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◇临床医学◇



# 甲状腺全切术后永久性甲状旁腺功能减退症发生独立危险因素及术后第1天免疫反应性甲状旁腺激素预测价值

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**摘要:** **目的** 探讨甲状腺全切术后永久性甲状旁腺功能减退症(PHPP)发生独立危险因素及术后第1天免疫反应性甲状旁腺激素(iPTH)预测价值。**方法** 纳入2015年1月至2019年12月于解放军联勤保障部队第九二六医院接受甲状腺全切术治疗病人共273例,根据甲状腺全切术后是否发生PHPP分组,采用单因素和多因素法评价甲状腺全切术后PHPP发生独立危险因素,描绘受试者操作特征曲线(ROC曲线)评价术后第1天iPTH预测价值。**结果** PHPP组术后第1天iPTH和血钙水平降低比例分别为72.73%(8/11),63.64%(7/11),显著高于无PHPP组的36.26%(95/262),35.88%(94/262)( $P<0.05$ )。多因素分析结果显示,术后第1天iPTH和血钙水平降低均是甲状腺全切术后PHPP发生独立危险因素( $P<0.05$ );ROC曲线分析结果显示,术后第1天iPTH水平预测甲状腺全切术后PHPP发生效能高于术后第1天血钙水平( $P<0.05$ )。**结论** 术后第1天iPTH和血钙水平降低病人在甲状腺全切术后更易发生PHPP,且术后第1天iPTH水平预测效能更高。

**关键词:** 甲状腺切除术; 甲状旁腺功能减退症; 危险因素; 免疫反应性甲状旁腺激素

## Independent risk factors for PHPP after total thyroidectomy and predictive value of iPTH on the first day after operation

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**Abstract:** **Objective** To investigate the independent risk factors for PHPP after total thyroidectomy and the predictive value of iPTH on the first day after operation. **Methods** A total of 273 patients with total thyroidectomy in 926 Hospital of Joint Logistics Support of the PLA from January 2015 to December 2019 were enrolled. Patients were divided into 2 groups according to the occurrence of PHPP after total thyroidectomy. Univariate and multivariate methods were used to evaluate the independent risk factors for PHPP after total thyroidectomy and ROC curve was drawn to evaluate the predictive value of iPTH on the first day after operation. **Results** The decreased proportion of iPTH and serum calcium level on the first day after operation in PHPP group were 72.73% (8/11) and 63.64% (7/11), respectively, which were significant higher than those of non-PHPP group 36.26%(95/262), 35.88%(94/262) ( $P<0.05$ ). The results of multivariate analysis showed that iPTH and lower serum calcium level on the first day after operation were independent risk factors for PHPP after total thyroidectomy ( $P<0.05$ ). ROC curve analysis showed that iPTH level on the first day after operation was more effective in predicting PHPP than blood calcium level on first day after operation ( $P<0.05$ ). **Conclusion** Patients with decreased iPTH and blood calcium levels on the first day after surgery were more likely to develop PHPP after total thyroidectomy, and the iPTH level on the first day after surgery was more predictive.

**Key words:** Thyroidectomy; Hypoparathyroidism; Risk factors; Immunoreactive parathyroid hormone

现有报道显示甲状腺手术后病人永久性甲状旁腺功能减退症(PHPP)发生率为1%~8%;此类病人术后应给予钙剂和维生素D合理补充,以降低相关并发症发生风险<sup>[1]</sup>。以往观点认为术后血钙水平可评估是否出现PHPP,但在临床实践中术后低钙血症发生影响因素复杂,且检测准确率存在争议<sup>[2-3]</sup>。血清免疫反应性甲状旁腺激素(immunoreactive parathyroid hormone, iPTH)半衰期仅为3~5 min,

故被认为可敏感提示术后早期血钙异常发生,并能够预测PHPP发生,但对于其测定时间和截断值临床并无统一标准<sup>[4]</sup>。本研究探讨甲状腺全切术后PHPP发生独立危险因素及术后第1天iPTH预测价值。

### 1 资料与方法

**1.1 一般资料** 纳入2015年1月至2019年12月于解放军联勤保障部队第九二六医院接受甲状腺全

切术治疗病人共 273 例,根据甲状腺全切术后是否发生 PHPP 分为 PHPP 组 11 例和无 PHPP 组 262 例。入选病人中男性 79 例,女性 194 例,年龄 (51.94±12.35) 岁;根据病理组织学类型划分,结节性甲状腺肿 62 例,甲状腺滤泡性肿瘤 41 例,甲状腺乳头状癌 161 例,滤泡样癌 6 例,髓样癌 2 例,未分化癌 1 例;基线平均 iPTH 水平为 (38.36±12.75) ng/L,基线平均血钙水平为 (2.27±0.10) mmol/L。病人均接受甲状腺全切除术,术后第 1 天完成血钙和 iPTH 检测,且术后随访资料完整;同时排除仅行单侧甲状腺腺叶次全或全切,既往存在甲状旁腺疾病、代谢性骨病、肾功能衰竭、颈部手术史及长时间服用钙剂/维生素 D 治疗者。病人及其近亲属知情同意。本研究符合《世界医学协会赫尔辛基宣言》相关要求。

**1.2 方法** 入选病人手术均由同一组手术医师完成,根据术前病理组织学诊断确定术式,包括单纯甲状腺全切术和甲状腺全切+中央区 LN 清扫;对于出现低血钙症状或无症状但存在严重低钙血症者,给予 10% 葡萄糖酸钙 1~2 g/d 静脉注射,待血钙>1.9 mmol/L 或症状消失停用。查阅病例收集病人性别、年龄、术式及围手术期实验室指标。iPTH 检测采用贝克曼 AU3000 型全自动生化分析仪,正常值为 15~65 ng/L;血清离子水平检测采用罗氏 Cobas 210 型全自动生化分析仪,其中血钙正常值为 2.1~2.6 mmol/L,低钙血症判定标准为血钙<2.0 mmol/L,低 iPTH 判定标准为 iPTH<15 ng/L。PHPP 判定标准为术后 6 个月血清 iPTH<15 ng/L,需给予钙剂和(或)维生素 D 补充<sup>[5]</sup>。

**1.3 统计学方法** 选择 SPSS 22.0 软件处理数据;符合正态分布计量资料以  $\bar{x} \pm s$  表示,比较采用配对 *t* 检验;计数资料以例(%)表示,比较采用  $\chi^2$  检验;多因素分析采用 logistic 回归模型;描绘 ROC 曲线评估预测效能。*P*<0.05 为差异有统计学意义。

2 结果

**2.1 临床资料分析** PHPP 组术后第 1 天 iPTH 和血钙水平降低比例分别为 72.73% (8/11), 63.64% (7/11), 显著高于无 PHPP 组的 36.26% (95/262), 35.88% (94/262) (*P*<0.05);两组其他临床资料比较差异无统计学意义 (*P*>0.05);见表 1。

**2.2 甲状腺全切术后 PHPP 发生危险因素多因素分析** 多因素分析结果显示,术后第 1 天 iPTH 和血

表 1 甲状腺全切术 273 例临床资料比较/例

| 指标           | PHPP 组<br>( <i>n</i> =11) | 无 PHPP 组<br>( <i>n</i> =262) | $\chi^2$ 值 | <i>P</i> 值 |
|--------------|---------------------------|------------------------------|------------|------------|
| 年龄           |                           |                              | 0.84       | 0.670      |
| <45 岁        | 5                         | 126                          |            |            |
| ≥45 岁        | 6                         | 136                          |            |            |
| 性别           |                           |                              | 0.60       | 0.820      |
| 男性           | 2                         | 44                           |            |            |
| 女性           | 9                         | 219                          |            |            |
| 术式           |                           |                              | 1.07       | 0.500      |
| 甲状腺全切+       |                           |                              |            |            |
| 淋巴结清扫        | 7                         | 151                          |            |            |
| 单纯甲状腺全切      | 4                         | 111                          |            |            |
| 基线维生素 D      |                           |                              | 3.31       | 0.090      |
| 正常           | 6                         | 192                          |            |            |
| 降低           | 5                         | 70                           |            |            |
| 基线血清镁离子      |                           |                              | 1.01       | 0.540      |
| 正常           | 8                         | 175                          |            |            |
| 降低           | 3                         | 87                           |            |            |
| 术后第 1 天 iPTH |                           |                              | 14.38      | <0.001     |
| 正常           | 3                         | 167                          |            |            |
| 降低           | 8                         | 95                           |            |            |
| 术后第 1 天血钙    |                           |                              | 16.77      | <0.001     |
| 正常           | 4                         | 168                          |            |            |
| 降低           | 7                         | 94                           |            |            |

注:PHPP 为永久性甲状旁腺功能减退症,iPTH 为免疫反应性甲状旁腺激素。

钙水平降低均是甲状腺全切术后 PHPP 发生独立危险因素 (*P*<0.05)。见表 2。

表 2 甲状腺全切术后 PHPP 发生危险因素多因素分析

| 指标           | $\beta$ 值 | SE 值 | Wald $\chi^2$ 值 | <i>P</i> 值 | OR 值 | 95%CI       |
|--------------|-----------|------|-----------------|------------|------|-------------|
| 术后第 1 天 iPTH | 1.01      | 0.48 | 7.26            | 0.010      | 3.24 | (2.02,6.90) |
| 术后第 1 天血钙    | 0.92      | 0.44 | 5.07            | 0.030      | 2.38 | (1.19,4.06) |
| 术式           | 0.63      | 0.59 | 1.21            | 0.360      | 1.57 | (0.92,3.60) |
| 年龄           | 0.15      | 0.57 | 0.03            | 0.870      | 1.13 | (0.77,1.75) |
| 性别           | 0.47      | 0.53 | 0.68            | 0.540      | 1.29 | (0.81,2.06) |
| 基线维生素 D      | 0.29      | 0.51 | 0.27            | 0.700      | 1.85 | (0.94,2.70) |
| 基线血清镁离子      | -0.52     | 0.68 | 0.98            | 0.420      | 0.47 | (0.26,1.13) |

**2.3 甲状腺全切术后 PHPP 发生预测价值 ROC 曲线分析** ROC 曲线分析结果显示,术后第 1 天 iPTH 水平预测甲状腺全切术后 PHPP 发生效能高于术后第 1 天血钙水平 (*P*<0.05)。见表 3。

表 3 甲状腺全切术后 PHPP 发生预测价值 ROC 曲线分析

| 指标           | 曲线下面积 | 截断值         | <i>P</i> 值 | 95%CI       | 灵敏度/%  | 特异度/% |
|--------------|-------|-------------|------------|-------------|--------|-------|
| 术后第 1 天 iPTH | 0.97  | 5.34 ng/L   | <0.001     | (0.92,0.99) | 100.00 | 87.03 |
| 术后第 1 天血钙    | 0.73  | 2.01 mmol/L | <0.001     | (0.69,0.78) | 68.47  | 74.75 |

### 3 讨论

甲状腺手术过程外科医师需注意识别及保护甲状旁腺,但在临床实践中部分病人接受甲状腺全切术后依然可观察到术后早期出现低钙血症及PHPP的风险<sup>[6-7]</sup>。国外学者报道显示<sup>[8-9]</sup>,接受甲状腺全切术病人术后随访3年,行多因素分析后证实PHPP发生与手术医师操作经验、术中甲状旁腺误切、术后第1天PTH及血钙水平独立相关。本次研究纳入2015年1月至2019年12月于我院接受甲状腺全切术治疗病人共273例中,发生PHPP共11例,发生率与以往报道结果相符<sup>[10-11]</sup>;进一步多因素分析提示,术后第1天iPTH和血钙水平降低均是甲状腺全切术后PHPP发生独立危险因素( $P<0.05$ )。

有学者研究认为,甲状腺全切术后第1天iPTH水平截断值设为15 ng/L预测PHPP发生效能较差<sup>[12-13]</sup>。本次研究描绘ROC曲线分析结果显示,术后第1天iPTH截断值选择5.34 ng/L, AUC=0.97,灵敏度和特异度为100.00%, 87.03%,与既往研究结果相近。在临床实际工作中,PHPP发生率较低,同时术后甲状旁腺功能恢复处于动态过程;而随时间延长部分受损前明显甲状旁腺腺体功能可能逐渐恢复。对于行甲状腺全切术治疗病人如术后第1天iPTH水平显著升高,往往提示术中甲状旁腺未受损伤或损伤小,周围血供良好,术后甲状旁腺功能更易恢复<sup>[14-16]</sup>。本次研究结果还证实,术后第1天iPTH水平预测甲状腺全切术后PHPP发生效能高于术后第1天血钙水平( $P<0.05$ ),即术后第1天iPTH水平预测PHPP发生效能更高;对于术后第1天iPTH>5.34 ng/L者术后PHPP发生风险较低。

对于甲状腺术后iPTH水平检测试剂目前仍存在争议测定时间,不同研究间术后早期iPTH测定时间从20 min到24 h不一<sup>[17-18]</sup>。有报道认为,术后20 min检测PTH水平如<13 ng/L,低钙血症预测灵敏度和特异度分别为100%, 93%;而术后4 h检测PTH水平如<10 ng/L预测灵敏度和特异度分别90%, 85%;此外术后第1天检测iPTH如<16 ng/L则预测灵敏度和特异度分别为98%, 83%<sup>[19-20]</sup>。而根据本次结果,笔者认为可根据术后第1天检测iPTH水平预测甲状腺全切术后病人PHPP发生风险。

本次研究亦存在一定不足:属于单中心回顾性报道,且发生PHPP病例数较少,难以完全排除混在因素影响,所得结论仍有待后续更为严谨深入研究进一步确证。

综上所述,术后第1天iPTH和血钙水平降低病人在甲状腺全切术后更易发生PHPP,且术后第1天iPTH水平预测效能更高。

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## 肝细胞癌病人介入术后急性严重腹痛发生危险因素及预测模型构建

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**摘要:** **目的** 探讨肝细胞癌(HCC)病人肝动脉插管化疗栓塞(TACE)术后急性严重腹痛发生危险因素。**方法** 回顾性分析2017年1月至2020年9月于焦作市第二人民医院行TACE治疗的HCC病人共178例临床资料, 根据TACE术后急性严重腹痛发生情况分为急性严重腹痛组和非急性严重腹痛组, 采用单因素和多因素法评价HCC病人TACE术后急性严重腹痛发生风险独立影响因素, 并基于此构建预测模型。**结果** 178例病人TACE术后24 h内发生急性严重腹痛28例, 发生率为15.73%; 急性严重腹痛组初治比例、病灶最大径>5 cm比例、病灶数量≥3个比例、病灶侵犯血管比例、既往TACE术后中重度腹痛史比例及接受载药微球TACE比例分别为75.00%(21/28), 64.29%(18/28), 75.00%(21/28), 46.43%(13/28), 28.57%(8/28), 60.71%(17/28), 显著高于非急性严重腹痛组的57.62%(87/151), 39.07%(59/151), 50.99%(77/151), 25.17%(38/151), 11.92%(18/151), 33.77%(51/151)( $P<0.05$ ); 急性严重腹痛组既往TACE治疗史比例为39.29%(11/28), 显著少于非急性严重腹痛组的62.25%(94/151)( $P<0.05$ ); 多因素分析结果显示, 肝内多发肿瘤病灶、既往TACE术后腹痛史、既往TACE治疗史及TACE类型均是HCC病人TACE术后急性严重腹痛发生风险独立影响因素( $P<0.05$ ); TACE术后急性中重度腹痛发生风险预测模型ROC曲线分析结果显示,  $AUC=0.81$ , 95%CI: (0.75, 0.88), 最佳截断值为0.49, 灵敏度和特异度分别为75.86%, 73.10%。**结论** HCC病人TACE术后急性严重腹痛发生风险与肝内多发肿瘤病灶、既往TACE术后腹痛史、既往TACE治疗史及TACE类型独立相关, 基于此构建预测模型具有良好预测效能。

**关键词:** 癌, 肝细胞; 肝动脉插管化疗栓塞; 腹痛; 风险; 影响因素

### Risk factors for moderate and severe acute abdominal pain in patients with HCC after TACE and predictive model establishment

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**Abstract:** **Objective** To investigate the risk factors for moderate and severe acute abdominal pain in patients with HCC after TACE. **Methods** Clinical data of 178 patients with HCC after TACE were retrospectively chosen in the Second People's Hospital of Jiaozuo from January 2017 to September 2020. All patients were grouped according to the incidence of moderate and severe acute abdominal pain after TACE and the independent risk factors for moderate and severe acute abdominal pain after TACE were evaluated by univariate and multivariate methods to establish the predictive model. **Results** Twenty-eight cases in 178 patients had moderate or severe acute abdominal pain within 24 hours after TACE and the incidence rate was 15.73%. The proportion of initial treatment cases, lesions with the maximum diameter of >5 cm, lesions number ≥3, lesions invading blood vessels, the history of moderate and severe abdominal pain after TACE and patients receiving drug loaded microspheres TACE in acute severe abdominal pain group were 75.00%(21/28),