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· 专题报道 ·

机器人辅助与传统腹腔镜肾部分切除术治疗早期肾癌合并肥胖患者的疗效对比

富智斌^{1△}, 陈如潭^{2△}, 顾迪¹, 董凯¹, 江爱民¹, 晏睿¹, 时佳子¹, 吴震杰¹, 王林辉^{1*}

1. 海军军医大学(第二军医大学)长征医院泌尿外科, 上海 200003

2. 海军军医大学(第二军医大学)长征医院影像医学与核医学科, 上海 200003

[摘要] **目的** 比较机器人辅助腹腔镜肾部分切除术(RAPN)与传统腹腔镜肾部分切除术(LPN)治疗早期肾癌合并肥胖患者的临床疗效。**方法** 回顾性分析2016年1月至2018年8月我院收治的71例行RAPN或LPN治疗的早期肾癌(cT1N0M0)合并肥胖(BMI \geq 28 kg/m²)患者的临床资料。RAPN组34例,男22例、女12例,年龄为(51.2 \pm 13.4)岁, BMI为(30.36 \pm 2.21) kg/m², 肿瘤最大径为(3.67 \pm 1.09) cm, R.E.N.A.L.评分为(7.3 \pm 1.7)分, 术前估算的肾小球滤过率(eGFR)为(92.8 \pm 22.0) mL/(min \cdot 1.73 m²), 手术采用经腹腔途径7例、经后腹腔途径27例; LPN组37例,男26例、女11例,年龄为(56.2 \pm 12.6)岁, BMI为(29.74 \pm 1.36) kg/m², 肿瘤最大径为(3.37 \pm 0.93) cm, R.E.N.A.L.评分为(6.9 \pm 1.6)分, 术前eGFR为(90.4 \pm 22.4) mL/(min \cdot 1.73 m²), 手术采用经腹腔途径6例、经后腹腔途径31例。记录两组患者手术时间、术中出血量、术中输血率、肾脏热缺血时间、手术中转率、术中及术后并发症发生率、切缘阳性率、术后住院时间、术后肾功能下降百分比等指标并进行比较。**结果** 两组患者手术均顺利完成, 均未发生术中并发症, 无术中转为开放手术或根治性肾切除术。RAPN组肾脏热缺血时间[(19.2 \pm 5.6) min]短于LPN组[(21.8 \pm 4.1) min], 术后住院时间[(6.0 \pm 1.2) d]短于LPN组[(7.4 \pm 2.8) d], 差异均有统计学意义(P 均 $<$ 0.05)。RAPN组与LPN组的手术时间分别为(153.0 \pm 33.3) min和(140.1 \pm 32.3) min, 术中出血量分别为(88.5 \pm 49.1) mL和(106.2 \pm 72.0) mL, 术中输血率分别为2.9%(1/34)和5.4%(2/37), 术后并发症发生率分别为0和8.1%(3/37), 术后肾功能下降百分比分别为2.1%(-4.8%, 9.3%)和5.8%(1.5%, 15.7%), 差异均无统计学意义(P 均 $>$ 0.05)。术后病理结果显示所有患者手术切缘均为阴性。**结论** RAPN和LPN均为治疗早期肾癌合并肥胖患者的有效术式。与LPN相比, RAPN治疗早期肾癌合并肥胖患者能减少术中肾脏热缺血时间, 缩短术后住院时间, 更利于保护患者肾功能, 加快术后恢复。

[关键词] 肥胖症; 肾肿瘤; 机器人手术; 腹腔镜技术; 肾部分切除术**[中图分类号]** R 737.11**[文献标志码]** A**[文章编号]** 0258-879X(2020)07-0704-05

Robot-assisted and traditional laparoscopic partial nephrectomy in the treatment of obese patients with early renal tumors: a comparison of clinical efficacy

FU Zhi-bin^{1△}, CHEN Ru-tan^{2△}, GU Di¹, DONG Kai¹, JIANG Ai-min¹, YAN Rui¹, SHI Jia-zi¹, WU Zhen-jie¹, WANG Lin-hui^{1*}

1. Department of Urology, Changzheng Hospital, Naval Medical University (Second Military Medical University), Shanghai 200003, China

2. Department of Medical Imaging and Nuclear Medicine, Changzheng Hospital, Naval Medical University (Second Military Medical University), Shanghai 200003, China

[Abstract] **Objective** To compare the clinical efficacy of robot-assisted partial nephrectomy (RAPN) and traditional laparoscopic partial nephrectomy (LPN) in the treatment of obese patients with early renal tumors. **Methods** The clinical data of 71 obese patients (body mass index [BMI] \geq 28 kg/m²) with cT1N0M0 renal tumors, who receiving RAPN or LPN in our hospital between Jan. 2016 and Aug. 2018, were retrospectively collected. There were 22 males and 12 females in RAPN group ($n=34$), with a mean age of (51.2 \pm 13.4) years and a mean BMI of (30.36 \pm 2.21) kg/m². The mean tumor size, R.E.N.A.L. score and preoperative estimated glomerular filtration rate (eGFR) were (3.67 \pm 1.09) cm, 7.3 \pm 1.7 and (92.8 \pm 22.0)

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*通信作者(Corresponding author). Tel: 021-81886813, E-mail: wanglinhui@smmu.edu.cn

mL/(min \cdot 1.73 m²), respectively. The operation was performed by transperitoneal approach in seven cases and retroperitoneal approach in 27 cases. There were 26 males and 11 females in LPN group ($n=37$), with a mean age of (56.2 \pm 12.6) years and a mean BMI of (29.74 \pm 1.36) kg/m². The mean tumor size, R.E.N.A.L. score and preoperative eGFR were (3.37 \pm 0.93) cm, 6.9 \pm 1.6 and (90.4 \pm 22.4) mL/(min \cdot 1.73 m²), respectively. The operation was performed by transperitoneal approach in six cases and retroperitoneal approach in 31 cases. The operation time, estimated blood loss, intraoperative blood transfusion rate, warm ischemia time, intraoperative conversion rate, incidence of intra- and postoperative complications, positive surgical margin, postoperative hospital stay, and variation of eGFR from baseline were recorded and compared between the two groups. **Results** The partial nephrectomy operation was successfully completed in both groups with no intraoperative complications, and there was no intraoperative conversion to open surgery or radical nephrectomy. There were significant differences in warm ischemia time ([19.2 \pm 5.6] min vs [21.8 \pm 4.1] min) and postoperative hospital stay ([6.0 \pm 1.2] d vs [7.4 \pm 2.8] d) between the RAPN group and LPN group (both $P<0.05$). No significant differences were found in operation time ([153.0 \pm 33.3] min vs [140.1 \pm 32.3] min), estimated blood loss ([88.5 \pm 49.1] mL vs [106.2 \pm 72.0] mL), intraoperative blood transfusion rate (2.9% [1/34] vs 5.4% [2/37]), incidence of postoperative complications (0 vs 8.1% [3/37]) or variation of eGFR from baseline (2.1% [-4.8%, 9.3%] vs 5.8% [1.5%, 15.7%]) between the two groups (all $P>0.05$). Post-operation pathology results showed no positive surgical margin in the two groups. **Conclusion** Both RAPN and LPN are effective for the treatment of obese patients with early renal tumors. Compared with LPN, RAPN can reduce the warm ischemia time, shorten postoperative hospital stay, better protect renal function and accelerate postoperative recovery.

[Key words] obesity; kidney neoplasms; robotic surgical procedures; laparoscopy; partial nephrectomy

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得益于医学诊疗技术的发展, 早期肾癌(cT1N0M0)的诊断比例不断升高。肾部分切除术为早期肾癌外科治疗的推荐术式^[1], 相比于肾癌根治术, 肾部分切除术的肿瘤学疗效相当, 对术后肾功能的保护更优, 心血管事件的发生率更低^[2-3]。随着生活水平的提高, 我国肥胖人口比例不断上升, 现已成为全世界肥胖人口最多的国家^[4-5]。在早期肾癌的外科治疗中, 肥胖因素的存在会使手术难度增大, 导致手术时间延长、出血量增多等^[6]。

随着微创技术和手术机器人系统在泌尿外科领域的应用, 机器人辅助腹腔镜肾部分切除术(robot-assisted laparoscopic partial nephrectomy, RAPN)与腹腔镜肾部分切除术(laparoscopic partial nephrectomy, LPN)的比例不断提高。美国学者已经分别证实RAPN和LPN相对于开放肾部分切除术(open partial nephrectomy, OPN)治疗早期肾癌合并肥胖患者的围手术期疗效更佳^[7-8], 但目前尚未见RAPN与LPN治疗早期肾癌合并肥胖患者的疗效对比研究。本研究回顾性分析我院2016年1月至2018年8月同一术者采用RAPN或LPN治疗的早期肾癌合并肥胖患者的临床资料, 比较RAPN与LPN治疗早期肾癌合并肥胖患者的临床疗效和安全性。

1 对象和方法

1.1 一般资料 回顾性分析我院2016年1月至2018年8月同一术者采用RAPN或LPN治疗的早期肾癌合并肥胖患者的临床资料。纳入标准:

(1) 患者BMI \geq 28 kg/m²^[9]; (2) 术前行影像学检查发现肾脏肿瘤最大径不超过7 cm。排除标准:

(1) 多发或双侧肾脏肿瘤; (2) 伴有淋巴结或远处转移; (3) 术中采用非肾动脉主干阻断方式。根据纳入标准入组同期进行肾部分切除术治疗的患者76例, 根据排除标准排除5例, 最终纳入71例患者, 其中34例接受RAPN治疗(RAPN组), 37例接受传统LPN治疗(LP组)。RAPN组患者年龄为21~77岁, 平均(51.2 \pm 13.4)岁; 男22例(64.7%), 女12例(35.3%); BMI为(30.36 \pm 2.21) kg/m²; 吸烟史9例, 饮酒史7例, 高血压病史17例, 糖尿病史8例; 卡氏体力状况(Karnofsky performance status, KPS)评分为(97.7 \pm 5.0)分; 美国麻醉医师协会(American Society of Anesthesiologists, ASA)评分为(2.06 \pm 0.34)分; 肿瘤最大径为(3.67 \pm 1.09) cm; 肿瘤位于左侧20例, 右侧14例; R.E.N.A.L.评分为(7.3 \pm 1.7)分; 术前估算的肾小球滤过率(estimated glomerular filtration rate, eGFR)为(92.8 \pm 22.0) mL/(min \cdot 1.73 m²);

手术采用经腹腔途径7例,经后腹腔途径27例。LPN组患者年龄为32~80岁,平均(56.2±12.6)岁;男26例(70.3%),女11例(29.7%);BMI为(29.74±1.36) kg/m²;吸烟史14例,饮酒史2例,高血压病史24例,糖尿病史4例;KPS评分为(98.1±4.6)分;ASA评分为(2.00±0.33)分;肿瘤最大径为(3.37±0.93) cm;肿瘤位于左侧16例,右侧21例;R.E.N.A.L.评分为(6.9±1.6)分;术前eGFR为(90.4±22.4) mL/(min·1.73 m²);手术采用经腹腔途径6例,经后腹腔途径31例。两组上述资料差异均无统计学意义(*P*均>0.05)。

1.2 手术方法 所有患者均采用全身麻醉。结合术前影像学检查选择合适的手术入路,位于肾脏上极或背侧的肿瘤选择经后腹腔入路,位于肾脏下极或腹侧的肿瘤则选择经腹腔入路。传统LPN和RAPN的手术步骤详见本团队的前期报道^[10],手术过程简述如下。(1)经腹腔途径肾部分切除术:松解腹腔内粘连,切开侧腹膜及肝结肠韧带,充分显露视野,游离十二指肠找到其后方的下腔静脉,从下腔静脉右侧切开肾周筋膜,分离出肾动脉和肾静脉,寻找到肿瘤后阻断肾动脉,切除肾肿瘤和周围少许肾实质,分层缝合肾脏创面后解除肾动脉的阻断,确认肾脏创面无活动性出血后放置引流管,取出标本后缝合皮肤切口。(2)经后腹腔途径肾部分切除术:清理腹膜后脂肪,游离肾脏,充分显露肾脏肿瘤,于腰肌前间隙找到肾动脉,阻断血供后切除肾肿瘤,后续手术操作同经腹腔途径。

1.3 观察指标 观察并记录手术时间、术中出血量、肾脏热缺血时间、术中输血情况、术中和术后

并发症发生情况、切缘阳性率、术中转开放手术或根治性肾切除术情况、术后住院时间、术后肾功能下降百分比等临床指标。本研究中肾功能采用eGFR进行评估,eGFR是根据患者肌酐采用美国慢性肾脏病流行病学合作工作组(Chronic Kidney Disease Epidemiology Collaboration,CKD-EPI)公式^[11]计算而得。

1.4 统计学处理 应用SPSS 24.0软件处理数据。计量资料以 $\bar{x}\pm s$ 或中位数(下四分位数,上四分位数)表示,两组间比较采用独立样本*t*检验或Mann-Whitney *U*检验;计数资料以频数和百分数表示,两组间比较采用Pearson χ^2 检验或Fisher确切概率法。检验水准(α)为0.05。

2 结果

两组患者手术均顺利完成,均未发生术中并发症,无术中转开放手术或根治性肾切除术。由表1可见,RAPN组肾脏热缺血时间[(19.2±5.6) min]短于LPN组[(21.8±4.1) min],术后住院时间[(6.0±1.2) d]短于LPN组[(7.4±2.8) d],差异均有统计学意义(*P*均<0.05)。两组患者手术时间、术中出血量、术中输血率、术后肾功能下降百分比等指标差异均无统计学意义(*P*均>0.05)。LPN组有3例患者发生术后并发症,分别为肾动静脉瘘1例、肾脏创面出血1例及双肺炎1例,而RAPN组患者均未发生术后并发症,两组患者术后并发症发生率差异无统计学意义(*P*>0.05)。所有患者术后病理结果显示手术切缘均为阴性。

表1 两组早期肾癌合并肥胖患者围手术期指标比较

Tab 1 Comparison of perioperative indicators of obese patients with early renal tumors between the two groups

Indicator	RAPN group <i>N</i> =34	LPN group <i>N</i> =37	<i>P</i> value
Operation time (min), $\bar{x}\pm s$	153.0±33.3	140.1±32.3	0.101
Estimated blood loss (mL), $\bar{x}\pm s$	88.5±49.1	106.2±72.0	0.235
Warm ischemia time (min), $\bar{x}\pm s$	19.2±5.6	21.8±4.1	0.027
Intraoperative blood transfusion <i>n</i> (%)	1 (2.9)	2 (5.4)	1.000
Intraoperative conversion to open surgery or radical nephrectomy <i>n</i>	0	0	
Intraoperative complication <i>n</i>	0	0	
Postoperative complication <i>n</i> (%)	0	3 (8.1)	0.241
Positive surgical margin <i>n</i>	0	0	
Postoperative hospital stay (d), $\bar{x}\pm s$	6.0±1.2	7.4±2.8	0.011
Variation of eGFR from baseline (%), $\bar{x}\pm s$	2.1 (-4.8, 9.3)	5.8 (1.5, 15.7)	0.109

RAPN: Robot-assisted partial nephrectomy; LPN: Laparoscopic partial nephrectomy; eGFR: Estimated glomerular filtration rate

3 讨论

肥胖被认为是机体亚健康的一种表现,在多种疾病的外科治疗中,因皮肤脂肪层过厚使得术中暴露视野减小,内脏脂肪过多导致脏器及血管难以分离,增加了手术的操作难度;过厚的脂肪层发生液化的概率更高,会影响术后手术切口的愈合和整体的恢复^[12-13]。

近年来,机器人和腹腔镜手术因其创伤小、痛苦少、术后恢复快、安全性高等优势在肾癌外科治疗中的比例不断上升。有研究发现相比正常体质量的肾癌患者,肥胖的肾癌患者行OPN手术治疗时手术时间和肾脏热缺血时间更长、术中出血量更多^[8]。但当肥胖肾癌患者行RAPN或LPN治疗时,围手术期疗效与正常体质量肾癌患者之间无明显差异^[14-16],提示机器人和腹腔镜技术上的优势可减少肥胖对手术造成的影响。与OPN相比,机器人与腹腔镜的优势进一步体现,早期肾癌合并肥胖患者行RAPN或LPN的手术时间和住院时间更短,术后并发症的发生率更低^[7,17]。目前,国内外尚未见RAPN与LPN两种术式治疗早期肾癌合并肥胖患者临床疗效及安全性的对比研究。

既往的meta分析显示RAPN治疗早期肾癌相比LPN在肾脏热缺血时间上更具优势^[18]。本研究结果显示,RAPN治疗早期肾癌合并肥胖患者肾脏热缺血时间和术后住院时间均较LPN组更短。不同于传统腹腔镜,机器人腹腔镜具有三维高清镜头,手术视野更清晰和立体,手术器械与组织间的距离感更强,可有效减少过多腔内脂肪及过厚脂肪层对手术视野和手术操作造成的影响。过多脂肪组织、过厚脂肪层及部分患者腹部过度的隆起不仅在套管置入和组织分离等操作时增加了工作量,还放大了腹腔镜器械切口处的支点效应,影响了手术操作的灵活性,术者在进行肾肿瘤切除和肾脏创面缝合等操作时需耗费更多体力。机器人手术因其特有的机械臂而灵活性更强,准确性更高,且允许术者以坐姿操作,有效节省了术者的体力,在切割和缝合时做到“快、狠、准”,这也体现在RAPN组肾脏热缺血时间比LPN组更短。此外,机器人手术可以有效减少手术创伤,使患者术后能够更早地进行锻炼,加快了患者的恢复,患者术后住院时间更短。虽然本研究中RAPN组和LPN组在手术并发

症上的差异不具有统计学意义,但LPN组出现了3例术后并发症,而RAPN组则无一例术后并发症,这可能与RAPN手术创伤更小有关。

RAPN组术后肾功能的下降幅度相比LPN组更小,但不具有统计学意义,这可能是因为两组患者的肾脏热缺血时间较短(平均肾脏热缺血时间均小于25 min),对肾功能产生的影响有限,同时存在术侧肾脏的代偿因素,而肾小球滤过率是根据患者肌酐估算而得,准确性不及发射单光子计算机断层扫描测量的肾小球滤过率。此外,本研究病例数较少,未进行长期随访,关于RAPN和LPN对早期肾癌合并肥胖患者肾功能的影响还有待进一步研究。

RAPN组与LPN组在肿瘤学疗效上相当,术后病理结果显示两组均无切缘阳性病例。相比LPN,RAPN的操作空间更小,但手术并发症发生率及肿瘤切缘阳性率并未增加,RAPN组患者均未发生术中和术后并发症。总之,RAPN和LPN均是治疗早期肾癌合并肥胖患者的有效术式。相比传统腹腔镜技术,机器人辅助腹腔镜技术在减少肾脏热缺血时间、缩短术后住院时间等方面具有一定优势,可作为优选方案。

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