡方检验。影响胎膜早破孕妇GBS感染的危险因素用logistic回归模型分析。$P<0.05$为差异有统计学意义。

表1 健康对照组与观察组一般资料比较

Table 1 Comparison of general information between the healthy control group and the observation group

组别	n	年龄/岁	孕周	孕次	产次
健康对照组	120	28.42 ± 4.15	36.04 ± 0.55	3.24 ± 1.64	0.40 ± 0.60
观察组	122	27.60 ± 4.14	36.06 ± 0.56	3.30 ± 1.68	0.44 ± 0.50
χ^2/t		1.539	0.280	0.281	0.564
P		0.125	0.780	0.779	0.573

2 结果

2.1 健康对照组与观察组孕妇 GBS 感染情况比较

健康对照组GBS感染发生率为5.00%，低于观察组的19.67%(χ^2=11.992，$P<0.001$)。

2.2 影响胎膜早破孕妇发生GBS感染的单因素分析

单因素分析结果显示：两组孕妇胎位异常、双胎或多胎妊娠和巨大儿发生率比较，差异具有统计学意义($P<0.05$，表2)。

2.3 影响胎膜早破孕妇发生 GBS 感染的多因素 logistic 回归分析

多因素logistic回归模型分析结果显示：胎位异常、双胎或多胎妊娠和巨大儿为影响胎膜早破孕妇发生GBS感染的危险因素($P<0.05$，表3)。

2.4 GBS 阴性组和 GBS 阳性组孕妇相关不良妊娠结局比较

GBS阴性组早产、产后出血和宫内感染发生率分别为10.20%、3.06%、2.04%；GBS阳性组早产、产后出血和宫内感染发生率分别为25.00%、20.83%、16.67%；GBS阳性组早产、产后出血和宫内感染发生率均高于GBS阴性组($P<0.05$，表4)。

2.5 GBS 阴性组和 GBS 阳性组新生儿结局比较

GBS阳性组新生儿窒息和新生儿肺炎感染发生率分别为20.83%、25.00%，GBS阴性组新生儿窒息和新生儿肺炎感染发生率分别为4.08%和2.04%，GBS阳性组新生儿窒息和新生儿肺炎感染发生率均高于GBS阴性组($P<0.05$)；GBS阴性组新生儿感染发生率为5.10%，低于GBS阳性组(12.50%)，差异无统计学意义($P>0.05$，表5)。

表2 影响胎膜早破孕妇发生GBS感染的单因素分析

Table 2 Single factor analysis of GBS infection in pregnant women with premature rupture of membranes

组别	n	胎位异常/[例(%)]		双胎或多胎妊娠/[例(%)]		巨大儿/[例(%)]	
		有	无	有	无	有	无
GBS阴性组	98	4 (4.08)	94 (95.92)	3 (3.06)	95 (96.94)	2 (2.04)	96 (97.96)
GBS阳性组	24	14 (58.33)	10 (41.67)	10 (41.67)	14 (58.33)	10 (41.67)	14 (58.33)
χ^2		45.115		30.18		34.134	
P		<0.001		<0.001		<0.001	

表3 影响胎膜早破孕妇发生GBS感染的多因素logistic回归分析

Table 3 Multivariate logistic regression analysis of GBS infection in pregnant women with premature rupture of membranes

变量	回归系数(B)	标准误(SE)	Wald χ^2	*P*	OR (95% CI)
胎位异常	1.145	0.650	6.698	<0.001	3.706 (1.036~13.250)
双胎或多胎妊娠	2.134	0.780	20.689	<0.001	8.448 (1.831~38.970)
巨大儿	1.851	0.315	7.568	<0.001	6.366 (3.434~11.804)

表4 GBS阴性组和GBS阳性组孕妇相关不良妊娠结局比较

Table 4 Comparison of adverse pregnancy outcomes between pregnant women in the GBS negative group and the GBS positive group

组别	*n*	早产/[例(%)]	产后出血/[例(%)]	宫内感染/[例(%)]
GBS阴性组	98	10 (10.20)	3 (3.06)	2 (2.04)
GBS阳性组	24	6 (25.00)	5 (20.83)	4 (16.67)
χ^2		10.667	9.938	8.819
P		0.001	0.002	0.003

表5 GBS阴性组和GBS阳性组新生儿结局比较

Table 5 Comparison of neonatal outcomes between the GBS negative group and the GBS positive group

组别	*n*	新生儿窒息/[例(%)]	新生儿感染/[例(%)]	新生儿肺炎/[例(%)]
GBS阴性组	98	4 (4.08)	5 (5.10)	2 (2.04)
GBS阳性组	24	5 (20.83)	3 (12.50)	6 (25.00)
χ^2		7.918	1.722	16.585
P		0.005	0.189	<0.001

3 讨论

胎膜早破为孕产妇严重的并发症，可增加宫内感染及产褥感染概率，增高早产率及围生儿病死率[8]。由于胎膜早破会导致生殖道被外界致病菌，尤其是GBS感染侵入，因此GBS感染和胎膜早破的关联性引起广泛讨论。

GBS作为一种致病菌，具备的绒毛膜吸附能力和穿透能力极强。研究[9]显示：CBS感染后可在2 h内吸附于母体组织中，逐步侵入绒毛膜，并通过炎症细胞的吞噬作用及细菌产生的蛋白水解酶作用使胎膜局部张力减低，从而导致胎膜早破。杨艳华等[10]研究发现：GBS感染在胎膜早破与正常孕妇间存在差异，且二者呈正相关。本研究结果显示：健康对照组GBS感染发生率为5.00%，低于观察组的19.67%，这与既往研究[11]结果相似，有力地佐证了GBS感染与胎膜早破的关系，提示及时发现GBS感染并进行有效干预对预防胎膜早破具有重要意义。

GBS感染与胎膜早破互相作用、互相促进。研究[12-13]显示：胎膜早破会促进感染概率，由于阴道内存在酸度，病原体不能上行进入羊膜腔，当发生胎膜早破时，流出的羊水破坏了阴道的酸度，使得病原体更易上行侵袭。本研究进一步采用logistic回归模型分析胎膜早破与GBS感染的关系，结果显示胎位异常、双胎或多胎妊娠和巨大儿为孕妇胎膜早破GBS感染的危险因素($P<0.05$)。分析其原因在于：1)胎位异常可使产妇骨盆和胎儿先露部分间隙变大，导致胎盘受力不均，诱发胎膜破裂的发生；3)双胎或多胎妊娠和巨大儿均对腹压有一定影响，导致胎膜结构的改变，从而出现胎膜早破[14-16]。

此外，本研究就GBS感染与早产、产后出血、宫内感染、新生儿肺炎和新生儿窒息的相关性进行分析，结果显示：GBS阳性组早产、产后出血和宫内感染发生率及新生儿窒息和新生儿肺炎感染均高于GBS阴性组($P<0.05$)，表明合并GBS感染的孕晚期产妇发生早产、产后出血和宫内感染的风险较大。其原因可能与胎膜早破后造成GBS上行感染至宫颈和阴道进羊膜腔，并在子宫扩散，从而引起新生儿窒息和早产甚至出血等不良结局有关，进一步提示及时监测生殖道GBS感染孕晚期产妇以减少不良母婴结局的发生[17-18]。

综上，胎位异常、双胎或多胎妊娠和巨大儿均可影响孕晚期胎膜早破产妇GBS感染，GBS感染可致新生儿窒息、新生儿感染和新生儿肺炎的发生，同时引起早产、产后出血和宫内感染等不良妊娠结局的发生。临床需要对孕晚期产妇生殖道GBS感染进行及时监测和处理，以降低其不良母婴结局的发生率。

参考文献

1. 周蒨, 张晨, 刘小华, 等. B族溶血性链球菌感染合并足月胎膜早破的产妇引产与期待治疗的比较[J]. 上海医学, 2018, 41(10): 23-27.
   ZHOU Qian, ZHANG Chen, LIU Xiaohua, et al. Comparison of induction of labor and expectant treatment of parturients with group B hemolytic streptococcus infection combined with term premature rupture of membranes[J]. Shanghai Medical Journal, 2018, 41(10): 23-27.
2. 黄绪芬. 妊娠晚期孕妇生殖道B族溶血性链球菌感染对妊娠结局的影响[J]. 实用临床医药杂志, 2018, 22(23): 87-89.
   HUANG Xufen. The influence of group B hemolytic streptococcal infection in the reproductive tract of pregnant women in the third trimester of pregnancy on pregnancy outcome[J]. Journal of Clinical Medicine in Practice, 2018, 22(23): 87-89.
3. 朱李登, 蔡丽平, 黄庆凤, 等. 妊娠晚期妇女B族链球菌带菌与妊娠结局的相关性研究[J]. 检验医学与临床, 2017, 14(24): 3688-3691.
   ZHU Lideng, CAI Liping, HUANG Qingfen, et al. Study on the correlation between the carrier of group B streptococcus and pregnancy outcome in late pregnancy women[J]. Laboratory Medicine and Clinic, 2017, 14(24): 3688-3691.
4. 高飞, 王雅慧, 张敏洁, 等. 妊娠晚期B族链球菌感染对妊娠结局的影响[J]. 武警医学, 2018, 29(12): 41-43.
   GAO Fei, WANG Yahui, ZHANG Minjie, et al. The influence of group B streptococcal infection in late pregnancy on pregnancy outcome[J]. Medical Journal of the Chinese People Armed Police Forces, 2018, 29(12): 41-43.
5. 王晓娜, 丛桂敏, 冯小静, 等. 围产期孕妇生殖道B族链球菌感染高危因素分析及母婴结局探讨[J]. 微生物学免疫学进展, 2019, 47(1): 51-55.
   WANG Xiaona, CONG Guimin, FENG Xiaojing, et al. Analysis of high-risk factors of group B streptococcal infection in pregnant women's reproductive tract during perinatal period and discussion on maternal and infant outcomes[J]. Progress in Microbiology and Immunology, 2019, 47(1): 51-55.
6. 吴丹燕, 鲁云涯, 史燕红, 等. 不同分娩方式对生殖道B族链球菌感染孕妇妊娠结局的影响[J]. 中国计划生育和妇产科, 2018, 10(5): 74-78.
   WU Danyan, LU Yunya, SHI Yanhong, et al. The influence of different modes of delivery on pregnancy outcome of pregnant women infected with group B streptococcus of genital tract[J]. Chinese Journal of Family Planning & Gynecotokology, 2018, 10(5): 74-78.
7. 谢幸, 苟文丽. 妇产科学[M]. 8版. 北京: 人民卫生出版社, 2013: 133-135.
   XIE Xin, GOU Wenli. Obstetrics and gynecology[M]. 8th ed. Beijing: People's Medical Publishing House, 2013: 133-135.
8. Emonet S, Schrenzel J, Martinez de Tejada B. Molecular-based screening for perinatal group B Streptococcal infection: implications for prevention and therapy[J]. Mol Diagn Ther, 2013, 17(6): 355-361.
9. 杨振莉, 姜贻乾, 来汉江. 孕妇B族链球菌感染对母婴结局的影响分析[J]. 浙江医学, 2018, 40(7): 709-711, 716.
   YANG Zhenli, JIANG Yiqian, LAI Hanjiang. Analysis of the influence of group B streptococcal infection in pregnant women on maternal and infant outcomes[J]. Zhejiang Medical Journal, 2018, 40(7): 709-711, 716.
10. 杨艳华, 吴军, 严格. 胎膜早破与胎儿纤维连接蛋白及B族溶血性链球菌感染的关系[J]. 中国妇幼保健, 2018, 33(20): 55-57.
    YANG Yanhua, WU Jun, YANG Ge. The relationship between premature rupture of membranes and fetal fibronectin and group B hemolytic streptococcus infection[J]. Maternal and Child Health Care of China, 2018, 33(20): 55-57.
11. Solomon C, Collis RE, Collins PW. Haemostatic monitoring during postpartum haemorrhage and implications for management[J]. Br J Anaesth, 2012, 109(6): 851-863.
12. Park JS, Cho DH, Yang JH, et al. Usefulness of a rapid real-time PCR assay in prenatal screening for group B streptococcus colonization[J]. Ann Lab Med, 2013, 33(1): 39-44.
13. 冀云鹏, 周雪原, 王杰, 等. 呼和浩特地区妊娠晚期孕妇生殖道B族链球菌感染对妊娠结局 的影响[J]. 中国妇产科临床杂志, 2017, 18(2): 162-163.

YI Yunpeng, ZHOU Xueyuan, WANG Jie, et al. The influence of group B streptococcal infection in the reproductive tract of pregnant women in the third trimester of pregnancy in Hohhot area[J]. Chinese Journal of Clinical Obstetrics and Gynecology, 2017, 18(2): 162-163.

14. 张兰, 朱樱梅, 李敏许. 妊娠期B族链球菌感染的高危因素及其对新生儿预后影响分析[J]. 中国妇幼健康研究, 2017, 28(6): 731-733.
ZHANG Lan, ZHU Yinmei, LI Minxu. Analysis of the high-risk factors of group B streptococcal infection during pregnancy and its influence on the prognosis of neonates[J]. Chinese Journal of Woman and Child Health Research, 2017, 28(6): 731-733.

15. Verani JR, McGee L, Schrag SJ, et al. Prevention of perinatal group B streptococcal disease--revised guidelines from CDC, 2010[J]. MMWR Recomm Rep, 2010, 59(RR-10): 1-36.

16. 张莹, 孙晖, 王英, 等. 抗感染干预对孕妇生殖道B族链球菌感染胎膜早破的影响[J]. 中华医院感染学杂志, 2017, 27(1): 179-181.
ZHANG Yin, SUN Hui, WANG Ying, et al. Anti-infective intervention on the premature rupture of membranes caused by group B streptococcus infection in pregnant women[J]. Chinese Journal of Nosocomiology, 2017, 27(1): 179-181.

17. 郭华峰, 杨筱青, 杨俊娟. 妊娠晚期孕妇生殖道 B族溶血性链球菌感染及临床结局研究[J]中国妇幼保健, 2014, 29(30): 4897-4898.
GUO Huafeng, YANG Youqing, YANG Junjuan. Study on the infection and clinical outcome of group B hemolytic streptococcus in the reproductive tract of pregnant women in the third trimester of pregnancy[J]. Maternal and Child Health Care of China, 2014, 29(30): 4897-4898.

18. 张倩, 严涵, 张凤. 妊娠晚期生殖道B族溶血性链球菌(GBS)感染及对妊娠结局的影响分析[J]. 河北医学, 2018, 24(4): 608-612.
ZHANG Qian, YAN Han, ZHANG Feng. Reproductive tract group B hemolytic streptococcus (GBS) infection in the third trimester of pregnancy and its impact on pregnancy outcome[J]. Journal of Hebei Medicine, 2018, 24(4): 608-612.

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