·临床研究·

非心脏手术老年患者术中输血的影响因素与预后分析

白海燕,张莹,周建玲*
(应急总医院手术室,北京 100028)

【摘 要】 **目的** 探讨影响老年非心脏手术患者术中输血的相关因素,分析术中输血对患者预后的影响。**方法** 回顾性分析2023年6月至2024年6月应急总医院收治的150例老年非心脏手术患者的临床资料,根据其术中是否输血分为输血组(56例)与对照组(94例),采用二元logistic回归模型分析影响老年非心脏手术患者术中输血的相关因素,同时比较输血组与对照组术后感染、急性缺血性损伤及住院时间≥28 d发生率。数据分析采用SPSS 26.0软件,根据数据类型进行卡方检验或t检验。**结果** 以老年非心脏手术患者术中是否输血作为因变量,行二元logistic回归分析结果提示,年龄>79岁(OR=3.313,95%CI 1.466~7.488)、高血压(OR=1.944,95%CI 1.041~3.634)、术前美国麻醉医师协会(ASA)分级Ⅲ~Ⅳ级(OR=6.290,95%CI 1.780~22.225)、术前血红蛋白(Hb)<110 g/L(OR=3.842,95%CI 1.594~9.263)、手术持续时间>4 h(OR=2.408,95%CI 1.171~4.954)、术中出血量>1 500 ml(OR=14.140,95%CI 1.647~121.404)是老年非心脏手术患者术中输血的危险因素(P<0.05)。输血组发生感染比例高于对照组,差异有统计学意义(P<0.05)。**结论** 具有高龄、合并高血压、术前ASA分级Ⅲ~Ⅳ级、术前Hb<110 g/L、手术持续时间>4 h、术中出血量>1 500 ml等因素的老年非心脏手术患者术中输血风险高,且术中出血会增加患者术后感染率。

【关键词】 老年人;非心脏手术;术中输血;预后
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Influencing factors of intraoperative blood transfusion in elderly patients with non-cardiac surgery and prognostic analysis

Bai Haiyan, Zhang Ying, Zhou Jianling*
(Operating Room, Emergency General Hospital, Beijing 100028, China)

【**Abstract**】 **Objective** To investigate the related factors affecting intraoperative blood transfusion in elderly patients undergoing non-cardiac surgery, and to analyze the influence of intraoperative blood transfusion on the prognosis of patients. **Methods** A retrospective study was conducted on 150 elderly patients who underwent non-cardiac surgery in our hospital between June 2023 and June 2024. They were divided into a transfusion group (n=56) and a control group (n=94) based on whether they received intraoperative blood transfusion. Binary logistic regression model was used to identify the factors associated with intraoperative blood transfusion. The incidence of postoperative infection, acute ischemic injury and length of hospital stay ≥28 d were compared between two groups. Statistical analysis was performed using SPSS 26.0, and *Chi*-square test or t test was applied depending on data type. **Results** With intraoperative blood transfusion as the dependent variable, binary logistic regression analysis identified the following risk factors: age >79 years (OR=3.313, 95%CI 1.466-7.488), hypertension (OR=1.944, 95%CI 1.041-3.634), preoperative American Society of Anesthesiologists (ASA) grade Ⅲ-Ⅳ (OR=6.290, 95%CI 1.780-22.225), preoperative hemoglobin (Hb) <110 g/L (OR=3.842, 95%CI 1.594-9.263), operative duration >4 h (OR=2.408, 95%CI 1.171-4.954), and intraoperative blood loss >1 500 ml (OR=14.140, 95%CI 1.647-121.404). The incidence of infection was significantly higher in the transfusion group than in the control group (P<0.05). **Conclusion** Elderly patients undergoing non-cardiac surgery with advanced age, concomitant hypertension, preoperative ASA grade Ⅲ-Ⅳ, preoperative Hb <110 g/L, operative duration >4 h, and intraoperative blood loss >1 500 ml are at high risk for intraoperative blood transfusion. Intraoperative blood transfusion increases the incidence of postoperative infection.

【**Key words**】 aged; non-cardiac surgery; intraoperative blood transfusion; prognosis
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Corresponding author: Zhou Jianling, E-mail: bjry2024@163.com

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通信作者: 周建玲, E-mail: bjry2024@163.com

术中输血可有效改善围术期急性失血症状、提高器官供氧率量、纠正术中贫血。尽管输血在临床中被广泛应用,但随着研究的不断进展,不少学者证实术中输血与多种不良预后相关[1]。同时,血液制品十分珍贵,有效识别术中高危输血风险者,不仅可为临床合理分配血液制品,优化围术期血液管理提供参考,也是制定针对性、个性化围术期管理方案,降低术中输血率的重要前提。老年人生理储备差,术中失血对老年外科手术者所造成的影响尤甚,故临床医师更倾向于对老年患者输血[2]。基于此,本研究利用院内老年非心脏手术者的相关数据资料,对影响老年非心脏手术患者术中输血的相关因素,及术中输血对患者预后的影响进行报道,旨在为临床精准识别术中输血的高危人群提供参考,现将结果报道如下。

1 对象与方法

1.1 研究对象

回顾性分析 2023 年 6 月至 2024 年 6 月应急总医院收治的 150 例老年非心脏手术患者的临床资料,根据其术中是否输血分为输血组(56 例)与对照组(94 例)。(1)纳入标准:年龄≥60 岁;行非心脏外科手术治疗;术中采取全身或硬膜外麻醉;临床、手术及麻醉记录资料完整。(2)排除标准:单纯介入手术或有创操作;重要信息记录不全;严重合并症。样本量的选取:logistic 回归分析样本量一般为自变量个数的 5~10 倍,本研究拟分析老年非心脏手术者术中输血的影响因素有 29 项,故样本量在 145~290 之间,考虑到院内实际情况,最终纳入 150 例患者。本研究方案经应急总医院伦理委员会批准(批准文号:K25-50)。所有受试者均在入组前签署书面知情同意书。研究符合《赫尔辛基宣言》。

1.2 方法

1.2.1 收集资料 根据临床经验及相关文献[3,4],收集以下可能影响术中输血的相关因素。(1)人口学及一般临床资料:包括年龄、性别、身高、体质量、体质量指数(body mass index, BMI)、基础性疾病、既往输血史、既往手术史、吸烟史、饮酒史、过敏史、长期用药史[用药时间≥3 个月即可认为存在长期用药史,用药类型包括血管紧张素转换酶抑制剂/血管紧张素受体阻滞剂(angiotensin-converting enzyme inhibitors/angiotensin receptor blockers, ACEI/ARB)、β-受体阻滞剂(β-receptor blacker, β-RB)、利尿剂、钙通道阻滞剂、他汀类药物、胰岛素制剂等]、血型。(2)术前资料:包括术前美国麻醉医师协会(American Society of Anesthesiologists, ASA)分级、术前血红蛋白(hemoglobin, Hb)、白蛋白(albumin, Alb)、血小板计数(platelet, PLT)、凝血酶原时间(prothombin time, PT)、活化部分凝血活酶时间(activited partial thomboplastin time, APTT)、国际标准化比值(international normalizedratio, INR)。(3)本次手术信息:包括手术科室、手术分级(1~2 级,3~4 级)、手术时机(急诊/择期)、日间/非日间手术、手术持续时间、术中出血量、手术切口类别(0~1 类,2~3 类)。

1.2.2 记录预后情况 收集患者预后相关资料,包括术后感染、急性缺血性损伤(包括急性肾损伤、急性心肌梗死、脑梗死等)及住院时间≥28 d 情况。

1.3 统计学处理

采用 SPSS 26.0 统计学软件进行数据分析。计数资料采用例数(百分率)表示,组间比较采用 χ^2 检验,对 1<理论频数<5 的四格表计数资料进行连续矫正卡方检验;计量资料采用均值±标准差($\bar{x}\pm s$)表示,组间比较采用独立样本 t 检验。将单因素分析有意义的变量作为自变量,采用二元 logistic 回归模型分析影响老年非心脏手术患者术中输血的危险因素。$P<0.05$ 为差异有统计学意义。

2 结 果

2.1 老年非心脏手术术中输血单因素分析

输血组患者年龄>79 岁、合并高血压、术前 ASA 分级Ⅲ~Ⅳ级、术前 Hb<110 g/L、术前 Alb<35 g/L、手术持续时间>4 h、术中出血量>1 500 ml、术前 INP 水平高于对照组,术前 PLT 水平低于对照组,差异均有统计学意义($P<0.05$;表 1)。

2.2 影响老年非心脏手术术中输血的二元 logistic 回归分析

以老年非心脏手术者术中是否输血作为因变量(未输血=0,输血=1),单因素分析中有意义的指标作为自变量,赋值说明:年龄(X1,60~79 岁=0,>79 岁=1)、高血压(X2,否=0,是=1)、术前 ASA 分级(X3,Ⅰ~Ⅱ级=0,Ⅲ~Ⅳ级=1)、术前 Hb(X4,≥110 g/L=0,<110 g/L=1)、术前 Alb(X5,≥35 g/L=0,<35 g/L=1)、术前 PLT 水平(X6,实际值录入)、术前 INR 水平(X7,实际值录入)、手术持续时间(X8,≤2 h=1,2~4 h=2,>4 h=3)、术中出血量(X9,<500 ml=1,500~1 500 ml=2,>1 500 ml=3)。行二元 logistic 回归分析结果显示,年龄>79 岁、高血压、ASA 分级Ⅲ~Ⅳ级、Hb<110 g/L、手术持续时间>4 h、术中出血量>1 500 ml 是老年非心脏手术者术中输血的危险因素($P<0.05$;表 2)。

表1 老年非心脏手术术中输血单因素分析

Table 1 Univariate analysis of intraoperative blood transfusion in elderly patients undergoing non-cardiac surgery

Item	Blood transfusion group (n=56)	Control group (n=94)	χ^2/t	P value
Gender[n(%)]			0.066	0.797
Male	31(55.36)	50(53.19)		
Female	25(44.64)	44(46.81)		
Age[n(%)]			6.725	0.010
60-79 years	33(58.93)	74(78.72)		
>79 years	23(41.07)	20(21.78)		
Body height(m, $\bar{x}\pm s$)	1.67±0.13	1.69±0.11	1.006	0.316
Body weight(kg, $\bar{x}\pm s$)	61.78±10.64	62.58±9.84	0.467	0.641
BMI(kg/m^2, $\bar{x}\pm s$)	23.49±2.19	23.87±2.22	1.019	0.310
Diabetes mellitus[n(%)]	10(17.86)	15(78.72)	0.208	0.648
Hypertension[n(%)]	24(42.86)	21(21.28)	7.034	0.008
Heart disease[n(%)]	12(21.43)	22(23.40)	0.078	0.780
Previous history of blood transfusion[n(%)]	1(1.79)	4(4.26)	0.664	0.415
Previous history of surgery[n(%)]	9(16.07)	17(18.09)	0.099	0.753
Smoking history[n(%)]	15(26.79)	29(30.85)	0.280	0.597
History of alcohol drinking[n(%)]	7(12.50)	13(13.83)	0.054	0.817
History of allergy[n(%)]	3(5.36)	4(4.26)	0.096	0.757
Long-term medication history[n(%)]				
ACEI/ARB	4(7.14)	10(10.64)	0.507	0.477
β-RB	3(5.36)	7(7.45)	0.246	0.620
Diuretic	2(3.57)	3(3.19)	0.016	0.900
Calcium channel blocker	8(14.29)	11(11.70)	0.212	0.645
Statin	2(3.57)	3(3.19)	0.016	0.900
Insulin preparation	9(16.07)	13(13.83)	0.141	0.707
Blood type[n(%)]			2.027	0.567
A	15(26.79)	27(28.72)		
B	13(23.21)	29(30.85)		
O	24(42.86)	30(31.92)		
AB	4(7.14)	8(8.51)		
Preoperative ASA grading[n(%)]			5.774	0.016
Grade Ⅰ-Ⅱ	40(71.43)	82(87.23)		
Grade Ⅲ-Ⅳ	16(28.57)	12(12.77)		
Preoperative Hb[n(%)]			7.673	0.006
<110 g/L	10(17.86)	4(4.26)		
≥110 g/L	46(82.14)	90(95.74)		
Preoperative Alb[n(%)]			6.140	0.013
<35 g/L	11(19.64)	6(6.38)		
≥35 g/L	45(80.36)	88(93.62)		
Preoperative PLT($\times10^9$/L, $\bar{x}\pm s$)	94.15±7.63	113.17±10.36	11.938	<0.001
APTT(s, $\bar{x}\pm s$)	40.15±4.85	39.87±5.07	0.332	0.740
TT(s, $\bar{x}\pm s$)	22.23±3.78	21.94±4.05	0.435	0.664
PT(s, $\bar{x}\pm s$)	19.84±4.25	18.79±4.44	1.423	0.157
INR($\bar{x}\pm s$)	1.86±0.17	1.63±0.15	8.638	<0.001
Surgical department[n(%)]			1.087	0.998
Department of hepatobiliary and pancreatic surgery	5(8.93)	7(7.45)		
Department of gastrointestinal surgery	7(12.50)	14(14.89)		
Department of orthopedic surgery	3(5.36)	6(6.38)		
Department of gastroenterology	12(21.43)	16(17.02)		
Department of gynecology	9(16.07)	17(18.09)		
Department of neurosurgery	8(14.29)	13(13.83)		
Department of thoracic surgery	9(16.07)	14(14.89)		
Department of trauma emergency	2(3.57)	4(4.26)		
ICU	1(1.79)	3(3.19)		
Surgical grading[n(%)]			3.741	0.053
Grade 1-2	36(64.29)	74(78.72)		
Grade 3-4	20(35.71)	20(21.28)		
Surgical timing[n(%)]			0.936	0.333
Elective surgery	47(83.93)	84(89.36)		
Emergency surgery	9(16.07)	10(10.64)		
Day surgery	50(89.29)	88(93.62)	0.895	0.344
Surgical time[n(%)]			8.810	0.012
≤2 h	20(35.71)	50(53.19)		
2-4 h	20(35.71)	34(36.17)		
>4 h	16(28.58)	10(10.64)		
Intraoperative blood loss volume[n(%)]			8.489	0.014
<500 ml	19(33.93)	46(48.94)		
500-1 500 ml	20(35.71)	37(39.36)		
>1 500 ml	17(30.36)	11(11.70)		
Type of surgical incision[n(%)]			0.029	0.864
Type 0-1	26(46.43)	45(47.87)		
Type 2-3	30(53.57)	49(52.13)		

BMI: body mass index; ACEI/ARB: angiotensin-converting enzyme inhibitors/angiotensin receptor blockers; β-RB: β-receptor blacker; ASA: American Society of Anesthesiologists; Hb: hemoglobin; Alb: albumin; PLT: platelet; APTT: activited partial thomboplastin time; TT: thrombin time; PT: prothombin time; INR: international normalizedratio; ICU: intensive care unit.

表 2 影响老年非心脏手术术中输血的二元 logistic 回归分析

Table 2 Binary Logistic regression analysis affecting intraoperative blood transfusion in elderly patients undergoing non-cardiac surgery

Factor	β	*SE*	*Wald* χ^2	*OR*	95%*CI*	*P* value
Age>79 years	1.198	0.416	8.293	3.313	1.466-7.488	0.004
Hypertension	0.665	0.319	4.346	1.944	1.041-3.634	0.038
ASA grade Ⅲ-Ⅳ	1.839	0.644	8.154	6.290	1.780-22.225	0.005
Hb<110 g/L	1.346	0.449	8.987	3.842	1.594-9.263	0.003
Alb<35 g/L	1.279	0.847	2.280	3.593	0.683-18.899	0.132
Preoperative PLT	-0.893	0.617	2.095	0.409	0.122-1.372	0.149
Preoperative INR	0.798	0.525	2.310	2.221	0.794-6.215	0.129
Surgical time						
≤2 h	-	-	-	1.000	-	-
2-4 h	0.798	0.523	2.328	2.221	0.797-6.191	0.128
>4 h	0.879	0.368	5.705	2.408	1.171-4.954	0.017
Intraoperative blood loss volume						
<500 ml	-	-	-	1.000	-	-
500-15 00 ml	2.125	1.843	1.329	8.373	0.226-310.219	0.250
>1 500 ml	2.649	1.097	5.831	14.140	1.647-121.404	0.016

ASA: American Society of Anesthesiologists; Hb: hemoglobin; Alb: albumin; PLT: platelet; INR: international normalizedratio. -: no datum.

2.3 输血组及对照组预后指标比较

输血组中发生感染者占比高于对照组,差异有统计学意义(P<0.05)。两组急性缺血性损伤及住院时间≥28 d 占比比较,差异无统计学意义(P>0.05;表 3)。

表 3 输血组及对照组预后指标比较

Table 3 Comparison of prognosis indicators between blood transfusion group and control group [n (%)]

Group	n	Infection	Acute ischemic injury	Hospitalization time≥28 d
Blood transfusion	56	6(10.71)	4(7.14)	5(8.93)
Control	94	1(1.06)	1(1.06)	1(1.06)
χ^2		5.337	2.359	3.790
P value		0.021	0.125	0.052

3 讨 论

随着我国老龄化社会的来临,老年人群手术需求日益增加,不同于中青年,老年患者基础性疾病多,机体储备差,加上部分患者具有长期用药史,其手术耐受力下降,手术麻醉难度高,术中更易出现贫血及大量失血,围术期管理难度大。术中输血是抢救因手术发生急性血液丢失者的重要手段,尽管随着输血技术的不断改进,同种异体输血(allogenic blood transfusion, ABT)所造成的疾病传播率已降至最低,但其依旧可能引起溶血反应、免疫学反应甚至急性缺血性损伤,降低患者预后[5,6]。有效识别需进行术中输血的高危个体,尽早进行针对性干预并调整医院血液制品分配,在保障老年患者外科手术安全性中具有重要意义。

本研究以医院近年来接收的 150 例老年非心脏手术者作为研究对象,经二元 logistic 回归分析发现,年龄>79 岁、合并高血压、术前 ASA 分级Ⅲ~Ⅳ级、术前Hb<110 g/L、手术持续时间>4 h、术中出血量>1 500 ml是其术中输血的危险因素。提示具备以上特征的老年非心脏手术者术中输血风险高,应着重具备以上特征者的术前预防、术前备血及术中监测工作,分析其原因如下。(1)高龄非心脏手术者术中输血风险明显升高,这与高龄患者器官代偿能力下降、基础性疾病多、病程长、血管脆性增加及凝血功能异常等因素相关[7]。(2)高血压患者血管壁所承受的压力更高,同时长期高血压将增加血管脆性,手术应激易导致血管破裂,增加术中出血风险,同时高血压患者需长期服用抗凝剂或阿司匹林,影响机体凝血功能,增加输血风险[8,9]。(3)术前 ASA 分级是临床评估患者整体健康状况的常见指标,ASA 分级Ⅲ~Ⅳ级者常合并严重基础性疾病,机体代偿急性失血及贫血的功能下降,故其术中输血风险高[10]。(4)张大学等[11]报道称,术前 Hb 水低是老年髋部骨折患者术中输血的危险因素,与本研究结论一致。提示术前 Hb 水平低将增加术中输血风险,故建议临床在纠正患者贫血状态,提高术前 Hb 水平的基础上再进行外科手术。(5)手术持续时间越长,提示手术越复杂,操作难度越高,同时患者病情越严重,且随着手术时间的延长,患者手术风险及出血量也随之增加[12,13]。术中失血量与术中输血呈正相关[14]。故建议临床积极改进手术方式,最大限度缩短手术时间,减少术中失血,降低输血风险。

输血的实际效应一直备受争议,输血能快速有效地缓解失血相关症状,但同时也可能增加患者术后并发症及病死风险[15]。本研究统计发现,术中输血的老年非心脏手术者术后感染、急性缺血性损伤以及住院时间≥28 d者占比均高于未进行输血的对照组,但由于样本量较小,仅有术后感染率显示出明显差异,提示术中输血会增加老年非心脏手术者手术风险。但术中输血与患者预后的关系尚存在争议:有学者表示,输血行为本身会加剧患者术后不良风险,但同时,输血是个体病情危重的标志,并不是降低患者预后的直接因素[16,17]。基于此,临床还需积极探索老年非心脏术手术者的术中输血安全阈值及适应证,做好围术期血液管理,降低术中输血率,提高老年非心脏手术者术中输血安全性。

综上所述,高龄、合并高血压、术前ASA分级Ⅲ~Ⅳ级、术前Hb水平<110 g/L、手术持续时间>4 h、术中出血量>1 500 ml的老年非心脏手术者术中输血风险高,且术中出血会增加患者术后感染率。做好术前及术中管理,积极纠正术前贫血,提高患者机体手术耐受力,减少术中出血、缩短手术时间在降低术中输血率中具有一定意义。但本研究所纳入的样本量较小,且属于单中心研究,所得结论可能存在一定偏倚,为提高研究结论的可靠性还需针对以上不足开展多中心大样本量研究,此外,还需积极探索老年非心脏手术者术中输血安全阈值,以提高输血安全性。

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