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星状神经节阻滞治疗烧伤后应激性溃疡的临床研究*

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摘要 目的:探讨星状神经节阻滞(stellate ganglion block, SGB)对烧伤所致应激性溃疡的临床疗效及其可能作用机制。**方法:**选取我院烧伤科收治的烧伤后应激性溃疡出血患者 40 例,将其随机分为星状神经节阻滞组(SGB 组, n=20)和常规治疗组(Control 组, n=20)。SGB 组进行烧伤规范治疗的同时采用星状神经节阻滞治疗,隔日一次,持续治疗一周;Control 组只进行常规烧伤治疗。检测和比较两组患者治疗前后血浆 ET-1、NO 的含量及治疗后临床症状的改善情况。**结果:**与 Control 组相比, SGB 组患者治疗后血浆 ET-1 及 NO 含量均显著降低($P<0.05$), 患者的临床总有效率明显高于 Control 组($P<0.05$)。**结论:**星状神经节阻滞可有效提高烧伤后应激性溃疡患者的临床疗效,可能与其调节血浆 ET-1、NO 的含量有关。

关键词:星状神经节阻滞;内皮素-1;一氧化氮;烧伤;应激性溃疡

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Clinical Research on the Effect of Stellate Ganglion Block on the Stress Ulcer after Burn Injury*

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ABSTRACT Objective: To investigate the clinical effects of stellate ganglion block(SGB) on the stress ulcer in burn patients and explore the underlying mechanisms. **Methods:** 40 patients with burn injury induced stress ulcer were randomized to two groups: SGB group (n=20) and Control group (n=20). SGB group was treated with conventional symptomatic therapy, SGB group underwent SGB every two days for 1 week on the basis of Control group. And the levels of plasma ET-1 and NO were detected using ELISA before and after therapy. And the clinical efficacy of the two groups was observed after the treatment. **Results:** Compared with the Control group, the levels of plasma ET-1 and NO were markedly lower in the SGB group ($P<0.05$), while the clinical efficacy was higher($P<0.05$). **Conclusion:** SGB could enhance the clinical efficacy stress ulcer in burn patients, which might be related to the decrease of plasma ET-1 and NO levels.

Key words: SGB; ET-1; NO; Burn; Stress ulcer

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前言

应激性溃疡(stress ulcer, SU)是指机体在各类严重创伤、烧伤、危重疾病等应激状态下发生的胃及十二指肠黏膜的急性糜烂和溃疡,严重时可导致消化道出血、穿孔^[1],威胁患者的生命。目前,烧伤后应激性溃疡的治疗主要是液体复苏、抗酸药物等对症治疗,但治疗效果并不十分理想^[2]。星状神经节阻滞(stellate ganglion block, SGB)是一种微创治疗方法,即将局麻药注射到颈部星状神经节(stellate ganglion, SG)及其周围疏松结缔组织内,可逆性阻滞星状神经节的节前、节后纤维及其所支配

的头、面、颈、上肢及上胸部等部位的交感神经,使这些区域的血管扩张,进而改善组织血供^[3,4],目前已广泛应用于疼痛及非疼痛性疾病的治疗^[5-7]。SGB可调节植物神经系统功能紊乱^[8,9],且有研究报道其可以有效减轻应激反应,改善下丘脑-垂体-肾上腺皮质轴和下丘脑-垂体-甲状腺轴的功能^[10,11]。因此,我们推测 SGB 可能有助于改善应激性溃疡。因此,本临床研究拟探讨 SGB 对 SU 的治疗作用及其相关的作用机制,旨在为大面积烧伤后应激性溃疡的临床治疗提供新的治疗途径和理论依据。

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1 材料与方法

1.1 研究对象及分组

选取本院烧伤科收治的烧伤合并应激性溃疡出血的患者40例,烧伤面积 $\geq 30\%$,男女不限,年龄18~65岁。患者伤前均无心、肝、肾等器质性疾病病史并无胃病史。本项临床研究获我院医学伦理委员会批准,并经所有患者对本研究知情同意且签署知情同意书。

40例烧伤患者采用随机数字表法随机分为两组:星状神经节阻滞组(SGB组,n=20)和常规治疗组(Control组,n=20)。其中SGB组男11例,女9例,年龄18~65岁,平均(48.3 $\pm$ 2.9)岁,Control组男13例,女7例,年龄18~65岁,平均(43.2 $\pm$ 3.3)岁。两组年龄、男女比例、严重程度等方面比较差异均无统计学意义($P < 0.05$),具有可比性。

1.2 试剂和仪器

2%利多卡因注射液、0.75%布比卡因注射液、ET-1试剂盒(上海西塘),NO试剂盒(上海西塘),SC-2546低速离心机(安徽中科中佳科学仪器有限公司)。

1.3 研究方法

SGB组患者在常规烧伤治疗的基础上,对患者进行单侧SGB治疗,隔日一次,持续治疗一周。本实验SGB采用颈气管旁入路法,即在胸锁关节上2.5 cm与前正中线外侧1.5 cm相交处向第7颈椎横突基底部穿刺。患者取仰卧位,用手指将颈总动脉推向外侧,进针后针尖遇骨质,回抽无血后注入2%利多

卡因4 mL、0.75%布比卡因1.5 mL及生理盐水2.5 mL。SGB后,患者出现同侧眼睑下垂、眼裂变窄、瞳孔缩小等霍纳综合征(Horner's syndrome)的症状,表明星状神经节阻滞成功。

1.4 观察指标

1.4.1 疗效判定标准 ① 显效:治疗开始后36 h内出血停止;② 有效:治疗开始后36~72 h内出血停止;③ 无效:治疗72 h以上仍有出血表现,甚至出血量增加。

1.4.2 血浆ET-1、NO的测定 所有患者均于治疗前、后抽取静脉血5 mL,3000 r/min离心15 min,取上清液-80℃条件下保存。采用酶联免疫吸附法(ELISA)检测患者血浆ET-1和NO的含量,全部操作严格按照说明书进行。

1.5 统计学分析

采用SPSS17.0统计软件对数据进行统计分析,计量资料数据均以($\bar{x} \pm s$)表示,两样本间均数比较采用t检验,计数资料采用卡方检验,以 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 两组临床疗效的比较

SGB组患者接受治疗后,有9例患者治疗效果显著,有7例患者治疗有效,总有效率80%;Control组患者接受治疗后,有5例患者治疗效果显著,有6例患者治疗有效,总有效率55%。SGB组治疗总有效率显著高于Control组,差异有统计学意义($P < 0.05$),见表1。

表1 两组患者临床疗效对比

Table 1 The comparison of therapeutic effect between two groups

Groups	n	Excellent	Effectivity	Invalid	Effective rate
SGB group	20	9	7	4	80%
Control group	20	5	6	9	55%*

Note: compared with the Control group, * $P < 0.05$.

2.2 两组治疗前后血浆ET-1及NO的含量比较

治疗前,两组患者血浆ET-1及NO含量比较差异无统计学意义($P > 0.05$)。治疗后,两组患者血浆ET-1、NO含量均较治

疗前有所下降,且SGB组血浆ET-1、NO含量均显著低于Control组($P < 0.05$),见表2。

表2 两组患者治疗前后血浆ET-1和NO含量的比较(pg/mL, $\bar{x} \pm s$)

Table 2 Comparison of the plasma ET-1 and NO content before and after treatment between two groups(pg/mL, $\bar{x} \pm s$)

Groups	n	ET-1		NO	
		Before treatment	After treatment	Before treatment	After treatment
SGB group	20	85.47 $\pm$ 12.58	40.10 $\pm$ 6.70	164.76 $\pm$ 21.75	67.61 $\pm$ 14.48
Control group	20	89.32 $\pm$ 13.77	66.69 $\pm$ 12.51*	162.62 $\pm$ 20.78	114.15 $\pm$ 8.79*

Note: compared with the Control group, * $P < 0.05$.

3 讨论

烧伤患者尤其是大面积、特大面积烧伤患者应激性溃疡的发病率较高^[12],其发病机制可能是烧伤后机体产生应激反应,交感神经活动增强,激活下丘脑-垂体-肾上腺系统,从而引发一系列病理生理反应,使儿茶酚胺、皮质醇、胰高血糖素等的分泌增加,引起胃黏膜血管痉挛,胃黏膜下动静脉短路开放,血流量明显减少,以致胃肠血流灌注不足,胃黏膜屏障受损,胃黏膜

细胞脱落多于再生,修复困难,从而引起胃黏膜缺血、糜烂、坏死、出血^[13-17]。

颈部星状神经节属于植物神经系统,其大部分通过交感-肾上腺髓质系统的兴奋产生相应的交感神经活动,研究显示^[18-20]SGB可以减弱应激性刺激引起的下丘脑交感神经中枢的过度兴奋,将处于病理性亢进状态的交感神经活动调整至正常水平并维持其稳态,改善局部组织缺血、缺氧和代谢异常,从而达到终止恶性循环、治疗疾病的目的。由于大多数应激是通过大

脑皮质、大脑边缘系统刺激下丘脑植物神经系统,引起交感神经系统活动增强,导致下丘脑、植物神经、免疫及内分泌系统活动失调,出现如血管收缩、微循环障碍等一系列病理生理变化,从而导致应激性溃疡等疾病的发生^[21]。因此,我们推测 SGB 可能通过调理及改善这种病理生理过程,改善胃黏膜损伤,减轻应激性溃疡出血。本研究结果显示烧伤后应激性溃疡出血的患者接受 SGB 治疗后治疗总有效率显著高于对照组,说明 SGB 可显著提高应激性溃疡的临床疗效,改善患者的临床症状。

ET-1 是目前已知最强的血管收缩肽,具有强大的收缩血管和调节局部组织微循环的作用。研究表明^[22-25]机体在应激状态下血浆及胃黏膜 ET-1 水平明显升高,并与胃黏膜血流量的减少呈正相关,而使用了 ET-1 拮抗剂或受体拮抗剂后,胃黏膜的损伤程度明显减轻,提示 ET-1 可能在急性胃黏膜损伤的病理生理过程中起着重要作用。本研究结果显示 SGB 治疗的烧伤后应激性溃疡患者的血浆 ET-1 水平明显降低,提示 SGB 可能通过降低血浆内皮素水平,减轻胃黏膜的损伤,从而改善应激性溃疡出血。有动物实验表明颈交感干离断可减少应激大鼠胃黏膜组织的 ET-1 含量,减轻胃黏膜损伤,与本研究结果一致^[26]。

NO 对胃黏膜具有保护和损伤的双重作用,其可增加胃黏膜血流量、刺激胃酸分泌,保护胃黏膜;但又能与氧自由基形成过氧化硝酸盐而导致细胞脂质损伤^[27]。NO/ET-1 的比例平衡对维持胃黏膜血流量具有重要作用,胃黏膜受损后 ET-1 升高,为了维持胃黏膜血流量稳定,诱导性 NO 浓度相应增高,并与多种物质如过氧化氢、超氧化物阴离子自由基等发生反应,产生毒性物质,加重胃黏膜损伤^[28]。因此在应激性溃疡的发生发展过程中,ET-1 和 NO 浓度可能均增加,共同参与胃黏膜的缺血缺氧性损伤^[27,29]。而本实验结果提示患者接受 SGB 治疗后血浆 NO 含量明显低于 Control 组,其机制可能与 SGB 能抑制中枢和外周交感神经活动,使 NO 合成减少有关,说明 SGB 可能通过调节血浆中 NO 的含量保护胃黏膜。赵广翔等^[30]的实验表明颈交感干离断可增加浸水应激大鼠的胃黏膜血流量,降低应激大鼠血清及胃黏膜 NO 的含量,从而对胃黏膜损伤产生保护作用,支持本实验研究结果。

综上所述,星状神经节阻滞治疗烧伤后应激性溃疡的疗效显著提高,其机制可能与 SGB 调节血浆 ET-1、NO 的含量有关。因此,SGB 可推荐用于烧伤后应激性溃疡的治疗,其具有操作简单,侵入性伤害小,可实施床边治疗,费用低,并能连续应用及重复应用等优点。但临床上在烧伤早期行 SGB 是否能预防 SU 的发生并减轻其损伤程度尚需进一步研究。

参考文献(References)

- [1] Kim ED, Yoo WJ, Kim YN, et al. Ultrasound-guided pulsed radiofrequency treatment of the cervical sympathetic chain for complex regional pain syndrome: A retrospective observational study [J]. *Medicine (Baltimore)*, 2017, 96(1): e5856
- [2] Hoffmann JC, Prinz C, Labenz J, et al. S2k guideline Helicobacter pylori and gastroduodenal ulcer disease 2016-Statement on stress ulcer prophylaxis and optimized therapy [J]. *Z Gastroenterol*, 2017, 55(3): 307-309
- [3] Yucel I, Demiraran Y, Ozturan K, et al. Complex regional pain syndrome type I: efficacy of stellate ganglion blockade[J]. *J Orthop Traumatol*, 2009, 10(4): 179
- [4] Hu N, Wu Y, Chen BZ, et al. Protective effect of stellate ganglion block on delayed cerebral vasospasm in an experimental rat model of subarachnoid hemorrhage[J]. *Brain Res*, 2014, 1585(10): 63-71
- [5] Zhao HY, Yang GT, Sun NN, et al. Efficacy and safety of stellate ganglion block in chronic ulcerative colitis [J]. *World J Gastroenterol*, 2017, 23(3): 533-539
- [6] Chen YQ, Xie YY, Wang B, et al. Effect of stellate ganglion block on hemodynamics and stress responses during CO₂-pneumoperitoneum in elderly patients[J]. *J Clin Anesth*, 2017, 37(2): 149-153
- [7] Jain V, Rath GP, Dash HH, et al. Stellate ganglion block for treatment of cerebral vasospasm in patients with aneurysmal subarachnoid hemorrhage-A preliminary study[J]. *J Anaesthesiol Clin Pharmacol*, 2011, 27(4): 516-521
- [8] Lynch JH, Mulvaney SW, Kim EH, et al. Effect of stellate ganglion Block on specific symptom clusters for treatment of post-traumatic stress disorder[J]. *Mil Med*, 2016, 181(9):1135-1141
- [9] Marker S, Krag M, Møller MH. What's new with stress ulcer prophylaxis in the ICU[J]. *Intensive Care Med*, 2017, (1): 25
- [10] Wu TG, Li JH, Hu HY, et al. Effects of continuous stellate ganglion block on serum thyroid hormone and cortisol levels in patients with severe brain injury[J]. *Clin J Anesthesiol*, 2011, 31(3): 334-337
- [11] Du Q, Wang ZG, Zhu PF, et al. Effects of stellate ganglion block on the pituitary-adrenal and pituitary-thyroid axes after severe trauma in rats[J]. *J Trauma Surg*, 2008, 10(3): 244-246
- [12] Lewis GM, Pham TN, Robinson E, et al. Pressure ulcers and risk assessment in severe burns[J]. *Journal Of Burn Care & Research*, 2012, 33(5): 619-623
- [13] Almadi MA, Barkun AN. Intensive care unit stress ulcer prophylaxis: is it still needed?[J]. *Ann Saudi Med*, 2016, 36(6): 434-435
- [14] Wang L, Luo P, Zhang F, et al. Toll-like receptor 4 protects against stress-induced ulcers via regulation of glucocorticoid production in mice[J]. *Stress*, 2017, 20(1): 2-9
- [15] Choi YH, Lee JH, Shin JJ, et al. A revised risk analysis of stress ulcers in burn patients receiving ulcer prophylaxis [J]. *Clin Exp Emerg Med*, 2015, 2(4): 250-255
- [16] 肖桂荣,吴欣雅,徐琰. 应激性溃疡药物预防的国内外指南分析[J]. *华西医学*, 2014, 29(12): 2242-2245
- [17] Xiao Gui-rong, Wu Xin-ya, Xu Ting. Analysis of guidelines for stress ulcer drug prophylaxis in and out China[J]. *West China Medical Journal*, 2014, 29(12): 2242-2245
- [17] Lewis GM, Pham TN, Robinson E, et al. Pressure ulcers and risk assessment in severe burns[J]. *Journal of Burn Care & Research*, 2012, 33(5): 619-623
- [18] Fudim M, Boortz-Marx R, Patel CB, et al. Autonomic modulation for the treatment of ventricular arrhythmias: therapeutic use of percutaneous stellate ganglion blocks [J]. *J Cardiovasc Electrophysiol*, 2016, 26(12): 131-135
- [19] 全守波,王清秀,杨光,等. 星状神经节阻滞对全脑缺血再灌注家兔循环呼吸的影响[J]. *卒中与神经疾病*, 2002, 9(2): 89-92
- [19] Quan Shou-bo, Wang Qing-xiu, Yang Guang, et al. Effects of stellate ganglion block on circulation and respiration during global cerebral ischemia reperfusion in rabbits [J]. *Stroke and Nervous Diseases*, 2002, 9(2): 89-92

- Transplantation, 2016, 31(5): 454
- [12] 梁培松, 王伟佳, 王结珍, 等. 血清胱抑素 C 对新生儿窒息后肾损伤诊断价值的 Meta 分析 [J]. 国际检验医学杂志, 2013, 34(14): 1801-1802
- Liang Pei-song, Wang Wei-jia, Wang Jie-zhen, et al. A meta-analysis of the diagnostic value of serum cystatin C in kidney injury induced by asphyxia newborn [J]. International Journal of Laboratory Medicine, 2013, 34(14): 1801-1802
- [13] 宋语桐, 任立红. 血清胱抑素 C 对新生儿窒息后肾损伤早期诊断的临床意义[J]. 中国儿童保健杂志, 2013, 21(4): 396-398
- Song Yu-tong, Ren Li-hong. Clinical significance of serum cystatin C for early diagnosis of renal injury induced by asphyxia in neonates[J]. Chinese Journal of Child Health Care, 2013, 21(4): 396-398
- [14] 李雅雯, 王晓蕾, 王昌林, 等. 血清胱抑素 C 在新生儿窒息后肾损伤早期诊断中的价值[J]. 新乡医学院学报, 2011, 28(4): 479-480
- Li Ya-wen, Wang Xiao-lie, Wang Chang-lin, et al. Early diagnostic value of serum cystatin C in kidney injury induced by asphyxia neonatorum [J]. Journal of Xinxiang Medical College, 2011, 28(4): 479-480
- [15] Hadzimuratovic E, Skrabin S, Hadzimuratovic A, et al. Postasphyxial renal injury in newborns as a prognostic factor of neurological outcome[J]. Journal of Maternal-fetal & Neonatal Medicine, 2014, 27(4): 407-410
- [16] 李荟. 血清胱抑素 C 和尿微量白蛋白在新生儿窒息缺氧缺血肾损害中的变化[J]. 中国实用医刊, 2014, 41(2): 71-72
- Li Hui. Changes in serum cystatin C and urine microalbumin in hypoxic ischemic kidney injury induced by asphyxia neonatorum [J]. Chinese Journal of Practical Medicine, 2014, 41(2): 71-72
- [17] Takazakura A, Sakurai M, Bando Y, et al. Renoprotective effects of atorvastatin compared with pravastatin on progression of early diabetic nephropathy. [J]. Journal of Diabetes Investigation, 2015, 6 (3): 346-353
- [18] Dajak M, Ignjatovi S, Stojimirovi B, et al. Beta-trace protein as a marker of renal dysfunction in patients with chronic kidney disease: comparison with other renal markers[J]. Journal of Medical Biochemistry, 2010, 29(2): 66-72
- [19] Si X Y, Li J J, Yao T, et al. Transforming growth factor- β 1 in the microenvironment of ischemia reperfusion-injured kidney enhances the chemotaxis of mesenchymal stem cells to stromal cell-derived factor-1 through upregulation of surface chemokine (C-X-C motif) receptor 4[J]. Molecular Medicine Reports, 2014, 9(5): 1794-1798
- [20] Nolan K A, Brennan E P, Scholz C C, et al. Paricalcitol protects against TGF- β 1 induced fibrotic responses in hypoxia and stabilises HIF- α in renal epithelia.[J]. Experimental Cell Research, 2015, 330 (2): 371-381
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- (上接第 5343 页)
- [20] Wu TG, Li JH, Hu HY, et al. Effects of continuous stellate ganglion block on serum thyroid hormone and cortisol levels in patients with severe brain injury[J]. Clin J Anesthesiol, 2011, 31(3): 334-337
- [21] Du Q, Wang ZG, Zhu PF, et al. Effects of stellate ganglion block on the pituitary-adrenal and pituitary-thyroid axes after severe trauma in rats[J]. J Trauma Surg, 2008, 10(3): 244-246
- [22] Said SA, El-Mowafy AM. Role of endogenous endothelin-1 in stress-induced gastric mucosal damage and acid secretion in rats[J]. Regul Pept, 1998, 73(1): 43-50
- [23] Fukumura D, Kurose I, Miura S, et al. Role of endothelin-1 in repeated electrical stimulation-induced microcirculatory disturbance and mucosal damage in rat stomach[J]. J Gast roenterol Hepatol, 1996, 11(6): 279-285
- [24] Hsieh JS, Howng SL, Huang TJ, et al. Endothelin-1, inducible nitric oxide synthase and macrophage inflammatory protein-1 α in the pathogenesis of stress ulcer in neurotraumatic patients [J]. J Trauma, 2006, 61(4): 873-878
- [25] Du Y, Zhao W, Lu L, et al. Study on the antiulcer effects of veronicastrum axillare on gastric ulcer in rats induced by ethanol based on tumor necrosis factor- α (TNF- α) and endothelin-1 (ET-1)[J]. Asian Pac J Trop Biomed, 2013, 3(12): 925-930
- [26] 赵广翊, 姚鹏, 孟凌新, 等. 星状神经节阻滞预防大鼠应激性溃疡的研究[J]. 中国医科大学学报, 2007, 36(4): 412-413
- Zhao Guang-yi, Yao Peng, Meng Ling-xin, et al. Protective effect of stellate ganglion block on stress ulcer in rats [J]. Journal Of China Medical University, 2007, 36(4): 412-413
- [27] 杨院平. 一氧化氮与内皮素在胃粘膜损伤中的作用与关系[J]. 陕西医学杂志, 2002, 31(2): 137-140
- Yang Yuan-ping. The relationship between NO and ET in the injure of gastric muscoa[J]. Shanxi Medical Journal, 2002, 31(2): 137-140
- [28] Szlachcic A, Krzysiek-Maczka G, Pajdo R, et al. The impact of asymmetric dimethylarginine (ADAMA), the endogenous nitric oxide (NO) synthase inhibitor, to the pathogenesis of gastric mucosal damage[J]. Curr Pharm Des, 2013, 19(1): 90-97
- [29] A MK, Aziz NM, E MA, Rifaai RA. Possible contribution of nitric oxide and prostaglandin in the protective effect of angiotensin (1-7) against stress induced gastric ulceration in adult male albino rats[J]. Bratisl Lek Listy, 2016, 117(12): 715-721
- [30] 赵广翊, 高林林, 孟凌新. 颈交感干离断对应激大鼠 NO 及胃粘膜血流量的影响[J]. 临床麻醉学杂志, 2005, 21(11): 773-775
- Zhao Guang-yi, Gao Lin-lin, Meng Ling-xin. Effects of transection of the cervical sympathetic trunk on gastric mucosal blood flow and the changes of NO in water immersion restrain rats[J]. J Clin Anesthesiol, 2005, 21(11): 773-775