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重症监护病房长期机械通气患者撤机困难的原因 及死亡影响因素分析*

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摘要 目的:探讨重症监护病房(ICU)长期机械通气患者撤机困难的原因及撤机死亡的影响因素。**方法:**对2015年6月至2018年10月我院收治的80例长期机械通气患者的临床资料进行回顾性分析,按照患者撤机结果分为撤机成功组52例和撤机困难组28例,根据患者存活情况分为存活组59例和死亡组21例。比较各组临床资料,分析撤机困难的原因及撤机死亡的影响因素。**结果:**撤机困难组年龄、心功能不全比例、多器官功能障碍(MODS)比例、呼吸机相关肺炎(VAP)比例、肝功能不全比例、肾功能不全比例、血尿素氮显著高于撤机成功组,机械通气时间、气管切开时间显著长于撤机成功组,血清白蛋白显著低于撤机成功组($P<0.05$)。死亡组年龄、合并糖尿病比例、心功能不全比例、MODS比例、VAP比例、肝功能不全比例、肾功能不全比例、血尿素氮显著高于存活组,机械通气时间、气管切开时间显著长于存活组,血清白蛋白显著低于存活组($P<0.05$)。多因素 Logistic 回归分析显示:年龄、合并糖尿病、MODS、VAP、机械通气时间、气管切开时间、血清白蛋白是 ICU 长期机械通气患者撤机死亡的影响因素($P<0.05$)。**结论:**患者治疗期间发生脏器功能不全或器官功能衰竭、机械通气时间较长、气管切开时间较长、营养状态较差是长期机械通气患者撤机困难的主要原因,年龄、合并糖尿病、MODS、VAP、机械通气时间、气管切开时间、血清白蛋白是 ICU 长期机械通气患者撤机死亡的影响因素。

关键词:机械通气;重症监护病房;撤机困难;原因;死亡;危险因素

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Causes of Difficulty in Weaning Patients with Long-term Mechanical Ventilation in Intensive Care Unit and Influencing Factors of Death*

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ABSTRACT Objective: To explore the causes of difficulty in weaning patients with long-term mechanical ventilation in intensive care unit (ICU) and the influencing factors of death. **Methods:** The clinical data of 80 patients with long-term mechanical ventilation who were admitted to our hospital from June 2015 to October 2018 were retrospectively analyzed. All the patients were divided into successful weaning group (52 cases), difficult weaning group (28 cases) according to the results of weaning. The patients were divided into survival group (59 cases) and death group (21 cases) depending on patient survival. The clinical data of each group were compared, and the causes of difficult weaning and the influencing factors of death were analyzed. **Results:** The age, cardiac insufficiency ratio, multiple organ dysfunction (MODS) ratio, ventilator-associated pneumonia (VAP) ratio, liver insufficiency ratio, renal insufficiency ratio, blood urea nitrogen in the difficult weaning group were significantly higher than those in the successful weaning group. The mechanical ventilation time and tracheotomy time were significantly longer than those in the successful weaning group, and serum albumin was significantly lower than that in the successful weaning group ($P<0.05$). Age, complicated with diabetes mellitus ratio, cardiac insufficiency ratio, MODS ratio, VAP ratio, liver insufficiency ratio, renal insufficiency ratio, blood urea nitrogen in the death group were significantly higher than those in the survival group, mechanical ventilation time and tracheotomy time were significantly longer than those in the survival group, and serum albumin was significantly lower than that in the survival group ($P<0.05$). Multivariate logistic regression analysis showed that age, complicated with diabetes mellitus, MODS, VAP, mechanical ventilation, tracheotomy time, serum albumin were the influencing factors of weaning death in ICU patients with long-term mechanical ventilation ($P<0.05$). **Conclusion:** During the treatment period, the main causes of difficulty in weaning patients with long-term mechanical ventilation are organ dysfunction or organ failure, longer mechanical ventilation time, longer tracheotomy time and poor nutritional status. The age, complicated with diabetes mellitus, MODS, VAP, mechanical ventilation time, tracheotomy time, serum albumin are the influencing factors of weaning death in ICU patients with long-term mechanical ventilation.

Key words: Mechanical ventilation; Intensive care unit; Difficulty in weaning; Causes; Death; Risk factors

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前言

重症监护病房(Intensive care unit, ICU)是医院内抢救危重疾病患者的重要场所,呼吸机是ICU救治患者中使用的重要仪器设备^[1]。近年来,随着呼吸机的广泛应用以及生命支持技术的不断进步,大量危重病患者得到了及时、有效的救治,使得患者生命得以延续,同时也导致需长期器械通气患者的数量越来越多,患者病死率及医疗成本居高不下,已经成为ICU医生面临的重要问题^[2,3]。有报道显示,长期机械通气患者中有25%~40%的患者存在撤机困难,30%~40%患者可能病死^[4,5]。本研究通过探讨ICU长期机械通气患者撤机困难的原因及死亡影响因素,旨在为长期机械通气患者的救治提供依据,现报道如下。

1 资料与方法

1.1 一般资料

对2015年6月至2018年10月期间我院收治的80例长期机械通气患者的临床资料进行回顾性分析,纳入标准:(1)因各种原因导致的呼吸衰竭需进行机械通气治疗者;(2)机械通气时间 ≥ 7 d者;(3)具备机械通气指征者;(4)患者病历资料完整,家属对研究知情同意,并签署知情同意书。排除标准:(1)患者存在无自主呼吸能力的原发疾病;(2)进入ICU前已进行机械通气治疗12h以上者;(3)撤机前放弃治疗者。撤机成功判定标准^[6]:撤机后患者主观上无不适,无需机械通气 >48 h,无呼吸困难等临床症状,患者能自主呼吸,未发生呼吸窘迫,患者呼吸频率、心率、血压和血流动力学稳定,血氧饱和度正常,血气分析无异常。撤机困难判定标准^[7]:存在以下任何一项者认为撤机困难:(1)患者自主呼吸测试不合格者;(2)撤机后6h内出现呼

吸困难、心率加快、血气分析异常者;(3)撤机后48h内需要再次建立人工气道者。撤机死亡判定标准^[8]:在进行机械通气时死亡或撤机后48h以内因呼吸衰竭死亡者。按照患者撤机结果分为撤机成功组52例和撤机困难组28例,根据患者存活情况分为存活组59例和死亡组21例。

1.2 研究方法

收集患者的年龄、性别、合并高血压、合并糖尿病、机械通气时间、气管切开时间、血清白蛋白、血尿素氮以及治疗期间心功能不全、多器官功能障碍(Multiple organ dysfunction, MODS)、呼吸机相关肺炎(Ventilator-associated pneumonia, VAP)、肝功能不全、肾功能不全等资料,并分析ICU长期机械通气患者死亡影响因素。

1.3 统计学方法

应用SPSS23.0软件进行统计学分析,计数资料以率表示,应用卡方检验,计量资料以均数 $\pm$ 标准差表示,两组数据比较应用t检验,应用多因素Logistic回归分析ICU长期机械通气患者死亡的影响因素, $P<0.05$ 表明差异具有统计学意义。

2 结果

2.1 撤机成功组和撤机困难组临床资料比较

两组性别、合并高血压比例、合并糖尿病比例比较无统计学差异($P>0.05$),撤机困难组年龄、心功能不全比例、MODS比例、VAP比例、肝功能不全比例、肾功能不全比例、血尿素氮显著高于撤机成功组($P<0.05$),机械通气时间、气管切开时间显著长于撤机成功组($P<0.05$),血清白蛋白显著低于撤机成功组($P<0.05$),见表1。

表1 撤机成功组和撤机困难组临床资料比较

Table 1 Comparison of clinical data between successful weaning group and difficult weaning group

Factors	Successful weaning group (n=52)	Difficult weaning group (n=28)	χ^2/t	P
Age (years)	60.19 $\pm$ 4.35	72.13 $\pm$ 3.37	11.247	0.000
Gender (male/female)	34/18	18/10	0.010	0.922
Complicated with hypertension [n (%)]	5(9.62)	3(10.71)	0.024	0.876
Complicated with diabetes mellitus [n (%)]	7(13.46)	4(14.29)	0.032	0.827
Cardiac insufficiency [n(%)]	8(15.38)	18(64.29)	19.839	0.000
MODS[n (%)]	0(0.00)	14(50.00)	31.515	0.000
VAP [n (%)]	10(19.23)	16(57.14)	11.924	0.000
Liver insufficiency [n(%)]	3(5.77)	16(57.14)	26.525	0.000
Renal insufficiency [n (%)]	4(7.69)	12(42.86)	14.066	0.000
Mechanical ventilation time (d)	15.24 $\pm$ 5.42	30.43 $\pm$ 6.78	16.937	0.000
Tracheotomy time (d)	3.22 $\pm$ 0.78	6.34 $\pm$ 1.23	6.932	0.000
Serum albumin (g/L)	36.23 $\pm$ 4.18	31.22 $\pm$ 3.78	3.485	0.005
Blood urea nitrogen (mmol/L)	8.33 $\pm$ 2.16	13.78 $\pm$ 2.72	8.936	0.000

2.2 存活组和死亡组临床资料比较

两组性别、合并高血压比例比较无统计学差异($P>0.05$),死亡组年龄、合并糖尿病比例、心功能不全比例、MODS 比例、

VAP 比例、肝功能不全比例、肾功能不全比例、血尿素氮显著高于存活组,机械通气时间、气管切开时间显著长于存活组,血清白蛋白显著低于存活组($P<0.05$),见表 2。

表 2 存活组和死亡组临床资料比较
Table 2 Comparison of clinical data between survival group and death group

Factors	Survival group(n=59)	Death group(n=21)	χ^2/ t	<i>P</i>
Age (years)	60.91± 4.62	74.11± 3.87	14.287	0.000
Gender (male/female)	37/22	15/6	0.517	0.412
Complicated with hypertension [n (%)]	4(6.78)	4(19.05)	2.590	0.108
Complicated with diabetes mellitus [n(%)]	3(5.08)	8(38.10)	14.231	0.000
Cardiac insufficiency [n (%)]	6(10.17)	20(95.23)	51.090	0.000
MODS [n (%)]	0(0.00)	14(66.67)	47.677	0.000
VAP[n (%)]	11(18.64)	15(71.43)	19.670	0.000
Liver insufficiency [n (%)]	4(6.78)	15(71.43)	35.744	0.000
Renal insufficiency [n (%)]	6(10.17)	10(47.62)	13.575	0.000
Mechanical ventilation time (d)	15.12± 5.55	34.95± 6.12	19.283	0.000
Tracheotomy time (d)	3.17± 0.83	7.12± 1.08	7.673	0.000
Serum albumin (g/L)	37.05± 4.28	28.73± 3.05	4.836	0.028
Blood urea nitrogen (mmol/L)	7.37± 2.53	15.62± 2.45	10.373	0.000

2.3 ICU 长期机械通气患者撤机死亡的多因素 Logistic 回归分析

以患者是否死亡为因变量,以年龄、合并糖尿病、心功能不全、MODS、VAP、肝功能不全、肾功能不全、血尿素氮、机械

通气时间、气管切开时间、血清白蛋白为自变量进行多因素 Logistic 回归分析,结果显示:年龄、合并糖尿病、MODS、VAP、机械通气时间、气管切开时间、血清白蛋白是 ICU 长期机械通气患者撤机死亡的影响因素($P<0.05$),见表 3。

表 3 ICU 长期机械通气患者撤机死亡的多因素 Logistic 回归分析
Table 3 Multivariate Logistic regression analysis of weaning mortality in patients with long-term mechanical ventilation in ICU

Variable	β value	Standard error	Wald χ^2	<i>P</i> value	OR(95%CI)
Age	0.843	0.428	5.847	0.012	1.472(1.121~1.816)
Complicated with diabetes mellitus	1.242	0.141	10.344	0.000	1.875(1.263~3.625)
MODS	1.328	0.128	15.332	0.000	3.852(2.321~4.926)
VAP	1.142	0.135	12.433	0.000	2.614(1.772~3.528)
Mechanical ventilation time	1.067	0.372	7.283	0.000	1.673(1.221~2.716)
Tracheotomy time	1.128	0.176	6.372	0.003	1.541(1.121~2.816)
Serum albumin	0.784	0.227	5.352	0.018	1.338(1.121~1.816)

3 讨论

机械通气是 ICU 常用的生命支持方法之一,通过机械通气可以使危重病患者生命得以延续^[9]。然而近年来大量资料显示^[10,11],长期进行机械通气的患者会对呼吸机产生依赖性,导致撤机困难。研究报道指出^[12,13],长期进行机械通气虽然能够延长部分患者的生存时间,但撤机后患者死亡率仍较高。本研究中撤机困难者 28 例,占总病例数的 35.00%,死亡患者 21 例,死亡率为 26.25%,表明长期机械通气患者撤机困难发生率和患

者死亡率仍较高,患者总体预后不容乐观。

撤机困难是 ICU 治疗的难题,通过我们对 ICU 撤机成功和失败病例的总结分析发现与以下因素有关:(1) 患者治疗期间发生脏器功能不全或器官功能衰竭^[14]。本研究中撤机困难组心功能不全、MODS、VAP、肝功能不全、肾功能不全、血尿素氮显著高于撤机成功组,提示治疗期间脏器功能不全或器官功能衰竭增加撤机困难的风险。分析原因是这部分患者疾病较重,治疗后虽然病情好转,但身体状态较差,影响了自主呼吸功能的触发^[15]。(2) 患者机械通气时间较长。研究表明,长时间机械

通气可导致患者对机械通气产生依赖性,从而增加机械通气撤机困难的发生率^[16,17]。目前何时撤机,如何撤机仍是医护人员面临的重要难题。虽然治疗指南中有机械通气撤机的标准,但由于患者病情不同,个体也存在差异,撤机时机需要医生自己掌握^[18]。我们从工作中发现,患者撤机可以经过一个试撤机的过程,通过带气管插管吸氧进行试撤机,如果患者能够维持自主呼吸 48h 以上则尝试撤机,可以提高撤机成功率。(3)患者气管切开时间较长。气管切开会使得气道暴露于空气中,增加感染发生的几率^[19,20]。周森等研究表明较细管径的插管可能增加肺部感染的几率,影响撤机完成^[21]。本研究则进一步提示气管切开时间较长会影响撤机的完成。(4)患者营养状态较差。本研究中撤机困难组血清白蛋白显著低于撤机成功组,提示营养状态较差会增加撤机困难的发生,推测营养状态较差可能会影响神经肌肉功能,导致自主呼吸触发困难^[22,23]。

本研究还发现年龄、合并糖尿病、MODS、VAP、机械通气时间、气管切开时间、血清白蛋白是 ICU 长期机械通气患者撤机死亡的危险因素。高龄患者脏器功能较差,身体抵抗能力降低,长期进行机械通气后呼吸系统储备功能进一步下降,死亡风险较高^[24-26]。合并糖尿病患者机体免疫功能降低,发生肺部感染后不易康复,且感染容易复发^[27]。机械通气时间增加、气管切开时间增加是长期机械通气患者撤机困难发生的重要原因。早期器官切开可以降低气道阻力,促进气道内分泌物排出,但长时间气管切开可以增加肺内感染的几率,增加患者死亡风险^[28]。血清白蛋白降低可以导致血浆胶体渗透压降低,患者易发生肺水肿,导致肺功能降低^[29],同时血清白蛋白降低导致患者免疫功能降低,降低患者的抗病能力,也增加患者死亡风险^[30]。

综上所述,患者治疗期间发生脏器功能不全或器官功能衰竭、机械通气时间较长、气管切开时间较长、患者营养状态较差是长期机械通气患者撤机困难的主要原因,年龄、合并糖尿病、MODS、VAP、机械通气时间、气管切开时间、血清白蛋白是 ICU 长期机械通气患者撤机死亡的危险因素,值得临床重点关注,建议采取相应的针对性措施以提高 ICU 长期机械通气患者的救治成功率。

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