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·临床研究·

血乳酸联合APACHE Ⅱ评分预测慢性阻塞性肺疾病急性加重期并呼吸衰竭预后的价值

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[摘 要] **目的** 探讨血乳酸联合急性生理与慢性健康Ⅱ(APACHE Ⅱ)评分对慢性阻塞性肺疾病急性加重期(AECOPD)并呼吸衰竭患者预后的预测价值。**方法** 选取本院2020年2月至2022年1月收治的156例AECOPD并呼吸衰竭患者,根据预后情况分为预后不良组与预后良好组。对比2组患者入院时、入院12 h、入院24 h血乳酸水平及APACHE Ⅱ评分,分析预后不良的影响因素及血乳酸联合APACHE Ⅱ评分对预后不良的预测价值。**结果** AECOPD并呼吸衰竭患者预后不良发生率为28.85%;入院时、入院12 h、入院24 h预后不良组血乳酸水平及APACHE Ⅱ评分均先升高后降低($P<0.05$),预后良好组则逐渐降低($P<0.05$),且预后不良组入院时、入院12 h、24 h血乳酸水平及APACHE Ⅱ评分均高于预后良好组($P<0.05$)。高血糖,机械通气时间较长,入院12 h、入院24 h血乳酸水平及APACHE Ⅱ评分较高均是预后不良的危险因素($P<0.05$)。入院12 h、入院24 h血乳酸水平与APACHE Ⅱ评分联合预测AECOPD并呼吸衰竭患者预后不良的灵敏度、曲线下面积(*AUC*)均高于单独预测($P<0.05$),特异度与单独预测比较差异无统计学意义($P>0.05$),且入院24 h血乳酸水平、APACHE Ⅱ评分联合预测的*AUC*高于入院12 h($P<0.05$)。**结论** AECOPD并呼吸衰竭患者入院12 h、入院24 h血乳酸水平和APACHE Ⅱ评分与预后不良密切相关,且入院24 h血乳酸联合APACHE Ⅱ评分对预后的预测价值更高。

[关键词] 血乳酸;急性生理与慢性健康评分Ⅱ;慢性阻塞性肺疾病急性加重期;呼吸衰竭

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Value of blood lactate combined with APACHE Ⅱ score in the prediction of the prognosis of acute exacerbation of chronic obstructive pulmonary disease with respiratory failure

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Abstract: Objective To investigate the prognostic value of blood lactate combined with acute physiology and chronic health evaluation Ⅱ (APACHE Ⅱ) score in patients with acute exacerbation of chronic obstructive pulmonary disease (AECOPD) and respiratory failure.

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Methods A total of 156 patients with AECOPD with respiratory failure treated in our hospital from February 2020 to January 2022 were selected, and they were divided into the poor prognosis group and good prognosis group according to their prognosis. The blood lactate levels and APACHE Ⅱ scores at admission, 12 hours after admission and 24 hours after admission of the two groups were compared. The influencing factors of poor prognosis and the predictive value of blood lactate combined with APACHE Ⅱ score for poor prognosis were analyzed. **Results** The incidence of poor prognosis in patients with AECOPD and respiratory failure was 28.85%. The blood lactate levels and APACHE Ⅱ scores at admission, 12 hours after admission and 24 hours after admission in the poor prognosis group were first increased and then decreased ($P<0.05$), and those in the good prognosis group were gradually decreased ($P<0.05$), and the blood lactate levels and APACHE Ⅱ scores at admission, 12 hours after admission and 24 hours after admission in the poor prognosis group were higher than those in the good prognosis group ($P<0.05$). Hyperglycemia, long mechanical ventilation time, and high levels of blood lactate and APACHE Ⅱ scores 12 hours after admission and 24 hours after admission were the risk factors of poor prognosis ($P<0.05$). The sensitivity and *area under the curve* (*AUC*) of blood lactate levels combined with APACHE Ⅱ scores 12 hours and 24 hours after admission in predicting the poor prognosis of AECOPD patients with respiratory failure were higher than those of individual prediction ($P<0.05$), but there was no significant differences in the specificity between the combined prediction and individual prediction ($P>0.05$), and the *AUC* of the combined prediction of blood lactate level and APACHE Ⅱ score 24 hours after admission was higher than that of 12 hours after admission ($P>0.05$). **Conclusion** The blood lactate levels and APACHE Ⅱ scores of AECOPD patients with respiratory failure 12 hours and 24 hours after admission are closely related to the poor prognosis, and the prediction value of blood lactate combined with APACHE Ⅱ score 24 hours after admission is higher.

Keywords: blood lactate; acute physiology and chronic health evaluation Ⅱ; acute exacerbation of chronic obstructive pulmonary disease; respiratory failure

慢性阻塞性肺疾病(chronic obstructive pulmonary disease,COPD)多发于老年群体,以持续的气流受限、进行性肺功能下降为特征[1]。慢性阻塞性肺疾病急性加重期(acute exacerbation of chronic obstructive pulmonary disease,AECOPD)常伴有呼吸衰竭,随病情进展造成肺实质细胞变性、坏死,影响呼吸系统及循环系统功能,严重者可危及患者生命[2]。AECOPD并呼吸衰竭患者经机械通气等治疗后可能发生预后不良[3]。故对AECOPD并呼吸衰竭患者密切监测并及时干预至关重要。血乳酸是体内糖代谢的中间产物,可作为反映组织氧代谢的敏感指标[4]。急性生理与慢性健康Ⅱ(acute physiology and chronic health evaluation Ⅱ,APACHE Ⅱ)评分是一种病情评估工具[5],其评估结果可在一定程度上反映AECOPD并呼吸衰竭患者近期预后[6]。上述指标对AECOPD并呼吸衰竭患者近期预后不良均有一定预测价值,但由于不同脏器基础功能状态不一,单独监测血乳酸水平及APACHE Ⅱ评分无法准确评估机体氧代谢情况。基于此,本研究探讨血乳酸联合APACHE Ⅱ评分对AECOPD并呼吸衰竭患者预后的预测价值,旨在为此类患者预后评估提供参考依据。

1 资料与方法

1.1 临床资料

选取我院2020年2月至2022年1月收治的156例AECOPD并呼吸衰竭患者。其中男91例,女65例;年龄52~85岁,平均(74.58±2.15)岁;BMI平均(23.27±1.12)kg/m^2;COPD分级:Ⅲ级84例,Ⅳ级72例;病程4~19年,平均(11.26±2.34)年。纳入标准:①符合AECOPD诊断标准[7]且伴有呼吸衰竭;②能独立完成预后评分;③进行营养支持、抗感染、化痰、解痉平喘、无创机械辅助通气治疗。排除标准:①肝、肾、肺等重要器官严重损伤;②有认知功能障碍;③有恶性肿瘤及自身免疫性疾病;④入院时已出现心力衰竭、合并其他呼吸系统疾病;⑤患感染性疾病;⑥患有其他可能影响心肺功能的疾病,如冠心病、肺结核等。本研究经我院伦理委员会批准(202001-004)。

1.2 方法

血乳酸检测:所有患者均在入院时、入院12 h、入院24 h抽取动脉血约3 mL,用肝素抗凝,采用全自动血气分析仪检测血乳酸水平。

APACHE Ⅱ评分包括①年龄≤44岁记0分;45~54岁记2分;55~64岁记3分;65~74岁记5分;≥75岁记6分。②急性生理学:共12个项目组成,每个项目0~4分。③慢性健康状况:不符合慢性器官功能不全或免疫功能抑制的诊断标准记0分;择期手术后入ICU记2分;急诊手术或非手术后入ICU记5分。APACHE Ⅱ评分总分71分,分数越高提示预后越差。

预后判定:患者经治疗后呼吸困难症状好转(氧分压升高20%以上,二氧化碳分压下降20%以上),成

功脱机为预后良好;患者经治疗后呼吸困难症状无好转甚至加重,转为有创机械通气或死亡为预后不良。统计AECOPD并呼吸衰竭患者预后不良情况,根据患者预后情况分为预后良好组与预后不良组。

资料收集与分析:收集患者性别、年龄、BMI、吸烟史(连续或累积吸烟≥6个月为有吸烟史)、COPD病程、高血糖(空腹血糖>6.1 mmol/L或餐后2 h血糖>7.8 mmol/L)、机械通气时间、血乳酸水平及APACHE Ⅱ评分等临床资料。采用单因素和多因素*Logistic*回归分析预后不良的影响因素,记录*OR*和95%*CI*。采用受试者工作特征(*receiver operating characteristic*,*ROC*)曲线分析血乳酸联合APACHE Ⅱ评分单独及联合预测AECOPD并呼吸衰竭患者预后不良的价值,联合预测采用并联方式,即任一指标预测预后不良为联合预测预后不良,记录单独及联合预测的灵敏度、特异度、曲线下面积(*area under the curve*,*AUC*)、95%*CI*等,其中灵敏度=真阳性例数/(真阳性例数+假阴性例数)×100%,特异度=真阴性例数/(真阴性例数+假阳性例数)×100%,以灵敏度为纵坐标、100-特异度为横坐标绘成*ROC*曲线下的面积即为*AUC*。

1.3 统计学方法

以SPSS 26.0软件进行统计学分析,计量资料以均数±标准差($\bar{x}\pm s$)表示,重复测量的资料比较采用重复测量方差分析和*LSD-t*检验;计数资料以率(%)表示,采用χ^2检验;采用*Logistic*回归分析预后不良的影响因素;采用*ROC*曲线分析血乳酸联合APACHE Ⅱ评分对AECOPD并呼吸衰竭患者预后不良的预测价值。*P*<0.05为差异有统计学意义。

2 结果

2.1 AECOPD并呼吸衰竭患者预后不良情况

AECOPD并呼吸衰竭患者共有45例预后不良,发生率为28.85%(45/156)。

2.2 AECOPD并呼吸衰竭患者预后不良的单因素分析

2组患者性别、年龄、BMI、COPD病程、吸烟史比较,差异无统计学意义(*P*>0.05),预后不良组高血糖占比、机械通气时间均高/长于预后良好组(*P*<0.05);预后不良组入院时、入院12 h、入院24 h血乳酸水平及APACHE Ⅱ评分均先升高后降低(*P*<0.05),预后良好组均逐渐降低(*P*<0.05),且预后不良组入院时、入院12 h、入院24 h血乳酸水平及APACHE Ⅱ评分均高于预后良好组(*P*<0.05),见表1。

2.3 AECOPD并呼吸衰竭患者预后不良多因素*Logistic*回归分析

将有差异的变量(高血糖,机械通气时间,入院时、入院12 h、入院24 h血乳酸水平及APACHE Ⅱ评分)纳入多因素*Logistic*回归分析。结果显示,高血糖,机械通气时间较长,入院12 h、入院24 h的血乳酸水平及高APACHE Ⅱ评分较高是AECOPD并呼吸衰竭患者近期预后不良的危险因素(*P*<0.05),见表2。

2.4 分析血乳酸、APACHE Ⅱ评分动态变化单独及联合预测AECOPD并呼吸衰竭患者预后不良的价值

入院12 h、24 h血乳酸与APACHE Ⅱ评分联合预测AECOPD并呼吸衰竭患者预后不良的灵敏度、*AUC*均高于单独预测(*P*<0.05),特异度与单独预测比较,差异无统计学意义(*P*>0.05);且入院24 h血乳酸和APACHE Ⅱ评分联合预测的灵敏度、特异度与入院12 h比较,差异无统计学意义(*P*>0.05),但*AUC*高于入院12 h,见图1、表3。

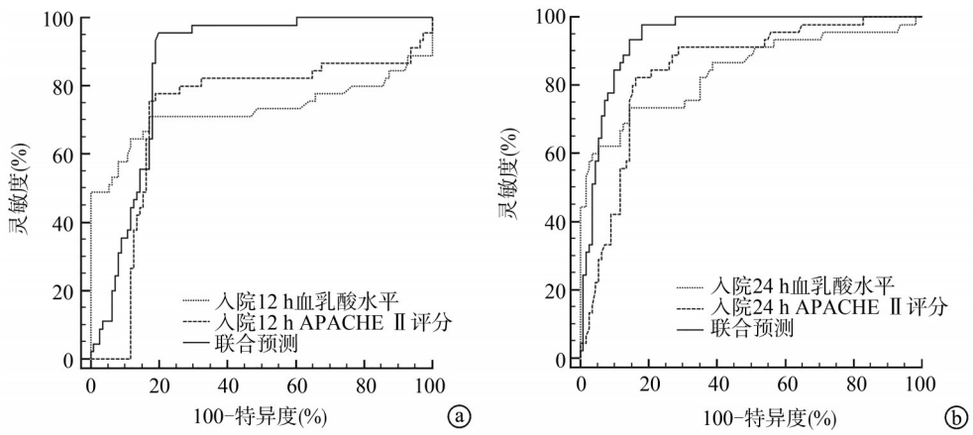
表1 AECOPD并呼吸衰竭患者预后不良影响单因素分析

影响因素		预后不良组(*n*=45)	预后良好组(*n*=111)	$\chi^2/t/F$	*P*
性别[例(%)]	男	30(66.67)	61(54.95)	1.807	0.179
	女	15(33.33)	50(45.05)		
年龄(岁)		74.96±2.22	74.43±2.18	1.497	0.136
BMI(kg/m^2)		23.42±1.24	23.21±1.16	1.004	0.317
COPD病程(年)		11.51±2.36	11.16±2.25	0.868	0.387
吸烟史[例(%)]		20(44.44)	39(35.14)	1.180	0.277
高血糖[例(%)]		31(68.89)	41(36.94)	13.154	0.000
机械通气时间(d)		7.88±2.31	4.25±1.58	11.294	0.000
血乳酸(mmol/L)	入院时	3.68±1.32	3.22±1.29^{a}	$F_{组间}$=9.065, $F_{时间}$=17.257, $F_{交互}$=13.273	$P_{组间}$=0.008, $P_{时间}$<0.001, $P_{交互}$<0.001
	入院12 h	4.76±1.21^{b}	2.70±0.49^{ab}		
	入院24 h	4.23±1.24^{bc}	2.15±0.36^{abc}		
APACHE Ⅱ评分(分)	入院时	25.22±3.32	24.08±3.16^{a}	$F_{组间}$=5.146, $F_{时间}$=12.331, $F_{交互}$=8.154	$P_{组间}$=0.028, $P_{时间}$<0.001, $P_{交互}$=0.003
	入院12 h	26.96±3.51^{b}	23.17±3.46^{ab}		
	入院24 h	23.49±3.54^{bc}	17.71±3.97^{abc}		

a:与预后不良组比较,*P*<0.05;b:与入院时比较,*P*<0.05;c:与入院12 h比较,*P*<0.05

表2 AECOPD并呼吸衰竭患者近期预后不良的危险因素分析

影响因素	β	*SE*	$Wald\chi^2$	*P*	*OR*	95%*CI*
高血糖(否=0,是=1)	1.573	0.552	8.120	0.004	4.821	4.214~5.072
机械通气时间(实测值)	1.536	0.589	6.801	0.009	4.646	4.348~4.937
入院时血乳酸水平(实测值)	0.568	0.545	1.086	0.297	1.765	0.979~1.996
入院12 h血乳酸水平(实测值)	1.654	0.517	10.235	0.001	5.228	4.964~5.501
入院24 h血乳酸水平(实测值)	1.689	0.492	11.785	0.000	5.414	5.153~5.834
入院时APACHE Ⅱ评分(实测值)	0.563	0.549	1.052	0.306	1.755	0.975~1.989
入院12 h APACHE Ⅱ评分(实测值)	1.482	0.613	5.845	0.017	4.402	4.032~4.819
入院24 h APACHE Ⅱ评分(实测值)	1.496	0.603	6.155	0.013	4.464	4.186~4.641



a:入院12 h;b:入院24 h

图1 血乳酸水平、APACHE Ⅱ评分单独及联合预测预后不良的*ROC*曲线

表3 不同时间点血乳酸水平、APACHE Ⅱ评分对AECOPD并呼吸衰竭患者预后不良的诊断价值

项目	入院12 h				入院24 h			
	灵敏度(%)	特异度(%)	*AUC*	95%*CI*	灵敏度(%)	特异度(%)	*AUC*	95%*CI*
血乳酸水平	71.11*	82.88	0.729*	0.652~0.797	73.33*	85.59	0.841*	0.774~0.894
APACHE Ⅱ评分	77.78*	81.08	0.719*	0.641~0.788	82.22*	83.78	0.845*	0.779~0.898
联合预测	95.56	80.18	0.862	0.797~0.912	97.78	81.98	0.941#	0.892~0.973

*:与联合预测比较,*P*<0.05;#:与入院12 h联合预测比较,*P*<0.05

3 讨论

AECOPD常合并呼吸衰竭,其发病机制为组织细胞缺氧引起代谢功能紊乱,导致乳酸堆积[8]。本研究中,AECOPD并呼吸衰竭患者预后不良发生率为28.85%,与于海容等[9]报道的29.87%相近,证实了AECOPD并呼吸衰竭患者预后不良发生率较高,故及时、准确地评估AECOPD并呼吸衰竭患者病情及预测预后情况是保障患者安全的关键。

本研究结果显示,预后不良组入院时、入院12 h、入院24 h血乳酸水平及APACHE Ⅱ评分均先升高后降低,预后良好组均逐渐降低,且预后不良组各时段血乳酸水平及APACHE Ⅱ评分均高于预后良好组,说明AECOPD并呼吸衰竭不同预后患者短期内血乳酸水平及APACHE Ⅱ评分变化存在明显差异,可能与病情进展和预后相关。既往研究报道,动态血乳酸水平与AECOPD并呼吸衰竭患者预后相关[10],本研究结果与之相符。血乳酸是葡萄糖无氧分解的产物,当组织缺氧、组织灌注不足时,细胞内线粒体氧浓度降低,丙酮酸含量增加,产生大量乳酸,加剧患者病情,影响预后[11]。监测血乳酸水平可及时反映患者缺氧缺血状态。APACHE Ⅱ评分系统主要由急性生理、慢性健康状况及年龄评分三部分所组成,其设计合理,结果可靠,是目前国内外ICU应用最广泛的评分模型[12]。有研究报道,APACHE Ⅱ评分与AECOPD并呼吸衰竭患者病情的严重程度呈正相关[13],本研究结果与之相似。AECOPD并呼吸衰竭患者免疫力降低,体内平均动脉压、动脉血氧分压等指标异常程度越高,APACHE Ⅱ评分越高,患者预后越差[14]。本研究经*Logistic*回归分析也证实了入院12 h、24 h血乳酸及APACHE Ⅱ评分较高均是AECOPD并呼吸衰竭患者预后不良的危险

因素。此外,本研究进一步通过*ROC*分析发现,入院12 h、24 h血乳酸水平和APACHE Ⅱ评分联合预测AECOPD并呼吸衰竭患者预后不良的灵敏度、*AUC*均高于单独预测,且入院24 h联合预测的*AUC*高于入院12 h,提示上述动态变化的指标联合能够提高对此类患者近期预后不良的预测效能,且入院24 h上述指标联合预测临床价值更高。分析原因为血乳酸水平、APACHE Ⅱ评分可反映病情进展情况,预后良好组入院治疗后血乳酸水平、APACHE Ⅱ评分均持续降低,而预后不良患者上述指标在入院12 h升高、入院24 h降低,可能是患者入院12 h病情不能得到有效缓解甚至加重,机体无氧代谢持续增加,但入院24 h病情已趋于稳定,故采用该时间点数据预测效能更高。因此,临床医师可通过动态监测血乳酸水平变化及APACHE Ⅱ评分评估AECOPD并呼吸衰竭患者发生预后不良的风险,从而制订合理的防预措施改善预后。

此外,本研究发现高血糖、机械通气时间较长均是AECOPD并呼吸衰竭患者预后不良的危险因素,与既往报道[15-16]相符。AECOPD并呼吸衰竭患者免疫力降低,急性感染后高血糖引起糖代谢紊乱进一步削弱了机体对疾病的抵抗力,预后不良发生的风险增加;机械通气用于缓解患者的呼吸衰竭,但长时间的机械通气治疗易使患者产生呼吸机依赖性,导致撤机失败,诱发死亡。

综上,入院12 h、入院24 h高血乳酸水平,高APACHE Ⅱ评分及高血糖、机械通气时间较长均是AECOPD并呼吸衰竭患者近期预后不良的危险因素,血乳酸水平联合APACHE Ⅱ评分的动态变化对近期预后不良有一定预测价值,且入院24 h联合预测价值更高。

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