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· 论 著 ·

超声造影结合 Bosniak 分级预测肾脏囊性病灶良恶性风险分层的应用价值

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[摘要] **目的** 探讨参照 Bosniak 分级 CT 标准更新版(2019 版)的超声造影 CT-Bosniak 分级标准及超声造影 RJ-Bosniak 分级标准在预测肾脏囊性病灶良恶性中的应用价值。**方法** 回顾性分析 2015 年 6 月至 2020 年 7 月在上海交通大学医学院附属瑞金医院及其无锡分院超声科进行超声造影检查的 316 例患者的 347 枚肾脏囊性病灶的超声造影声像图。参照 2019 版 Bosniak 分级 CT 标准和瑞金医院标准分别对超声造影声像图进行 Bosniak 分级, 其中参照 CT 标准者定义为超声造影 CT-Bosniak 标准, 按照瑞金医院临床实践经验总结所定分级标准定义为超声造影 RJ-Bosniak 分级标准。所有的入组病例最终由穿刺活检或手术病理学及增强 CT 或 MRI 等影像学检查随访证实。采用四格表计算 2 种超声造影 Bosniak 分级标准对肾脏囊性病灶良恶性诊断的准确度、灵敏度、特异度等。**结果** 以手术或穿刺活检所得病理结果及临床最终诊断为金标准, 347 枚肾脏囊性病灶中良性病灶 308 枚, 恶性病灶 39 枚。347 枚病灶中超声造影 CT-Bosniak 分级 I 级 198 枚, II 级 45 枚, II F 级 50 枚, III 级 26 枚, IV 级 28 枚; 超声造影 RJ-Bosniak 分级 I 级 198 枚, II 级 28 枚, II F 级 66 枚, III 级 28 枚, IV 级 27 枚。以 Bosniak III 级和 IV 级为恶性诊断标准, 超声造影 CT-Bosniak 分级和 RJ-Bosniak 分级正确诊断良、恶性病灶分别 290 枚、36 枚和 292 枚、38 枚, 判断肾囊性恶性病灶的准确度、灵敏度、特异度、阳性预测值、阴性预测值分别为 93.95% (326/347) 和 95.10% (330/347)、92.31% (36/39) 和 97.44% (38/39)、94.16% (290/308) 和 94.81% (292/308)、66.67% (36/54) 和 70.37% (38/54)、98.98% (290/293) 和 99.66% (292/293)。该 2 种分级标准的诊断结果均与金标准结果高度一致 (*Kappa* 值分别为 0.74 和 0.79)。**结论** 超声造影 Bosniak 分级标准对肾脏囊性病灶良恶性的鉴别诊断有较高的价值。瑞金医院所用的 Bosniak 分级标准使用简单、有效, 值得在临床推广应用。

[关键词] 肾肿瘤; 肾脏囊性病灶; 超声造影检查; Bosniak 分级**[中图分类号]** R 737.11**[文献标志码]** A**[文章编号]** 0258-879X(2021)08-0840-06

Value of contrast-enhanced ultrasound combined with Bosniak classification in predicting the risk stratification of benign and malignant cystic renal masses

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[Abstract] **Objective** To explore the value of contrast-enhanced ultrasound (CEUS) computed tomography (CT)-Bosniak classification (referring to the update version of Bosniak classification [CT, 2019]) and CEUS Ruijin (RJ)-Bosniak classification in predicting benign and malignant cystic renal masses. **Methods** The CEUS images of 347 cystic renal masses from 316 patients who underwent CEUS in Ruijin Hospital or Wuxi Branch of Ruijin Hospital, Shanghai Jiao Tong University School of Medicine from Jun. 2015 to Jul. 2020 were retrospectively analyzed. Classification according to the CT standard of Bosniak classification (version 2019) was defined as CEUS CT-Bosniak, and that of Ruijin Hospital clinical experience was defined as CEUS RJ-Bosniak. All the patients were confirmed by biopsy or surgical pathology, enhanced CT or magnetic resonance imaging (MRI). Four grid table was used to calculate the accuracy, sensitivity and specificity of the 2 CEUS Bosniak classifications in the diagnosis of benign and malignant cystic renal masses. **Results** In the 347 renal cystic foci, 308 benign foci and 39 malignant foci were diagnosed based on the gold standards (the pathological results of surgery or biopsy and the final clinical diagnosis). Of the 347 lesions, there were 198 cases of category I, 45 cases of category II, 50

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cases of category II F, 26 cases of category III, and 28 cases of category IV according to CEUS CT-Bosniak classification; 198 cases of category I, 28 cases of category II, 66 cases of category II F, 28 cases of category III, and 27 cases of category IV according to CEUS RJ-Bosniak classification. Whith Bosniak categories III and IV as diagnostic criteria of malignant foci, 290 benign and 36 malignant foci were correctly diagnosed by CEUS CT-Bosniak classification, while 292 benign lesions and 38 malignant foci were correctly diagnosed by CEUS RJ-Bosniak classification. The accuracy, sensitivity, specificity, and positive and negative predictive values between the diagnostic results of CEUS CT-Bosniak and CEUS RJ-Bosniak classification were 93.95% (326/347) and 95.10% (330/347), 92.31% (36/39) and 97.44% (38/39), 94.16% (290/308) and 94.81% (292/308), 66.67% (36/54) and 70.37% (38/54), and 98.98% (290/293) and 99.66% (292/293), respectively. The diagnostic results of the 2 standards were highly consistent with the gold standard results (*Kappa* values were 0.74 and 0.79, respectively).

Conclusion CEUS combined with Bosniak classification has high value in differential diagnosis of benign and malignant renal cystic masses. RJ-Bosniak classification is simple and effective, which is worthy of clinical application.

[**Key words**] kidney neoplasms; cystic renal mass; contrast-enhanced ultrasonography; Bosniak classification

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目前临床上尚无理想的用于辅助诊断肾肿瘤的血清肿瘤标志物,传统影像学手段如常规超声、CT或MRI在肾占位性疾病的诊断和鉴别诊断中也有较大局限性,通常需结合增强影像学检查。据报道约有10%的肾细胞癌表现为囊性,而良性肾脏囊性病灶如出血性或感染性囊肿等因病灶内部结构复杂,与其他肾恶性囊性病灶鉴别诊断困难^[1]。超声造影弥补了常规超声在检出与鉴别诊断肾局灶性病变等方面的不足,能够为临床提供非常有价值的诊断信息。本研究参照肾脏囊性病灶Bosniak分级CT标准更新版(2019版)^[2]和上海交通大学医学院附属瑞金医院所使用的肾脏囊性病灶超声造影诊断标准,探讨超声造影在肾脏囊性病灶良恶性鉴别诊断中的临床应用价值。

1 资料和方法

1.1 研究对象 选择2015年6月至2020年7月在上海交通大学医学院附属瑞金医院及其无锡分院超声科进行超声造影检查的316例患者的347枚肾脏囊性病灶,包括男201例(223枚)、女115例(124枚),年龄为20~83(56.85±11.60)岁,病灶最大径为0.5~10.4(2.69±1.93)cm。依据肾脏囊性病灶超声造影Bosniak分级CT标准更新版(2019版)^[2]和瑞金医院超声造影RJ-Bosniak分级标准分别对超声造影声像图进行分级。所有入选病灶均经手术或穿刺病理学活检及其他增强影像学检查随访至少12个月证实。本研究通过上海交通大学医学院附属瑞金医院药物临床试验伦理委员会审批[(2018)伦审第(8)号-2]。

1.2 研究方法

1.2.1 检查方法 使用Mindray Re7、Re 8(深圳迈瑞生物医疗电子股份有限公司,探头SC5-1U)、百胜Esaote MyLabTwice(意大利百胜集团,探头CA541)彩色多普勒超声诊断仪,造影剂为声诺维(SonoVue,意大利Bracco公司,规格:每支59mg)。首先行常规灰阶及彩色多普勒超声检查;然后选取病灶合适切面后固定探头,选择使用低机械指数造影模式,将造影剂按照造影剂标准配制要求混匀稀释,每次抽取0.8~1.0 mL经上肢浅静脉快速团注,同时启动超声仪造影计时器计时,实时连续动态观察造影灌注过程3~6 min,使用高清硬盘刻录全程。由经验丰富的超声科副主任医师和主治医师各1名对造影图像逐帧回放观察,独立判断,观察病灶和周围肾皮质各时相的造影灌注情况,并记录相应数据。

1.2.2 观察指标 (1)常规超声:清晰显示肾脏囊性病灶后记录病灶的位置、大小、形态、边界、内部回声(囊隔数目和厚度、囊壁厚度、壁结节大小和形态等),彩色多普勒超声示病灶囊壁、内部囊隔和壁结节的血流情况等。(2)超声造影:观察囊壁、囊隔及壁结节等的增强程度、增强时相、增强形态等。①增强程度:以局部最高增强强度为准分高增强、等增强、低增强等。②增强时相:分为快进快退、同进同退、快进慢退、同进慢退、同进快退等类型。参照肾脏囊性病灶Bosniak分级CT标准更新版(2019版)^[2],在综合评估分析后根据超声造影CT-Bosniak分级标准(表1)进行分级,另外根据瑞金医院借鉴Bosniak分级标准并结合近10年肾超声造影经验总结的超声造影RJ-Bosniak分级标准(表2)进行分级。

表1 参照肾脏囊性病灶 Bosniak 分级 CT 标准更新版 (2019 版)^[2] 的超声造影 CT-Bosniak 分级

Tab 1 Contrast-enhanced ultrasound CT-Bosniak classification of cystic renal masses refer to updated version of Bosniak (CT, 2019)^[2]

Classification	Classification standard
I	Thin (≤ 2 mm), smooth and well-defined wall; the wall may be enhanced; and no septa, nodule or calcification
II	Thin (≤ 2 mm) and few (1-3) septa; smooth wall; the septa and wall may be enhanced; may have any type of calcification
II F	Smooth, modestly thickened (3 mm) and enhanced wall; or one or more modestly thickened septa; or many (≥ 4) smooth, thin (≤ 2 mm) and enhanced septa
III	One or more thickened and enhanced septa (≥ 4 mm); or enhanced irregular (displaying ≤ 3 mm obtusely margined convex protrusion[s]) wall or septa
IV	One or more enhanced nodule(s) (convex solid protrusion [≥ 4 mm] with obtuse margins to wall or septa or convex solid protrusion [in any size] with acute margins to wall or septa)

CT: Computed tomography.

表2 上海交通大学医学院附属瑞金医院借鉴 Bosniak 分级标准并结合近 10 年肾超声造影经验总结的超声造影 RJ-Bosniak 分级标准

Tab 2 Contrast-enhanced ultrasound RJ-Bosniak classification according to Bosniak classification combined with clinical experience during recent 10 years in Ruijin Hospital Affiliated to Shanghai Jiao Tong University School of Medicine

Classification	Classification standard
I	Thin (≤ 2 mm), smooth and well-defined wall; the wall may be enhanced; and no septa, nodule or calcification
II	Thin (≤ 2 mm) and few (1-3) septa; smooth wall; the septa and wall may be enhanced; may have fine calcification
II F	Smooth, modestly thickened (< 3 mm) and enhanced wall; or many (≥ 4) modestly thickened (< 3 mm) and enhanced septa
III	Enhanced thick (3 mm \leq thickness < 4 mm) wall or septa; or enhanced solid nodule(s) (< 4 mm); or enhanced cellular intensive septa
IV	One or more enhanced nodule(s) (≥ 4 mm); or many (≥ 4) enhanced and thickened (≥ 4 mm) septa

1.2.3 最终诊断标准 入组的 347 枚病灶中 58 枚由穿刺活检或手术病理证实, 余 289 枚经 CT 增强或 MRI 增强等影像学方法随访至少 12 个月证实。

1.3 统计学处理 应用 SPSS 23.0 软件进行统计学分析, 采用四格表计算根据超声造影相关分级标准判断肾脏囊性病灶良恶性的准确度、灵敏度、特异度、阳性预测值和阴性预测值。两组间比较采用 χ^2 检验或 Fisher 确切概率法。超声造影相关 Bosniak 分级标准与临床金标准诊断的一致性采用 Kappa 检验 (Kappa 值为 0.40~0.60 表示中度一致, 0.60~0.80 表示高度一致, > 0.81 表示有极好的一致性) 进行分析。检验水准 (α) 为 0.05。

2 结果

2.1 肾脏囊性病灶的病理、临床诊断结果及超声造影分级 穿刺活检或手术病理证实恶性病灶 39 枚、良性病灶 19 枚, 余 289 枚临床诊断为良性病灶。347 枚病灶中超声造影 CT-Bosniak 分级 I 级 198 枚, II 级 45 枚, II F 级 50 枚, III 级 26 枚, IV

级 28 枚; 超声造影 RJ-Bosniak 分级 I 级 198 枚, II 级 28 枚, II F 级 66 枚, III 级 28 枚, IV 级 27 枚。

以 Bosniak 分级 III~IV 级为恶性病变诊断标准, 超声造影 RJ-Bosniak 正确诊断恶性病灶 38 枚, 漏诊 1 枚, 误诊 16 枚, 正确诊断良性病灶 292 枚; 超声造影 CT-Bosniak 正确诊断恶性病灶 36 枚, 漏诊 3 枚, 误诊 18 枚, 正确诊断良性病灶 290 枚。58 枚病理检查确诊病灶的 2 种标准分级结果见表 3。

2.2 超声造影声像图特征预测肾脏囊性病灶良恶性的价值 肾良性囊性病灶内无分隔和壁结节等, 或囊隔少且薄; 恶性病灶分隔数目多且以不规则增厚者多见, 并可合并高增强的壁结节等征象。本组大部分 (99.14%, 344/347) 病灶的囊壁均较纤细, 厚度为 1~2 mm; 仅 3 枚 (0.86%, 3/347) 病灶的囊壁较厚 (≥ 3 mm), 其中 2 枚为复杂囊肿, 1 枚为肾透明细胞癌。典型病例超声造影声像图见图 1。病灶内分隔数目 ≥ 4 个且囊隔厚度 ≥ 3 mm 和蜂窝状密集分隔对判断肾脏恶性囊性病灶的特异性较高, 均为 99.35% (306/308)。存在可强化

的壁结节对恶性病灶诊断的灵敏度、准确度和阴性预测值最高, 分别为 87.18% (34/39)、97.41% (338/347)、98.38% (304/309)。高增强的囊隔

和壁结节对恶性病灶诊断的准确度、特异度和阴性预测值均较高 (均 > 93%), 阳性预测值最高为 90.91% (20/22)。见表 4。

表 3 穿刺活检或手术病理确诊的 58 枚肾脏囊性病灶的 2 种超声造影 Bosniak 分级结果

Tab 3 Two types of contrast-enhanced ultrasound Bosniak classification results of 58 renal cystic foci confirmed by biopsy or surgical pathology

Pathological result	N	CT-Bosniak					RJ-Bosniak				
		IV	III	II F	II	I	IV	III	II F	II	I
Clear cell renal cell carcinoma	27	23	3	1	0	0	25	2	0	0	0
Metastatic tumor	1	1	0	0	0	0	1	0	0	0	0
Papillary renal cell carcinoma	1	0	0	1	0	0	0	1	0	0	0
Multilocular cystic renal neoplasm of low malignant potential	6	0	6	0	0	0	0	6	0	0	0
Tubulocystic carcinoma of the kidney	1	0	0	0	1	0	0	0	1	0	0
Cyst with intracystic hemorrhage or infection	11	1	6	4	0	0	1	8	2	0	0
Tuberculosis	1	0	0	1	0	0	0	0	1	0	0
Simple cyst	7	0	3	1	0	3	0	2	5	0	0
Malignant proven by other hospital	3	0	3	0	0	0	0	3	0	0	0

CT: Computed tomography.

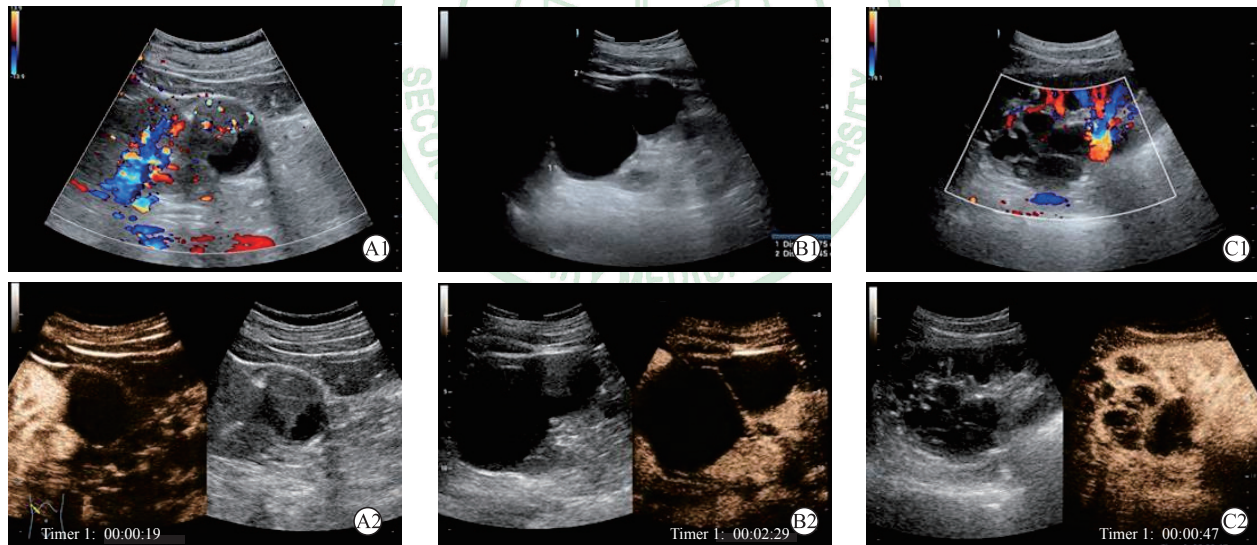


图 1 典型病例的肾脏囊性病灶超声造影声像图

Fig 1 Contrast-enhanced ultrasound images of cystic renal masses in typical cases

A1, A2: A complex cyst at the lower pole of right kidney in a 57-year-old male. The mass was considered as Bosniak I and could be a cyst with intracystic hemorrhage confirmed by enhanced computed tomography. A1: Color Doppler flow image demonstrated punctiform vascularization in the nodule; A2: Contrast-enhanced ultrasound image showed enhanced thin smooth wall without enhanced nodule. B1, B2: A complex cyst at the upper pole of right kidney in a 43-year-old male. The mass was considered as Bosniak II and was confirmed to be a benign mass based on serial follow-up of 4 years. B1: Gray scale image showed a cystic mass with 2 thin septa; B2: Contrast-enhanced ultrasound image demonstrated enhanced thin smooth wall and septa without enhanced nodule. C1, C2: A complex cystic mass with multiple thick (about 6 mm at the thickest point) septa at the lower pole of left kidney in a 22-year-old male. It was considered as RJ-Bosniak IV and confirmed to be clear cell renal cell carcinoma by surgical pathology. C1: Color Doppler flow image demonstrated punctiform vascularization at the septa; C2: Contrast-enhanced ultrasound image showed hyperenhancement and rapid wash-in and slow wash-out pattern at the thick septa.

表4 超声造影声像图特征对肾脏恶性囊性病灶的诊断价值

Tab 4 Diagnostic value of contrast-enhanced ultrasonography for malignant cystic renal masses

Feature	Accuracy	Sensitivity	Specificity	PPV	% (n/N)
					NPV
Septa thickness ≥ 3 mm and number ≥ 4	89.34 (310/347)	10.26 (4/39)	99.35 (306/308)	66.67 (4/6)	89.74 (306/341)
Cellular intensive septa	89.63 (311/347)	12.82 (5/39)	99.35 (306/308)	71.43 (5/7)	90.00 (306/340)
Enhanced nodule(s)	97.41 (338/347)	87.18 (34/39)	98.70 (304/308)	89.47 (34/38)	98.38 (304/309)
Hyper-enhanced septa and nodule(s)	93.95 (326/347)	51.28 (20/39)	99.35 (306/308)	90.91 (20/22)	94.15 (306/325)

PPV: Positive predictive value; NPV: Negative predictive value.

2.3 超声造影 Bosniak 分级对肾脏囊性病灶良恶性的鉴别诊断

2.3.1 不同分级标准诊断肾囊性病灶的良性率 超声造影 RJ-Bosniak 分级和超声造影 CT-Bosniak 分级 II 级及以下的肾脏囊性病灶的良性率分别为 100.00% (226/226) 和 99.59% (242/243), 有明确病理诊断结果的 II F 级病灶的良性率分别为 88.89% (8/9) 和 75.00% (6/8), III 级病灶的良性率分别为 45.45% (10/22) 和 42.86% (9/21), IV 级病灶良性率分别为 3.70% (1/27) 和 4.00% (1/25)。

2.3.2 不同分级标准诊断肾囊性恶性病灶的价值 以 III 级及以上为恶性病灶的诊断标准, 超声造影 CT-Bosniak 分级和超声造影 RJ-Bosniak 分级判断肾脏囊性恶性病灶的准确度、灵敏度、特异度、阳性预测值、阴性预测值分别为 93.95% (326/347) 和 95.10% (330/347)、92.31% (36/39) 和 97.44% (38/39)、94.16% (290/308) 和 94.81% (292/308)、66.67% (36/54) 和 70.37% (38/54)、98.98% (290/293) 和 99.66% (292/293); 2 种分级标准的诊断结果均与金标准结果高度一致 ($Kappa$ 值分别为 0.74 和 0.79)。2 种分级标准的诊断准确度、灵敏度、特异度、阳性预测值、阴性预测值差异均无统计学意义 (P 均 > 0.05)。

3 讨论

肾脏囊性病灶的病理学种类较多, 极少数恶性肿瘤也可能与单纯性囊肿表现相同或相似^[3]。肾脏复杂性囊性病灶包括囊肿合并出血或感染、肾恶性肿瘤出血囊性变、低度恶性潜能多房囊性肾肿瘤等。对于肾脏囊性病灶的诊断和鉴别诊断, 超声造影已被证实与 CT、MRI 有相似的诊断效能^[4]。超声造影可以显示肾脏囊性病灶内部组织结构的微循环灌注情况, 有助于弥补常规超声诊断的局限性, 为疾病诊断提供更多有价值的信息。超声造影无辐

射, 诊断灵敏度高, 可实时动态连续观察, 且所使用纯血池造影剂无心肾毒性、过敏率低, 得到临床医师的关注和认可。

Bosniak^[5-6] 根据肾脏囊性病灶的 CT 特征性表现提出 Bosniak 分级系统, 用于评估肾脏囊性病灶的恶性风险。Bosniak 分级系统目前已成为指导临床处理决策的综合性管理指南^[7]。本研究结果显示超声造影 CT-Bosniak 分级和 RJ-Bosniak 分级的诊断结果均与金标准结果呈高度一致性 ($Kappa$ 值分别为 0.74 和 0.79), 但这 2 种分级标准之间的诊断准确度、灵敏度、特异度等差异均无统计学意义 (P 均 > 0.05)。本组数据显示使用超声造影 RJ-Bosniak 分级标准, II 级及以下肾脏囊性病灶的良性率为 100.00% (226/226), II F 级肾脏囊性病灶的良性率为 88.89% (8/9), III 级和 IV 级病灶良性率分别为 45.45% (10/22) 和 3.70% (1/27), 与文献报道结果^[7-8] 相近。应用超声造影结合 Bosniak 分级标准可以评估肾脏囊性病灶的性质, 能为临床医师做出正确决策提供有用信息, 从而避免良性病灶不必要的手术切除及使恶性病灶得以尽早诊治。

Bosniak 分级的诊断指标中囊内分隔被业界认为是判断肾脏囊性病灶良恶性的关键, 但意见并不统一。既往 Bosniak 分级系统 (2004 版) 认为分隔厚度 > 1 mm、分隔数目 > 4 个判断为肾囊性恶性病灶的可能性较大^[9]; 而陈惠莉等^[10] 则认为分隔厚度 ≥ 3 mm 诊断肾囊性恶性病灶的特异度较高。本研究结果显示肾脏囊性病灶内囊隔厚度 ≥ 3 mm 且分隔数目 ≥ 4 个以及蜂窝状密集分隔判断肾囊性恶性病灶的特异度均较高 [均达 99.35% (306/308)]。2019 版 Bosniak 分级系统虽然对“发丝样薄”“略增厚”和“厚”做出了规定, 但对厚度为 2~4 mm 的囊隔并没有明确的分级标准, 仍使临床实际操作存在困扰, 瑞金医院所用的 Bosniak 分级方法筛选了临床应用中相对有价值的诊断指标, 整体分级标

准简单明了,测量数值标准连贯性好,将囊壁和囊隔厚度分为 ≤ 2 、 < 3 、 < 4 和 ≥ 4 mm,分别适用于I/II、II F、III、IV级,将临床工作中准确测量时会出现毫米级测量差异的实际情况包括在内,具有一定的临床适用性和便捷性。另外,本研究结果显示有可强化的壁结节是Bosniak III~IV级病灶的特征,可作为预测恶性病灶的可靠征象,其准确度、特异度和阴性预测值分别为97.41% (338/347)、98.70% (304/308)和98.38% (304/309),灵敏度和阳性预测值分别为87.18% (34/39)和89.47% (34/38),这与Silverman等^[2]的研究结果相近。本组数据显示肾脏囊性病灶若具有高增强囊隔(囊隔厚度 ≥ 3 mm且囊隔数目 ≥ 4 个或囊隔呈蜂窝状密集分布)或高增强的壁结节,其为恶性病灶的准确度、特异度、阳性预测值、阴性预测值均高于90%。超声造影RJ-Bosniak分级标准结果与金标准结果高度一致(Kappa值为0.79)。

但本组数据中有1例病理结果显示为肾脏复杂囊肿的良性病灶被归为IV级,分析原因为超声造影对肾脏囊性病灶内部囊壁、囊隔、壁结节等结构的微循环灌注具有较高的灵敏性,此病例显示多条粗大且呈现快进快退高增强的囊隔,因此病灶分级被过高估计。另外本组数据中,1例管状囊性肾细胞癌因其内部仅见少量纤细分隔和点状灌注区域,且分隔与肾实质呈同进同退等增强表现而被归为II F级,与特殊病理类型和病灶内部表现有关,这与既往报道10%的肾细胞癌超声造影也显示为单纯囊性表现^[1]具有相似性。因此,超声造影对部分少见类型或表现不典型的肾脏囊性病灶也与其他影像学手段同样存在一定局限性,需结合临床诊断指标进行综合判断,在协助确定患者的治疗策略时须兼顾患者年龄、伴随疾病、预期寿命及治疗偏好等多个因素。

本研究存在一定局限性,如随访时间较短,未行手术治疗的Bosniak分级为I~II F级肾脏囊性病灶中不能完全排除假阴性存在^[11-12],故本研究在一定程度上可能会高估实际诊断能力,需在以后的研究中不断扩大样本量予以完善。

综上所述,超声造影结合Bosniak分级标准检查肾脏囊性病灶简便易行,是一个有效评估肾脏囊性病灶良恶性的方法,具有较好的临床应用价值,可避免部分肾良性病灶因外科手术所导致的过度治疗。瑞金医院所用的Bosniak分级方法筛选了临床

相对有价值的诊断指标,整体分级标准相对简单、全面,同样达到了较好的临床应用效果,为临床推广使用提供了较好的参考价值。

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