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1.5T 磁共振不同序列用于检出妇科肿瘤盆腔淋巴结转移的比较 *

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摘要 目的:比较 1.5T 磁共振(MRI)不同序列条件下对妇科肿瘤盆腔淋巴结转移的检出情况,探讨最佳检出序列条件。**方法:**选取 2015 年 5 月-2017 年 5 月初诊为卵巢癌、宫颈癌、子宫内膜癌的患者 78 例作为研究对象,均行盆腔淋巴结清扫术。所有患者术前均行 T1 加权序列(T1WI)、T2 加权序列(T2WI)、增强扫描(T1WI+C)、弥散加权成像(DWI)检查,记录每个序列检查条件下检出的盆腔转移淋巴结个数及分布。以病理结果作为判断的"金标准"进行对比。**结果:**对比病理检查结果,应用 DWI 序列对妇科肿瘤盆腔淋巴结转移的检出率(95.8%)显著高于 T2WI-MRI 序列(85.8%)和 T1WI-MRI 序列(75.0%)($P<0.05$);DWI 序列与 T1WI+C 序列(90.8%)相比差异无统计学意义($P>0.05$);DWI 阈值法与 DWI 短径法相比,淋巴结的检出率差异无统计学意义($P>0.05$)。**结论:**应用 1.5T 磁共振检查妇科肿瘤盆腔淋巴结转移时,采用 DWI 序列扫描对于转移淋巴结的具有较高的检出率,显著优于其他序列扫描;在进行阳性淋巴结判断中,ADC 阈值法和短径法均可选用。

关键词:1.5T 磁共振;妇科肿瘤;淋巴结转移

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Comparison of Different Scan Programs of 1.5T MRI for the Detection of Pelvic Lymph Node Metastasis in Gynecological Tumor*

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ABSTRACT Objective: To compare different sequences of 1.5T MRI for the detection of gynecological tumor pelvic lymph node metastasis, and discuss the optimal detection sequence. **Methods:** 78 cases of patients who were diagnosed with ovarian cancer, cervical cancer, endometrial cancer with pelvic lymph node metastasis in gynaecology of our hospital were selected from May 2015 to May 2017, they were performed the pelvic lymph node dissection. Before the operation, every patient was examined by conventional T1 weighted imaging (T1WI), T2 weighted imaging (T2WI), T1WI contrast (T1WI + C), diffusion weighted imaging (DWI) scan program, and their lymphatic metastasis team location and number were recorded and summed. The positive ratios of lymphatic node at different scan program with the pathological results, and analyzed the two positive DWI criteria were compared. **Results:** Compared with the pathological report (50 teams 120 nodes), the number of pelvic lymphatic nodes showed the higher ratio at DWI program (50 teams 115 nodes) than T1WI-MRI (75.0%) and T2WI-MRI (85.8%), the positive ratio was 95.8%. But there was no significant difference between DWI sequence and T1WI+C sequence (90.8%) ($P>0.05$), and the detection rate of lymph nodes showed no significant difference between the DWI threshold method and DWI short diameter method ($P>0.05$). **Conclusion:** DWI scan program was superior to conventional T1WI and T2WI scan at 1.5T MRT. As for positive ratio criteria, both short calibration criteria and apparent diffusion coefficient (ADC) value criteria were reasonable.

Key words: 1.5T MRI; Gynecological tumor; Lymph node metastasis

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前言

某些妇科肿瘤如宫颈癌、卵巢癌等极易发生盆腔淋巴结转移,盆腔淋巴结转移是影响妇科肿瘤预后的重要因素之一^[1-4]。因此,在进行妇科肿瘤临床诊疗过程中,早期发现并且准确诊断转移淋巴结对制定合理的淋巴结手术清扫计划及改善患者

预后情况至关重要。当前,主要依靠常规的 CT 或 MRI 进行相关淋巴结异常的检测,并以淋巴结短径大于 1 cm 视为转移淋巴结,但该判断标准敏感度较低,尤其是对于直径小于 1 cm 的转移淋巴结假阴性率较高^[5,6]。目前为止,磁共振弥散加权成像(diffusion weighted imaging, DWI)是唯一能够在活体组织中进行水分子弥散测量的方法,能够感应水分子的微观扩散运动,

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可以从细胞或分子水平研究各种疾病的病理状态,并能进行定性诊断^[7]。本研究拟探讨 1.5T 磁共振不同序列对于妇科肿瘤淋巴结转移的检出率,以期对盆腔淋巴结清扫术前诊断提供理论依据,现将研究结果报道如下。

1 材料与方法

1.1 研究对象

收集 2015 年 5 月-2017 年 5 月于四川省资阳市第一人民医院放射科进行相关妇科检查疑为恶性肿瘤伴有盆腔淋巴结转移的患者 78 例,包括宫颈癌 34 例、卵巢癌 24 例、子宫内膜癌 20 例。其中,绝经期患者 41 例,年龄 31~65 岁(50 ± 4.7)岁。病例入选标准:①患者在四川省资阳市第一人民医院进行手术治疗并行盆腔淋巴结清扫术;②术前 2 周内放射科进行 MRI 检查(1.5T 磁共振);③患者在磁共振检查与接收手术前未进行任何放化疗治疗;④患者病例资料及病理结果等资料齐全。经过筛选后最终 78 例患者入组。

1.2 检查方法

磁共振检查仪器采用德国西门子公司 1.5T 磁共振仪(MagnetomAvanto 1.5T)。78 例患者在术前均实施 T1 加权序列(T1WI)、T2 加权序列(T2WI)、增强扫描(T1WI+C)、弥散加权成像(DWI)检查。其中轴位 T1WI 扫描序列的参数设置为:TR600 ms、TE8.9 ms、层距 0.5 mm、层厚 2 mm、FOV30 cm、NEX4、矩阵 320×192 ; 周围 T2WI 脂肪抑制扫描序列参数设置为:TR3000 ms、TE119.9 ms、带宽 41.7 kHz、层距 0.5 mm、层厚 2 mm、视野 30 cm、激励次数 4 次、矩阵 288×256 ;增强扫描采用注射对比剂(国药准字 H19991368,上海旭东海普药业有限公司),给药剂量 0.2 mL/kg 体重,扫描参数设置同 T1WI。DWI 扫描参数设置为 $b=600 \text{ s/mm}^2$, TR=4000 ms, TE=57.4 ms, FOV=30 cm, NEX=4, 带宽=250 kHz, 层距=0.5 mm, 矩阵 128×128 。采用仪器处理软件做出表观弥散系数(ADC)图,并与 T2WI 扫描图融合,选取所需淋巴结,得到 ADC 值及短径值。

1.3 治疗方法

针对患者的肿瘤类型选择相适应的根治性手术及盆腔淋巴结清扫术。术中记录清扫淋巴结的部位及个数,并对每个淋巴结进行病理确诊。

1.4 观察指标

记录并对比每个序列检查条件下盆腔淋巴结个数,术中记录实际盆腔淋巴结清扫术个数,包括双侧髂内、髂外、髂总、闭孔、闭孔窝、腹股沟淋巴共 12 组淋巴结,同时计算不同序列条件下妇科肿瘤盆腔淋巴结转移的检出率。结合 DWI 序列扫描图,分别以 ADC 阈值及淋巴结短径为判断标准,分析阳性检出率。在四组扫描序列的扫描图像上,查找双侧髂总、髂外、闭孔、髂内、闭孔窝、腹股沟深淋巴结,将短径大于 1.0 cm 的标记为转移淋巴结。

1.5 统计学分析

分别对每个患者进行四种序列的扫描(T1WI、T2WI、T1WI+C、DWI),统计检出的淋巴结个数、短径、ADC 值等,计算 4 种扫描序列的阳性检出率、短径平均值等。计量资料用均数加减标准差表示($\bar{x} \pm s$),多组间比较采用方差分析。计数资料采用例数(n)表示,组间比较采用卡方检验,以 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 MRI 扫描及病检检出结果

T1WI-MRI 扫描结果:对 78 例患者的 12×78 组淋巴结进行扫描后,共 21 例患者 35 组,合计 90 个淋巴结以短径判断标准诊断为转移性淋巴结,其平均短径为 $(11.2 \pm 3.5) \text{ mm}$ 。T2WI-MRI 扫描结果:21 例患者共 45 组,合计 103 个淋巴结以短径判断标准诊断为转移性淋巴结,其平均短径为 $(9.3 \pm 2.2) \text{ mm}$ 。T1WI 增强扫描结果:21 例患者共 45 组,合计 109 个淋巴结以短径判断标准诊断为转移性淋巴结,其平均短径为 $(11.1 \pm 2.3) \text{ mm}$ 。结果见表 1。

经 DWI 扫描检测所有患者的淋巴结后,共有 21 例患者合计 50 组淋巴结,115 个淋巴结经过阈值标准判断为肿瘤转移淋巴结;扫描结果经短径判断标准共 21 例患者,合计 50 组淋巴结,108 个淋巴结判断为肿瘤转移淋巴结,短径值 $(8.8 \pm 2.9) \text{ mm}$ 。结果见表 1。

病检结果:对所有淋巴结进行病理检查中,21 例患者合计 50 组,120 个经病检确诊为转移淋巴结。结果见表 1。

表 1 病检及不同序列扫描阳性淋巴结检出结果

Table 1 The positive lymph nodes were detected by biopsy and different sequential scanning

Inspection method	n	Cases (groups/cases)	The common iliac group (group/cases)	The external iliac group (group/cases)	Obturator group (group/case)	Internal iliac group (group/case)	Obturator fossa group (group/case)	Deep inguinal group (group/case)	Average short diameter (mm)
T1WI-MRI	21	35/90	7/7	12/43	7/15	7/15	0/0	2/10	11.2 ± 3.5
T2WI-MRI	21	45/103	1/14	18/48	8/18	8/15	5/3	5/5	9.3 ± 2.2
T1WI+C	21	45/109	7/14	18/45	7/18	7/22	3/0	3/10	11.1 ± 2.3
Pathological examination	21	50/120	8/16	19/54	9/20	8/19	3/6	3/5	-
DWI(threshold value)	21	50/115	8/15	19/50	9/19	8/17	3/6	3/8	-
DWI(minor axis)	21	50/108	8/13	19/48	9/18	8/16	3/6	3/7	8.8 ± 2.9

2.2 不同扫描序列下转移性淋巴结检出结果与病理结果的比较

不同扫描序列下,以 DWI 扫描(阈值法)检出阳性淋巴结最多(50 组 115 个),与病理检查结果相比(50 组 120 个),其阳性检出率为 95.8%(115/120);与病理检查结果比较,T1WI-MRI 序列扫描检出阳性淋巴结 35 组共 90 个,阳性检出率为 75.0%(90/120);T2WI-MRI 序列扫描检出阳性淋巴结 45 组共 103 个,阳性检出率为 85.8%;T1WI+C 序列增强扫描检出阳性淋巴结 45 组共 109 个,阳性检出率为 90.8%(109/120)。

T1WI-MRI 扫描与 DWI-MRI 扫描相比,阳性检出率差异有统计学意义 ($P<0.001$);T2WI-MRI 扫描与 DWI-MRI 扫描结果相比,阳性检出率差异有统计学意义($P=0.007$);T1WI+C 增强扫描检出结果与 DWI-MRI 扫描结果相比,阳性检出率差异无统计学意义($P=0.121$)

2.3 DWI-MRI 序列检查不同判断标准阳性检出结果比较

采用 DWI-MRI 序列检查转移淋巴结,与病理检查结果相比,阈值判断标准检出 50 组共 115 个转移淋巴结,检出率为 95.8%;短径判断标准,检出 50 组共 108 个转移淋巴结,检出率为 90%。两种判断标准相比差异无统计学意义($P=0.078$)。

3 讨论

多种妇科盆腔恶性肿瘤均可累及女性生殖系统,主要包括卵巢癌、宫颈内膜癌、宫颈癌等^[8,9]。不同的肿瘤常常累及女性生殖系统的不同部位,相对应的淋巴结的转移也会出现显著差别。卵巢癌主要累及附件,癌细胞主要由 2 种途径转移,分别是顺卵巢血管上行至腹主动脉及腰部淋巴结和炎阔韧带下行至髂内外及髂总淋巴结,另外存在极少数经圆韧带转移至腹股沟淋巴结^[10-12]。宫颈癌主要累及宫颈,以髂外淋巴结转移多见^[13-15]。子宫内膜癌主要累及宫颈及宫体,以髂内、闭孔、髂外为主,并逐步累及髂总淋巴结,其中以髂外组淋巴结最易受累^[16]。因此,本研究主要选取包括卵巢癌、宫颈内膜癌、宫颈癌等 3 种女性盆腔恶性肿瘤进行研究。

由于本研究旨在比较 1.5 T 磁共振不同序列下对于妇科肿瘤盆腔淋巴结转移检出率的差别,同时因病例较少,所以研究中不涉及具体肿瘤淋巴结转移的规律及特点。本研究结果表明 DWI 扫描的转移淋巴结检出率最高,与病检结果相比阈值法达到 95.8%,与 T1WI(75.0%)、T2WI(85.8%)具有显著的差异。DWI 扫描图片分析中,以淋巴结短径为判断标准时,淋巴结阳性检出率与阈值法和 T1WI+C 扫描未表现出明显差异,在检测工作过程中,对于这三种方法均可使用。其原因在于 T1WI、T2WI 和 T1WI+C 主要根据扫描图片的形态学特征进行判断,这种诊断方法对于结果的判断一方面受扫描图像的空间分辨率等因素影响较大。另一方面,转移淋巴结与周围组织或器官的信号差异也会对扫描的检出率造成影响,例如 T2WI 相对于 T1WI 更容易检出病变灶含水量的差异,而 T1WI+C 相比两者来说对于转移病灶的信号变化更加突出,所以检出率相比两者高。本研究结果也证明了这一点:T1WI+C 的对转移淋巴结的检出率较 T1WI 和 T2WI 的检出率高。肿瘤细胞核浆比大,细胞内外间隙较小,排列紧密^[17,18],因而细胞中的水分子含量较高,分子扩散受到一定的限制,当发生淋巴结转移时,其与正常的淋巴细胞相比,将呈现不同的信号强度^[19-21]。而在 DWI

扫描成像中,由于突出了水成分高信号的特性,因而在理论上,DWI 扫描具有较高阳性检出率^[22,23]。在本研究中,转移淋巴结由于水成分较高,经 DWI 扫描后将呈现出较高的信号,ADC 峰值也出现降低,同时在病灶周围较低的背景信号衬托下,更加容易观察,在分析过程中可以清晰的看到阳性淋巴结的边界,这也使得短径判断阳性成为可能。同时,可以对呈现出的高信号区域信号轻度进行测定,通过信号强度判断阳性淋巴结。

既往提出的关于妇科肿瘤盆腔淋巴结转移的判断标准,如淋巴结直径为 5 mm、6 mm、8 mm 和 1 cm 的诊断标准^[24-26],灵敏度和特异度均未得到临床工作者及学术界的广泛认可。因此,学术界有学者推荐使用最小 ADC 值小于 $0.983 \times 10^{-3} \text{ mm}^2/\text{s}$ 为判断标准^[27]。本研究参考了这一判断标准并与 1 cm 判断标准进行了比较,结果显示两种判断标准在淋巴结转移检出率方面的差异缺乏统计学意义。有研究显示超过 50%的子宫内膜癌盆腔转移淋巴结的直径在 1 cm 以下^[28-30],分析原因可能是由于在扫描检查过程中,对于直径 1 cm 以内的转移淋巴结体积过小,ADC 图上未出现信号增强或者难以测量,这也提示在今后临床工作或者学术研究中,应当对直径小于 1 cm 的转移淋巴结进行重点关注,提出更加切合临床实际的转移淋巴结判断标准,需要进一步进行相关研究。

综上所述,在妇科肿瘤盆腔淋巴结转移的检测中应用 1.5T 磁共振能有效提升检出率,不同序列扫描下对转移淋巴结的检出率以 DWI 较高,与病检结果相比差异不显著,具有较好的应用效果,并且在临床应用中避免了造影剂的使用,具有一定的临床应用价值。但在临床工作中,由于 DWI 相对于增强扫描而言并未显著提高妇科肿瘤盆腔转移淋巴结的检出率,因此对于已经进行增强扫描的患者,结合成本效益分析可以不加 DWI 序列扫描。

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