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肺脏超声对新生儿呼吸窘迫综合征的诊断价值及肺超声评分的评估价值分析*

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摘要 目的:探讨肺脏超声对新生儿呼吸窘迫综合征(NRDS)的诊断价值,并分析肺超声评分的临床应用价值。**方法:**本研究选择2017年5月至2018年5月于我院确诊的NRDS患儿45例作为观察组,选择同期于我院就诊的非肺病患儿45例作为对照组,所有患儿均行肺脏超声检查。分析NRDS患儿肺脏超声特征性征象,比较肺脏超声对两组患儿各种征象的检出率,分析肺脏超声对NRDS的诊断价值,比较两组肺超声评分。**结果:**NRDS患儿全部存在肺实质征象,超声下肺组织回声呈肝样伴支气管充气征,轻度的NRDS患儿于肺脏超声下表现为局灶性的肺实质,且支气管充气征不明显;重度的NRDS患儿于肺脏超声下表现为肺实质范围的进一步扩大,且支气管充气征随病情的加重而愈发明显。观察组肺实质、胸膜线异常、A线消失、弥漫性肺水肿、支气管充气征等征象的检出率显著高于对照组($P<0.05$),两组B线存在征象的检出率比较无统计学差异($P>0.05$)。肺实质、胸膜线异常和A线消失三种特征征象同时存在时对NRDS诊断的灵敏度和特异性均为100.00%,肺实质、胸膜线异常和支气管充气征三种特征征象同时存在时对NRDS诊断的灵敏度为80.00%,特异性为100.00%。观察组双肺、左肺、右肺、双侧肺、双肺底肺超声评分均高于对照组($P<0.05$)。**结论:**肺脏超声对NRDS的诊断价值较高,且肺超声评分可以评估NRDS患儿的病情严重程度,有助于指导患儿的治疗。

关键词:新生儿;呼吸窘迫综合征;肺脏超声;肺超声评分;诊断

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Diagnostic Value of Pulmonary Ultrasound in Neonatal Respiratory Distress Syndrome and Assessment Value Analysis of Pulmonary Ultrasound Score*

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ABSTRACT Objective: To explore the diagnostic value of pulmonary ultrasound in neonatal respiratory distress syndrome (NRDS), and to analyze the clinical application value of pulmonary ultrasound score. **Methods:** In this study, 45 children with NRDS who were diagnosed in our hospital from May 2017 to May 2018 were selected as observation group. 45 cases of non-pulmonary children in our hospital during the same period were selected as control group. All children underwent pulmonary ultrasonography. The characteristics of lung ultrasonography in children with NRDS were analyzed. The detection rate of various signs of pulmonary ultrasound between the two groups were compared. The diagnostic value of pulmonary ultrasound in NRDS were analyzed. Pulmonary ultrasound scores were compared between the two groups. **Results:** The pulmonary parenchymal signs were found in all children with NRDS. Ultrasound echoes of lung tissue were hepatoid with bronchial inflation sign. The mild NRDS children showed focal parenchyma under pulmonary ultrasonography, and the bronchial aeration sign was not obviously. Severe NRDS children showed further enlargement of lung parenchyma under pulmonary ultrasonography, and bronchial inflation sign became more and more obvious with the aggravation of the disease. The detection rate of pulmonary parenchyma, abnormal pleural line, disappearance of line A, diffuse pulmonary edema and bronchial inflation sign in the observation group were significantly higher than those in the control group ($P<0.05$). There was no significant difference in the detection rate of existence of B line between the two groups ($P>0.05$). The sensitivity and specificity of NRDS diagnosis were 100.00% when the three characteristic signs of lung parenchyma, abnormal chest model line and disappearance of A line coexisted. The sensitivity

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of NRDS diagnosis was 80.00% when the three characteristic signs of lung parenchyma, abnormal chest pattern and bronchial inflatability coexisted, the specificity was 100.00%. The ultrasound scores of two lungs, left lung, right lung, bilateral lung and bilateral lung base in the observation group were higher than those in the control group ($P<0.05$). **Conclusion:** Pulmonary ultrasound is of high diagnostic value for NRDS, and the pulmonary ultrasound score can evaluate the severity of NRDS in children, it is help to guide the treatment of children.

Key words: Neonates; Respiratory distress syndrome; Pulmonary ultrasonography; Pulmonary ultrasound score; Diagnosis

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前言

新生儿呼吸窘迫综合征 (Neonatal respiratory distress syndrome, NRDS) 是一种肺功能不全的疾病, 是由于新生儿出生时或出生后短期内缺乏肺表面活性物质及肺部发育不完整所致的疾病, 高发于早产儿, 具有起病急、病情重的特点^[1-3]。早期表现为呼吸窘迫, 发病后 2 天内病情逐渐加重, 若抢救不及时可导致患儿呼吸衰竭, 严重者可致死亡^[4-6]。NRDS 防治目标是针对患儿的病情采取恰当的干预措施, 尽可能的增加存活率, 降低可能的不良反应, 因此对于 NRDS 的及早诊断至关重要。精确的诊断及评估可以为 NRDS 治疗的各个阶段提供依据, 如产前管理、产房稳定、肺表面活性物质治疗、稳定病情后的氧疗、机械通气应用及败血症预防等^[7-9]。目前 NRDS 的诊断手段包括临床症状评估、血气分析及 X 线检查^[10], 新生儿各脏器发育并未完全, 对于 X 线更为敏感, 而病情的评估需要反复的检查, 从而引起并扩大辐射损伤, 因此急需一种安全准确的检查及评

估手段来探查 NRDS。本研究分析 NRDS 患儿行肺脏超声的影像学特点, 探讨肺脏超声对 NRDS 患儿的诊断价值以及肺超声评分的评估价值, 现报道如下。

1 资料与方法

1.1 一般资料

选择 2017 年 5 月至 2018 年 5 月于我院确诊的 NRDS 患儿 45 例作为观察组, 纳入标准: (1) 经临床症状评估、血气分析及 X 线检查等确诊为 NRDS; (2) 具有典型的临床症状如紫绀、呻吟、吸凹及呼吸急促等; (3) 动脉血氧分析 / 吸氧浓度 ≤ 200 mmHg; (4) 胸部 X 线检查表现为两肺浸润影。排除标准: (1) 心源性肺水肿者; (2) 已使用肺表面活性物质或采取必要治疗措施者。选择同期于我院就诊的非肺病患儿 45 例作为对照组。两组患儿性别、胎龄、体重、身长、分娩方式等一般资料比较, 差异无统计学意义 ($P>0.05$), 见表 1。本研究经我院临床机构备案且通过伦理委员会批准, 患儿家长或监护人均签署知情同意书。

表 1 两组患儿一般资料比较

Table 1 Comparison of general data between the two groups of children

Groups	Gender(Male/ Female)	Gestational age (weeks)	Weight (kg)	Length (cm)	Vaginal delivery	Caesarean section
Control group(n=45)	25/20	31.35± 3.03	1.71± 0.58	40.68± 4.34	15	30
Observation group(n=45)	23/22	30.80± 2.87	1.78± 0.55	41.02± 4.30	18	27
χ^2/t	0.179	-0.884	0.588	0.373	0.431	
P	0.693	0.379	0.558	0.71	0.512	

1.2 方法

1.2.1 肺脏超声检查 采用迈瑞 M9 便携式彩色多普勒超声诊断仪, 探头选择凸阵探头和线阵探头, 探头频率分别为 3~5MHz 和 8~12MHz。于安静状态下, 患儿采取仰卧位、侧卧位及俯卧位, 以胸骨旁线、腋前线、腋后线、后正中线及双乳头连线, 将每侧肺脏分成前上、前下、腋上、腋下、后上、后下 6 个区域, 从上至下, 从左至右, 对双肺 12 区超声声像图进行规范化存图、记录。检查内容包括胸膜线、A 线、B 线、肺实质、弥漫性肺水肿、支气管充气征等。

1.2.2 肺超声评分标准 参照 NRDS 的肺超声评分方法^[11], 对患儿双肺 12 区超声声像图进行评分。肺超声评分为 12 个区域得分总和, 总分 48 分, 得分越高说明肺部损伤越严重。

1.3 统计学方法

应用 SPSS 21.0 软件对数据进行统计分析, 计数资料采用率表示, 应用 χ^2 检验进行分析, 计量资料采用 ($\bar{x} \pm s$) 表示, 应用 t 检验进行分析, $P<0.05$ 表示差异有统计学意义。

2 结果

2.1 NRDS 患儿肺脏超声特征性征象分析

NRDS 患儿全部存在肺实质征象, 超声下肺组织回声呈肝样伴支气管充气征, 轻度的 NRDS 患儿于肺脏超声下表现为局灶性的肺实质, 且支气管充气征不明显; 重度的 NRDS 患儿于肺脏超声下表现为肺实质范围的进一步扩大, 且支气管充气征随病情的加重而愈发明显。肺水肿或肺泡间质综合征也全部表现于 NRDS 患儿, 且肺组织含水量与肺水肿程度密切相关。正常情况下超声检查显示肺脏与壁层胸膜之间可形成高回声信号, 呈像为光滑、规则的胸膜线, 而 NRDS 患儿则全部变得模糊、显示不清甚至消失。

2.2 肺脏超声对各种征象的检出率比较及诊断价值分析

观察组肺实质、胸膜线异常、A 线消失、弥漫性肺水肿、支气管充气征等征象的检出率显著高于对照组 ($P<0.05$), 两组 B 线存在征象的检出率比较无统计学差异 ($P>0.05$), 见表 2。肺实

质、胸膜线异常和 A 线消失三种特征征象同时存在时对 NRDS 诊断的灵敏度和特异性均为 100.00%,肺实质、胸膜线异常和 支气管充气征三种特征征象同时存在时对 NRDS 诊断的灵敏度为 80.00%,特异性为 100.00%。

表 2 肺脏超声对两组患儿各种征象的检出率比较[n(%)]

Table 2 Comparison of the detection rates of various signs between the two groups by pulmonary ultrasonograph [n (%)]

Groups	Pulmonary parenchyma	Abnormal pleural line	Disappearance of line A	Existence of B line	Diffuse pulmonary edema	Bronchial inflation sign
Control group(n=45)	0(0.00)	0(0.00)	0(0.00)	8(17.78)	0(0.00)	0(8.89)
Observation group(n=45)	45(100.00)	45(100.00)	45(100.00)	4(8.89)	33(73.33)	36(80.00)
χ^2	86.044	86.044	86.044	1.534	52.105	43.245
P	0.000	0.000	0.000	0.215	0.000	0.000

2.3 两组肺超声评分比较

于对照组($P<0.05$),见表 3。

观察组双肺、左肺、右肺、双侧肺、双肺底肺超声评分均高

表 3 两组肺超声评分比较($\bar{x} \pm s$,分)

Table 3 Comparison of pulmonary ultrasound scores in two groups($\bar{x} \pm s$, scores)

Groups	Two lungs	Left lung	Right lung	Bilateral lung	Bilateral lung base
Control group(n=45)	11.89 $\pm$ 5.86	7.01 $\pm$ 1.87	5.13 $\pm$ 1.12	5.93 $\pm$ 1.28	3.21 $\pm$ 0.68
Observation group(n=45)	24.76 $\pm$ 6.97	9.37 $\pm$ 2.85	9.10 $\pm$ 1.14	10.89 $\pm$ 2.26	5.18 $\pm$ 1.01
t	9.481	4.644	16.664	12.810	10.854
P	0.000	0.000	0.000	0.000	0.000

3 讨论

NRDS 是一种临床常见的新生儿疾病^[12,13],由于缺乏肺表面活性物质,呼气末肺泡萎陷,致使出生后不久出现进行性加重的呼吸窘迫和呼吸衰竭^[14,15]。NRDS 多见于早产儿,且胎龄越小,发病率越高^[16]。长期以来对于 NRDS 的诊断主要是依靠临床症状评估、血气分析及 X 线检查^[17]。若患儿具有典型的临床表现结合 X 线检查则可以很快确诊,但是还是需要和其他呼吸系统疾病进行鉴别诊断,如新生儿暂时性呼吸增快、B 组链球菌肺炎、膈疝等^[18]。鉴别诊断需要反复的 X 线拍片,而随着循证医学的发展越来越多的国际学者认为 X 线的放射性是具有累积性质的,对人体的损伤是不可逆的,X 线对新生儿今后的生长发育是否造成影响还有待时间检验^[19,20]。此外,新生儿是一类特殊的群体,体位较难保持一致,呼吸运动难以自控,因此胸片质量可受到较大影响。因此急需寻找一种损伤小、准确度高的检查手段来检查新生儿肺部疾病。肺脏超声作为一种新型辅助诊断技术,近年来多应用于多种成人及儿童疾病的诊疗,目前,肺部超声联盟已经针对一些肺部疾病对运用肺脏超声诊断制定了共识^[21]。

本研究结果显示,NRDS 患儿全部存在肺实质征象,且 NRDS 患儿肺实质、胸膜线异常、A 线消失、弥漫性肺水肿、支气管充气征等征象的检出率显著高于非肺病患儿,但两组 B 线存在征象的检出率比较无统计学差异,提示肺脏超声检出效果较好,正常肺脏胸膜线是一条光滑、清晰、规则、宽度不超过 0.5 mm 的曲线,若出现粗糙、模糊或不规则、厚度>0.5 mm,则为异常。弥漫性肺水肿是另一种特征征象,较传统的 X 线检查仅能显示双侧均匀一致的磨玻璃样改变,很难说明病变原因是胸腔积液、肺水肿还是肺不张,肺脏超声则可提供更多的临床信息,根据呈像的不同则可进行鉴别诊断。其他的特征性征象,如肺实

质、A 线消失、B 线存在和支气管充气征可反应出早期的肺部病变^[22-24]。由于肺泡与空气交界面具有表面张力,NRDS 患儿缺乏表面活性物质,肺泡受压致使肺泡通气不良,X 线呈像表现为两肺透亮度减低和细颗粒状阴影,血流通过受压迫区域时并未发生交换,致使氧分压降低,二氧化碳分压升高,代偿机制致使支气管扩张^[25-27]。本研究中观察组双肺、左肺、右肺、双侧肺、双肺底肺超声评分均高于对照组,说明肺超声评分能较好的评估患儿肺部病变。针对肺部 12 个区域进行超声检查,可从多方位进行观察,捕捉病变从前胸部到背部的变化,因此床旁肺脏超声作为一种简便易行、无创无辐射、灵活开展的检查手段,不仅为临床医生在 NRDS 检查方式的选择上拓宽了视野,也可弥补床旁胸片灵敏度低的不足^[28,29]。此外,本研究中肺脏超声对 NRDS 患儿诊断的灵敏度和特异性均较高,在 Perri A 等人^[30]的研究中,肺脏超声对 NRDS 患儿诊断的灵敏度和特异性分别为 86.00%和 88.00%,也证实了肺脏超声是一种无创、床边可重复的方法。

综上所述,肺脏超声对 NRDS 的诊断价值明显,相关征象的检出率较高,肺超声评分也与 NRDS 病情严重程度密切相关,但是本研究样本量较小,可能会对结果造成一定的偏倚,今后有待进一步进行随机多中心的大样本研究。

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