

气管切开不同时机对重型颅脑损伤患者肺部感染的影响

肖金红¹ 胡丙兰¹ 黄忠明¹ 王旭¹ 刘海军²

【摘要】目的 探究气管切开不同时机对重型颅脑损伤(HCI)患者肺部感染的影响,为更有效地治疗重型颅脑损伤提供临床依据。**方法** 选取2016年1月至2018年12月遵义医科大学第五附属(珠海)医院收治的160例重型颅脑损伤患者为研究对象,按照气管切开的不同时机分为观察组(80例)和对照组(80例)。观察组和对照组患者分别于颅脑损伤24 h内(早期)和24 h后(晚期)实施气管切开救治方案,观察两组HCI合并肺部感染者的病原菌构成及感染控制的有效率,比较其疗效及手术前后的肺通气功能。**结果** 观察组患者不良反应如肺部感染(33.75%)、皮下气肿(8.75%)、低氧血症(3.75%)、出血(10.00%)、食管气管瘘(6.25%)、气胸(6.25%)等发生率均显著低于对照组(61.25%、20.00%、13.75%、25.00%、21.25%和16.25%),差异具有统计学意义($\chi^2 = 12.13$ 、 $P < 0.001$, $\chi^2 = 4.11$ 、 $P = 0.040$, $\chi^2 = 4.10$ 、 $P = 0.040$, $\chi^2 = 6.23$ 、 $P = 0.010$, $\chi^2 = 7.59$ 、 $P = 0.010$, $\chi^2 = 6.01$ 、 $P = 0.010$)。重型颅脑损伤患者肺部感染病原体主要分为革兰阴性菌(60.00%、51/85),以铜绿假单胞菌(25.88%、22/85)为主;革兰阳性菌(34.12%、29/85)中以金黄色葡萄球菌(23.53%、20/85)为主;真菌(5.88%、5/85)感染中以白假丝酵母菌(4.71%、4/85)为主。观察组患者HCI合并肺部感染的治疗有效率(77.28%、21/27)显著优于对照组(32.66%、16/49)($\chi^2 = 14.18$ 、 $P < 0.001$),且其整体的生存率(88.89%、24/27)亦高于对照组(67.36%、33/49)($\chi^2 = 4.38$ 、 $P = 0.04$),差异均有统计学意义。观察组中HCI合并肺部感染者 PO_2 [(128.22 ± 11.79) mmHg]和 SaO_2 [(96.55 ± 1.41)%]均显著高于对照组[(101.35 ± 10.27) mmHg和(94.26 ± 1.64)%],差异有统计学意义($t = 15.37$ 、9.47, P 均 < 0.001)。观察组中HCI合并肺部感染者 PCO_2 [(35.79 ± 5.33) mmHg]低于对照组[(43.72 ± 6.06) mmHg],差异有统计学意义($t = 8.77$ 、 $P < 0.001$)。**结论** 重型颅脑损伤患者早期实施气管切开,能有效提高疗效,降低并发症发生率,改善患者预后。

【关键词】 气管切开; 重型颅脑损伤; 肺部感染

Effect of tracheotomy at different opportunities on pulmonary infection of patients with heavy craniocerebral injury Xiao Jinhong¹, Hu Binglan¹, Huang Zhongming¹, Wang Xu¹, Liu Haijun². ¹Department of Neurosurgery, Fifth Affiliated (Zhuhai) Hospital of Zunyi Medical University, Zhuhai 519100, China; ²Department of Neurosurgery, Third Affiliated Hospital of Guizhou Medical University, Buyi and Miao Autonomous Prefecture 558000, China
Corresponding author: Xiao Jinhong, Email: sugar_119@163.com

【Abstract】Objective To explore the influence of tracheotomy timing on pulmonary infection in patients with severe head injury (HCI), and to provide clinical basis for more effective treatment. **Methods** Total of 160 patients with severe craniocerebral injury admitted to the Fifth Affiliated Hospital (Zhuhai) of Zunyi Medical University from January 2016 to December 2018 were selected, and divided into observation group (80 cases) and control group (80 cases) according to the different timing of tracheotomy. The cases in observation group were given tracheotomy within 24 hours (early) of craniocerebral injury, while the cases in control group were given tracheotomy after 24 hours (late) of craniocerebral injury. The pathogenic bacteria composition and infection control of the two groups of patients with pulmonary infection were observed, and the clinical efficacy and pulmonary ventilation function before and after surgery were compared, respectively. **Results** The incidences of adverse reactions such as pulmonary infection (33.75%), subcutaneous emphysema (8.75%), hypoxemia (3.75%), hemorrhage (10.00%), esophago-tracheal fistula (6.25%) and pneumothorax (6.25%) of cases in observation group with early tracheotomy

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作者单位: 519100 珠海市, 遵义医科大学第五附属(珠海)医院神经外科¹; 558000 贵州黔南布依族苗族自治州, 贵州医科大学第三附属医院神经外科²

通信作者: 肖金红, Email: sugar_119@163.com

were significantly lower than those of the control group with late tracheotomy (61.25%, 20.00%, 13.75%, 25.00%, 21.25%, 16.25%), with significant differences ($\chi^2 = 12.13, P < 0.001$; $\chi^2 = 4.11, P = 0.04$; $\chi^2 = 4.10, P = 0.04$; $\chi^2 = 6.23, P = 0.01$; $\chi^2 = 7.59, P = 0.01$; $\chi^2 = 6.01, P = 0.01$). Gram-negative bacteria (60.00%, 51/85) were predominant in pulmonary infections of severe craniocerebral injury and *Pseudomonas aeruginosa* was predominant (25.88%, 22/85). *Staphylococcus aureus* (23.53%, 20/85) was predominant in Gram-positive bacteria (34.12%, 29/85) and *Candida albicans* (4.71%, 4/85) was predominant in fungal infection (5.88%, 5/85). The recovery rate of HCl pulmonary infection after early tracheotomy (77.28%, 21/27) was significantly higher than that of control group (32.66%, 16/49) and the overall survival rate (88.89%, 24/27) was also higher than that of control group (67.36%, 33/49), with significant differences ($\chi^2 = 14.18, P < 0.001$; $\chi^2 = 4.38, P = 0.04$). PO_2 of patients in observation group [(128.22 ± 11.79) mmHg] and SO_2 [$(96.55 \pm 1.41)\%$] were higher than those in control group with tracheotomy [(101.35 ± 10.27) mmHg] and [$(94.26 \pm 1.64)\%$], with significant differences ($t = 15.37, P < 0.001$; $t = 9.47, P < 0.001$). PCO_2 of patients in observation group [(35.79 ± 5.33) mmHg] was significantly lower than that of patients in control group [(43.72 ± 6.06) mmHg], with significant difference ($t = 8.77, P < 0.001$). **Conclusions** Early tracheotomy in patients with severe craniocerebral injury could effectively improve the clinical therapeutic effect, reduce complications and improve the prognosis of patients.

【Key words】 Tracheotomy; Severe craniocerebral injury; Pulmonary infection

颅脑损伤 (craniocerebral injury, CI) 指头部因受到暴力撞击而导致的头皮损伤 (头皮水肿、头皮裂伤、头皮撕脱伤)、颅骨损伤 (颅盖骨折、颅底骨折) 及脑损伤 (脑震荡、脑挫裂伤、颅内血肿) [1-2]。若患者发生广泛性脑挫裂伤、广泛性颅骨骨折或脑干损伤、广泛性血肿等, 拉斯哥昏迷 (Glasgow Coma Scale, GCS) 评分为3~8分, 常为重型颅脑损伤 (heavy craniocerebral injury, HCI) [3-4]。据流行病学研究显示, 颅脑损伤的发生率约为3%, 仅次于四肢伤, 其病死率 (约5%) 居外伤首位, HCI病死率甚至高达50%, 且致残率亦居高不下, 给社会及患者家庭带来巨大的经济及精神压力 [5-6]。因此, 对HCI及时有效地救治, 最大限度降低继发性损伤及并发症十分必要。研究发现, HCI患者及时实施气管切开, 能有效降低并发症的发生 [7-8]。为探究不同时机气管切开对HCI患者肺部感染的影响, 本研究分析进行早期和晚期气管切开肺部感染者的病原菌构成及感染控制率, 并比较早期和晚期气管切开患者疗效及手术前后的肺通气功能, 以期为临床更有效的治疗提供依据, 现报道如下。

资料与方法

一、研究对象

选择2016年1月至2018年12月遵义医科大学第五附属 (珠海) 医院收治的160例HCI患者, 按照气管切开的不同时机分为观察组 (80例) 和对照组 (80例)。观察组患者于颅脑损伤24 h内 (早期)

实施气管切开的救治方案, 男性50例、女性30例, 年龄15~46岁, 平均年龄 (31.75 ± 8.90) 岁。对照组患者于颅脑损伤24 h后 (晚期) 实施气管切开的救治方案, 年龄15~45岁, 平均年龄 (30.27 ± 9.31) 岁。

入选标准: 患者经临床诊断为HCI; 不合并其他器官重大损伤及严重基础性疾病。本研究经遵义医科大学第五附属 (珠海) 医院伦理委员会批准 (批号: 2018[K13]号), 所有患者均签署知情同意书。

二、研究方法

1. 气管切开: 患者取平卧位, 双肩垫高, 充分暴露颈部。消毒铺巾局部麻醉后, 拒门齿约17 cm处, 穿刺针垂直进入气道, 导丝经穿刺针入气道, 拔除穿刺针。沿导丝横行切开皮肤1 cm后逐层扩张螺旋入气道, 退出后置入合适的气切全套, 拔除气管插管, 连接呼吸机后固定。两组患者均常规行抗感染治疗、雾化吸入、吸痰及营养支持等综合治疗。

2. 格拉斯哥昏迷 (GCS) 评分标准: 评分项目为语言、睁眼及运动3个项目分数之和。语言类别中分为正常交流 (5分)、言语错乱 (4分)、只能发出单个单词 (3分)、只能发音 (2分)、无发音 (1分)。睁眼类别中分为自发睁眼 (4分)、根据语言指令睁眼 (3分)、因受疼痛等刺激睁眼 (3分)、无睁眼 (1分)。运动类别中分为根据吩咐动作 (6分)、对疼痛等刺激做出定位反应 (5分)、对疼痛等刺激作屈曲反应 (4分)、异常屈曲的去皮质状态 (3分)、异常伸展的去脑状态 (2分)、无反应 (1分)。此评分标准可信度高, 健康人GCS评分为15分, 分数越低的患者昏迷程度越

重, GCS评分为3~8分者为HCl。

3. 患者肺部感染控制的标准: 显著有效: 患者肺部感染症状消失、胸片恢复正常、全血中白细胞数目及比例恢复正常; 有效: 患者肺部感染症状有所改善、胸片结果提示病灶好转、全血中白细胞数目及比例显著降低; 无效: 患者肺部感染症状无改善、胸片结果显示病灶无好转、全血中白细胞数目及比例未降低, 甚至加重; 病死: 治疗期间死亡。总有效 = (显著有效 + 有效) / 单组患者 × 100%。

4. 患者肺部感染病原菌的鉴定: 入组肺部感染的患者取深部痰液收集于无菌容器内, 进行一般涂片及病原菌培养。操作过程中遵循无菌原则, 应用梅里埃生物公司VITEK-60全自动细菌分析仪进行菌株鉴定。

5. 观察指标: 观察两组患者的临床疗效及肺通气功能, 计算两组患者肺部感染者的病原菌构成及感染控制的有效率。

三、统计学处理

运用SPSS 19.0软件进行数据的统计分析。患者年龄、PO₂、PCO₂和SaO₂均属计量资料且呈正态分布, 采用 $\bar{x} \pm s$ 表示, 两组间比较采用成组设计 t 检验。患者不良反应、临床疗效、病原菌及感染控制有效率均为计数资料, 采用卡方检验。以 $P < 0.05$ 为差异有统计学意义。

结 果

一、两组患者的不良反应

观察组患者的不良反应, 如肺部感染(33.75%)、皮下气肿(8.75%)、低氧血症(3.75%)、出血(10.00%)、食管气管瘘(6.25%)和气胸(6.25%)等发生率均显著低于对照组(61.25%、20.00%、13.75%、25.00%、21.25%和16.25%), 差异均具有统计学意义($\chi^2 = 12.13$ 、 $P < 0.001$, $\chi^2 = 4.11$ 、 $P = 0.04$, $\chi^2 = 4.10$ 、 $P = 0.04$, $\chi^2 = 6.23$ 、 $P = 0.01$, $\chi^2 = 7.59$ 、 $P = 0.01$, $\chi^2 = 6.01$ 、 $P = 0.01$), 见表1。

二、HCl合并肺部感染者的病原菌分布

观察组和对照组共76例HCl患者合并肺部感染, 共分离出85株病原菌, 其中革兰阳性菌29株, 占34.12% (29/85), 以金黄色葡萄球菌为主; 革兰阴性菌51株, 占60.00% (51/85), 以铜绿假单胞菌为主; 真菌5株, 占5.88% (5/85), 以白假丝酵母菌为主, 详见表2。

表2 76例HCl肺部感染者的病原菌分布

病原菌	株数 (%)
革兰阳性菌	29 (34.12)
金黄色葡萄球菌	20 (23.53)
其他	9 (10.59)
革兰阴性菌	51 (60.00)
铜绿假单胞菌	22 (25.88)
肺炎克雷伯菌	9 (10.59)
鲍曼不动杆菌	10 (11.76)
大肠埃希菌	3 (3.53)
其他	7 (8.24)
真菌	5 (5.88)
白假丝酵母菌	4 (4.71)
其他	2 (1.17)
合计	85 (100.00)

三、观察组和对照组中HCl合并肺部感染者的感染控制有效率

观察组中HCl合并肺部感染者的恢复有效率(77.28%)显著优于对照组(32.66%), 且整体生存率(88.89%)也显著高于对照组(67.36%), 差异均有统计学意义($\chi^2 = 14.18$ 、 $P < 0.001$, $\chi^2 = 4.38$ 、 $P = 0.04$), 见表3。

四、观察组和对照组HCl合并肺部感染者血气水平

观察组HCl合并肺部感染者PO₂[(128.22 ± 11.79) mmHg]和[SaO₂ (96.55 ± 1.41) %]均显著高于对照组HCl合并肺部感染者[(101.35 ± 10.27) mmHg和(94.26 ± 1.64) %], 差异均有统计学意义($t = 15.37$ 、 9.47 , P 均 < 0.001)。观察组HCl合并肺部感染者PCO₂[(35.79 ± 5.33) mmHg]显著低于对照组[(43.72 ± 6.06) mmHg], 差异有统计学意义($t = 8.77$ 、 $P < 0.001$), 见表4。

表1 两组患者的不良反应[例(%)]

组别	例数	肺部感染	皮下气肿	低氧血症	出血	食管气管瘘	气胸
观察组	80	27 (33.75)	7 (8.75)	3 (3.75)	8 (10.00)	5 (6.25)	5 (6.25)
对照组	80	49 (61.50)	16 (20.00)	10 (13.75)	20 (25.00)	17 (21.25)	13 (16.25)
χ^2 值		12.13	4.11	4.10	6.23	7.59	6.01
P 值		< 0.001	0.04	0.04	0.01	0.01	0.01

表3 观察组和对照组 HCl 合并肺部感染者的感染控制 [例 (%)]

组别	例数	显著有效	有效	无效	死亡	总有效率	生存率
观察组	27	8 (29.63)	13 (48.15)	3 (11.11)	3 (11.11)	21 (77.78)	24 (88.89)
对照组	49	7 (14.29)	9 (18.37)	17 (34.70)	16 (32.64)	16 (32.66)	33 (67.36)
χ^2 值		2.59	7.51	4.99	4.31	14.18	4.38
<i>P</i>		0.11	0.01	0.03	0.04	< 0.001	0.04

表4 观察组和对照组中 HCl 合并肺部感染者的血气水平 ($\bar{x} \pm s$)

分组	例数	PO ₂ (mmHg)		PCO ₂ (mmHg)		SaO ₂ (%)	
		术前	术后	术前	术后	术前	术后
观察组	27	62.19 ± 8.12	128.22 ± 11.79	53.12 ± 6.44	35.79 ± 5.33	87.09 ± 2.00	96.55 ± 1.41
对照组	49	61.18 ± 5.82	101.35 ± 10.27	53.79 ± 6.72	43.72 ± 6.06	87.38 ± 1.94	94.26 ± 1.64
<i>t</i> 值		0.90	15.37	0.65	8.77	0.93	9.47
<i>P</i> 值		0.37	< 0.001	0.52	< 0.001	0.35	< 0.001

注: 1 mmHg = 0.133 kPa; 观察组: PO₂: 术前 vs. 术后: $t = 41.25$ 、 $P < 0.001$, PCO₂: 术前 vs. 术后: $t = 18.53$ 、 $P < 0.001$, SaO₂: 术前 vs. 术后: $t = 34.48$ 、 $P < 0.001$; 对照组: PO₂: 术前 vs. 术后: $t = 30.43$ 、 $P < 0.001$, PCO₂: 术前 vs. 术后: $t = 9.96$ 、 $P < 0.001$, SaO₂: 术前 vs. 术后: $t = 24.25$ 、 $P < 0.001$

讨 论

重型颅脑损伤 (HCl) 是临床常见的危重疾病, 随着人们生活条件的改善, 其发生率逐渐升高^[9-10]。HCl 患者常处于昏迷状态, 自主呼吸微弱或消失, 其排痰需采取气管切开等机械通气手段, 最常见的并发症为肺部感染, 感染持续时间长、易反复^[11-13]。可能原因为: ①建立人工气道前, 患者颅内压升高导致反流误吸, 误吸物与气道本身分泌物淤积未及时排除而淤积在气管及支气管中, 导致大量细菌定植和增殖^[14-15]; ②人工气道建立后, 患者本身呼吸道功能受损, 呼吸道抵御感染等风险的能力降低, 从而诱发或加剧肺部感染的发生^[16-18]。肺部感染常导致呼吸障碍, 最终引起 PO₂、SaO₂ 降低、PCO₂ 升高^[19]。因此, HCl 患者有效预防肺部感染、维持肺通气功能, 对其疗效至关重要。目前气管切开是 PCI 患者救治的常用手段^[20], 但气管切开的时机对临床疗效的影响研究甚少, 故探究不同时机气管切开对 PCI 患者的影响具有临床意义。

本研究显示, 行晚期气管切开组患者的肺部感染发生率显著高于行早期气管切开组患者, 提示早期气管切开可显著降低患者的肺部感染率, 且感染易控制, 并发皮下血肿及低氧血症的概率亦降低, 提示在进行其他抢救措施的同时, 应及早予以气管切开。肺部感染者以革兰阴性菌 (主要为铜绿假单胞菌) 及革兰阳性菌 (主要为金黄色葡萄球菌) 为主。气管切开术能迅速扩充气体通道、增加

气体交换、加速分泌物的排出, 从而有效控制 HCl 患者的肺部感染, 进而缩短治疗时间^[21-23]。本研究发现, 行早期气管切开的 HCl 合并肺部感染者的感染控制率显著高于晚期气管切开的 HCl 合并肺部感染者的感染控制率。肺通气功能方面, 早期实施气管切开的 HCl 合并肺部感染者术后 PO₂、SaO₂ 均高于晚期实施手术者, 而 PCO₂ 低于晚期实施气管切开者。以上均提示早期气管切开可增加肺供氧、加强肺通气、提高氧利用率, 进而改善患者的通气状况、提高疗效。

行早期气管切开可能从以下几个方面发挥作用: ①及时清除误吸物, 降低肺部感染的发生^[24-25]; ②开放气道, 有效避免气道堵塞导致的缺氧及相关并发症^[26]; ③提高供氧率, 抑制脑细胞因缺氧导致的功能受损^[27]。同时, 早期气管切开后有效的护理措施亦必不可少^[28]。

综上, HCl 患者行早期气管切开可以有效降低患者肺部感染的发生, 促进肺部感染的控制率, 改善患者的呼吸功能, 减少并发症, 促进血气的恢复, 改善组织器官的缺血缺氧, 为治疗原发病争取时间和创造条件, 降低病死率, 更有利于提高疗效, 提升生存质量。

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