

· 临床研究 ·

无创正压通气治疗慢性阻塞性肺疾病急性加重期合并Ⅱ型呼吸衰竭的疗效分析

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【摘要】目的 研究无创正压通气(NIPPV)治疗慢性阻塞性肺疾病急性加重(AECOPD)合并Ⅱ型呼吸衰竭的疗效。**方法** 选取2012年1月至2014年12月昆山市第一人民医院急诊医学科收治的AECOPD合并Ⅱ型呼吸衰竭患者47例。根据随机、对照的原则分为观察组($n=24$)和NIPPV组($n=23$),其中观察组给予常规抗感染、祛痰、平喘、持续低流量吸氧等治疗;NIPPV组在常规治疗的基础上加用NIPPV治疗。对比治疗24h、72h后患者的血气分析、心率及呼吸次数等指标。**结果** 与治疗前相比,两组患者在治疗后的第24小时和72小时,呼吸次数、心率、动脉血二氧化碳分压(PaCO_2)和乳酸(Lac)显著降低($P<0.05$),动脉血氧分压(PaO_2)和pH显著上升($P<0.05$);而且与第24小时相比,第72小时的各值改善更为明显($P<0.05$)。两组患者在治疗后第72小时的N末端前脑钠肽(NT-proBNP)值也有显著下降($P<0.05$)。与观察组相比,NIPPV组患者的呼吸次数、心率、 PaCO_2 、Lac、pH、 PaO_2 和NT-proBNP均有更为显著的改善($P<0.05$)。此外,NIPPV组较观察组住院天数与住院费用明显减少($P<0.05$)。**结论** NIPPV在治疗AECOPD合并Ⅱ型呼吸衰竭患者中疗效显著,值得临床推广应用。

【关键词】 无创正压通气;慢性阻塞性肺病;呼吸衰竭

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Efficiency of non-invasive positive pressure ventilation in the treatment of acute exacerbation of chronic obstructive pulmonary disease complicated with type Ⅱ respiratory failure

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【Abstract】 Objective To determine the curative effect of non-invasive positive pressure ventilation (NIPPV) in the treatment of the patients with acute exacerbation of chronic obstructive pulmonary disease (AECOPD) complicated with type Ⅱ respiratory failure. **Methods** Forty-seven AECOPD patients complicated with type Ⅱ respiratory failure who admitted in our department from January 2012 to December 2014 were recruited in this study. They were randomly divided into the observation group ($n=24$) and the NIPPV group ($n=23$). All patients were given conventional treatment, including antibiotics, expectorant, anti-asthma and persistent low flow oxygen therapies. The NIPPV group was additionally treated with NIPPV. The blood gas analysis results, heart rate, breathing rate and serum level of N-terminal pro-brain natriuretic peptide (NT-proBNP) were compared between the 2 groups before and at 24 and 72 hours after the treatment. **Results** Compared with the values before treatment, the heart rate, breathing rate, arterial partial pressure of carbon dioxide (PaCO_2), and serum level of lactic acid (Lac) were decreased significantly ($P<0.05$), while, PaO_2 and pH value were elevated significantly at 24 and 72 hours after treatment in both groups ($P<0.05$), with those of the latter time point more significantly ($P<0.05$). The serum level of NT-proBNP was also reduced in the 2 groups at 72 hours after treatment ($P<0.05$). Compared with the observation group, the NIPPV group had more marked improvements in the heart rate, breathing rate, pH value, PaO_2 and serum levels of Lac and NT-proBNP ($P<0.05$). What's more, this group also had significantly shorter hospital stay and reduced costs than the other one ($P<0.05$). **Conclusion** NIPPV has remarkable curative effect in the treatment of AECOPD patients complicated with type Ⅱ respiratory failure, and it is worthy of being widely applied in clinical practice.

【Key words】 noninvasive positive pressure ventilation; chronic obstructive pulmonary disease; respiratory failure

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随着我国步入老龄化社会,慢性阻塞性肺疾病(chronic obstructive pulmonary disease, COPD)的患病率呈持续增长,已经成为危害人民身体健康最重要的慢性呼吸系统疾病^[1]。COPD是以不完全可逆的气流受限为病理特征的一种疾病,由于气流受限,残气量多,呼气末压力高,并长期存在缺氧、二氧化碳潴留和(或)营养不良,易导致呼吸肌疲劳^[2]。而在COPD急性加重期(acute exacerbation of COPD, AECOPD),由于呼吸系统感染、支气管痉挛等因素更易加重呼吸肌疲劳,易致并发Ⅱ型呼吸衰竭。有创机械通气(invasive mechanical ventilation, IMV)是治疗AECOPD的有效方式,但由于其损伤较大、并发症多、病程延长以及费用高等缺陷,在临床应用中受到一定程度的限制^[2,3]。近年来,采用无创正压通气(non-invasive positive pressure ventilation, NIPPV)治疗AECOPD合并呼吸衰竭的方法受到了越来越多的关注。因此,本研究以AECOPD并发Ⅱ型呼吸衰竭患者为研究对象,在常规治疗的基础上给予NIPPV治疗,观察治疗前后患者各指标的变化情况,以期NIPPV在临床上的应用提供有益线索。

1 对象与方法

1.1 研究对象

选取2012年1月至2014年12月昆山市第一人民医院急诊医学科收治的AECOPD合并Ⅱ型呼吸衰竭患者47例。入选标准:(1)根据中华医学会制定的《慢性阻塞性肺疾病诊治指南诊断标准》确诊为COPD;(2)静息状态下,动脉血氧分压(partial pressure of oxygen, PaO₂) < 60mmHg,动脉血二氧化碳分压(partial pressure of carbon dioxide, PaCO₂) > 50mmHg;(3)神志清楚,依从性好;(4)无应用NIPPV禁忌证^[1]。排除标准:(1)治疗过程中因病情加重需要行有创通气治疗者;(2)治疗过程中并发其他脏器严重功能障碍者;(3)自愿退出者;(4)治疗过程中死亡。根据随机、对照的原则分为观察组($n = 24$)和NIPPV组($n = 23$)。其中观察组男17例,女7例,年龄(70.34 ± 9.43)岁;NIPPV组男16例,女7例,年龄(69.23 ± 9.78)岁。

1.2 方法

两组患者入院后均采用抗感染(根据痰培养及药敏结果选择适宜抗生素)、抗炎、平喘、祛痰、维持水电解质及酸碱平衡、营养支持等综合治疗。此外,观察组采用持续低流量吸氧($2 \sim 3\text{L}/\text{min}$);

NIPPV组则采用NIPPV治疗。采用美国伟康BiPAP、S/T(Harmony)双水平呼吸机。设置参数:自主呼吸/定时模式(S/T模式);氧流量 $2 \sim 6\text{L}/\text{min}$;呼吸频率 $12 \sim 16$ 次/min;初始吸气压为 $4 \sim 5\text{cmH}_2\text{O}$,逐步调至 $12 \sim 20\text{cmH}_2\text{O}$;初始呼气末压为 $0\text{cmH}_2\text{O}$,逐步升至 $4 \sim 6\text{cmH}_2\text{O}$ 。并且根据患者病情适宜调整氧流量、呼气压以及吸气压,保持氧饱和度 > 90%,氧浓度保持在30%~45%,通气时间维持3次/d, 3~5h/次,并逐渐缩短通气次数及时间,直至完全脱机。

1.3 统计学处理

采用SPSS19.0统计学软件进行处理。计量资料以均数 ± 标准差($\bar{x} \pm s$)表示,组间比较采用 t 检验。计数资料以百分率表示,组间比较采用 χ^2 检验。 $P < 0.05$ 为差异具有统计学意义。

2 结果

2.1 两组患者基线资料比较

两组患者的年龄、肝肾功能、空腹血糖及超敏C-反应蛋白等方面的差异均无统计学意义($P > 0.05$;表1),表明两组患者基线资料均衡,具有可比性。

2.2 两组患者治疗前后各观察指标比较

与治疗前相比,两组患者在治疗后的第24小时和72小时,呼吸次数、心率、PaCO₂和乳酸(lactic acid, Lac)显著降低($P < 0.05$),PaO₂和酸碱度(power of hydrogen, pH)显著上升($P < 0.05$),且与第24小时相比,第72小时的各值改善更为明显($P < 0.05$)。两组患者在治疗后的第72小时的N末端前脑钠肽(N-terminal pro-brain natriuretic peptide, NT-proBNP)值也有显著下降($P < 0.05$)。与观察组相比,NIPPV组患者的呼吸次数、心率、PaCO₂、Lac、pH、PaO₂和NT-proBNP均有更为显著的改善($P < 0.05$;表2)。

2.3 两组患者住院天数与住院费用的比较

与观察组患者相比,NIPPV组患者的住院时间明显缩短[(12.52 ± 1.85) vs (14.87 ± 1.75) d],住院费用显著降低[(7582.15 ± 1425.63) vs (8752.56 ± 1644.52) 元],差异均有统计学意义($P < 0.05$)。

3 讨论

COPD是一种以持续气流受限为特征的疾病,在急性加重期时,通气与换气功能障碍会进一步加重,

表1 基线资料比较
Table 1 Comparison of baseline data between two groups ($\bar{x} \pm s$)

Item	Observation group (n = 24)	NIPPV group (n = 23)	P
Age(years)	70.34 ± 9.43	69.23 ± 9.78	0.694
ALT(U/L)	23.56 ± 8.54	23.21 ± 9.23	0.893
AST(U/L)	22.23 ± 9.13	22.41 ± 10.24	0.959
BUN(mmol/L)	5.69 ± 1.63	5.17 ± 1.75	0.297
Cr(μmol/L)	79.54 ± 20.98	77.04 ± 21.13	0.686
FBG(mmol/L)	6.91 ± 1.27	6.42 ± 1.16	0.175
hs-CRP(mg/L)	20.64 ± 18.28	22.75 ± 20.79	0.713

NIPPV: non-invasive positive pressure ventilation; ALT: alanine aminotransferase; AST: aspartate aminotransferase; BUN: blood urea nitrogen; Cr: creatinine; FBG: fasting blood glucose; hs-CRP: high-sensitivity C-reactive protein

表2 两组患者治疗前后各观察指标
Table 2 Comparison of the observed indices before and after treatment between two groups ($\bar{x} \pm s$)

Index	Observation group (n = 24)			NIPPV group (n = 23)		
	Before treatment	At 24 hours after treatment	At 72 hours after treatment	Before treatment	At 24 hours after treatment	At 72 hours after treatment
Breathing rate (times/min)	28.13 ± 3.18	25.67 ± 2.01*	23.50 ± 1.79* [△]	28.09 ± 3.30	23.96 ± 1.92* [#]	20.91 ± 1.47* ^{△#}
Heart rate(beats/min)	106.46 ± 8.18	99.33 ± 8.29*	90.88 ± 6.01* [△]	105.69 ± 7.49	92.43 ± 7.46* [#]	81.30 ± 4.62* ^{△#}
pH	7.20 ± 0.08	7.26 ± 0.06*	7.31 ± 0.07* [△]	7.22 ± 0.09	7.30 ± 0.07* [#]	7.37 ± 0.06* ^{△#}
PaO ₂ (mmHg)	47.58 ± 5.03	63.79 ± 6.65*	71.71 ± 5.08* [△]	47.26 ± 5.15	75.00 ± 6.99* [#]	84.96 ± 4.62* ^{△#}
PaCO ₂ (mmHg)	76.54 ± 7.50	69.25 ± 6.57*	57.87 ± 5.58* [△]	75.13 ± 8.68	63.69 ± 7.66* [#]	51.04 ± 5.14* ^{△#}
Lac(mmol/L)	4.03 ± 1.09	3.00 ± 0.93*	2.38 ± 0.67* [△]	4.06 ± 1.14	2.18 ± 0.71* [#]	1.69 ± 0.51* ^{△#}
NT-proBNP(ng/L)	374.28 ± 164.49		150.38 ± 26.89*	391.88 ± 172.46		132.75 ± 23.12* [#]

NIPPV: non-invasive positive pressure ventilation; PaO₂: partial pressure of oxygen; PaCO₂: partial pressure of carbon dioxide; Lac: lactic acid; NT-proBNP: N-terminal pro-brain natriuretic peptide. Compared with before treatment, * $P < 0.05$; compared with 24 hours after treatment, [△] $P < 0.05$; compared with the observation group, [#] $P < 0.05$

易致组织缺氧和CO₂潴留,从而引发Ⅱ型呼吸衰竭。早期保证足够肺泡通气、纠正组织缺氧是AECOPD治疗的首要任务。

Lac作为机体无氧代谢的产物,在排除患者有剧烈运动、服用双胍类药物等影响血乳酸浓度的因素后,血乳酸浓度可以作为判断组织低灌注、缺氧程度及酸碱紊乱类型的指标,与病情的严重程度和预后密切相关^[4]。且血乳酸浓度下降和早期Lac清除率升高等表现与病情转归相一致,能较早期地反映患者的病情变化,是判断疾病预后的独立预测因素^[5]。所以检测血乳酸值变化能有效地指导我们对AECOPD患者进行合理的治疗。

NT-proBNP与脑利钠肽(brain natriuretic peptide, BNP)是脑利钠肽前体(pro-brain natriuretic peptide, proBNP)的裂解产物,两种多肽来源相同且等摩尔分泌,但是NT-proBNP几乎完全经肾小球滤过清除且半衰期更长,所以一般情况下血清NT-proBNP的摩尔浓度是BNP的6倍^[6]。因此,目前临床上主要检测的是NT-proBNP。COPD发展到后期时,由于长期缺氧导致肺血管重塑,可能合并有肺动脉高压甚至慢性肺源性心脏病(chronic pulmonary heart disease, CPHD)。BNP是反映右心室负荷过

重的重要标志物之一,血浆BNP水平与平均肺动脉压具有一定正相关性^[7-9],且BNP在COPD患者疗效的评价上也有显著的相关性^[10,11],所以治疗后NT-proBNP的下降程度也可作为判断病情变化和预后的辅助评价指标之一。本研究的47例患者入院时NT-proBNP值普遍偏高,这可能与AECOPD患者组织缺氧、CO₂潴留加重、感染、酸中毒、肺动脉压增加及神经内分泌系统的激活等因素有关。所以经治疗后,NIPPV组NT-proBNP显著下降可作为病情好转的表现。此外,BNP是COPD急性发作的独立危险因素。当高水平BNP的COPD患者合并较为隐匿的左心衰竭,若临床上未予警惕和重视,则会增加患者的病死率^[12-14]。

本次研究结果显示,NIPPV组患者在治疗后第24小时和72小时的呼吸次数、心率、PaCO₂、Lac、pH和PaO₂等指标较观察组均有更为显著的改善($P < 0.05$)。有力地说明了NIPPV能够更为有效地改善患者的肺氧合功能、缓解呼吸衰竭并提高全身组织氧供应。本研究表明了NIPPV的应用可减低心率及心脏的静脉回血量,减少心脏做功,改善氧合,保护心肌功能。另外,NIPPV组的住院时间与住院费用较观察组明显减少。

综上所述, NIPPV是治疗AECOPD合并Ⅱ型呼吸衰竭的一种安全、有效的治疗措施, 可使部分患者避免因行有创通气所造成的损伤及相关并发症, 早期应用能够阻止病情恶化, 甚至逆转病情。NIPPV使用方便, 可作为AECOPD合并Ⅱ型呼吸衰竭的常规治疗措施。

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