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• 临床研究 •

细菌性肺炎患者痰标本病原菌类型及肺超声评分 在病情评估中的应用*

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【摘要】 目的 分析细菌感染性肺炎患者痰标本中病原菌分布特点及肺超声评分在病情评估中的应用价值。方法 选取本院收治的216例细菌感染性肺炎患者为本次研究对象。收集患者临床资料,采集痰液标本进行菌种鉴定,测定患者血清白细胞(WBC)、C反应蛋白(CRP)、降钙素原(PCT)水平。由护理人员对患者进行肺部超声检查及肺部超声评分,采用双肺十二区评分法进行肺超声评分,并采取相应的护理措施。结果 216例细菌感染性肺炎患者,共检出病原菌216株,包括146株革兰阴性菌,58株革兰阳性菌,12株真菌。革兰阴性菌主要包括流感嗜血杆菌(29.17%,63/216)、肺炎克雷伯菌(11.11%,24/216)、卡他莫拉菌(6.94%,15/216)、大肠埃希菌(5.56%,12/216)。革兰阳性菌主要包括肺炎链球菌(15.28%,33/216)、金黄色葡萄球菌(4.63%,10/216)。真菌主要为白色假丝酵母菌(4.63%,10/216)。革兰阳性菌感染患者出现咳嗽、双肺湿啰音、感染中毒症的占比显著高于革兰阴性菌感染患者,差异有统计学意义($P < 0.05$),出现气促、缺氧症的占比低于革兰阴性菌感染患者,差异无统计学意义($P > 0.05$)。革兰阴性菌组患者WBC为 $(15.01 \pm 4.01) \times 10^9/L$,革兰阳性菌组患者WBC为 $(14.80 \pm 3.91) \times 10^9/L$,比差异不具有统计学意义($P > 0.05$)。革兰阴性菌组患者CRP为 $(33.15 \pm 7.66) \text{mg/L}$,PCT为 $(4.74 \pm 1.35) \mu\text{g/L}$,革兰阳性菌组患者CRP为 $(15.60 \pm 6.32) \text{mg/L}$,PCT为 $(3.20 \pm 1.02) \mu\text{g/L}$,差异有统计学意义($P < 0.05$)。患者发热时间为 $(8.05 \pm 2.87) \text{d}$,住院时间为 $(12.27 \pm 3.89) \text{d}$,与肺超声评分呈负相关($P < 0.05$)。患者进行抗菌治疗前后的肺超声评分差异有统计学意义($P < 0.05$)。结论 细菌感染性肺炎患者病原菌主要为革兰阴性菌,以流感嗜血杆菌为主。不同病原菌感染类型患者的临床表现及血清炎症因子水平具有一定差异性。肺超声评分可以用于对患者病情程度进行评估,评分越低,患者发热时间、住院时间越长。

【关键词】 细菌感染性肺炎;病原菌;肺超声评分**【文献标识码】** A **【文章编号】** 1673-5234(2024)08-0972-04

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The phlegm Ssamples pathogen types and Application of pulmonary ultrasound scores in the evaluation of patients with bacterial pneumonia

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【Abstract】 **Objective** To analyze the distribution characteristics of pathogenic bacteria in sputum samples of patients with bacterial infectious pneumonia and the application value of pulmonary ultrasound score in disease assessment. **Methods** 216 patients with bacterial infectious pneumonia admitted to our hospital were selected as the subjects of this study. The clinical data of patients were collected. The sputum samples were collected for bacterial identification, and the levels of serum white blood cells (WBC), C-reactive protein (CRP), and procalcitonin (PCT) in patients were measured. The pneumonia ultrasound examination were performed on patients and the dual lung twelve zone scoring method was used for lung ultrasound scoring. **Results** A total of 216 strains of pathogenic bacteria were detected in 216 patients with bacterial pneumonia, including 146 strains of Gram negative bacteria, 58 strains of Gram positive bacteria, and 12 strains of fungi. Gram negative bacteria mainly included *Haemophilus influenzae* (29.17%, 63/216), *Klebsiella pneumoniae* (11.11%, 24/216), *Moraxella catarrhalis* (6.94%, 15/216), and *Escherichia coli* (5.56%, 12/216). Gram positive bacteria mainly included *Streptococcus pneumoniae* (15.28%, 33/216) and *Staphylococcus aureus* (4.63%, 10/216). The main fungus was *Candida albicans* (4.63%, 10/216). The proportion of cough, wet lung rales, and infection poisoning in patients with Gram positive bacterial infection was significantly higher than that in patients with Gram

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negative bacterial infection, and the difference was statistically significant ($P < 0.05$). The proportion of dyspnea and hypoxia was lower than that in patients with Gram negative bacterial infection, and the difference was not statistically significant ($P > 0.05$). The WBC of patients in the Gram negative bacterial group was $(15.01 \pm 4.01) \times 10^9/L$, while that of patients in the Gram positive bacterial group was $(14.80 \pm 3.91) \times 10^9/L$, with no statistically significant difference ($P > 0.05$). The CRP of patients in the Gram negative bacterial group was $(33.15 \pm 7.66) \text{ mg/L}$, and the PCT was $(4.74 \pm 1.35) \mu\text{g/L}$, the CRP of Gram positive bacterial group patients was $(15.60 \pm 6.32) \text{ mg/L}$, PCT was $(3.20 \pm 1.02) \mu\text{g/L}$, the difference in comparison was statistically significant ($P < 0.05$). The patient had a fever duration of (8.05 ± 2.87) days and a hospital stay of (12.27 ± 3.89) days, which was negatively correlated with lung ultrasound scores ($P < 0.05$). The difference in pulmonary ultrasound scores between patients before and after antibacterial treatment was statistically significant ($P < 0.05$).

Conclusion The main pathogenic bacteria in patients with bacterial infectious pneumonia were Gram negative bacteria, mainly *Haemophilus influenzae*. There were certain differences in clinical manifestations and serum inflammatory factor levels among patients with different types of pathogen infections. Pulmonary ultrasound score can be used to evaluate the severity of a patient's condition. The lower the score, the longer the patient's fever and hospitalization time.

【Keywords】 Bacterial infectious pneumonia; Pathogenic bacteria; Pulmonary ultrasound score

肺炎(Pneumonia)是由细菌、病毒、真菌等不同病原微生物感染或其他因素引发的肺部炎症,是常见的呼吸道疾病之一,可对患者支气管壁和肺泡功能造成影响,引发憋气、胸闷、呼吸困难的多种不良症状,对患者具有较大危害^[1-2]。细菌感染性肺炎约占肺炎的80%,病原体主要包括流感嗜血杆菌、肺炎链球菌、肺炎克雷伯菌、卡他莫拉菌、铜绿假单胞菌等^[3]。细菌感染性肺炎临床症状主要为发热、咳嗽、咳痰、胸痛等,具有起病急骤、发展快等特点,如不能及时控制病情容易进展为呼吸衰竭、心力衰竭等重症变现,对患者预后效果造成严重影响^[4]。临床诊断中,由于病原微生物培养时间较长,胸部X线及CT具有辐射,肺部超声具有便捷无辐射的优点,通过对超声伪影和真实图像的综合分析,可以对多种肺部疾病进行诊断和评估^[5-6]。

本研究以本院收治的216例细菌感染性肺炎患者为研究对象,分析细菌感染性肺炎患者痰标本中病原菌分布特点及肺超声评分在病情评估中的应用价值,结果报告如下。

材料与方 法

1 研究对象

选取山东第一医科大学附属聊城二院收治的216例细菌感染性肺炎患者为本次研究对象。男性患者121例,女性患者95例。年龄 (46.19 ± 7.38) 岁。纳入标准:①符合《成人社区获得性肺炎基层诊疗指南(2018年)》中有关细菌感染性肺炎的相关诊断标准^[7];②经痰培养病原学检查证实,检出单一细菌;③接受肺部超声检查;④住院时间 ≥ 2 d;⑤采集标本前7d内未使用过抗菌药物者。排除标准:①临床资料缺失;②合并其他肺部疾病者;③合并身体其他部位感染者;④合并血液系统疾病者;⑤合并严重心肺功能障碍

者;⑥合并免疫功能缺陷者;⑦长期使用糖皮质激素或免疫抑制剂者。

本研究获本院伦理委员会审核批准。

2 资料收集

通过院内电子病历系统,收集患者临床资料,包括性别、年龄、病原菌、发热时间、住院时间、临床表现(咳嗽、双肺湿啰音、气促、缺氧症、感染中毒症)等。

3 标本采集及病原菌鉴定

患者入院24 h内,采用负压抽取痰液法采集痰液标本进行病原菌鉴定。患者清洁口腔后,由专业医护人员将无菌吸痰管插入咽部以下,抽取1~2 mL分泌物置于含有生理盐水的无菌试管内,于30 min内送检。痰液标本通过涂片镜检,合格者进行痰液标本培养,不合格者重新采集标本。将痰液标本置于5% CO₂ 孵育箱内,于35 °C恒温条件下孵育48 h,观察菌落生长情况,进行纯化分离。采用全自动微生物鉴定系统(VITEK-2 Compact,法国梅里埃)进行菌种鉴定。每位患者连续两次或两次以上培养出同一种病原菌即确定为该病原菌感染。

4 WBC、CRP、PCT水平检测

患者入院次日清晨,采集其空腹状态下肘部静脉血3~5 mL,经离心处理后,保存备用。采用西门子血细胞分析仪测定白细胞(WBC)水平。采用全自动生化分析仪(BECKMANAU5800,美国贝克曼),应用免疫比浊法测定C反应蛋白(CRP)水平。采用全自动化学发光测定仪(新产业maglumi 4000 Plus,深圳新产业),应用电化学发光法测定降钙素原(PCT)水平。整体操作过程,严格遵照仪器操作说明书及试剂盒说明书执行。

5 肺部超声检查

5.1 检查设备 美国飞利浦彩色超声诊断仪器(型号

为EPIQ5),采用凸阵探头或线阵探头,探头频率为5~12 MHz。

5.2 检查方法 护理人员指导患者采用仰卧位和侧卧位,以胸骨旁线、腋前线、腋后线、后正中线和双乳头的连线作为分界线将两侧肺脏分为前上、前下、腋上、腋下、后上、后下6个区域。探头从第二肋间隙开始扫描,按照由上至下、由左向右的方向,沿肋间隙进行纵向扫描,然后旋转探头90度后进行横向扫描。对每个区域的超声扫描图像(静态图、动态图)进行记录和保存。

5.3 评分方法 本次研究采用双肺十二区评分法,将12个区域评分总和作为本次肺超声评分,总分值为0~48分。根据超声表现进行评分:平滑A线或孤立B线少于3条,计为4分;散在清晰B线,计为3分;大量B线(部分融合),计为2分;大量融合的B线(瀑布征),计为1分;肺实变,计0分。每个区域以最严重的表现进行评分,总分越低表示感染性肺炎越严重^[8]。

6 统计分析

采用SPSS 26.0统计学软件对本次研究数据进行分析处理,以不同病原菌分组,对比革兰阳性菌感染组与革兰阴性菌感染组患者临床表现、WBC、CRP、PCT水平,分析患者进行抗菌药物治疗前后的肺部超声评分,组间对比采用 χ^2 或 t 检验。采用Pearson相关分析肺部超声评分与患者发热时间、住院时间的相关性。 $P < 0.05$ 表示组间差异有统计学意义。

结 果

1 病原菌分布特点

216例细菌感染性肺炎患者检出病原菌216株。革兰阴性菌共146株(67.59%,146/216),包括63株流感嗜血杆菌(29.17%,63/216),24株肺炎克雷伯菌(11.11%,24/216),15株卡他莫拉菌(6.94%,15/216),12株大肠埃希菌(5.56%,12/216),8株福流感嗜血杆菌(3.70%,8/216),8株铜绿假单胞菌(3.70%,8/216),5株阴沟肠杆菌(2.31%,5/216),4株鲍曼不动杆菌(1.85%,4/216),3株产气肠杆菌(1.39%,3/216),2株嗜麦芽窄食单胞菌(0.93%,2/216),产酸克雷伯菌(0.93%,2/216)。革兰阳性菌共58株(26.85%,58/216),包括33株肺炎链球菌(15.28%,33/216),10株金黄色葡萄球菌(4.63%,10/216),7株表皮葡萄球菌(3.24%,7/216),5株屎肠球菌(2.31%,5/216),3株草绿色链球菌(1.39%,3/216)。真菌12株(5.56%,12/216),包括10株白色假丝酵母菌(4.63%,10/216),2株平滑假丝酵母菌(0.93%,2/216)。

2 不同病原菌感染患者临床表现对比

146例革兰阴性菌感染患者中,47例出现咳嗽(32.19%,47/146),20例出现双肺湿啰音(13.70%,20/146),83例出现气促(56.85%,83/146),74例出现缺氧症(50.68%,74/146),10例出现感染中毒症(6.85%,10/146)。58例革兰阳性菌感染患者中,41例出现咳嗽(70.69%,41/58),38例出现双肺湿啰音(65.52%,38/58),30例出现气促(51.72%,30/58),27例出现缺氧症(46.55%,27/58),23例出现感染中毒症(39.66%,23/146)。革兰阳性菌感染患者出现咳嗽、双肺湿啰音、感染中毒症的占比显著高于革兰阴性菌感染患者,差异有统计学意义($P < 0.05$),出现气促、缺氧症的占比低于革兰阴性菌感染患者,差异无统计学意义($P > 0.05$)。见表1。

表1 不同病原菌感染患者临床表现对比
Table 1 Comparison of clinical manifestations in patients with different pathogen infections

病原菌分组 Pathogen grouping	革兰阴性菌组 (n=146)		革兰阳性菌组 (n=58)		χ^2	P
	Gram negative bacterial group		Gram positive bacterial group			
	病例数 No.	百分比(%) Percentage	病例数 No.	百分比(%) Percentage		
咳嗽	47	32.19	41	70.69	25.081	0.000
双肺湿啰音	20	13.70	38	65.52	54.777	0.000
气促	83	56.85	30	51.72	0.441	0.507
缺氧症	74	50.68	27	46.55	0.284	0.594
感染中毒症	10	6.85	23	39.66	32.946	0.000

3 不同病原菌感染患者WBC、CRP、PCT水平对比

革兰阴性菌组患者WBC为 $(15.01 \pm 4.01) \times 10^9/L$,CRP为 $(33.15 \pm 7.66)mg/L$,PCT为 $(4.74 \pm 1.35)\mu g/L$ 。革兰阳性菌组患者WBC为 $(14.80 \pm 3.91) \times 10^9/L$,CRP为 $(15.60 \pm 6.32)mg/L$,PCT为 $(3.20 \pm 1.02)\mu g/L$ 。两组患者WBC水平差异无统计学意义($t = 0.344, P > 0.05$),CRP、PCT水平差异有统计学意义($t = 16.811, 8.825, P < 0.05$)。

4 肺超声评分在病情评估中的应用

4.1 肺超声评分与患者疾病严重程度的关系 将患者发热时间与住院时间作为评估患者疾病严重程度的量化指标,与患者肺超声评分进行相关性分析,结果显示:患者发热时间为 $(8.05 \pm 2.87)d$,与肺部超声评分呈负相关($r = -0.732, P < 0.05$),患者住院时间为 $(12.27 \pm 3.89)d$,与肺超声评分呈负相关($r = -0.772, P < 0.05$)。见图1~2。

4.2 进行抗菌药物治疗前后患者肺超声评分对比分析 患者进行抗菌治疗前,肺超声评分为 (29.48 ± 5.69) 分。经过抗菌药物治疗7d后,复查肺部超声,肺超声评分为 (32.10 ± 5.18) 分,治疗前后的肺超声评分差异有统计学意义($t = -17.034, P < 0.05$)。

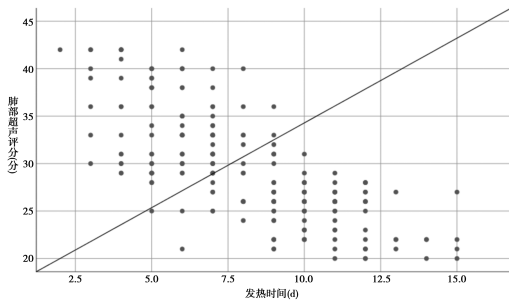


图1 肺超声评分与发热时间的相关性

Fig. 1 The correlation between pulmonary ultrasound score and fever time

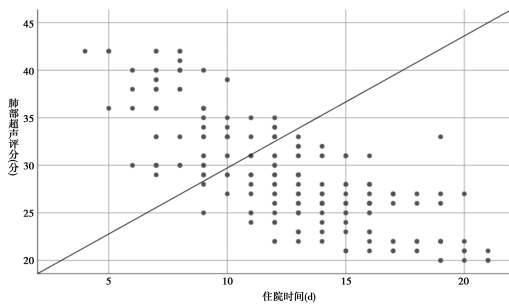


图2 肺超声评分与住院时间的相关性

Fig. 2 The correlation between lung ultrasound score and length of hospital stay

讨论

不同地区之间由于经济发展水平、医疗条件、地区气候的不同程度差别,细菌感染性肺炎患者的病原菌菌谱有所不同,同时研究对象的年龄差异、调查研究的季节差异都可以造成病原菌菌谱不同^[9]。本次研究中,共检出病原菌 216 株,67.59%为革兰阴性菌,26.85%为革兰阳性菌,5.56%为真菌。革兰阴性菌主要为流感嗜血杆菌与肺炎克雷伯菌,革兰阳性菌主要为肺炎链球菌与金黄色葡萄球菌,真菌主要为白色假丝酵母。随着抗菌药物在临床治疗中的广泛使用,不规范用药对细菌感染性肺炎患者的病原菌分布情况也产生了一定的影响,增加了治疗难度。临床治疗中,应在经验性依据本地区细菌感染性肺炎患者病原菌分布特征用药的基础上,结合患者病原学培养结果调整用药方案,有效保障患者的临床治疗与控制效果,降低重症肺炎的发生率。细菌感染性肺炎患者由于具有咳嗽、咳痰、呼吸困难等特征,护理上应采取对应措施,对于痰液较多的患者,积极排痰,防止痰液堵住气管诱发呼吸苦难,定期调整患者体位,避免患者痰液在肺里聚集,另外提示患者加强营养补充,提高机体免疫力,对抗体内炎症。

细菌感染性肺炎患者的临床特征包括高热、咳嗽、肺部湿啰音等,感染不同病原菌患者的临床症状具有一定的差异性^[10]。本次研究中,革兰阳性菌感染患者

出现咳嗽、双肺湿啰音、感染中毒症的占比分别为70.69%、65.52%、39.66%,显著高于革兰阴性菌感染患者,出现气促、缺氧症的占比分别为51.72%、46.55%,略低于革兰阴性菌感染患者。本次研究结果与国内相关报道相近^[11]。革兰阴性菌组患者WBC为 $(15.01 \pm 4.01) \times 10^9/L$,CRP为 $(33.15 \pm 7.66) \text{ mg/L}$,PCT为 $(4.74 \pm 1.35) \mu\text{g/L}$,革兰阳性菌组患者WBC为 $(14.80 \pm 3.91) \times 10^9/L$,CRP为 $(15.60 \pm 6.32) \text{ mg/L}$,PCT为 $(3.20 \pm 1.02) \mu\text{g/L}$,革兰阴性菌感染患者CRP、PCT水平显著高于革兰阳性菌感染患者。与王丹丹等^[12]研究结果一致。细菌感染性肺炎是细菌入侵机体后大量生长繁殖同时释放有毒物质引起的病例过程,可刺激机体释放大量炎症因子,PCT、CRP对呼吸道感染性疾病的诊断中具有较高的特异性^[13]。临床治疗中可以在患者病原学培养结果出来之前,患者临床特征、PCT、CRP水平可以为预估患者可能感染的病原菌类型提供一定的参考价值。

本次研究中,细菌感染性肺炎患者发热时间、住院时间与患者肺超声评分呈负相关。患者进行抗菌治疗前,肺超声评分为 (29.48 ± 5.69) 分,经过抗菌药物治疗7d后,肺超声评分为 (32.10 ± 5.18) 分,治疗前后的肺超声评分差异有统计学意义($P < 0.05$)。Dargent等^[14]研究显示,肺超声评分与新型病毒感染患者严重程度相关,通过评分的变化可以观察疾病进展。近些年来随着超声技术的快速发展,肺部超声检查对肺部疾病的诊断及病情严重程度评估的准确性日益升高,肺部超声可作为肺部疾病检查的首选方法,通过患者肺超声评分评估病情严重程度,可以为临床治疗提供参考依据^[15]。

综上所述,细菌感染性肺炎患者病原菌以流感嗜血杆菌为主,不同病原菌感染类型患者的临床表现及血清炎症因子水平具有一定差异性。肺超声评分可以用于对患者病情程度进行评估,辅助临床调整患者抗菌治疗方案。

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