

# 胃肠肿瘤患者血糖水平及炎症反应的相关性研究

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**【摘要】** 目的 探讨高血糖对胃肠肿瘤患者术后炎症反应的影响, 分析患者术后发生感染的危险因素。方法 回顾性分析 2021 年 1 月至 2023 年 12 月行胃肠肿瘤手术的患者 100 例, 根据患者术前血糖水平分为高血糖组(53 例)和正常血糖组(47 例)。比较两组患者一般临床资料、术前术后 C 反应蛋白(CRP)水平、免疫细胞水平及术后感染情况, 采用多因素 Logistic 回归模型分析术后感染的危险因素。**结果** 两组患者体重指数、术后 CRP 水平、术后单核细胞/淋巴细胞比值(MRL)、术后感染率方面差异均有统计学意义( $P$  均  $< 0.05$ ); 高血糖组患者术后 CRP 水平较正常血糖组明显升高( $P < 0.001$ ); 高血糖组患者术后 MRL 值显著高于正常血糖组( $P < 0.001$ )。是否发生术后感染、两组间总住院天数、术后住院天数、术前单核细胞值、术后 MRL 值与是否发生吻合口瘘比较, 差异有统计学意义( $P$  均  $< 0.05$ )。多因素 logistic 回归分析显示, 术后 MRL 是患者发生术后感染的独立危险因素( $P < 0.05$ )。**结论** 术前高血糖胃肠肿瘤患者术后 CRP 水平、MRL 值明显增高, 高血糖组患者术后感染发生率高于正常血糖组, 术后 MRL 是患者发生术后感染的独立危险因素。

**【关键词】** 血糖; 胃肠肿瘤; 炎症反应; 免疫细胞

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**Study on the correlation between blood sugar levels and inflammatory response in patients with gastrointestinal tumors** ZHANG Hong-yan<sup>1,2</sup>, DING Xuan-yin<sup>3,4</sup>, LEI Qian<sup>1,3</sup> 1. School of Clinical Medicine, Southwest Medical University, Luzhou 646000, China; 2. Department of Anesthesiology, Chengdu Wenjiang District People's Hospital, Chengdu 610000, China; 3. Sichuan Academy of Medical Sciences & Sichuan Provincial People's Hospital (Affiliated Hospital of University of Electronic Science and Technology of China), Chengdu 610072, China; 4. Department of Anesthesiology, Zigong Fourth People's Hospital, Zigong 643000, China

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**【Abstract】** **Objective** To explore the effect of hyperglycaemia on postoperative inflammatory response in patients with gastrointestinal tumours, and to investigate the risk factors of postoperative infection in these patients. **Methods** One hundred patients who underwent gastrointestinal tumour surgery from January 2021 to December 2023 were retrospectively analyzed. The patients were divided into a hyperglycaemia group ( $n=53$ ) and a normoglycaemia group ( $n=47$ ) according to their preoperative blood glucose levels. General clinical data, CRP levels before and after, immune cell levels and postoperative infections were compared between the two groups. Multivariate logistic regression model was used to analyze the risk factors of postoperative infection. **Results** There were significant differences in body mass index (BMI), postoperative CRP level, monocyte lymphocyte ratio (MLR) value, and postoperative infection rate between the two groups (all  $P < 0.05$ ). The postoperative CRP level of the hyperglycaemic group was significantly higher than that of the normoglycaemic group ( $P < 0.001$ ). The postoperative MLR value of the hyperglycaemia group was significantly higher than that of the normoglycaemia group ( $P < 0.001$ ). There were significant differences in total hospitalization days, postoperative hospitalization days, mononuclear cell values before operation, MLR values after operation and occurrence of anastomotic leakage between the two groups (all  $P < 0.05$ ). Multivariate logistic regression analysis showed that postoperative MLR was an independent risk factor for postoperative infection in the patients ( $P < 0.05$ ). **Conclusions** Postoperative CRP level and MLR value are significantly higher in patients with gastrointestinal tumors and preoperative hyperglycaemia. The incidence of postoperative infections is higher in the hyperglycaemic group than that in the normoglycaemic group. Postoperative MLR is an independent risk factor for postoperative infections in the patients.

**【Key words】** Blood glucose; Gastrointestinal tumor; Inflammatory response; Immune cells

糖尿病已成为严重威胁全球人类健康的一大疾病, 据统计 2021 年全球约有 5.36 亿人患有糖尿病, 其中 2 型糖尿病占糖尿病的 90%, 2 型糖尿病是导致残疾和死亡的主要原因之一<sup>[1]</sup>。2 型糖尿病是一种慢性炎症, 由胰岛素抵抗增加和葡萄糖代谢紊

乱引起<sup>[2]</sup>, 白细胞以及高敏 C 反应蛋白 (high-sensitivity C-reactive protein, hsCRP) 作为炎症标志物, 已被证明和糖尿病患者慢性炎症密切相关<sup>[1, 3]</sup>, 其中单核细胞/淋巴细胞比值 (monocyte to lymphocyte ratio, MLR)、中性粒细胞/淋巴细胞比值 (Neutrophil to lymphocyte ratio, NLR) 作为新型炎症标志物, 对糖尿病视网膜病变<sup>[4]</sup>、糖尿病动脉硬化<sup>[5]</sup> 等慢性炎症均有预测价值。而 CRP (C-reactive protein, CRP)

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作为一种急性炎症相关的敏感度较高的生物标志物,当感染早期、应激刺激或创伤时其表达水平会迅速上升,通常与患者感染严重程度呈正相关,糖尿病患者机体免疫功能下降,手术后更易发生感染,有研究报道 CRP 在糖尿病患者行胃癌及根治性直肠癌手术后对患者感染的预测作用<sup>[6,7]</sup>,但目前尚无 MLR、NLR 与糖尿病患者手术后急性感染的相关研究报道。本研究通过探讨血糖与胃肠肿瘤患者术后 CRP、MLR、NLR、术后感染之间的潜在关联,并分析本研究患者术后发生感染的危险因素,以期为临床诊疗提供理论支持,为胃肠道肿瘤患者术后感染的诊治及预防提供新的思路。

## 1 资料与方法

**1.1 一般资料** 回顾性分析 2021 年 1 月至 2023 年 12 月在成都市温江区人民医院行胃肠肿瘤手术的 100 例患者。纳入标准:①行胃肠道肿瘤手术;②

ASA 分级 I~III 级;③年龄 18~90 岁;④病史资料齐全。排除标准:①病史资料不完整或缺失的患者;②术前 2 周有感染病史的患者;③术后出现严重并发症或其他影响炎症反应的情况;④伴有严重心脑血管疾病及多器官功能衰竭;⑤I 型糖尿病患者;⑥两种及以上原发肿瘤的患者。共纳入 100 例患者,根据患者术前空腹血糖 $>7.0$  mmol/L 或空腹血糖 $6.1\sim7.0$  mmol/L 但糖化血红蛋白 $>6.0\%$  分为高血糖组(H 组 53 例),术前空腹血糖 $<6.1$  mmol/L 或空腹血糖 $6.1\sim7.0$  mmol/L 但糖化血红蛋白 $<6\%$  为正常血糖组(N 组 47 例)。两组患者在性别、年龄、住院时间、手术时间及尿量情况比较,差异均无统计学意义( $P$  均 $>0.05$ );两组患者术前空腹血糖及糖化血红蛋白差异明显( $P$  均 $<0.001$ );H 组患者 BMI 较 N 组高( $P<0.05$ )。见表 1。

表 1 N 组与 H 组一般资料比较

指标	总计( $n=100$ )	N 组( $n=47$ )	H 组( $n=53$ )	统计量	$P$
年龄(岁)	65.78 ± 12.12	64.02 ± 12.41	67.34 ± 11.74	$t=-1.37$	0.173
性别[ $n$ (%)]				$\chi^2=0.47$	0.493
	男	27 (57.45)	34 (64.15)		
	女	39 (39.00)	20 (42.55)		
BMI( $\text{kg}/\text{m}^2$ )	23.42 ± 3.89	22.56 ± 3.90	24.19 ± 3.76	$t=-2.12$	0.036
空腹血糖(mmol/L)	6.46 (5.29,7.88)	5.25 (5.01,5.83)	7.76 (7.14,9.34)	$Z=-7.89$	$<0.001$
糖化血红蛋白(%)	6.25 (5.97,6.72)	5.94 (5.61,5.97)	6.40 (6.05,6.90)	$Z=-3.40$	$<0.001$
2 型糖尿病[ $n$ (%)]	24(24)	0(0)	24(45.3)	-	$<0.001$
高血压[ $n$ (%)]	35(35)	13(27.2)	22(41.5)	-	0.147
手术时长(min)	245.22 ± 79.17	247.87 ± 79.23	242.87 ± 79.79	$t=0.31$	0.754
手术方式[ $n$ (%)]					
	腹腔镜	44 (93.62)	50 (94.34)	-	1.000
	开腹	4 (4.00)	2 (3.77)		
	腹腔镜中转开腹	2 (2.00)	1 (2.13)		
尿量(ml)	461.00±581.60	441.49±265.05	478.30±762.37	$t=-0.31$	0.206
ASA 分级[ $n$ (%)]				$\chi^2=6.76$	0.009
	II 级	35 (74.47)	26 (49.06)		
	III 级	12 (25.53)	27 (50.94)		

**1.2 方法** 通过查阅我院电子病历系统,收集两组患者性别、年龄、体质指数 (body mass index, BMI)、住院天数、术前空腹静脉血糖测量值、麻醉记录单、检验科术前术后免疫细胞(中性粒细胞、淋巴细胞及单核细胞)、CRP 等检验结果及患者术后并发症情况。术后并发症包括手术切口感染、肺部感染、尿路感染、吻合口瘘等情况。

**1.3 统计学方法** 本研究采用 SPSS 27.0 软件进行统计学分析。符合正态分布的连续数据采用均数±标准差表示,组间比较采用独立样本  $t$  检验,若不符合正态分布,采用中位数(Q1, Q3)表示,组间进行非参数检验分析(Mann-Whitney 检验)。计数

资料以例数(%)表示,采用 $\chi^2$  检验或 Fisher 精确检验。将单因素 Logistic 回归分析中有统计学差异的变量,进一步纳入多因素 Logistic 回归分析,采用 Forward LR 法筛选胃肠肿瘤患者发生术后感染的危险因素。 $P<0.05$  为差异有统计学意义。

## 2 结果

**2.1 两组患者术前术后 CRP 及免疫细胞比较** H 组患者术后 CRP 较 N 组明显增高( $P<0.001$ )。H 组患者术后 MRL 值显著高于 N 组( $P<0.001$ )。两组患者术前免疫细胞、术前 CRP 及术后各类免疫细胞数值比较,差异均无统计学意义( $P$  均 $>0.05$ )。见表 2。

表 2 N 组与 H 组术前术后炎症相关检验结果

指标		N 组(n=47)	H 组(n=53)	统计量	P
白细胞( $\times 10^9/L$ )	术前	5.75 $\pm$ 2.07	6.41 $\pm$ 2.42	$t=-1.44$	0.436
	术后	11.04 $\pm$ 4.25	11.78 $\pm$ 4.25	$t=-0.87$	0.385
中性粒细胞( $\times 10^9/L$ )	术前	3.80 $\pm$ 1.75	4.41 $\pm$ 2.34	$t=-1.42$	0.218
	术后	9.20 $\pm$ 4.01	9.71 $\pm$ 3.97	$t=-0.64$	0.522
淋巴细胞( $\times 10^9/L$ )	术前	1.31 $\pm$ 0.43	1.32 $\pm$ 0.46	$t=-0.05$	0.959
	术后	1.20 $\pm$ 0.66	1.35 $\pm$ 0.69	$t=-1.07$	0.44
单核细胞( $\times 10^9/L$ )	术前	0.41(0.30,0.51)	0.45(0.35,0.60)	$Z=-1.64$	0.102
	术后	0.50(0.35,0.71)	0.63(0.41,0.78)	$Z=-1.62$	0.105
hsCRP(mg/L)	术前	1.10(0.50,3.40)	1.60(0.78,5.00)	$Z=-1.23$	0.219
	术后	3.00(1.40,5.00)	5.00(2.40,5.00)	$Z=-2.80$	0.005
CRP(mg/L)	术前	5.00(5.00,5.00)	5.00(5.00,8.05)	$Z=-1.50$	0.133
	术后	5.00(5.00,10.95)	20.70(5.00,54.70)	$Z=-3.91$	<0.001
MRL	术前	0.35 $\pm$ 0.11	0.43 $\pm$ 0.25	$t=-2.01$	0.002
	术后	0.47 $\pm$ 0.22	0.65 $\pm$ 0.59	$t=-1.89$	<0.001

2.2 两组患者术后并发症比较 H 组术后感染发生率(包括肺部感染或尿路感染或切口感染)显著高于 N 组( $P<0.05$ )。见表 3。

表 3 N 组与 H 组术后并发症的比较 [n(%)]

指标	总计(n=100)	N 组(n=47)	H 组(n=53)	$\chi^2$	P
伤口感染	2(2.00)	0(0.00)	2(3.77)	-	0.497
吻合口瘘	4(4.00)	2(4.26)	2(3.77)	0.00	1.000
肺部感染	15(15.00)	5(10.64)	10(18.87)	1.32	0.250
尿路感染	4(4.00)	0(0.00)	4(7.55)	1.99	0.158
肺部感染或泌尿感染或伤口感染	20(20.00)	5(10.64)	15(28.30)	4.86	0.028

2.3 术后感染多因素 Logistic 回归分析 高血糖组患者术后 MRL 值明显高于正常组,多因素 Logistic 回归分析结果显示,术后 MRL 是患者发生术后感染的独立危险因素( $P<0.05$ ),术后 MRL 含

量每增加一个单位,患者发生术后感染的可能性增加 3.43 倍( $P<0.05$ )。因此高血糖患者术后感染的风险增加。见表 4。

表 4 术后感染的危险因素多因素 Logistic 回归分析

变量	$\beta$	SE	Z	P	OR	95% CI
截距项	-6.56	1.44	-4.56	<0.001	0.00	0.00 ~ 0.02
住院天数	0.17	0.09	1.97	0.048	1.18	1.01 ~ 1.40
术后住院天数	-0.05	0.09	-0.60	0.549	0.95	0.80 ~ 1.13
术前单核细胞	1.85	1.53	1.21	0.227	6.38	0.32 ~ 128.80
术后 MRL	1.23	0.52	2.38	0.017	3.43	1.24 ~ 9.47
吻合口瘘	1.97	1.43	1.37	0.170	7.15	0.43 ~ 118.91

### 3 讨论

3.1 血糖与术后感染 研究报道,腹部手术后感染是发病率和死亡率的主要原因之一,术后感染分为手术部位感染或远处感染<sup>[6]</sup>。糖尿病患者行腹部手术后更易发生感染,包括切口感染(10.5%)<sup>[7]</sup>、以及肺部感染<sup>[8]</sup>(9.67%)、尿路感染(5.8%)<sup>[9]</sup>等远处感染。CRP 是诊断感染较为灵敏的生物指标,

是组织或者器官损伤时,血浆中浓度明显增高的一种急性时相蛋白,由肝细胞合成,可直接或间接参与炎症反应过程<sup>[10,11]</sup>。本研究根据患者术前空腹血糖及糖化血红蛋白水平,将患者分为高血糖组(H 组)及正常血糖组(N 组),结果显示,虽然 H 组与 N 组术后肺部感染率、伤口感染率、尿路感染率无明显差异,但 H 组术后发生肺部感染或切口感染或尿

路感染的总人数与 N 组存在明显差异,且 H 组术后 CRP 显著升高,提示高血糖患者术后感染率明显增高,这可能与长期较高的血糖会影响患者的免疫系统,引起白细胞免疫下降,造成趋化性障碍,吞噬能力降低和杀菌活性降低有关<sup>[12]</sup>,从而使机体容易遭受感染侵害。此外,高血糖提供了一个富含营养物质的内环境,为病原体定植及繁殖创造条件,因而增加感染风险<sup>[13,14]</sup>。此外,H 组术后 MRL 值显著高于 N 组,且 Logistic 回归分析显示术后 MRL 是患者发生术后感染的独立危险因素( $P < 0.05$ ),术后 MRL 含量每增加一个单位,患者发生术后感染的可能性增加 3.43 倍( $P < 0.05$ ),提示血糖水平与术后感染存在明显的相关性,术前高血糖患者,术后发生感染的风险更高。本团队今后将继续扩大样本量进一步研究其相关性与作用机制。

**3.2 术后感染与免疫细胞反应** 感染是引起白细胞病理性升高最常见的原因,一般认为白细胞水平越高,感染越严重,因此白细胞是临床常用作判断感染的重要指标之一。而白细胞中,淋巴细胞、中性粒细胞、单核细胞是具有代表性的亚型。中性粒细胞在机体遭受细菌、病毒、真菌侵害或急性损伤时,在众多趋化因子,如内毒素、白细胞介素(IL)-8、肿瘤坏死因子(TNF)等的作用下,向感染部位迁移,并聚集在感染部位发挥吞噬病原体的作用,同时单核细胞-淋巴细胞反应通常被认为在慢性炎症的微环境中起着重要作用<sup>[15]</sup>,NLR 与中性粒细胞相关,在急性炎症反应中可作为应激的标志<sup>[16,17]</sup>,与炎症反应和生理应激对机体损伤的严重程度及强度相关<sup>[18]</sup>。MLR 值与单核细胞相关,单核细胞募集增多可以连续分泌促炎因子、酶和生长因子,淋巴细胞数目的减少往往表明免疫应答受到抑制<sup>[19,20]</sup>,MRL 值升高提示机体处于慢性炎症或者免疫抑制状态。中性粒细胞/淋巴细胞、单核细胞/淋巴细胞已被报道在多种糖尿病并发症<sup>[4,5]</sup>及胃癌患者手术预后<sup>[21]</sup>中具有重要价值,而本研究发现,术前单核细胞水平、术后 MRL 值与患者术后感染相关,术前单核细胞含量每增加一个单位,患者发生术后感染的可能性增加 17.18 倍;术后 MRL 含量每增加一个单位,患者发生术后感染的可能性增加 2.43 倍,并且术后 MRL 是患者术后感染的独立危险因素,对患者术后感染有良好的预测作用。

综上,术前高血糖胃肠肿瘤患者术后感染率有增加的趋势,高血糖患者术后 CRP 水平、术后 MRL 值显著升高,术后 MRL 是患者术后感染的独立危险因素。因此胃肠肿瘤患者术前控制血糖,可能会降低术后感染率,改善患者的预后,本研究以期为临

床诊疗提供一种新思路。

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# 听神经瘤术后患者误吸风险评估与导引式专项护理的应用研究

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**【摘要】** 目的 通过科学的误吸风险评估体系, 制定个性化的导引式专项护理方案, 并验证其有效性, 以优化听神经瘤术后患者的护理流程, 提升护理质量, 并改善患者的生活质量。方法 选取 2022 年 1 月至 2023 年 12 月我院收治的 150 例听神经瘤术后患者, 采用数字随机表法分为对照组与试验组各 75 例, 对照组实施常规护理, 试验组应用误吸高危评估导引式专项护理。比较两组患者不良事件发生情况、吞咽功能、营养指标。结果 护理后 1 周试验组进食误吸、呛食、吸入性肺炎、呼吸系统感染人数及发生率均少于对照组 ( $P < 0.05$ ); 临床检查、洼田饮水试验及总分均低于对照组 ( $P < 0.05$ ); 血清白蛋白、血红蛋白、铁、锌明显高于对照组 ( $P < 0.05$ )。结论 听神经瘤术后患者误吸风险评估与导引式专项护理的应用研究取得了显著成果, 为听神经瘤术后患者的护理提供了新思路和方法。

**【关键词】** 误吸高危评估; 导引式专项护理; 听神经瘤术后; 误吸风险; 营养管理

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**Application study on aspiration risk assessment and guided special care for patients with acoustic neuroma after surgery** XU Hui-na, LI Ya-rui, LU Feng-rui, REN Nan-nan, ZHANG Lin-cong  
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**【Abstract】 Objective** To improve the quality of care and improve the quality of life in patients with acoustic neuroma after surgery through a scientific aspiration risk assessment system and development of a personalized guided special care plan as well as verification of its effectiveness to optimize the nursing process. **Methods** One hundred and fifty postoperative patients with acoustic neuroma admitted to our hospital from January 2022 to December 2023 were selected. The patients were divided into a control group and an experimental group by using digital random table method, 75 patients in each group. The control group received routine nursing care. The experimental group received specialized nursing care guided by high-risk assessment of aspiration. The occurrence of adverse events, swallowing function and nutritional indicators were compared between the two groups. **Results** One week after nursing, the number and incidence of cases of aspiration, choking, aspiration pneumonia and respiratory infections in the experimental group were lower than those in the control group ( $P < 0.05$ ). The clinical examination, Wadian drinking water test, and total score in the experimental group were all lower than those in the control group ( $P < 0.05$ ). The levels of ALB, Hb, Fe and Zn in the experimental group were significantly higher than those in the control group ( $P < 0.05$ ). **Conclusions** The application research on the risk assessment of aspiration in postoperative patients with acoustic neuroma and guided specialized nursing has achieved significant results. It provides new ideas and methods for the nursing of postoperative patients with acoustic neuroma.

**【Key words】** High risk assessment for aspiration; Guided specialized nursing; Postoperative acoustic neuroma; Risk of aspiration; Nutrition management

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