

doi: 10.13241/j.cnki.pmb.2020.20.016

负压封闭引流技术联合游离植皮治疗深度烧伤创面的疗效及对患者血清炎症因子及疼痛介质的影响 *

闫永宏 武淑华 来治国 卢青军 勾利静

(中国人民解放军陆军第八十一集团军医院烧伤整形科 河北 张家口 075000)

摘要 目的:探讨负压封闭引流技术(VSD)联合游离植皮治疗深度烧伤创面的疗效及对患者血清炎症因子及疼痛介质的影响。**方法:**选取2018年2月~2020年2月期间我院收治的103例深度烧伤患者,按乱数表法分为研究组51例及对照组52例,对照组患者给予游离植皮治疗,研究组在对照组基础上联合VSD,比较两组平均换药次数、平均住院时间、创面愈合时间、细菌培养阳性率、首次植皮存活率、创面愈合率、并发症、炎症因子[白介素-6(IL-6)、C反应蛋白(CRP)、肿瘤坏死因子- α (TNF- α)]以及疼痛介质[5-羟色胺(5-HT)、脑内神经肽(NPY)、前列腺素E₂(PGE₂)]水平。**结果:**研究组平均换药次数少于对照组,创面愈合时间、平均住院时间短于对照组($P<0.05$)。研究组细菌培养阳性率低于对照组($P<0.05$),研究组首次植皮存活率、创面愈合率均高于对照组($P<0.05$)。治疗后,两组IL-6、CRP、TNF- α 、5-HT、NPY、PGE₂水平均较治疗前下降,且研究组低于对照组($P<0.05$)。研究组的并发症发生率为5.88%(3/51),低于对照组的21.15%(11/52)($P<0.05$)。**结论:**深度烧伤创面采用游离植皮联合VSD技术修复疗效显著,可有效促进创面愈合,降低并发症发生风险,降低炎症因子及疼痛介质水平。

关键词:负压封闭引流技术;游离植皮;深度烧伤创面;疗效;炎症因子;疼痛介质

中图分类号:R644;R622 **文献标识码:**A **文章编号:**1673-6273(2020)20-3875-04

The Curative Effect of Vacuum Sealing Drainage Technology Combined with Free Skin Grafting in the Treatment of Deep Burn Wounds and Its Influence on Serum Inflammatory Factors and Pain Mediators*

YAN Yong-hong, WU Shu-hua, LAI Zhi-guo, LU Qing-jun, GOU Li-jing

(Department of Burn and Plastic Surgery, the 81st Group Hospital of Chinese People's Liberation Army, Zhangjiakou, Hebei, 075000, China)

ABSTRACT Objective: To investigate the curative effect of vacuum sealing drainage (VSD) technology combined with free skin grafting in the treatment of deep burn wounds and its influence on serum inflammatory factors and pain mediators. **Methods:** 103 cases of deep burn patients in our hospital from February 2018 to February 2020 were selected, and divided into study group with 51 cases and control group with 52 cases according to random number table method. Patients in control group were treated with free skin grafting, and study group were combined with VSD on the basis of control group. The average dressing change times, average hospitalization time, wound healing time, bacterial culture positive rate, first skin graft survival rate, wound healing rate, complications, inflammatory factors [interleukin-6 (IL-6), C-reactive protein (CRP), tumor necrosis factor- α (TNF- α)] and pain mediators [5-hydroxytryptamine (5-HT), brain neuropeptide (NPY), prostaglandin E₂ (PGE₂)] levels were compared between the two groups. **Results:** The average dressing change times of the study group was less than that of the control group, and the average hospitalization time and wound healing time of the study group were shorter than those of the control group ($P<0.05$). The bacterial culture positive rate of the study group was lower than that of the control group ($P<0.05$), the first skin graft survival rate and wound healing rate of study group were higher than those of control group ($P<0.05$). After treatment, the levels of IL-6, CRP, TNF- α , 5-HT, NPY and PGE₂ of the two groups were lower than those before treatment, and the study group was lower than the control group ($P<0.05$). The incidence of complications in the study group was 5.88% (3/51) lower than that in the control group 21.15%(11/52)($P<0.05$). **Conclusion:** The application of free skin grafting combined with VSD technology in deep burn wounds repair has a significant curative effect, which can effectively promote wound healing, reduce the risk of complications, and reduce the level of inflammatory factors and pain mediators.

Key words: Vacuum sealing drainage technology; Free skin grafting; Deep burn wounds; Curative effect; Inflammatory factors; Pain mediators

Chinese Library Classification(CLC): R644; R622 **Document code:** A

Article ID: 1673-6273(2020)20-3875-04

* 基金课题:河北省自然科学基金项目(H2015105083)

作者简介:闫永宏(1974-),男,本科,副主任医师,研究方向:烧伤整形,E-mail: Tigerlaoyan@163.com

(收稿日期:2020-06-04 接受日期:2020-06-27)

前言

烧伤是临床上比较常见的外伤类型之一,常由火焰烧伤、电烧伤、化学烧伤等导致^[1]。深度烧伤患者病情危重,组织损害严重,严重者甚至可伤及皮下肌肉组织甚至骨骼;此外,正常皮纹内存在一定数量的细菌,烧伤后创面细菌感染较常见,易并发感染,导致创面长期难以愈合、遗留功能障碍等,影响患者生活质量^[2-4]。现临床针对深度烧伤创面的治疗方法是游离植皮,植皮后采取敷料加压包扎并定期换药直至创面愈合^[5],但游离植皮存在创面感染、皮片移位、创面渗液等并发症,疗效有待加强^[6]。负压封闭引流技术(VSD)是一种新型的创面处理技术,该技术可持续清除创面局部渗液,促进创面恢复^[7,8]。本研究通过对我院收治的部分深度烧伤患者给予 VSD 技术联合游离植皮治疗,疗效较好。

1 资料和方法

1.1 一般资料

选取 2018 年 2 月~2020 年 2 月期间我院收治的深度烧伤患者 103 例,纳入标准:(1)烧伤总体表面积分级达到深 II 度以上;(2)所有患者创面肉眼观察红白相间、痛觉反应迟钝;(3)患者及家属对研究知情同意,并知晓可能存在的风险;(4)可耐受植皮修复手术者,具有 VSD 适应证者。排除标准:(1)心、肝、肾等脏器严重功能损害患者;(2)合并凝血功能障碍疾病者;(3)敏感性、感染性疾病者;(4)免疫性疾病者;(5)活动性出血伤口;(6)严重低蛋白血症者;(7)精神障碍病史;(8)哺乳、妊娠期者。按乱数表法分为研究组及对照组。其中对照组 52 例,女性 19 例,男性 33 例,平均烧伤面积(52.87 ± 12.91)%;平均年龄(39.67 ± 5.42)岁;烧伤原因:交通事故燃油烧伤 14 例,化学品烧伤 18 例,燃料爆炸烧伤 10 例,热液烫伤 10 例。研究组 51 例,男性 29 例,女性 22 例,平均烧伤面积(53.12 ± 13.46)%;平均年龄(38.93 ± 4.93)岁;烧伤原因:交通事故燃油烧伤 17 例,化学品烧伤 19 例,燃料爆炸烧伤 8 例,热液烫伤 7 例。两组一般资料比较无差异($P>0.05$),均衡可比。本研究经本院医学伦理委员会批准。

1.2 方法

两组均给予常规治疗:纠正水电解质酸碱平衡紊乱、低蛋白血症及抗感染。在此基础上,对照组予以游离植皮治疗,局部清创,清除异常分泌物及坏死组织,打开死腔并见新鲜肉芽组织,生理盐水、碘伏等冲洗创面,待新鲜组织出血后,采用温盐水纱布和电凝进行创面止血,在腹部或健侧肢体取中厚皮片进行移植,植皮后给予无菌敷料加压包扎。研究组在对照组基础上采用 VSD 技术进一步治疗,根据创面大小及形态裁剪 VSD 敷料。采用酒精纱布消毒创面,将裁剪好后的 VSD 敷料覆盖创面,并用半透性粘贴薄膜覆盖封闭创面,引流管连接负压吸引装置及引流瓶,负压压力 200~300 mmHg,持续吸引 5~7 d 后更换 VSD 敷料及半透性粘贴薄膜。

1.3 观察指标

(1)记录两组平均住院时间、平均换药次数、创面愈合时间。(2)记录两组细菌培养阳性率、首次植皮存活率、创面愈合率。其中创面愈合率=(创面原始面积-创面残余面积)/创面原始面积 $\times 100\%$;细菌培养阳性率:治疗后用无菌器械取约创面肉芽组织,5 mm $\times$ 5 mm 大小,研磨后用无菌生理盐水 1 mL 稀释,平板接种,孵育 1d(37℃ 环境下),观察细菌培养阳性情况。首次植皮存活率:植皮成活面积/创面原始面积 $\times 100\%$ 。(3)记录两组并发症发生情况。(4)分别于治疗前后采集两组患者空腹静脉血 5 mL,3200 r/min 离心 8 min,离心半径 12 cm,检测血清白介素-6(IL-6)、C 反应蛋白(CRP)、肿瘤坏死因子- α (TNF- α)以及 5-羟色胺(5-HT)、脑内神经肽(NPY)、前列腺素 E2(PGE2)水平,检测过程中所用试剂盒购自武汉华美生物工程有限公司。

1.4 统计学方法

所有数据应用 SPSS 22.0 统计学软件进行分析,其中创面愈合时间、住院时间及血清指标等计量资料以($\bar{x} \pm s$)表示,实施 t 检验,计数资料以率表示,实施 χ^2 检验, $\alpha=0.05$ 为检验水准。

2 结果

2.1 两组平均换药次数、平均住院时间、创面愈合时间比较

研究组平均换药次数少于对照组,平均住院时间、创面愈合时间短于对照组($P<0.05$);详见表 1。

表 1 两组平均换药次数、平均住院时间、创面愈合时间比较($\bar{x} \pm s$)

Table 1 Comparison of average dressing change times, average hospitalization time and wound healing time between the two groups($\bar{x} \pm s$)

Groups	Average dressing change times(times)	Average hospitalization time(d)	Wound healing time(d)
Control group(n=52)	7.88 $\pm$ 1.37	32.81 $\pm$ 4.34	27.69 $\pm$ 2.31
Study group(n=51)	3.74 $\pm$ 0.56	24.13 $\pm$ 3.22	21.23 $\pm$ 2.26
t	9.825	16.731	13.427
P	0.000	0.000	0.000

2.2 两组细菌培养阳性率、首次植皮存活率、创面愈合率比较

研究组细菌培养阳性率低于对照组,首次植皮存活率、创面愈合率均高于对照组($P<0.05$);详见表 2。

2.3 两组炎症因子水平比较

治疗前,两组 IL-6、CRP、TNF- α 水平对比未见差异($P>0.05$);两组治疗后 IL-6、TNF- α 、CRP 水平较治疗前下降,且研究

组较对照组低($P<0.05$);详见表 3。

2.4 两组疼痛介质水平比较

治疗前,两组疼痛介质水平对比未见差异($P>0.05$);两组治疗后 5-HT、PGE2、NPY 水平较治疗前下降,且研究组较对照组低($P<0.05$);详见表 4。

表 2 两组细菌培养阳性率、首次植皮存活率、创面愈合率比较

Table 2 Comparison of bacterial culture positive rate, first skin graft survival rate and wound healing rate between the two groups

Groups	Bacterial culture positive rate(%)	First skin graft survival rate(%)	Wound healing rate(%)
Control group(n=52)	55.77	72.81± 4.34	77.69± 4.31
Study group(n=51)	35.29	86.13± 3.22	91.23± 3.26
χ^2/t	4.351	16.435	20.841
<i>P</i>	0.037	0.000	0.000

表 3 两组炎症因子水平比较($\bar{x} \pm s$)Table 3 Comparison of inflammatory factors between the two groups($\bar{x} \pm s$)

Groups	IL-6(pg/mL)		CRP(mg/L)		TNF- α (μ g/L)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control group(n=52)	354.22± 31.76	215.98± 24.62*	37.99± 4.31	29.84± 4.29*	7.85± 1.49	4.93± 0.76*
Study group(n=51)	353.14± 32.57	137.73± 22.51*	38.13± 5.38	20.17± 3.25*	7.79± 1.35	2.92± 0.48*
<i>t</i>	0.170	16.825	0.146	12.734	0.214	16.012
<i>P</i>	0.895	0.000	0.881	0.000	0.831	0.000

Note: compared with before treatment, **P*<0.05.

表 4 两组疼痛介质水平比较($\bar{x} \pm s$)Table 4 Comparison of pain mediators between the two groups($\bar{x} \pm s$)

Groups	5-HT(ng/L)		NPY(μ g/L)		PGE2(pg/mL)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control group(n=52)	226.13± 19.44	134.27± 21.35*	235.98± 23.97	178.78± 18.95*	228.24± 21.82	165.91± 17.86*
Study group(n=51)	225.16± 17.35	92.48± 19.42*	234.06± 21.74	136.19± 15.72*	229.18± 23.79	132.49± 15.62*
<i>t</i>	0.267	10.386	0.426	12.402	0.209	10.101
<i>P</i>	0.790	0.000	0.000	0.673	0.000	0.835

Note: compared with before treatment, **P*<0.05.

2.5 两组并发症发生率比较

21.15%(11/52)(*P*<0.05), 详见表 5。

研究组的并发症发生率为 5.88%(3/51), 低于对照组的

表 5 两组并发症发生率比较 例(%)

Table 5 Comparison of the incidence of complications between the two groups n(%)

Groups	Postoperative infection	Hematoma and effusion	Skin graft displacement	Total incidence rate
Control group(n=52)	5(9.62)	3(5.77)	3(5.77)	11(21.15)
Study group(n=51)	1(1.96)	1(1.96)	1(1.96)	3(5.88)
χ^2				5.113
<i>P</i>				0.024

3 讨论

深度烧伤后由于皮肤屏障功能遭到破坏, 体液与血液大量丢失, 免疫力下降, 患者极易出现全身炎症反应^[9,10], 同时创面渗出大量组织液以及坏死的组织, 有利于细菌生长繁殖, 导致血管内皮细胞遭到破坏, 凝血系统被激活, 引起血栓形成, 甚至引发多器官衰竭, 加重病情^[11-13]。据以往报道统计结果显示^[12], 烧伤死亡病例中约有 50%~70% 的患者死于烧伤感染, 而烧伤

感染的主要途径则在于创面, 创面的恢复程度与烧伤患者的安危息息相关。深度烧伤患者的组织缺损严重, 常规的手术治疗难以治愈, 临床多行植皮治疗^[13]。但因患者局部损伤严重, 易引发感染, 降低植皮成活率。VSD 将医用泡沫作为负压区域, 使负压在经过引流管时在医用材料表面均匀分布, 常用于处理复杂创面及深部引流^[14-16]。

本次研究结果显示, 研究组的创面愈合率、平均住院时间、首次植皮存活率、平均换药次数、创面愈合时间、细菌培养阳性

率均优于对照组,提示深度烧伤创面采用游离植皮联合 VSD 技术修复可进一步提高创面修复效果。可能与 VSD 以下几个优点有关:VSD 所营造的负压封闭环境能改善局部血流状况,促进机体微循环,加快受损组织皮肤的再生,保证了皮片存活、组织愈合所需的营养成份,缩短创面愈合时间,提高创面愈合率,利于患者早日恢复出院^[17-19]。患者烧伤创面常被病原菌所感染,而 VSD 技术所采用的封闭环境,可阻隔创面与外界病原菌的接触,并保持局部环境持续湿润,将局部组织代谢的酸性产物及渗液及时的进行引流,从而降低了病原菌的感染机率,降低细菌培养阳性率^[20-22]。VSD 可激发创面组织的修复因子大量分泌,保护创面形成的胶原成分,提高首次植皮存活率^[23]。频繁的换药会加重患者身体疼痛和经济负担,同时也会增加感染风险,VSD 技术可减少平均换药次数,避免了反复换药带来的潜在感染及不便^[24,25]。此外,烧伤创面可诱发机体产生各种炎症反应,IL-6、CRP、TNF- α 均是炎症反应过程中较为重要的细胞因子,其水平分泌增多,可调控机体发生水肿和组织损伤等病理过程,上述炎症因子还可通过刺激交感-肾上腺髓质系统以及肾素-血管紧张素系统引起外周血管收缩。本研究中游离植皮联合 VSD 技术修复可有效减轻机体炎症反应,而创面是炎症反应最重部位,VSD 技术可通过加强创面的引流来使局部或全身的炎症反应得以调节^[26]。5-HT 为重要的疼痛介质,其具有促进血小板生成的作用,导致局部组织水肿,刺激伤害性感受器,痛觉产生^[27]。PGE2 可促进炎症反应,加快痛觉在脊髓中的传导,加剧疼痛^[28]。NPY 可促进细胞膜去极化,提高血管及毛细血管的兴奋性,导致疼痛。相对于单纯的游离植皮,游离植皮联合 VSD 技术修复可有效抑制疼痛介质生成,有效缓解患者疼痛^[29]。主要是因为 VSD 技术可以做到及时地、持续 24 h 不间断地将组织渗出及坏死物清理,改善局部微循环及血流状态,减轻患者痛苦^[30]。另研究组并发症低于对照组,提示 VSD 可为游离植皮存活打下良好的基础,使植皮与创面始终贴合,皮片移位概率更小,降低并发症发生风险。

综上所述,深度烧伤创面采用游离植皮联合 VSD 技术修复疗效显著,可有效促进创面愈合,降低并发症发生风险,降低炎症因子及疼痛介质水平。

参考文献(References)

- [1] 严伟恒, 靳媛媛, 王宽, 等. 烧伤早期伴发脓毒症患者血清 PCT、hs-CRP、COR 及 WBC 的动态变化及临床意义 [J]. 现代生物医学进展, 2020, 20(4): 760-763, 697
- [2] Hall C, Hardin C, Corkins CJ, et al. Pathophysiologic Mechanisms and Current Treatments for Cutaneous Sequelae of Burn Wounds [J]. Compr Physiol, 2017, 8(1): 371-405
- [3] Griggs C, Goverman J, Bittner EA, et al. Sedation and Pain Management in Burn Patients[J]. Clin Plast Surg, 2017, 44(3): 535-540
- [4] Zuo KJ, Medina A, Tredget EE. Important Developments in Burn Care [J]. Plast Reconstr Surg, 2017, 139(1): 120e-138e
- [5] Bi H, Khan M, Li J, et al. Use of Incisional Negative Pressure Wound Therapy in Skin-Containing Free Tissue Transfer [J]. J Reconstr Microsurg, 2018, 34(3): 200-205
- [6] Yang X, Fang Z, Liu M, et al. Reconstruction of Deep Burn Wounds Around the Ankle With Free Fascia Flaps Transfer and Split-Thickness Skin Graft[J]. J Burn Care Res, 2019, 40(6): 763-768

- [7] Huang Q, Wang JT, Gu HC, et al. Comparison of Vacuum Sealing Drainage and Traditional Therapy for Treatment of Diabetic Foot Ulcers: A Meta-Analysis[J]. J Foot Ankle Surg, 2019, 58(5): 954-958
- [8] 唐强, 黄志群, 陆钢, 等. 再生医疗技术对深 II 度烧伤患者的炎症因子水平及创面愈合的影响[J]. 中国美容医学, 2020, 29(4): 94-97
- [9] 周忠志, 黄新灵. 重组人表皮生长因子凝胶联合纳米银敷料对深 II 度烧伤患者创面总体细菌培养阳性率及愈合时间的影响[J]. 中国地方病防治杂志, 2017, 32(12): 1400
- [10] Gacto-Sanchez P. Surgical treatment and management of the severely burn patient: Review and update [J]. Med Intensiva, 2017, 41 (6): 356-364
- [11] Oryan A, Alemzadeh E, Moshiri A. Burn wound healing: present concepts, treatment strategies and future directions[J]. J Wound Care, 2017, 26(1): 5-19
- [12] 贾媛, 赵华兴, 李行, 等. 烧伤患者创面感染的研究进展[J]. 临床与病理杂志, 2019, 39(3): 634-639
- [13] Williams FN, Herndon DN. Metabolic and Endocrine Considerations After Burn Injury[J]. Clin Plast Surg, 2017, 44(3): 541-553
- [14] 郭振荣. 我国大面积深度烧伤创面处理的进展[J]. 中华烧伤杂志, 2000, 16(1): 11
- [15] Wischmeyer PE. Glutamine in Burn Injury[J]. Nutr Clin Pract, 2019, 34(5): 681-687
- [16] Li Y, Li PY, Sun SJ, et al. Chinese Trauma Surgeon Association for management guidelines of vacuum sealing drainage application in abdominal surgeries-Update and systematic review [J]. Chin J Traumatol, 2019, 22(1): 1-11
- [17] Chen X, Liu L, Nie W, et al. Vacuum Sealing Drainage Therapy for Refractory Infectious Wound on 16 Renal Transplant Recipients[J]. Transplant Proc, 2018, 50(8): 2479-2484
- [18] Lv Z, Yu L, Wang Q, et al. Dermal regeneration template and vacuum sealing drainage for treatment of traumatic degloving injuries of upper extremity in a single-stage procedure [J]. ANZ J Surg, 2019, 89(7-8): 950-954
- [19] 成鑫, 汤俊. 新型生物敷料结合 VSD 对 II 度烧伤创面恢复及炎症反应的影响[J]. 药物生物技术, 2020, 27(1): 52-55
- [20] Zhang F, Gu Y, Wu L. Skin-stretching device promotes the treatment effect of vacuum sealing drainage technique on phases III and IV stress-induced injuries in aged patients with chronic critical illness: A retrospective study of 70 patients[J]. Medicine (Baltimore), 2019, 98 (47): e18027
- [21] Niu XF, Yi JH, Zha GQ, et al. Vacuum sealing drainage as a pre-surgical adjunct in the treatment of complex (open) hand injuries: Report of 17 cases[J]. Orthop Traumatol Surg Res, 2017, 103(3): 461-464
- [22] Wang HD, Zhu XF, Xu X, et al. Emphysematous Pyelonephritis Treated with Vacuum Sealing Drainage[J]. Chin Med J (Engl), 2017, 130(2): 247-248
- [23] Chen M, Yang H, Wang F, et al. Vacuum sealing drainage: A novel treatment method for primary cutaneous Mycobacterium intracellulare infection [J]. Indian J Dermatol Venereol Leprol, 2019, 85(6): 605-608
- [24] Gao X, Yin H, Sun J. Preoperative irrigation and vacuum sealing drainage with antibiotic-containing drainage fluid of foot and ankle wounds improves outcome of reconstructive skin flap surgery [J]. J Orthop Surg Res, 2019, 14(1): 374

- tinctive?[J]. Allergy Asthma Immunol Res, 2020, 12(3): 443-453
- [14] Guo XJ, Wang YY, Zhang HY, et al. Mast cell tryptase and carboxypeptidase A expression in body fluid and gastrointestinal tract associated with drug-related fatal anaphylaxis [J]. World J Gastroenterol, 2015, 21(47): 13288-13293
- [15] Desai A, Sowerwine K, Liu Y, et al. GATA-2-deficient mast cells limit IgE-mediated immediate hypersensitivity reactions in human subjects[J]. J Allergy Clin Immunol, 2019, 144(2): 613-617
- [16] Galli SJ. Recruiting CD33 on mast cells to inhibit IgE-mediated mast cell-dependent anaphylaxis[J]. J Clin Invest, 2019, 129(3): 955-957
- [17] Delgado SJ, Dehmel S, Twisterling E, et al. Disruptive anti-IgE inhibitors prevent mast cell-dependent early airway response in viable atopic lung tissue[J]. J Allergy Clin Immunol, 2020, 145(2): 719-722
- [18] Kurano M, Yatomi Y. Sphingosine 1-Phosphate and Atherosclerosis [J]. J Atheroscler Thromb, 2018, 25(1): 16-26
- [19] Spiegel S. Sphingosine-1-phosphate: From insipid lipid to a key regulator[J]. J Biol Chem, 2020, 295(10): 3371-3384
- [20] Grujic M, Paivandy A, Gustafson AM, et al. Modulation of sphingosine-1-phosphate in ulcerative colitis[J]. Expert Opin Biol Ther, 2020, 20(4): 413-420
- [21] 许惠娟, 宋梅, 林钊钊. 支气管哮喘患者血清中 IL-33、S1P 的水平及其临床意义[J]. 中国医药导报, 2019, 16(16): 87-90
- [22] Bryan AM, Del Poeta M. Sphingosine-1-phosphate receptors and innate immunity[J]. Cell Microbiol, 2018, 20(5): e12836
- [23] 赵蕴伟, 徐意芹, 李爽, 等. 哮喘发作期血清 S1P 水平对哮喘患者病情严重程度评估价值 [J]. 中华危重病急救医学, 2017, 29(9): 794-798
- [24] Kim SH. Sphingosine-1-Phosphate: Biomarker, Contributor, or Target for Asthma?[J]. Allergy Asthma Immunol Res, 2019, 11(3): 299-301
- [25] 刘菊满, 吴锐剑, 陈银慧, 等. β -catenin 信号通路在支气管哮喘发生发展中作用及机制的研究进展 [J]. 山东医药, 2020, 60(1): 101-105
- [26] Zastrzeżyńska W, Przybyszowski M, Bazan-Socha S, et al. Omalizumab may decrease the thickness of the reticular basement membrane and fibronectin deposit in the bronchial mucosa of severe allergic asthmatics[J]. J Asthma, 2019, 23: 1-10
- [27] 王青, 常小红. 支气管哮喘与免疫球蛋白 [J]. 临床荟萃, 2018, 33(11): 1005-1007, 1012
- [28] Lee DCP, Tay NQ, Thian M, et al. Prior exposure to inhaled allergen enhances anti-viral immunity and T cell priming by dendritic cells[J]. PLoS One, 2018, 13(1): e0190063
- [29] Zhou P, Wu T, Jin X, et al. Fc γ RIIIA Negatively Impacts Humoral Immune Responses but Not Overall Lung Inflammation in an Ovalbumin-Induced Allergic Asthma Mouse Model [J]. Int Arch Allergy Immunol, 2018, 176(1): 61-73
- [30] 闫红倩, 耿立梅, 任虹, 等. 综合外治法对支气管哮喘慢性持续期患者 γ 干扰素、白细胞介素 4、白细胞介素 17、免疫球蛋白 E 及嗜酸性粒细胞计数的影响和作用机制研究[J]. 河北中医, 2019, 41(5): 667-672, 678

(上接第 3878 页)

- [25] Lv Z, Yu L, Fu L, et al. Revision surgery with dermal regeneration template and vacuum sealing drainage for reconstruction of complex wounds following necrosis of reattached avulsed skins in a degloving injury: A case report[J]. Medicine (Baltimore), 2019, 98(23): e15864
- [26] Tan L, Hou Z, Gao Y. Efficacy of combined treatment with vacuum sealing drainage and recombinant human epidermal growth factor for refractory wounds in the extremities and its effect on serum levels of IL-6, TNF- α and IL-2[J]. Exp Ther Med, 2018, 15(1): 288-294
- [27] 陈俊明, 王涵, 王洪学, 等. 5-HT₃ 受体拮抗剂联合地塞米松预防化疗所致恶心呕吐的临床疗效 [J]. 中国癌症防治杂志, 2020, 12(2): 211-216
- [28] 陈建安, 李德富, 袁良, 等. PGE₂/EP 信号通路在肺部疾病中作用的研究进展[J]. 国际呼吸杂志, 2020, 40(12): 944-949
- [29] Qiu Y, Li Y, Gao B, et al. Therapeutic efficacy of vacuum sealing drainage-assisted irrigation in patients with severe multiple-space infections in the oral, maxillofacial, and cervical regions [J]. J Craniofac Surg, 2019, 47(5): 837-841
- [30] Yang F, Shi B, Cao L. Effect of vacuum sealing drainage on the expression of VEGF and miRNA-17-5p in seawater-immersed blast-injury wounds[J]. Exp Ther Med, 2017, 13(3): 1081-1086