

doi: 10.13241/j.cnki.pmb.2021.02.020

## MR 小 fov T1、T2 FSE 序列对直肠癌的诊断应用 \*

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**摘要** 目的:探究小视野(field of view, fov)磁共振(magnetic resonance, MR)检查在直肠癌 T 分期中的应用价值。方法:选择 2017 年 1 月至 2019 年 12 月经肠镜证实为直肠癌的 60 例患者,分别于其术前实施小 fov MR 检查,并由影像学医师根据结果判断患者 T 分期,并勾勒肿瘤边界,计算肿瘤体积,而后以术后直肠癌病理结果为金标准,计算小 fov MR 对直肠癌不同 T 分期检测的一致性,并分析小 fov MR 测算的肿瘤体积与肿瘤 T 分期的相关性。结果:(1)分析发现,小 fov MR 对直肠癌 T 分期的预测同病理 T 分期结果具有较高的一致性(Kappa=0.812),诊断准确率为 85.00%(102/120);(2)进一步分析显示,小 fov MR 对 T1 期诊断一致性 95.00%,灵敏度为 71.43%,特异度为 98.11%,T2 期诊断一致性为 81.67%,灵敏度为 90.00%,特异度为 65.00%,T3 期诊断一致性为 83.33%,灵敏度为 80.00%,特异度为 80.00%,T4 期诊断一致性为 71.67%,灵敏度为 66.67%,特异度为 85.22%;(3)相关性分析显示,肿瘤体积与病理 T 分期之间存在明显的正相关联系( $r=0.617, P<0.05$ )。结论:小 fov MR 在直肠癌 T 分期鉴别中具有较好的应用价值,能够应用于患者术后 T 分期评估和治疗方案的确定上,具有一定的应用前景。

**关键词:** 磁共振;小视野;直肠癌;诊断应用

中图分类号:R735.37;R445.2 文献标识码:A 文章编号:1673-6273(2021)02-293-04

## MR Small fov T1 and T2 FSE Sequences for the Diagnosis of Rectal Cancer\*

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**ABSTRACT Objective:** Investigate the value of small field of small view (fov) magnetic resonance (MR) examination in T staging of rectal cancer. **Methods:** A total of 60 patients with colon cancer confirmed by colonoscopy from January 2017 to December 2019 were selected, and a small fov MR examination was performed before surgery. The imaging stage was used to determine the T stage of the patient based on the results, and the tumor boundaries were calculated. Tumor volume, and then using postoperative rectal cancer pathological results as the gold standard, calculate the consistency of small fov MR for different T staging of rectal cancer, and analyze the correlation between tumor volume and small T staging calculated by small fov MR. **Results:** (1) The analysis found that small fov MR's prediction of rectal cancer T staging was highly consistent with pathological T staging results (Kappa=0.812), and the diagnostic accuracy was 85.00%. (2) The diagnosis consistency of small fov MR for T1 stage was 95.00%, sensitivity was 71.43%, specificity was 98.11%, T2 stage diagnosis was 81.67%, sensitivity was 90.00%, specificity was 65.00%, and T3 stage diagnosis was 83.33%, sensitivity was 80.00%, specificity was 80.00%, T4 diagnosis consistency was 71.67%, sensitivity was 66.67%, specificity is 85.22%. (3) Correlation analysis shows that tumor volume and pathological T stage There was a significant positive correlation between them ( $r=0.617, P<0.05$ ). **Conclusion:** Small fov MR has a good application value in the identification of T staging of rectal cancer, and can be used in the evaluation of T staging and the determination of treatment options for patients after surgery.

**Key words:** MR; Small fov; Rectal cancer; Diagnostic application

**Chinese Library Classification(CLC):** R735.37; R445.2 **Document code:** A

**Article ID:** 1673-6273(2021)02-293-04

### 前言

直肠癌的发病率有逐年上升趋势,数据显示,直肠癌属于消化道常见肿瘤之一,2012 年全球约有 136 万例新发结肠癌患者,居恶性肿瘤第 3 位,仅次于肺癌与乳腺癌,当年死亡病例数约为 69 万例,位居恶性肿瘤死亡率第 4 位<sup>[1-3]</sup>。我国近些年直肠癌发病率及死亡率也呈现递增趋势,35 岁以上人群中直

肠癌的发病率约为 24-32/10 万,死亡率约为 4.0%,位居我国恶性肿瘤发病第三位和死亡第五位,对居民生命健康造成严重威胁<sup>[4-6]</sup>。早期准确的诊断和治疗是改善直肠癌患者预后的重要前提,小 fov MR 检查是近些年新兴的影像学检查手段,相比于传统的 MRI 检查,小 fov MR 检测得到的图像分辨率更高,诊断准确率也更高<sup>[9,10]</sup>,本文作者通过研究发现,小 fov MR 在直肠癌 T 分期鉴别中具有较好的应用价值,结合肠镜、血清学指标、

\* 基金项目:江苏省自然科学基金面上项目(BK20151136)

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(收稿日期:2020-04-07 接受日期:2020-04-30)

病理学检测等,能够早期应用将有助于患者 T 分期评估和治疗方案的确定。

## 1 资料与方法

### 1.1 一般资料

选择 2017 年 1 月至 2019 年 12 月于经肠镜证实为直肠癌的 60 例患者为研究对象,其中男性患者 36 例,女性患者 24 例,年龄 59-72 岁,平均年龄(64.98±2.09)岁。

纳入标准:(1)入组患者均经肠镜活检确诊为直肠癌;(2)患者未接受放疗、化疗、免疫治疗;(3)经本院伦理学会批准;(4)患者家属签署知情同意书;(5)MRI 检测后一周内实施切除术者。

排除标准:(1)合并精神障碍者;(2)合并其他恶性肿瘤者;(3)既往放疗史;(4)MRI 检测禁忌者。

### 1.2 方法

所有入组患者均实施小 fov MR 检查,选择仪器为 GE Signa HDxt3.0T 超导性 MRI,线圈选择相控阵表面线圈,扫描方案确定为小 fov T1、T2 检查,检查方位横断位,检查前患者无需实施特殊肠道准备,视野设置为 18,层厚设置为 3 mm,层间距设置为 1.0 mm,T2 的 TR/TE 设置为 3500/120 ms,T1 的 TR/TE 设置为 1000/12.1 ms,NEX 设置为 4,矩阵为 320×224;检查前患者排空膀胱,取仰卧位,足先进,嘱患者平静呼吸,扫描定位线垂直肠管。

### 1.3 观察指标及评测标准

将采集的数据全部传入 AW4.4 工作站中,由 2 名经验丰富的影像学医师共同阅片,并对小视野进行分析,就直肠癌 T 分期进行讨论,如意见不一致可寻求上级协助;分期判断结束后,于定位线垂直肠管的斜轴位小视野兴趣区内对肿瘤区域进行勾画,计算肿瘤面积,同时根据层厚计算肿瘤体积<sup>[11,12]</sup>。

肿瘤 T 分期参照国际抗癌联盟(International Union Against Cancer,UICC)发布的第七版 TNM 分期标准<sup>[13]</sup>,即 T1 期肿瘤侵犯粘膜下层,T2 期肿瘤侵犯固有肌层,T3 期肿瘤已传统固有肌层侵犯浆膜下层,或侵犯无腹膜覆盖的结直肠旁组织,T4 期指肿瘤已穿透腹膜脏层。

### 1.4 统计学方法

应用 SPSS 21.0,计数资料以率(%)表示,采用卡方检验,计量资料以( $\bar{x} \pm s$ )表示,采用 t 检验,一致性分析采用 Kappa 进行分析,Kappa≤2.0 时视为一致性很差,0.2<Kappa≤0.4 视为一致性较差,0.4<Kappa≤0.6 视为一致性一般,0.6<Kappa≤0.8 视为一致性良好,Kappa>0.8 视为一致性极好, $P<0.05$  有统计学意义。

## 2 结果

### 2.1 小 fov MR 检测 T 分期与病理 T 分期对照

经分析发现,小 fov MR 对直肠癌 T 分期的预测同病理 T 分期结果具有较高的一致性(Kappa=0.812),诊断准确率为 85.00%(51/60),具体数据如表 1 所示。

表 1 小 fov MR 检查 T 分期与病理 T 分期对照  
Table 1 Comparison of T stage of small fov MR test and T stage of pathology

| MRI staging | Pathological staging (cases) |    |    |    |
|-------------|------------------------------|----|----|----|
|             | T1                           | T2 | T3 | T4 |
| T1          | 3                            | 1  | 2  | 0  |
| T2          | 1                            | 15 | 4  | 0  |
| T3          | 0                            | 3  | 20 | 4  |
| T4          | 0                            | 0  | 2  | 5  |

### 2.2 小 fov MR 对直肠癌 T 分期诊断效果

经分析发现,小 fov MR 对 T1 期诊断一致性 95.00%,灵敏度为 71.43%,特异度为 98.11%,T2 期诊断一致性为 81.67%,灵敏度为 90.00%,特异度为 65.00%,T3 期诊断一致性为

83.33%,灵敏度为 80.00%,特异度为 80.00%,T4 期诊断一致性为 71.67%,灵敏度为 66.67%,特异度为 85.22%,具体数据如表 2 所示。

表 2 小 fov MR 对直肠癌 T 分期诊断效果  
Table 2 Small fov MR in T stage diagnosis of rectal cancer

| Fov MR T staging | Consistency  | Sensitivity  | Specificity  |
|------------------|--------------|--------------|--------------|
| T1               | 95.00(57/60) | 71.43(5/7)   | 98.11(52/53) |
| T2               | 81.67(49/60) | 90.00(18/20) | 65.00(13/20) |
| T3               | 83.33(50/60) | 80.00(8/10)  | 80.00(40/50) |
| T4               | 71.67(43/60) | 66.67(2/3)   | 85.48(52/62) |

### 2.3 小 fov MR 对直肠癌肿瘤体积检测数据同病理 T 分期相关性分析

经相关性分析发现,小 fov MR 检测直肠癌肿瘤体积与病

理 T 分期之间存在明显的正相关联系( $r=0.617, P<0.05$ ),具体数据如表 3 所示。

表3 小 fov MR 对直肠癌肿瘤体积检测数据同病理 T 分期相关性分析

Table 3 Correlation analysis between small fov MR for rectal cancer tumor volume detection data and pathological T stage

| T staging | n  | Tumor volume( $\bar{x} \pm s$ )(mm <sup>3</sup> ) |
|-----------|----|---------------------------------------------------|
| T1        | 5  | 6802.89± 201.88                                   |
| T2        | 19 | 12110.78± 3019.83                                 |
| T3        | 28 | 2301.63± 5134.19                                  |
| T4        | 8  | 27898.09± 12102.98                                |

### 3 讨论

我国 30 年来直肠癌发病率以每年 3 %-4 % 的比率不断攀升<sup>[14]</sup>, 虽然我国 2012 年直肠癌标化发病率为 14.2/10 万, 位居世界第 75 位, 暂处非高发水平, 但我国直肠癌的发病和死亡总例数却位居世界第一位<sup>[15,16]</sup>, 据国家癌症中心全国肿瘤登记数据报告, 我国直肠癌病死率位居恶性肿瘤第 4 位, 已经成为威胁居民生命健康的重要因素<sup>[17,18]</sup>。早期的检测及干预是提高直肠癌患者生活质量, 延长其生存期的重要手段, 以往直肠癌病情判断多依赖病理学检查, 此方式检验周期长、患者较为痛苦, 临床推广难度也较大<sup>[19,20]</sup>。近些年, 随着影像学技术的发展, 越来越多的新技术逐渐被应用于直肠癌术前诊断及术后评估中<sup>[21]</sup>。

磁共振是当前临床上应用较多的断层成像的一种, 该检测手段能够利用磁共振像成从人体中获得电磁信号, 并通过重组来反映机体信息, 相比于传统的 CT、X 线检测等手段, 磁共振具有无电离辐射、软组织分辨率高、多参数等优点<sup>[22,23]</sup>, 已被广泛应用于各类肿瘤的术前诊断及预后评估中, 有研究指出, 磁共振检查已经被美国国立综合癌症网推荐为直肠癌术前分期的首选手段<sup>[24,25]</sup>。小 fov MR 是近些年在磁共振基础上发展形成的新型检查手段, 相比于传统的磁共振检查, 小 fov MR 具有更高的分辨率, 能够清晰的显示直肠壁解剖结构和肿瘤浸润程度<sup>[26,27]</sup>。

本文作者通过对 60 例镜检确诊为直肠癌患者实施小 fov MR 检查发现, 同术后病理检测结果相比较, 小 fov MR 对直肠癌 T 分期的预测一致性高达 85.00 %。与 Feng 等学者的研究一致, 该学者对小 fov MR 与 DCE-MRI 在直肠癌诊断价值的研究结果指出, 小 fov MR 能够清晰的显示直肠壁的 3 层结构, 明显的区分开粘膜层、粘膜下层和固有肌层, 对直肠癌的 T 分期能够提供准确清晰的图像基础, 诊断价值显著<sup>[28]</sup>。另有一项研究结果也显示, 小 fov MR 主观及客观图像质量参数明显要较常规 MRI 检测好, 其原因为小 fov MR 具有更好的清晰度和更细微的结构机构观察效果<sup>[29]</sup>。本研究作者分析其原因为传统的 MRI 检查空间分辨力小, 而小 fov MR 空间分辨力大, 同时小 fov MR 还能够改善图像质量, 使图像避免扭曲变形、减少伪影的出现, 能够更精细的显示直肠癌的细微结构, 对准确评估直肠癌患者 T 分期具有更好的效果, 同时在评估肿瘤坏死、囊变和出血区域中占据更大的优势<sup>[30,31]</sup>。本文的研究结果还显示, 小 fov MR 对直肠癌体积的检测同 T 分期具有一定的相关性, 分析其原因为小 fov MR 检查能够直观的显示直肠解剖结构和肿瘤浸润深度, 具有更高的空间分辨率, 因而可以作为一种较为可靠的肿瘤体积检测方式。本研究与上述学者不同的是, 本研究对直肠癌进行分期鉴定, 明确了小 fov MR 检查在直肠癌 T

分期鉴别中的价值, 对直肠癌的分期诊断具有重要的意义, 同时也对患者术后 T 分期评估和治疗方案的确定具有提示作用。综上所述, 本文作者分析认为, 小 fov MR 在直肠癌 T 分期鉴别中具有较好的应用价值, 能够应用于患者术后 T 分期评估和治疗方案的确定上, 同时小 fov MR 检测肿瘤体积越大, 提示患者的 T 分期越高。本研究也存在一定的不足, 阅片师可能在选择上存在一定的主观性, 缺乏客观的指标作为标准, 后续需要探索小 fov MR 诊断的判断的标准; 样本量少, 需要加大样本量进一步探究。

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