

· 临床研究 ·

## 老年断指再植患者术后血管危象发生现状及危险因素

董延晨<sup>1</sup>, 程保国<sup>2</sup>, 解琛<sup>2\*</sup>

(解放军联勤保障部队第九六〇医院:<sup>1</sup> 门诊部, <sup>2</sup> 手外科, 济南 250031)

**【摘要】目的** 调查老年断指再植患者术后血管危象发生现状, 并分析其危险因素。**方法** 采用横断面调查与纵向研究结合的方法, 通过简单随机抽样法对 2021 年 1 月至 2023 年 9 月解放军联勤保障部队第九六〇医院收治的 126 例行断指再植术治疗的老年患者展开调查, 在术后当日采用人口学资料调查表及焦虑自评量表、抑郁自评量表对患者的基本资料及不良情绪进行调查, 观察术后血管危象发生情况, 并以此分为血管危象组与非血管危象组, 术后对患者跟踪随访, 记录末次随访再植断指功能。采用 SPSS 24.0 软件进行数据分析。根据数据类型, 组间比较分别采用 *t* 检验、秩和检验及  $\chi^2$  检验。采用 logistic 回归分析评估老年断指再植患者术后血管危象的影响因素。**结果** 126 例患者在手术当日发放调查问卷, 共收回有效问卷 121 份, 有效回收率 96.03%。121 例行断指再植术治疗的老年患者术后血管危象发生率为 25.62% (31/121)。logistic 回归分析显示, 吸烟史 ( $OR=2.540, 95\%CI\ 1.206\sim5.347$ )、完全离断 ( $OR=2.782, 95\%CI\ 1.383\sim5.596$ )、离断平面为末节 ( $OR=3.456, 95\%CI\ 1.948\sim6.130$ )、断指缺血时间  $\geq 10\ h$  ( $OR=3.071, 95\%CI\ 1.622\sim5.815$ )、术后红外线热成像仪提示微循环障碍 ( $OR=8.432, 95\%CI\ 5.708\sim12.455$ ) 均为老年断指再植患者术后血管危象的危险因素 ( $P<0.05$ )。血管危象组末次随访再植断指功能明显较非血管危象组更差 ( $P<0.05$ )。**结论** 老年断指再植患者术后血管危象发生率可能较青壮年患者更高, 严重影响患者预后功能恢复, 吸烟史及断指离断、缺血严重是血管危象的高危因素, 红外线热成像仪能客观评估术区皮温变化, 辅助判断术后血管危象发生风险。

**【关键词】** 老年人; 断指再植术; 血管危象; 影响因素; 红外线热成像仪

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## Current status and risk factors of postoperative vascular crisis in elderly patients with replantated severed fingers

Dong Yanchen<sup>1</sup>, Cheng Baoguo<sup>2</sup>, Xie Chen<sup>2\*</sup>

(<sup>1</sup>Department of Outpatient, <sup>2</sup>Department of Hand Surgery, 960th Hospital of PLA Joint Logistics Support Force, Jinan 250031, China)

**【Abstract】Objective** To investigate the current status of postoperative vascular crisis in elderly patients with replanted severed fingers and analyze its risk factors. **Methods** In a cross-sectional survey and longitudinal study, 126 elderly patients who underwent replantation of severed fingers in the 960th Hospital of the PLA Joint Logistics Support Force from January 2021 to September 2023 were investigated using simple random sampling method. The demographic data questionnaire, self-rating anxiety scale and self-rating depression scale were used to investigate the basic data and negative emotions of the patients on the day of surgery. The occurrence of postoperative vascular crisis was observed, and the patients were divided into a vascular crisis group and a non-vascular crisis group. SPSS 24.0 was used for statistical analysis. Data comparison between two groups was performed using *t* test, rank-sum test or  $\chi^2$  test depending on data type. Logistic regression analysis was used to evaluate the influencing factors of postoperative vascular crisis in elderly patients with replanted severed fingers. **Results** Questionnaires were distributed to 126 patients on the day of surgery, and 121 valid questionnaires were recovered, with an effective recovery rate of 96.03%. The incidence rate of postoperative vascular crisis in 121 elderly patients who underwent replantation of severed fingers was 25.62% (31/121). Logistic regression analysis showed that smoking history ( $OR=2.540, 95\%CI\ 1.206\sim5.347$ ), complete disconnection ( $OR=2.782, 95\%CI\ 1.383\sim5.596$ ), disconnection at the distal phalanx ( $OR=3.456, 95\%CI\ 1.948\sim6.130$ ), ischemic time of the severed finger  $\geq 10\ h$  ( $OR=3.071, 95\%CI\ 1.622\sim5.815$ ), and microcirculation disturbance on postoperative infrared thermography ( $OR=8.432, 95\%CI\ 5.708\sim12.455$ ) were risk factors of postoperative vascular crisis in elderly patients with replanted severed fingers ( $P<0.05$ ). The function of replanted fingers in vascular crisis group was significantly worse than that in non-vascular crisis group at the last follow-up ( $P<0.05$ ). **Conclusion** The incidence

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通信作者: 解琛, E-mail: ripplitxie@163.com

rate of postoperative vascular crisis in elderly patients with replantation of severed fingers may be higher than that in young and middle-aged patients, seriously affecting the prognosis and function recovery of patients. Smoking history, disconnection of the severed finger, and severe ischemia are high risk factors of vascular crisis. Infrared thermography can objectively evaluate the changes in skin temperature in the surgical area and assist in determining the risk of postoperative vascular crisis.

**【Key words】** aged; replantation of severed fingers; vascular crisis; influencing factors; infrared thermography

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Corresponding author: Xie Chen, E-mail: ripplitxie@163.com

手外伤在骨科急诊常见,其中最常见的为手指外伤,好发于青壮年<sup>[1]</sup>。断指再植术是断指的主要治疗手段,但成功率在 60%~90%,血管危象是造成断指再植术失败的主要原因之一,虽然临床在术后每 2 h 评估 1 次术区情况,但仍难以避免血管危象的发生。因此,对血管危象高危因素予以重点防控,有其必要性<sup>[2]</sup>。目前,针对断指再植术后血管危象发生率及危险因素的报道主要集中在青壮年病例,老年断指患病率虽然低于青壮年,但老年人群基础疾病多、器官功能退化,其诱发再植术后血管危象的高危因素可能与青壮年患者不同<sup>[3]</sup>。基于此,本研究对老年断指再植患者术后血管危象发生情况、危险因素及预后转归情况展开分析,为老年患者断指再植术的临床干预提供参考数据如下。

## 1 对象与方法

### 1.1 研究对象

采用横断面调查与纵向研究结合的方法,通过简单随机抽样法对 2021 年 1 月至 2023 年 9 月解放军联勤保障部队第九六〇医院收治的符合纳入排除标准的 126 例行断指再植术治疗的老年患者展开调查,在术后当日发放调查问卷,剔除空白不完整问卷,共收回有效问卷 121 份(96.03%)。纳入标准:(1)单个手指断离,且均为锐器切割致手指断离,断面整齐;(2)年龄 $\geq 60$ 岁;(3)受伤时间明确;(4)采用丛神经阻滞麻醉仰卧位断指再植术;(5)对本研究知情且签署知情同意书。排除标准:(1)多发外伤;(2)合并严重感染;(3)合并血液系统疾病或免疫系统疾病;(4)凝血功能异常;(5)急性心、脑血管疾病;(6)存在视听障碍或受伤前有阿尔茨海默等认知功能障碍;(7)酒精或药物依赖史;(8)受伤前 3 d 内使用抗焦虑药、抗抑郁药等精神类药物;(9)术后出现意识障碍等无法配合调查。

### 1.2 方法

1.2.1 横断面调查 在术后当日,采用人口学资料调查表对患者性别、年龄、婚姻状况、受教育程度等

人口学资料进行调查。采用焦虑自评量表(self-rating anxiety scale, SAS)、抑郁自评量表(self-rating depression scale, SDS)调查患者心理状态,SAS 量表<sup>[4]</sup>及 SDS 量表<sup>[5]</sup>由 Zung 编制,标准分=初始分 $\times 1.25$ ,SAS 标准分 $\geq 50$ 分为有焦虑症状,SDS 标准分 $\geq 53$ 分为有抑郁症状。

1.2.2 围术期干预方法 所有患者均在术后严格卧床 5 d,并给予常规抗感染、镇痛、解痉、改善循环等干预,患肢抬高至右心房水平,使用 60 W 烤灯照射患肢,维持照射周围环境温度为 28℃。术后每 2 h 评估 1 次再植断指状况,连续观察 7 d,参考《外科学》<sup>[6]</sup>的诊断标志评估血管危象发生情况,并以此将 121 例老年患者分为血管危象组与非血管危象组。使用便携式红外线热成像仪监测再植断指组织与邻近正常组织的热像图,术后监测 1 次/12 h,测量时检测区域需在室温下暴露 3~5 min,测量时仪器距检测区域距离为 30~50 cm,再植断指组织与邻近正常组织温度差 $>2$ ℃且检测区域出现暗区提示微循环障碍。发生血管危象的患者先给予山莨菪碱抗痉挛、低分子肝素抗凝、罂粟碱扩血管等保守治疗,保守治疗不缓解则手术探查,对广泛血栓形成者行血管桥接联合皮瓣移植修复治疗。

1.2.3 纵向研究 术后对患者跟踪随访,指导患者术后 2~4 周门诊复查 1 次,使用《中华医学会手外科学会上肢部分功能评定试用标准》<sup>[7]</sup>评估再植断指功能,直至末次随访。

### 1.3 统计学处理

采用 SPSS 24.0 统计软件进行数据分析。计量资料用均数 $\pm$ 标准差( $\bar{x}\pm s$ )表示,采用  $t$  检验;计数资料用例数(百分率)表示,采用  $\chi^2$  检验,等级资料采用秩和检验。采用 logistic 回归分析评估老年断指再植患者术后血管危象的影响因素。 $P<0.05$  为差异有统计学意义。

## 2 结果

### 2.1 两组患者一般资料比较

121 例行断指再植术治疗的老年患者中,术后血管危象发生率为 25.62%(31/121),将发生血管

危象的 31 例患者纳入血管危象组,90 例未发生血管危象的患者纳入非血管危象组。两组患者吸烟史占比、离断情况、离断平面、断指缺血时间、术后红外线热成像仪是否提示微循环障碍比较,差异均有统计学意义(均  $P<0.05$ );其余资料比较,差异无统计学意义(表 1)。

2.2 老年断指再植患者术后血管危象的影响因素分析

以术后血管危象为因变量,上述有统计学意义的指标为自变量,赋值代入 logistic 回归方程,结果

显示,吸烟史、完全离断、离断平面为末节、断指缺血时间 $\geq 10$  h、术后红外线热成像仪提示微循环障碍均为老年断指再植患者术后血管危象的危险因素( $P<0.05$ ;表 2)。

2.3 两组患者末次随访时再植断指功能比较

121 例老年断指再植患者再植断指均成活,术后随访 3~12 个月,中位随访时间为 6 个月,血管危象组末次随访再植断指功能明显较非血管危象组更差( $Z=2.471,P<0.05$ ;表 3)。

表 1 两组患者一般资料比较

Table 1 Comparison of general data between two groups

| Item                                                                                     | Vascular crisis group( $n=31$ ) | Non-vascular crisis group( $n=90$ ) | $\chi^2/t$ | $P$ value |
|------------------------------------------------------------------------------------------|---------------------------------|-------------------------------------|------------|-----------|
| Gender( Male/female, $n$ )                                                               | 16/15                           | 58/32                               | 1.598      | 0.206     |
| Age[ $n(\%)$ ]                                                                           |                                 |                                     | 3.034      | 0.082     |
| 60–70 years                                                                              | 20(64.52)                       | 72(80.00)                           |            |           |
| >70 years                                                                                | 11(35.48)                       | 18(20.00)                           |            |           |
| Marital status[ $n(\%)$ ]                                                                |                                 |                                     | 0.354      | 0.552     |
| Married                                                                                  | 26(83.87)                       | 81(90.00)                           |            |           |
| Unmarried/divorced/widowed                                                               | 5(16.13)                        | 9(10.00)                            |            |           |
| Education level[ $n(\%)$ ]                                                               |                                 |                                     | 0.296      | 0.863     |
| Junior high school or below                                                              | 8(25.81)                        | 19(21.11)                           |            |           |
| Technical secondary school and senior high school                                        | 16(51.61)                       | 49(54.44)                           |            |           |
| Junior college or above                                                                  | 7(22.58)                        | 22(24.44)                           |            |           |
| Smoking[ $n(\%)$ ]                                                                       | 16(51.61)                       | 26(28.89)                           | 5.254      | 0.022     |
| Hypertension[ $n(\%)$ ]                                                                  | 8(25.81)                        | 19(21.11)                           | 0.293      | 0.588     |
| Diabetes mellitus[ $n(\%)$ ]                                                             | 4(12.90)                        | 8(8.89)                             | 0.088      | 0.767     |
| Position of severed finger[ $n(\%)$ ]                                                    |                                 |                                     | 0.345      | 0.987     |
| Thumb                                                                                    | 6(19.35)                        | 16(17.78)                           |            |           |
| Index finger                                                                             | 14(45.16)                       | 44(48.89)                           |            |           |
| Middle finger                                                                            | 6(19.35)                        | 14(15.56)                           |            |           |
| Ring finger                                                                              | 3(9.68)                         | 10(10.11)                           |            |           |
| Little finger                                                                            | 2(6.45)                         | 6(6.67)                             |            |           |
| Disconnection status[ $n(\%)$ ]                                                          |                                 |                                     | 6.484      | 0.011     |
| Complete disconnection                                                                   | 16(51.61)                       | 24(26.67)                           |            |           |
| Non-complete disconnection                                                               | 15(48.39)                       | 66(73.33)                           |            |           |
| Disconnection plane[ $n(\%)$ ]                                                           |                                 |                                     | 9.273      | 0.002     |
| End segment                                                                              | 14(45.16)                       | 16(17.78)                           |            |           |
| Others                                                                                   | 17(54.84)                       | 74(82.22)                           |            |           |
| Ischemic time of severed finger[ $n(\%)$ ]                                               |                                 |                                     | 6.263      | 0.012     |
| <10 h                                                                                    | 12(38.71)                       | 58(64.44)                           |            |           |
| $\geq 10$ h                                                                              | 19(61.29)                       | 32(35.56)                           |            |           |
| Anxiety on the day of surgery                                                            | 25(80.65)                       | 57(63.33)                           | 3.164      | 0.075     |
| Depression on the day of surgery                                                         | 22(70.97)                       | 50(55.56)                           | 2.273      | 0.132     |
| Microcirculation disturbance indicated by postoperative infrared thermography[ $n(\%)$ ] | 30(96.77)                       | 14(15.56)                           | 65.729     | <0.001    |

表 2 老年断指再植患者术后血管危象的 logistic 回归分析

Table 2 Logistic regression analysis of postoperative vascular crisis in elderly patients with replantation of severed fingers

| Factor                                                                        | $\beta$ | $SE$  | Wald $\chi^2$ | $P$ value | $OR$  | 95% $CI$     |
|-------------------------------------------------------------------------------|---------|-------|---------------|-----------|-------|--------------|
| Smoking                                                                       | 0.932   | 0.354 | 6.931         | 0.008     | 2.540 | 1.206–5.347  |
| Complete disconnection                                                        | 1.023   | 0.365 | 7.855         | 0.005     | 2.782 | 1.383–5.596  |
| Disconnection plane at the end segment                                        | 1.240   | 0.371 | 11.171        | 0.001     | 3.456 | 1.948–6.130  |
| Ischemic time of severed finger $\geq 10$ h                                   | 1.122   | 0.368 | 9.296         | 0.002     | 3.071 | 1.622–5.815  |
| Microcirculation disturbance indicated by postoperative infrared thermography | 2.132   | 0.469 | 20.665        | <0.001    | 8.432 | 5.708–12.455 |

表 3 两组患者末次随访时再植断指功能比较

Table 3 Comparison of function of replanted finger at the last follow-up between two groups [n(%)]

| Group               | n  | Excellent | Good      | Fair     | Poor    |
|---------------------|----|-----------|-----------|----------|---------|
| Vascular crisis     | 31 | 17(54.84) | 9(29.03)  | 4(12.90) | 1(3.23) |
| Non-vascular crisis | 90 | 69(76.67) | 17(18.89) | 4(4.44)  | 0(0.00) |

3 讨论

老年人群在生活中也可遭受锐器切割伤,但老年断指再植患者却未得到足够重视,其围术期并发症及预后观察缺乏临床报道<sup>[8]</sup>。本研究中,121 例行断指再植术治疗的老年患者术后血管危象发生率为 25.62%,高于国内无年龄限制报道的 13.56%~22.62%<sup>[9]</sup>,考虑与老年患者器官功能退化、肢端血流量降低、断指端血供减少、术后更易发生血管危象有关。

本研究结果显示,完全离断、离断平面为末节均为老年断指再植患者术后血管危象的危险因素,与青壮年断指再植患者的高危因素一致<sup>[10]</sup>。这也表明,断指再植术的难度大是造成血管危象的重要原因。另据文献报道<sup>[11]</sup>,手指离断 6~8 h 内是再植术治疗的黄金时间,断指缺血时间越长,术后更易发生血管危象。本研究中,断指缺血时间≥10 h 是老年断指再植患者术后血管危象的危险因素,与上述报道相似。

另外,吸烟被认为是多种疾病的高危因素,尼古丁、一氧化碳等烟雾可使血管内皮细胞舒张功能降低,术后易形成血栓,引发血管危象<sup>[12]</sup>。本研究也发现,吸烟史也是老年断指再植患者术后血管危象的危险因素,故临床应指导患者戒烟。有报道指出<sup>[13]</sup>,不良情绪可造成血管内皮细胞功能、凝血功能紊乱,增加血管痉挛、血栓形成风险。但本研究两组术后当日的焦虑、抑郁症状发生情况并无显著差异,与上述报道不同,考虑与不良情绪对血管危象的影响有限有关。目前,对于血管危象的监测主要通过人为观察及判断,近年有学者利用红外线热成像仪客观评估局部组织皮温,可更准确评估再植组织微循环状况<sup>[14]</sup>。本研究结果显示,术后红外线热成像仪提示微循环障碍可作为术后血管危象的危险因素,提示该监测项目有望成为血管危象监测及防控的重要工具。然而,由于样本量有限,本研究未能对血管危象的动脉及静脉危象分别比较分析,后续可行大样本量的多中心研究分别分析术后动脉危象及静脉危象各自的危险因素。

本研究还对两组患者术后恢复状况跟踪随访,血管危象组末次随访的功能状况较非血管危象组更差。这也与血管危象的疾病特点有关,发生血管危象的患者局部血运异常,可出现指体萎缩,影响手指功能恢复<sup>[15]</sup>。

综上,老年断指再植患者术后血管危象可导致预后恶化,吸烟史、断指离断及缺血情况均与术后血管危象发生风险有关,术后红外线热成像仪可辅助监测血管危象。

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