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· 临床研究 ·

小肝癌射频消融与经腹腔镜切除治疗的近期疗效及成本效果分析

刘勤¹, 周少波²

(1. 蚌埠医学院, 安徽 蚌埠 233000; 2. 蚌埠医学院第二附属医院 普通外科, 安徽 蚌埠 233004)

摘要

背景与目的: 射频消融术(RFA)与腹腔镜肝切除术均为治疗原发性小肝癌的重要方法, 两种治疗方法都有各自的适应证和优缺点, 这也是文献报道的重点, 但对于两种治疗方法的近期疗效特别是卫生经济学成本的研究还相对缺乏。本研究通过比较RFA与腹腔镜肝切除术治疗原发性小肝癌的近期疗效及医疗相关经济学成本的差别, 以期为临床原发性小肝癌治疗方式的选择提供帮助。

方法: 回顾性分析2017年8月—2019年7月收治的80例原发性小肝癌患者(肿瘤直径 ≤ 5 cm)资料, 其中40例行经皮RFA(RFA组), 40例行腹腔镜肝切除术(腔镜组)。比较两组患者相关临床指标与医疗成本。

结果: 两组患者术前的基本资料、肝功能指标及甲胎蛋白(AFP)水平均无统计学差异(均 $P>0.05$)。术后, RFA组的肝功能指标先升高后降, 腔镜组则呈持续降低, RFA组肝功能指标在术后3 d均明显高于腔镜组[ALT: (65.72 \pm 25.61) U/L vs. (45.26 \pm 23.36) U/L, AST: (77.27 \pm 12.51) U/L vs. (53.29 \pm 11.24) U/L, TBIL: (25.12 \pm 6.06) μ mol/L vs. (22.26 \pm 4.39) μ mol/L, 均 $P<0.05$], 但两组术后1个月肝功能指标均无统计学差异(均 $P>0.05$); 两组术后AFP水平均逐渐降低, 且两组间同时间点差异无统计学意义(均 $P>0.05$)。RFA组的手术时间、术中出血量、住院时间和术后并发症发生率均明显少于腔镜组[(62.6 \pm 11.7) min vs. (155.2 \pm 27.5) min, (5.2 \pm 0.5) mL vs. (76.2 \pm 11.3) mL, (4.3 \pm 1.2) d vs. (6.3 \pm 1.8) d, 5.0% vs. 17.5%, 均 $P<0.05$]; 两组肿瘤清除率均为100%。直接医疗成本构成中, RFA组的手术相关费用、药品费和住院费均明显低于腔镜组[(11 526.46 \pm 941.08)元 vs. (14 277.25 \pm 938.46)元, (1 825.33 \pm 179.5)元 vs. (2 614.19 \pm 222.4)元, (476.30 \pm 67.71)元 vs. (712.03 \pm 87.52)元, 均 $P<0.05$], 但两组检验检查费和其他费用无统计学差异(均 $P>0.05$); RFA组的直接医疗成本、间接医疗成本和总的医疗成本均明显低于腔镜组[(17 446.78 \pm 1 465.24)元 vs. (21 270.62 \pm 1 612.38)元, (782.23 \pm 66.80)元 vs. (1 654.67 \pm 120.47)元, (18 228.01 \pm 1 539.72)元 vs. (22 924.35 \pm 1922.67)元, 均 $P<0.05$]。

结论: RFA与腹腔镜肝切除术对原发性小肝癌的近期疗效相当, 但RFA治疗的手术时间与住院时间较短, 术后并发症发生率也较低, 因此, 其所产生的直接医疗成本和医疗总成本也低于腔镜手术。

关键词

肝肿瘤; 射频消融术; 肝切除术; 费用效益分析

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作者简介: 刘勤, 蚌埠医学院副教授, 主要从事经济学及卫生经济学方面的研究。

通信作者: 周少波, Email: zhoushaobodoctor@sina.com

Analysis of short-term efficacy and cost-effectiveness of percutaneous radiofrequency ablation and laparoscopic hepatectomy in treatment of small hepatocellular carcinoma

LIU Qin¹, ZHOU Shaobo²

(1. Bengbu Medical College, Bengbu, Anhui 233000, China; 2. Department of General Surgery, the Second Affiliated Hospital of Bengbu Medical College, Bengbu, Anhui 233004, China)

Abstract

Background and Aims: Radiofrequency ablation (RFA) and laparoscopic hepatectomy are important treatment modalities for small hepatocellular carcinoma (HCC), and both methods have their indications, advantages and limitations, which also are the main themes addressed by existing literature. However, there are relatively scarce data regarding the short-term efficacy especially the health economic costs of the two methods. Therefore, this study was conducted to determine the differences in short-term efficacy outcomes and medical costs between percutaneous RFA and laparoscopic hepatectomy in treatment of small HCC, so as to provide help for the selection of treatment options for small HCC in clinical practice.

Methods: The clinical data of 80 patients with small HCC (tumor diameter ≤ 5 cm) treated from August 2017 to July 2019 were retrospectively analyzed. Of the patients, 40 cases underwent percutaneous RFA (RFA group) and the other 40 cases underwent laparoscopic hepatectomy (laparoscopic group). The main clinical variables and medical costs were compared between the two groups of patients.

Results: There were no significant differences in preoperative baseline data and levels of liver function parameters and α -fetoprotein (AFP) between the two groups (all $P > 0.05$). The liver function parameters were initially increased and then decreased in RFA group, and were continuously declined in laparoscopic group after operation. The liver function parameters on postoperative 3 d were significantly higher in RFA group than those in laparoscopic group [ALT: (65.72 \pm 25.61) U/L vs. (45.26 \pm 23.36) U/L, AST: (77.27 \pm 12.51) U/L vs. (53.29 \pm 11.24) U/L, TBIL: (25.12 \pm 6.06) μ mol/L vs. (22.26 \pm 4.39) μ mol/L, all $P < 0.05$], but showed no significant differences on postoperative one month between the two groups (all $P > 0.05$). The AFP levels were gradually reduced in both groups after operation, which showed no significant differences between the two groups in the same time points (both $P > 0.05$). The operative time, intraoperative blood loss, length of hospital stay and incidence of postoperative complications in RFA group were significantly less than those in laparoscopic group [(62.6 \pm 11.7) min vs. (155.2 \pm 27.5) min, (5.2 \pm 0.5) mL vs. (76.2 \pm 11.3) mL, (4.3 \pm 1.2) d vs. (6.3 \pm 1.8) d, 5.0% vs. 17.5%, all $P < 0.05$]. The tumor removal rates were 100% in both groups. In the direct medical cost components, the costs for surgery-related care, medications and hospitalization in RFA group were significantly lower than those in laparoscopic group [(11 526.46 \pm 941.08) yuan vs. (14 277.25 \pm 938.46) yuan, (1 825.33 \pm 179.5) yuan vs. (2 614.19 \pm 222.4) yuan, (476.30 \pm 67.71) yuan vs. (712.03 \pm 87.52) yuan, all $P < 0.05$], but no significant differences were noted in the testing and examination and other costs between the two groups (both $P > 0.05$); the direct and indirect medical costs as well as the total medical costs in RFA group were significantly lower than those in laparoscopic group [(17 446.78 \pm 1 465.24) yuan vs. (21 270.62 \pm 1 612.38) yuan, (782.23 \pm 66.80) yuan vs. (1 654.67 \pm 120.47) yuan, (18 228.01 \pm 1 539.72) yuan vs. (22 924.35 \pm 1922.67) yuan, all $P < 0.05$].

Conclusion: RFA and laparoscopic hepatectomy have similar the short-term efficacy in treatment of small HCC. However, RFA is associated with shortened operative time and hospital stay as well as decreased incidence of postoperative complications, so the direct and total medical costs incurred by RFA are also lower than those by laparoscopic hepatectomy.

Key words

Liver Neoplasms; Radiofrequency Ablation; Hepatectomy; Cost-Benefit Analysis

CLC number: R735.7

精准医学是随着基因组技术、生物信息技术与大数据的快速发展而出现的新的医疗模式,它以基因组、蛋白质组、转录组等相关信息结合医学前沿技术,为患者制定个体化的疾病预防和治疗方案,以期获得最大疗效和降低不良反应,提高防治疾病的效费比^[1]。从另一个角度来看,精准医学也是指在患者大样本数据基础上,纳入患者自身的遗传学、分子或细胞学信息,结合临床因素和现有治疗手段,针对每一位患者个体化制订独特的诊疗方案。由此可见精准医学不仅仅只是以基因测序结果来指导临床用药,而且还应该包含临床治疗方式方法的精准化。肝癌是极其复杂、有高度异质性、需要多学科综合管理的疾病。肝癌的根治手段包括肝切除、肝移植和射频消融治疗。肝切除仍然是目前治疗肝脏恶性肿瘤的金标准,但常常受限于中晚期肿瘤切除导致剩余肝体积不足或是创伤过大。肝移植疗效肯定,但是供肝短缺和费用高昂严重制约着肝移植的发展。对于微创理念越来越普及的今天,小肝癌的治疗方式也越来越精准、微创。随着腹腔镜技术的发展,腹腔镜下肝癌的切除已经被广泛认可^[2-3]。射频消融(radiofrequency ablation, RFA)也是近年来普遍认可的一种根治性治疗小肝癌的手段^[4-5]。近期,关于RFA治疗肝癌的相关研究不少,既有经皮RFA,又有腹腔镜下消融。这些研究表明,对于小肝癌来说,RFA比手术切除创伤更小,风险更低而且可重复性高^[2,6-7]。RFA治疗已经越来越成为小肝癌的重要治疗方式,那就必然会占据越来越多的医疗资源,然而,这方面的研究目前较少见,本文就小肝癌的经皮RFA和腹腔镜下切除的成本-效果分析从卫生经济学角度做一初步评价。

1 资料与方法

1.1 一般资料

选择2017年8月—2019年7月蚌埠医学院附属医院收治的原发性肝癌患者80例。本研究病例的入选标准:(1)未经治疗的原发性肝癌;(2)肝功能Child-Pugh A级或B级;(3)肿瘤直径 ≤ 5 cm,无门静脉及远处转移,无卫星灶;(4)临床资料齐全并能够坚持随访。排除标准:(1)侵犯邻近组织器官或有远处转移;(2)凝血功能障碍;(3)其他RFA禁忌证。80例患者分为两组,每组各40例,分别行经超声或CT引导的经皮RFA术(RFA组)和腹腔

镜辅助肝切除术(腹腔镜组)。两组患者的一般资料如:性别、年龄、肿瘤直径等数据无统计学差异(均 $P>0.05$) (表1)。

表1 两组患者的一般资料比较($n=40$)

Table 1 Comparison of the general data between the two groups of patients ($n=40$)

资料	RFA组	腹腔镜组	P
年龄(岁, $\bar{x} \pm s$)	38.5 \pm 16.7	36.9 \pm 17.4	>0.05
性别[n(%)]			
男	29 (72.5)	30 (75.0)	>0.05
女	11 (27.5)	10 (25.0)	
Child-Pugh 分级[n(%)]			
A	35 (87.5)	33 (82.5)	>0.05
B	5 (12.5)	7 (17.5)	
肿瘤直径[cm, n(%)]			
< 3	18 (45.0)	19 (47.5)	>0.05
3~5	22 (55.0)	11 (52.5)	

1.2 治疗方法

经皮RFA术:常规消毒铺巾,采用腹壁局部麻醉,在超声或CT引导下将射频电极针送入肿瘤的中心位置,按说明书所示操作流程进行,一般从3个不同角度进针消融3次,确保肿瘤周边0.5~1.0 cm的正常肝组织纳入消融范围。常规行术中超声造影,发现残余病灶可及时补充消融,保证肿瘤消融完全^[8-9]。遵照说明处理针道以防止肿瘤种植或出血。腹腔镜辅助肝切除术:常规采用静吸复合全身麻醉,根据肿瘤位置及大小选用四孔或五孔法,术中B超明确病灶部位及范围,充分游离相应的肝周韧带并显露肿瘤后,行肿瘤根治性切除,切除范围至少包括肿瘤周围1~2 cm正常肝组织。

1.3 观察指标

1.3.1 临床指标 (1)分别记录患者术前、术后第3天和术后1个月的肝功能指标;(2)记录术前和术后1个月的AFP值;(3)统计每1例患者的手术时长、手术出血量和住院时长;(4)统计围手术期的并发症发生情况;(5)计算肿瘤清除度:术后2个月通过肝脏增强CT或增强MRI检查未发现肿瘤病灶,AFP水平恢复正常者可认为肿瘤完全清除^[10-11]。

1.3.2 医疗成本 (1)直接医疗成本:将两组患者的直接医疗费用归入手术、材料成本,药品成本,住院成本,其他成本(包括术后营养支持成本),额外成本(处理并发症和再次手术成本)等几大类。

对直接医疗成本和各类成本进行分析。(2) 医疗总成本:患者住院期间的医疗总成本由直接医疗成本和间接医疗成本组成。间接医疗成本一般是指因患者住院所造成的除去直接医疗成本以外的相关花费,其中最主要的部分是患者本人及其家属和陪护、陪同人员的误工费,以及家属及陪护人员因往返、陪同等造成的额外支出。陪同人员的误工天数为所有陪同人员误工天数的总和^[12]。

1.4 统计学处理

数据的统计分析采用SPSS 22.0统计学软件。计量资料采用单因素方差分析,数据以均数±标准差($\bar{x} \pm s$)表示;计数资料用 χ^2 检验; $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 两组血清肝功能指标及肿瘤标志物水平的比较

术前两组的肝功能指标天门冬氨酸氨基转氨酶(AST)、丙氨酸氨基转氨酶(ALT)、总胆红素(TBIL)与肿瘤标志物甲胎蛋白(AFP)水平比较,差异均无统计学意义(均 $P > 0.05$)。术后RFA组肝功能指标先升后降,腹腔镜组则呈持续降低;术后3 d, RFA组的AST、ALT、TBIL均明显高于腹腔镜组(均 $P < 0.05$),但两组以上指标在术后1个月均无统计学差异(均 $P > 0.05$)。两组术后AFP水平均逐渐降低,且两组间无统计学差异(均

$P > 0.05$) (表2)。

表2 两组肝功能指标及 AFP 水平的比较 ($n=40, \bar{x} \pm s$)
Table 2 Comparison of the liver function parameters and AFP levels between the two groups of patients ($n=40, \bar{x} \pm s$)

指标	RFA 组	腹腔镜组	P
ALT (U/L)			
术前	57.68 ± 13.46	58.42 ± 12.8	>0.05
术后 3 d	65.72 ± 25.61	45.26 ± 23.36	<0.05
术后 1 个月	38.43 ± 6.31	36.95 ± 6.12	>0.05
AST (U/L)			
术前	67.34 ± 16.32	68.77 ± 15.76	>0.05
术后 3 d	77.27 ± 12.51	53.29 ± 11.24	<0.05
术后 1 个月	38.36 ± 5.66	34.57 ± 5.27	>0.05
TBIL (μmol/L)			
术前	18.32 ± 5.24	19.65 ± 5.89	>0.05
术后 3 d	25.12 ± 6.06	22.26 ± 4.39	<0.05
术后 1 个月	18.25 ± 5.21	18.13 ± 4.89	>0.05
AFP (μg/L)			
术前	235.3 ± 24.6	242.7 ± 26.9	>0.05
术后 3 d	112.7 ± 22.3	104.4 ± 24.5	>0.05
术后 1 个月	61.1 ± 14.37	58.5 ± 16.62	>0.05

2.2 两组患者疗效指标比较

经皮RFA组患者的手术时间、术中出血量和住院时间均明显低于腹腔镜组(均 $P < 0.05$);腹腔镜组的术后总并发症发生率明显高于RFA组($P < 0.05$)。术后2个月门诊复查,两组患者完全清除率均为100%,差异均无统计学意义($P > 0.05$) (表3)。

表3 两组手术时间、术中出血量、住院时间、术后并发症、肿瘤清除率的比较

Table 3 Comparison of the operative time, blood loss, length of hospital stay, complications and tumor removal rates between the two groups

组别	手术时间 (min, $\bar{x} \pm s$)	出血量 (mL, $\bar{x} \pm s$)	住院时间 (d, $\bar{x} \pm s$)	并发症发生率 (%)	肿瘤清除率 (%)
RFA 组	62.6 ± 11.7	5.2 ± 0.5	4.3 ± 1.2	5.0	100
腹腔镜组	155.2 ± 27.5	76.2 ± 11.3	6.3 ± 1.8	17.5	100
P	<0.05	<0.05	<0.05	<0.05	>0.05

2.3 两组直接医疗成本构成比较

两组的直接医疗成本构成中,检验检查费和其他费用无统计学差异(均 $P > 0.05$);RFA组的

手术相关费用、药品费和住院费均明显低于腹腔镜组(均 $P < 0.05$) (表4)。

表4 两组直接医疗成本构成比较 (元, $n=40, \bar{x} \pm s$)

Table 4 Comparison of the direct medical cost components between the two groups (yuan, $n=40, \bar{x} \pm s$)

组别	手术相关费用	药品费	检验检查费	住院费	其他
RFA 组	11 526.46 ± 941.08	1 825.33 ± 179.5	2 246.19 ± 162.5	476.30 ± 67.71	1 373.53 ± 86.8
腹腔镜组	14 277.25 ± 938.46	2 614.19 ± 222.4	2 315.37 ± 206.8	712.03 ± 87.52	1 402.26 ± 89.4
P	<0.05	<0.05	>0.05	<0.05	>0.05

2.4 两组直接医疗成本、间接医疗成本及医疗总成本比较

RFA组的直接医疗成本、间接医疗成本和

总的医疗成本均明显低于腹腔镜组（均 $P < 0.05$ ）（表5）。

表5 两组直接医疗成本、间接医疗成本及医疗总成本比较（元， $n=40$ ， $\bar{x} \pm s$ ）

Table 5 Comparison of the direct, indirect and total medical costs between the two groups (yuan, $n=40$, $\bar{x} \pm s$)

组别	直接成本	间接成本	医疗总成本
RFA组	17 446.78 ± 1 465.24	782.23 ± 66.80	18 228.01 ± 1 539.72
腹腔镜组	21 270.62 ± 1 612.38	1 654.67 ± 120.47	22 924.35 ± 1 922.67
<i>P</i>	<0.05	<0.05	<0.05

3 讨论

手术切除是目前治疗原发性小肝癌的主要方式，随着腹腔镜外科技术的不断发展，腹腔镜肝切除术在临床上得到了越来越广泛的认可。近年来随着微创理念和精准治疗理念的深入人心，RFA也逐渐受到青睐，除了一些不能耐受外科手术切除的患者获得了根治的机会，小肝癌的患者也更多的选择RFA治疗。同样的疗效下，越精准、越微创成为必然的选择。经皮RFA的原理是在CT或超声引导下，精准地找到病灶点，利用电磁波产生的热量杀伤肿瘤细胞以治愈肿瘤。RFA比手术切除创伤更小，风险更低而且可重复性高，多项研究表明RFA治疗原发性小肝癌可获得与手术切除相同的根治性效果^[13-15]。

目前关于肝癌RFA术后影像学评价方法和评价时机尚无统一标准。现在常用对比增强超声造影，增强CT、增强MRI或PET-CT^[16]。其中PET-CT能在肝癌RFA术后残余肿瘤病灶形态学发生变化前作出早期判断，为肝癌患者早期复治提供了影像学依据。为早期精确判断肝癌RFA术后残余与复发肿瘤，除定期进行影像学随访外，还需结合患者临床实验室指标如AFP作出综合判断。此外，针对肝癌RFA术后残余与复发肿瘤的分子探针技术研究也不断深入，未来临床应用具有广阔前景。目前临床应用较广泛的是超声、CT/MRI影像学评估结合AFP水平。本研究通过术后3 d及术后1个月的检测中发现，两组的AFP值均逐步下降并趋于正常，组间比较无统计学差异；术后2个月复查增强CT或增强MRI，结合AFP水平发现，两组患者的肿瘤清除率无统计学差异（ $P > 0.05$ ）；说明这两种治疗原发性小肝癌的方式均具有可靠的疗效。

肝功能指标可以比较及时地反映肝脏受损情

况，其中尤其是AST、ALT、TBIL具有很好的检测意义。本研究中术后3 d，RFA组AST、ALT、TBIL均高于腹腔镜组，分析其原因可能由于RFA使肿瘤及附近的部分肝组织出现凝固坏死，造成肝功能短暂性受损。1个月后，RFA组的AST、ALT、TBIL下降，是因为随着坏死组织的完全吸收，肝功能逐步恢复正常。而腹腔镜组患者术中针对性的切除癌灶，对周围组织影响较小，术后肝功能基本正常。

RFA是通过将局部组织温度升高，使肿瘤及周边组织发生凝固性坏死，从而达到根治目的。有研究^[17-18]表明，对于直径 ≤ 5 cm的单发肝癌，RFA治疗的疗效与开腹手术切除相当，而且操作方便、对肝功能损伤较小，还可以重复多次进行治疗。徐治军等^[19]也认为，超声引导下经皮RFA治疗小肝癌具有创伤小、出血量少、手术时间短、住院时间短等优点。不足之处在于，RFA处理肝脏表面或者临近大血管的肿瘤时，效果尚未十分肯定^[20-21]。

本研究RFA组的手术时长、术中出血量和住院时长均显著低于腹腔镜组，RFA组的手术相关并发症发生率也明显低于腹腔镜组。其他学者的研究结果^[4, 19]也显示：经皮RFA术与手术肝切除相比，可以有效降低术中、术后并发症（如出血、感染、周围脏器的损伤等）的发生。说明RFA治疗小肝癌具有更加微创的优势。

患者住院期间医疗成本包括直接医疗成本和间接医疗成本。直接医疗成本包含手术材料费用、药品、营养支持费用、住院费用等^[22-23]。本研究中，两组的直接医疗成本比较，RFA组明显低于腹腔镜组。RFA组由于采用局部麻醉，手术时间短、并发症发生率低、术后恢复更快的特点，它的相关材料费、麻醉费、药品费和住院费均明显低于腹腔镜组。间接医疗成本，主要纳入计算的是

患者因病住院导致的误工费 and 家属及陪同人员的误工费。RFA组由于患者术后恢复更快、住院时间更短,患者及陪护人员误工成本等间接医疗成本也显著低于腹腔镜手术组。平均住院天数是影响医疗成本的重要因素,也是考核卫生资源利用效率的一个重要指标。RFA组术后住院天数减少,加快了床位周转,不仅有利于压缩高涨的医疗成本,并且减少患者的经济负担。医疗总成本由直接医疗成本和间接医疗成本组成,因此,本研究中RFA组的医疗总成本也是明显低于腹腔镜组的。

综合以上,RFA和腹腔镜下手术切除均为小肝癌的精准治疗方法,两者近期疗效相当。从卫生经济学角度来看,RFA治疗小肝癌相对于腹腔镜手术治疗,具有手术时间短、并发症发生率低、住院时间短等优势,因而具有更低的直接医疗成本和医疗总成本。但是,RFA方法也具有一些局限性,当肿瘤位于肝脏表面或邻近大血管时,操作中容易误伤大血管或损伤周围脏器,有时可能出现针道偏离,消融不彻底情况。在这种情况下,我们更推荐腹腔镜肝切除术。总之,应用精准医疗针对原发性小肝癌患者的治疗,对于广大患者的健康与社会的进步有着极为重大的价值和意义^[24-25]。随着精准医疗的逐渐成熟与发展,原发性小肝癌患者有希望获得更有价值的更加个体化的治疗方案,所需的治疗成本和所需的住院时间都将得到进一步减少。这些优势对于整个医疗卫生行业来说具有着重要作用。精准医疗的不断推进与发展也要求医务人员与时俱进,为患者提供更为个体化、更加人性化的治疗方案^[26-27]。

参考文献

- [1] National Research Council (US) Committee on A Framework for Developing a New Taxonomy of Disease. Toward Precision Medicine: Building a Knowledge Network for Biomedical Research and a New Taxonomy of Disease[M]. Washington (DC):National Academies Press (US), 2011.
- [2] Lai C, Jin RA, Liang X, et al. Comparison of laparoscopic hepatectomy, percutaneous radiofrequency ablation and open hepatectomy in the treatment of small hepatocellular carcinoma[J]. J Zhejiang Univ Sci B, 2016, 17(3):236-246. doi: 10.1631/jzus. B1500322.
- [3] 王细文, 王巍威, 赵宏智, 等. 经皮射频消融术与腹腔镜肝癌切除术治疗小肝癌的临床疗效观察[J]. 西部医学, 2017, 29(2):183-186. doi:10.3969/j.issn.1672-3511.2017.02.008.
- [4] Wang XW, Wang WW, Zhao HZ, et al. Comparison of percutaneous radiofrequency ablation and laparoscopic liver resection in treatment of small hepatocellular carcinoma[J]. Medical Journal of West China, 2017, 29(2):183-186. doi:10.3969/j.issn.1672-3511.2017.02.008.
- [5] Song J, Wang Y, Ma K, et al. Laparoscopic hepatectomy versus radiofrequency ablation for minimally invasive treatment of single, small hepatocellular carcinomas[J]. Surg Endosc, 2016, 30(10):4249-4257. doi: 10.1007/s00464-015-4737-1.
- [6] Hocquelet A, Papadopoulos P, Trillaud H. No-Touch Multibipolar Radiofrequency Ablation: The New Standard Ablative Technique for Hepatocellular Carcinoma 5 cm or Smaller?[J]. Radiology, 2016, 281(3):975-976. doi: 10.1148/radiol.2016160774.
- [7] Bertrand J, Caillol F, Borentain P, et al. Percutaneous hepatic radiofrequency for hepatocellular carcinoma: results and outcome of 46 patients[J]. Hepat Med, 2015, 7:21-27. doi: 10.2147/HMER. S67940.
- [8] 张雯雯, 王宏光, 史宪杰. 腹腔镜超声引导下肝肿瘤射频消融治疗的研究进展[J]. 解放军医学院学报, 2016, 37(5):514-517. doi:10.3969/j.issn.2095-5227.2016.05.027.
- [9] Zhang WW, Wang HG, Shi XJ. Advances in laparoscopic ultrasound guided radiofrequency ablation for treatment of liver tumor[J]. Academic Journal of Chinese PLA Medical School, 2016, 37(5):514-517. doi:10.3969/j.issn.2095-5227.2016.05.027.
- [10] 唐喆, 马宽生. 消融技术在肝癌外科治疗中的规范化应用[J]. 中华医学杂志, 2017, 97(31):2407-2410. doi:10.3760/cma.j.issn.0376-2491.2017.31.003.
- [11] Tang Z, Ma KS. Utilization of radiofrequency in surgical treatment of hepatocellular carcinoma[J]. Chinese Medicine, 2017, 97(31):2407-2410. doi:10.3760/cma.j.issn.0376-2491.2017.31.003.
- [12] Kang TW, Kim JM, Rhim H, et al. Small Hepatocellular Carcinoma: Radiofrequency Ablation versus Nonanatomic Resection--Propensity Score Analyses of Long-term Outcomes[J]. Radiology, 2015, 275(3):908-919. doi: 10.1148/radiol.15141483.
- [13] Casaccia M, Santori G, Bottino G, et al. Laparoscopic resection vs laparoscopic radiofrequency ablation for the treatment of small hepatocellular carcinomas: A single-center analysis[J]. World J Gastroenterol, 2017, 23(4):653-660. doi: 10.3748/wjg.v23.i4.653.
- [14] Hocquelet A, Aubé C, Rode A, et al. Comparison of no-touch multi-bipolar vs. monopolar radiofrequency ablation for small HCC[J]. J Hepatol, 2017, 66(1):67-74. doi: 10.1016/j.jhep.2016.07.010.
- [15] 刘勤, 周少波, 刘蔚东, 等. 腹腔镜与开腹直肠癌Dixon术的卫生经济学评价[J]. 中国现代医学杂志, 2009, 19(10):1566-1568.
- [16] Liu Q, Zhou SB, Liu WD, et al. Cost-effectiveness analysis of

- laparoscopic versus open anterior resection for rectal cancer[J]. *China Journal of Modern Medicine*, 2009, 19(10):1566–1568.
- [13] Ziemiłowicz TJ, Wells SA, Lubner MG, et al. Hepatic Tumor Ablation[J]. *Surg Clin North Am*, 2016, 96(2):315–339. doi: 10.1016/j.suc.2015.12.006.
- [14] Miura JT, Johnston FM, Tsai S, et al. Surgical resection versus ablation for hepatocellular carcinoma \leq 3 cm: a population-based analysis[J]. *HPB (Oxford)*, 2015, 17(10):896–901. doi: 10.1111/hpb.12446.
- [15] 崔芒芒, 朱晓琳, 张侗, 等. 射频消融治疗符合米兰标准的早期肝癌疗效分析[J]. *中国肿瘤临床*, 2017, 44(11):539–543. doi:10.3969/j.issn.1000-8179.2017.11.256.
- Cui MM, Zhu XL, Zhaog T, et al. Efficacy analysis of radiofrequency ablation in the treatment of early-stage hepatocellular carcinoma within the Milan criteria[J]. *Chinese Journal of Clinical Oncology*, 2017, 44(11):539–543. doi:10.3969/j.issn.1000-8179.2017.11.256.
- [16] Frieser M, Kiesel J, Lindner A, et al. Efficacy of contrast-enhanced US versus CT or MRI for the therapeutic control of percutaneous radiofrequency ablation in the case of hepatic malignancies[J]. *Ultraschall Med*, 2011, 32(2):148–153. doi: 10.1055/s-0029-1245934.
- [17] 曾鹏, 周乐杜, 王栋, 等. 射频消融治疗小肝癌疗效及预后因素分析[J]. *中国普通外科杂志*, 2014, 23(7):904–909. doi:10.7659/j.issn.1005-6947.2014.07.008.
- Zeng P, Zhou LD, Wang D, et al. Radiofrequency ablation for small hepatocellular carcinoma: efficacy and prognostic factors[J]. *Chinese Journal of General Surgery*, 2014, 23(7):904–909. doi:10.7659/j.issn.1005-6947.2014.07.008.
- [18] Yi HM, Zhang W, Ai X, et al. Radiofrequency ablation versus surgical resection for the treatment of hepatocellular carcinoma conforming to the Milan criteria: systemic review and meta-analysis[J]. *Int J Clin Exp Med*, 2014, 7(10):3150–3163.
- [19] 徐治军, 许戈良, 马金良, 等. 超声引导下经皮射频消融与腹腔镜肝切除术治疗原发性小肝癌的对比研究[J]. *中国普通外科杂志*, 2017, 26(1):18–24. doi:10.3978/j.issn.1005-6947.2017.01.004.
- Xu ZJ, Xu GL, Ma JL, et al. Ultrasound guided percutaneous radiofrequency ablation versus laparoscopic hepatectomy for small primary liver cancer[J]. *Chinese Journal of General Surgery*, 2017, 26(1):18–24. doi:10.3978/j.issn.1005-6947.2017.01.004.
- [20] Zorbas G, Samaras T. A study of the sink effect by blood vessels in radiofrequency ablation[J]. *Comput Biol Med*, 2015, 57:182–186. doi: 10.1016/j.compbimed.2014.12.014.
- [21] Poch FG, Rieder C, Ballhausen H, et al. The vascular cooling effect in hepatic multipolar radiofrequency ablation leads to incomplete ablation ex vivo[J]. *Int J Hyperthermia*, 2016, 32(7):749–756. doi: 10.1080/02656736.2016.1196395.
- [22] Fleck LM. Controlling Healthcare Costs: Just Cost Effectiveness or "Just" Cost Effectiveness?[J]. *Camb Q Healthc Ethics*, 2018, 27(2):271–283. doi: 10.1017/S0963180117000603.
- [23] Liu B, Wei M, Liu F, et al. Radiofrequency ablation plus nucleotide analogues for hepatitis B virus-related hepatocellular carcinoma: a cost-effectiveness analysis[J]. *Am J Transl Res*, 2018, 10(8):2685–2695.
- [24] Hasegawa K, Kokado N, Makuuchi M, et al. Comparison of resection and ablation for hepatocellular carcinoma: a cohort study based on a Japanese nationwide survey[J]. *J Hepatol*, 2013, 58(4):724–749. doi: 10.1016/j.jhep.2012.11.009.
- [25] Li D, Kang J, Golas BJ, et al. Minimally invasive local therapies for liver cancer[J]. *Cancer Biol Med*, 2014, 11(4):217–236. doi: 10.7497/j.issn.2095-3941.2014.04.001.
- [26] Maluccio M, Covey A. Recent progress in understanding, diagnosing, and treating hepatocellular carcinoma[J]. *CA Cancer J Clin*, 2012, 62(6):394–399. doi: 10.3322/caac.21161.
- [27] Haddad FS, McLawhorn AS. Guidelines for reporting health economic research[J]. *Bone Joint J*, 2016, 98-B(2):147–151. doi: 10.1302/0301-620X.98B2.37643.

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