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• 专题报道 •

肾周脂肪梅奥粘连概率评分在机器人辅助腹腔镜肾部分切除术中的初步应用

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[摘要] **目的** 探讨肾周脂肪梅奥粘连概率(MAP)评分在机器人辅助腹腔镜肾部分切除术(RAPN)术前评估中的临床意义。**方法** 回顾性分析2016年10月至2018年10月海军军医大学(第二军医大学)长征医院由同一术者行RAPN的229例T1aN0M0期肾肿瘤患者资料。患者年龄为(53.14±11.84)岁;男145例,女84例;左侧肾肿瘤122例,右侧肾肿瘤107例;术前估算的肾小球滤过率(eGFR)为(100.24±24.35)mL/(min·1.73m²)。根据MAP评分将患者分为MAP低分(≤3分)组175例和MAP高分(>3分)组54例,比较两组之间临床资料的差异。**结果** 229例患者RAPN手术均顺利完成,无术中转为根治性肾切除术或开放手术者。手术时间为(140.57±41.05)min,术中出血量为(98.56±65.38)mL,总输血率为7.9%(18/229),术后住院时间为(6.41±2.39)d。4例患者未阻断肾动脉,13例患者为选择性分支动脉阻断,其余患者均为肾动脉主干阻断,肾脏热缺血时间为(17.73±7.91)min。13例Clavien-Dindo分级Ⅱ级的患者围手术期进行输血治疗,4例患者因术后出血行数字减影血管造影栓塞止血,1例因出血而再次急诊手术行根治性肾切除术,所有患者经治疗后均平稳出院。术后随访1年,均未见肿瘤复发或转移。末次随访时eGFR为(94.40±22.63)mL/(min·1.73m²),与术前相比差异有统计学意义($P=0.001$)。与MAP低分组患者比较,MAP高分组患者手术时间较长[(152.51±39.53)min vs (136.91±41.15)min, $P=0.015$],术中出血量较多[(123.11±93.15)mL vs (94.75±59.89)mL, $P=0.029$],并发症Clavien-Dindo分级较高[Ⅰ级45例(83.3%)、Ⅱ级8例(14.8%)、Ⅲ级1例(1.9%) vs Ⅰ级165例(94.3%)、Ⅱ级7例(4.0%)、Ⅲ级3例(1.7%), $P=0.019$],术后住院时间较长[(7.04±3.32)d vs (6.21±2.01)d, $P=0.027$]。**结论** MAP评分能提前评估RAPN术中肾脏和肿瘤游离时间延长、出血量增加的风险,指导临床医师术前做好手术规划。

[关键词] 肾肿瘤;梅奥粘连概率评分;机器人手术;腹腔镜技术;肾部分切除术

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Application of Mayo adhesive probability score in robot-assisted laparoscopic partial nephrectomy

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[Abstract] **Objective** To investigate the clinical value of Mayo adhesive probability (MAP) score in the preoperative evaluation of robot-assisted laparoscopic partial nephrectomy (RAPN). **Methods** The clinical data of 229 patients with T1aN0M0 renal tumor who received RAPN by the same surgeon in Changzheng Hospital of Naval Medical University (Second Military Medical University) from Oct. 2016 to Oct. 2018 were retrospectively analyzed. There were 145 males and 84 females, with an average age of (53.14±11.84) years, including 122 cases of left renal tumor and 107 cases of right renal tumor. The preoperative estimated glomerular filtration rate (eGFR) was (100.24±24.35) mL/(min·1.73 m²). The patients were divided into two groups according to the MAP score: low-MAP group (MAP score≤3, n=175) and high-

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MAP group (MAP score > 3, $n=54$). The clinical data were compared between the two groups. **Results** The RAPN was successfully performed in all the 229 patients, with no intraoperative conversion to radical nephrectomy or open surgery. The operation time was (140.57 ± 41.05) min, the intraoperative blood loss was (98.56 ± 65.38) mL, the total transfusion rate was 7.9% (18/229), and the postoperative hospital stay was (6.41 ± 2.39) days. Four patients had no renal artery blocking, 13 patients had selective branch artery blocking, and the rest patients had main renal artery blocking. The warm ischemia time of kidney was (17.73 ± 7.91) min. Thirteen patients with Clavien-Dindo classification grade II received perioperative blood transfusion therapy, four patients received digital subtraction angiography embolization for hemostasis due to postoperative hemorrhage, and one patient underwent emergency radical nephrectomy due to hemorrhage. All patients were discharged uneventfully after treatment. During a 1-year follow-up, no tumor recurrence or metastasis was found. The eGFR at the latest follow-up was (94.40 ± 22.63) mL/(min \cdot 1.73 m 2), significantly different from preoperation ($P=0.001$). Compared with the low-MAP group, the high-MAP group had significantly longer operation time ($[152.51 \pm 39.53]$ min vs $[136.91 \pm 41.15]$ min, $P=0.015$), more intraoperative blood loss ($[123.11 \pm 93.15]$ mL vs $[94.75 \pm 59.89]$ mL, $P=0.029$), higher Clavien-Dindo classification (45 cases [83.3%] in grade I, eight [14.8%] in grade II and one [1.9%] in grade III vs 165 [94.3%] in grade I, seven [4.0%] in grade II and three [1.7%] in grade III, $P=0.019$), and longer postoperative hospital stay ($[7.04 \pm 3.32]$ d vs $[6.21 \pm 2.01]$ d, $P=0.027$). **Conclusion** MAP score can be used to evaluate the risk of prolonged kidney and tumor dissociation time and increased bleeding in RAPN in advance, guiding clinicians to make better preoperative surgical plan.

[Key words] kidney neoplasms; Mayo adhesive probability score; robotic surgical procedures; laparoscopy; partial nephrectomy

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肾部分切除术已成为早期肾肿瘤特别是T1a期肾肿瘤患者首选的治疗方式^[1]。术前难度评估、手术入路规划对手术的顺利实施起着十分重要的作用。除了肾肿瘤本身的解剖特征外,肾周脂肪粘连也能增加肾部分切除术的复杂性^[2]。为了客观、准确地预测肾周脂肪粘连对肾部分切除术的影响, Davidiuk等^[3]于2014年提出了基于影像学特征预测肾周脂肪粘连的梅奥粘连概率(Mayo adhesive probability, MAP)评分系统。为了探讨MAP评分在机器人辅助腹腔镜肾部分切除术(robot-assisted laparoscopic partial nephrectomy, RAPN)术前评估中的临床意义,本研究回顾性分析了海军军医大学(第二军医大学)长征医院行RAPN治疗的229例早期肾肿瘤患者资料,现报告如下。

1 资料和方法

1.1 一般资料 回顾性分析2016年10月至2018年10月海军军医大学(第二军医大学)长征医院由同一术者使用达芬奇手术机器人系统行RAPN治疗的早期肾肿瘤患者资料。纳入标准:(1)单发肾肿瘤,对侧肾脏结构正常;(2)肿瘤直径 ≤ 4 cm(临床分期为T1aN0M0期);(3)术前行计算机断层扫描血管造影(computed tomography angiography, CTA)检查,明确肾动脉分支及变异情况;(4)既往无肾脏手术史

及腹部手术史。共筛选出229例符合条件的肾肿瘤患者,年龄为 (53.14 ± 11.84) 岁;男145例,女84例;左侧肾肿瘤122例,右侧肾肿瘤107例;术前估算的肾小球滤过率(estimated glomerular filtration rate, eGFR)为 (100.24 ± 24.35) mL/(min \cdot 1.73 m 2)。

1.2 手术方法 所有患者均使用达芬奇手术机器人系统(da Vinci Si)完成手术操作,经后腹腔、经腹腔入路方式则由术前根据影像学及肿瘤位置解剖特点制定。套管位置和具体手术步骤参照我们的前期临床研究^[4]。内生型肾肿瘤可在术中使用超声进行定位;对估计肾动脉阻断时间超过30 min的患者可进行原位冰水降温,从而更好地保护肾功能。

1.3 MAP评分标准与分组 根据术前CT资料对患者进行MAP评分,具体评分为以下两项之和:

(1)肾静脉水平肾背侧包膜到后侧腹壁的纵向距离, < 1 cm为0分,1~1.9 cm为1分, ≥ 2 cm为2分;(2)肾周炎症线条,肾周无炎症线为0分,肾周炎症线I型为2分,肾周炎症线II型为3分^[3]。

根据MAP评分标准^[3]及既往文献中的分组类型^[5],将所有患者分为MAP低分组(≤ 3 分)和MAP高分组(> 3 分)。MAP低分组患者共175例,年龄 (53.11 ± 11.62) 岁,男106例、女69例,伴高血压41例;MAP高分组患者共54例,年龄 (53.24 ± 12.69) 岁,男39例、女15例,伴高血压

13例。两组患者年龄、性别、高血压病史差异无统计学意义 ($P>0.05$)。

1.4 观察指标 完整收集所有患者的基本资料、术中情况及围手术期并发症等临床资料, 并发症采用 Clavien-Dindo 分级^[6]进行评估。

1.5 统计学处理 采用 SPSS 21.0 软件进行统计学分析。计量资料以 $\bar{x}\pm s$ 表示, 组间比较采用独立样本 t 检验; 计数资料以例数和百分数表示, 组间比较采用 χ^2 检验。检验水准 (α) 为 0.05。

2 结果

2.1 手术治疗效果 229 例患者的 RAPN 手术均顺利完成, 无手术中转为根治性肾切除术或开放手术者。手术时间为 (140.57 ± 41.05) min, 术中出血量为 (98.56 ± 65.38) mL, 总输血率为 7.9% (18/229), 术后住院时间为 (6.41 ± 2.39) d。在肾动脉阻断方式上, 4 例患者肾动脉无阻断, 13 例患者为选择性分支动脉阻断, 其余均为肾动脉主干阻断, 肾脏热缺血时间为 (17.73 ± 7.91) min。在围手术期并发症

分析中, Clavien-Dindo 分级 I 级 210 例 (91.7%)、II 级 15 例 (6.6%)、III 级 4 例 (1.7%)。有 13 例 Clavien-Dindo 分级 II 级的患者围手术期进行输血治疗, 4 例患者因术后出血行数字减影血管造影栓塞止血, 1 例因出血而再次急诊手术行根治性肾切除术, 所有患者经治疗后均平稳出院。术后随访 1 年, 均未见肿瘤复发或转移。末次随访时 eGFR 为 (94.40 ± 22.63) mL/(min \cdot 1.73 m²), 与术前 [(100.24 ± 24.35) mL/(min \cdot 1.73 m²)] 相比差异有统计学意义 ($P=0.001$)。

2.2 MAP 低分组与高分组患者围手术期资料比较 MAP 低分组和 MAP 高分组患者围手术期资料见表 1。由表 1 可见, 与 MAP 低分组患者比较, MAP 高分组患者手术时间较长、术中出血量较多、并发症 Clavien-Dindo 分级较高、术后住院时间较长, 差异均有统计学意义 (P 均 <0.05); 两组患者 BMI、肿瘤直径、R.E.N.A.L. 评分、手术入路、肾脏热缺血时间、出院前血肌酐水平等临床指标差异均无统计学意义 (P 均 >0.05)。

表 1 MAP 低分组与高分组早期肾肿瘤患者围手术期资料比较

Tab 1 Comparison of perioperative data of early renal tumor patients between low- and high-MAP groups

Index	High-MAP group $N=54$	Low-MAP group $N=175$	Statistic	P value
BMI ($\text{kg}\cdot\text{m}^{-2}$), $\bar{x}\pm s$	24.91 \pm 3.78	24.06 \pm 2.94	$t=1.518$	0.133
Tumor diameter (mm), $\bar{x}\pm s$	29.07 \pm 8.34	28.23 \pm 8.25	$t=0.656$	0.512
R.E.N.A.L. score n (%)			$\chi^2=1.157$	0.561
4-6	25 (46.3)	94 (53.7)		
7-9	27 (50.0)	73 (41.7)		
10-12	2 (3.7)	8 (4.6)		
Surgical approach n (%)			$\chi^2=2.548$	0.131
Retroperitoneal	42 (77.8)	116 (66.3)		
Transperitoneal	12 (22.2)	59 (33.7)		
Operation time (min), $\bar{x}\pm s$	152.51 \pm 39.53	136.91 \pm 41.15	$t=2.455$	0.015
Intraoperative blood loss (mL), $\bar{x}\pm s$	123.11 \pm 93.15	94.75 \pm 59.89	$t=2.198$	0.029
Warm ischemia time (min), $\bar{x}\pm s$	18.87 \pm 8.74	17.38 \pm 7.68	$t=1.203$	0.230
Clavien-Dindo classification n (%)			$\chi^2=7.913$	0.019
Grade I	45 (83.3)	165 (94.3)		
Grade II	8 (14.8)	7 (4.0)		
Grade III	1 (1.9)	3 (1.7)		
Postoperative hospital stay (d), $\bar{x}\pm s$	7.04 \pm 3.32	6.21 \pm 2.01	$t=2.226$	0.027
Serum creatinine before discharge ($\mu\text{mol}\cdot\text{L}^{-1}$), $\bar{x}\pm s$	80.93 \pm 22.21	77.83 \pm 25.97	$t=0.791$	0.430

MAP: Mayo adhesive probability; BMI: Body mass index

3 讨论

近年来, 机器人手术借助其精确解剖和精细操作上的优势, 已成为肾脏肿瘤手术治疗的重要方式^[7]。

手术难度及并发症风险评估对于制定手术方案、保证手术效果具有重要意义^[8]。临床上已有诸如 R.E.N.A.L. 评分、PADUA 评分、C-指数、肿瘤接触面积等评分系统^[9], 但是这些评分系统都是基于肿

瘤本身的因素,并没有考虑到肾周脂肪等肿瘤的环境,忽视了手术过程中肿瘤分离和暴露上的客观因素。

已有研究证明肾周脂肪粘连增加肾部分切除的复杂性^[2]。BMI已被广泛用于评估患者肥胖程度,包含四肢皮下、会阴部、腹壁、腹腔内脏等部位的脂肪,是对全身脂肪的总体性评估^[10],但不能有效区分皮下和内脏脂肪^[11]。George等^[12]对488例行腹腔镜肾部分切除术的患者资料进行分析,按BMI<25 kg/m²、25~30 kg/m²和>30 kg/m²分组比较,各组在术中出血量、手术时间、输血量及术中中转开放手术等方面差异无统计学意义。因此,BMI在患者特异性测量中是一种不完善和不精确的方法,特别是对于体质量处于健康范围的患者^[13]。相比于BMI、腹部脂肪厚度这2个指标,肾周脂肪状况能更客观、准确地评价肾部分切除术的操作难度,具有更高的特异性^[14]。MAP评分作为评估肾周脂肪粘连状况的评价指标,量化分级了肾周脂肪的特点,受到泌尿外科医师的重视。

本研究对患者围手术期资料进行分析后发现,高MAP评分能增加RAPN患者的手术时间、术中出血量及并发症的发生风险。在手术时间方面,高MAP评分虽然延长了RAPN的整体手术时间,但不影响肾脏热缺血时间,分析其原因主要有:(1)肾周脂肪粘连减小了腹腔镜手术的操作空间,增加了肾脏游离和肿瘤暴露的难度,但不影响游离完成后肿瘤切除和创面缝合的操作;(2)肾门部存在肾周脂肪粘连时,肾门部血管的游离难度增加,手术风险也大大提高。Chang等^[15]认为肾周脂肪粘连的存在显著增加了肾脏、肿瘤分离的时间和操作复杂性。Khene等^[16]对202例RAPN患者进行分析后指出,有肾周脂肪粘连的患者较没有肾周脂肪粘连患者的手术时间延长40 min,失血量增加了2倍,转为开放手术或根治性肾脏切除术的风险也显著增加。本研究也发现高MAP评分组患者的术中出血量高于低MAP评分组患者。高MAP评分患者除了肾门血管分离难度加大以外,肾脏及肿瘤分离过程中肾周炎性增生性血管破裂出血、粘连的肾被膜剥脱均会大大增加出血量^[17]。

结合以往手术经验,我们认为对高MAP评分的肾肿瘤患者进行RAPN时需注意以下几点:

(1)术前必须行肾动脉CTA检查,明确肾门解剖

特点及肾动脉变异情况;(2)肾周粘连严重的患者,需按照解剖特点边止血边分离,切勿强行暴力分离;(3)术中寻找肾门血管时,需时刻留意是否有变异血管的存在;(4)术中遇到脂肪粘连覆盖且外生不明显的肾肿瘤,可在术中超声定位后按照内生型肿瘤进行手术操作;(5)注意周围正常肾组织肾包膜的保留,以免缝合时撕裂;(6)对于肾脏和肿瘤游离时间明显延长的患者,需加强与助手、器械护士及麻醉医师的整体配合,确保手术的安全性。

此外,MAP评分也可能与局限性肾癌的生存预后相关。有研究表明,肾周脂肪粘连可能是Gerota筋膜脂肪组织慢性炎症改变所致^[18]。脂肪组织作为人体最大的内分泌器官,能参与分泌众多的细胞因子和活性分子^[19]。多项研究发现,IL-6、血管内皮生长因子等与肥胖密切相关的生物学标志物与肾透明细胞癌的发生风险显著相关^[20-21]。Thiel等^[5]的一项前瞻性研究表明,高MAP评分的局限性肾癌患者无进展生存期明显降低,说明肾细胞癌的侵袭性可能与肾周脂肪厚度和脂肪粘连有关,但这一结果仍需加大样本进一步研究。

综上所述,MAP评分能提前评估RAPN术中肾脏和肿瘤游离时间延长、出血量增加的风险,指导临床医师术前做好手术规划,具有积极的临床应用价值。

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