

• 综 述 General review •

MR 多序列成像对前列腺癌穿刺活检及重复活检的指导价值

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【摘要】 前列腺超声引导下穿刺活检是前列腺癌术前诊断的金标准, 诸多学者将含功能成像在内的 MR 多序列成像与超声穿刺活检相结合以提高穿刺活检癌的检出率。本文复习了前列腺超声引导下穿刺活检的适应证、发现率和局限性, 回顾 MR 多序列成像对前列腺癌的发现、定位以及指导超声引导穿刺的价值。

【关键词】 前列腺癌; 磁共振成像; 穿刺

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The guiding value of multi-sequence MRI in performing biopsy and repeated biopsy of the prostate cancer SONG Guo-ping, CHENG Ying-sheng. Institute of Diagnostic and Interventional Radiology, Shanghai Sixth People's Hospital, Shanghai 200233, China

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【Abstract】 Prostate biopsy is the gold standard for the diagnosis of prostate cancer before surgery. In recent years many researchers have used multi-sequence MR scanning that contains functional MRI together with ultrasound-guided biopsy to improve the detection rate of prostate cancer. Many studies have indicated that this combination technique is very useful for the confirmation of prostate cancer. This article aims to make a comprehensive review about the indications, the detection rate and the limitation of ultrasound-guided biopsy of the prostate, and to discuss the clinical value of multi-sequence MR scanning in detecting and localizing the prostate cancer, as well as in guiding ultrasound-guided puncturing. (J Intervent Radiol, 2013, 22: 605-609)

【Key words】 prostate cancer; MR imaging; puncture

前列腺癌在欧美地区发病率较高, 在美国约占男性癌肿的 25%^[1]。近年来随着我国国民对健康体检的重视以及对前列腺癌检出手段的进步, 前列腺癌的发病率在不断上升, 已占到男性泌尿和生殖系统恶性肿瘤的第 3 位^[2]。前列腺穿刺病理检查是前列腺癌诊断的金标准, 可以发现、定位癌灶, 评估肿瘤的恶性程度, 也可指导临床分期, 为后续选择治疗方案提供依据。MR 多序列成像检查对于前列腺癌有着较高的灵敏度和特异度, 将两者结合应用可以有效提高穿刺阳性率。

1 前列腺穿刺适应证

根据我国前列腺癌诊断治疗指南^[3]前列腺超声穿刺活检指征包括: ① 直肠指检 (digital rectal examination, DRE) 发现结节, 不论血清前列腺特异性抗原 (PSA) 值。② PSA > 10 ng/ml, 不计游离/总 PSA 值 (f/tPSA) 和 PSA 密度 (PSAD) 值。③ PSA 4 ~ 10 ng/ml, f/tPSA 异常或 PSAD 值异常。④ PSA 4 ~ 10 ng/ml, f/tPSA 和 PSAD 值正常, 超声发现前列腺低回声结节或 (和) MR 发现异常信号。⑤ 重复穿刺活检指征: 第 1 次前列腺穿刺阴性结果, 以下情况需重复穿刺活检: a. PSA > 10 ng/ml, 不论 f/tPSA 或 PSAD。b. PSA 4 ~ 10 ng/ml, 复查 f/tPSA 或 PSAD 值异常, 或 DRE 和影像学异常。c. PSA 4 ~ 10 ng/ml, 复查 f/tPSA、PSAD、DRE、影像学均正常, 严密随访,

每 3 个月复查 PSA。如果 PSA 连续 2 次 $> 10 \text{ ng/ml}$ 或每年 PSA 速率 (PSAV) $> 0.75 \text{ ng/ml}$ 应该再次穿刺活检。d. 重复穿刺的时机: 2 次穿刺间隔时间尚有争议, 目前多为 1 ~ 3 个月; e. 重复穿刺次数: 对于 2 次穿刺阴性结果者, 属于上述情况者, 推荐进行 2 次以上穿刺。

血清 PSA 检测是最基础的筛查手段, 最常用的包括血清 tPSA, fPSA/tPSA 比率; 其他还包括 PSAD、PSAV、PSA 体积参考值等。朱刚等^[4]统计穿刺阳性率为 17.6%。PeLzer 等^[5]报道当血清 PSA $4.1 \sim 10.0 \text{ ng/ml}$ 时, 穿刺活检的阳性率为 27.0%。DRE 异常是前列腺癌穿刺活检的绝对适应证, Roberts 等^[6]报道, 在一组 327 例 DRE 异常而行穿刺活检的患者中活检阳性率为 18%。Fowler 等^[7]研究表明, 当 DRE 阳性, 而血 PSA 水平分别为 $< 1.0 \text{ ng/ml}$, $1.0 \sim 1.9 \text{ ng/ml}$, $2.0 \sim 2.9 \text{ ng/ml}$, $3.0 \sim 3.9 \text{ ng/ml}$, 其阳性率分别为 4%, 15%, 27% 和 29%。由此可见, DRE 异常时其穿刺活检阳性率与血清 PSA 水平密切相关。

2 超声引导在前列腺穿刺中的应用

超声广泛应用于前列腺癌筛查、确诊和穿刺活检术。超声对癌灶定位的能力有限, 其灵敏度和特异度为 40% ~ 50%^[8-10]。一些小的癌灶不能被灰阶超声所发现。低回声病灶也不一定是前列腺癌, 诸如前列腺炎、前列腺增生和萎缩病灶也可表现为低回声, 从而降低超声诊断前列腺癌的特异度^[11]。

超声常用于实时引导穿刺活检前列腺病灶。6 点系统穿刺法是经典穿刺方法^[12], 但由于其穿刺点少, 假阴性率超过 20%。因为超声引导穿刺活检有多至 40% 假阴性^[13-14], 因此许多学者提出了 8 针、10 针等扩展穿刺法, 甚至是多达 20 针以上的饱和穿刺法。Stamatiou 等^[15]报道, 对一组 286 例患者行 10 针或更多针穿刺与传统 6 针穿刺法比较提高了肿瘤的发现率。胡建波等^[16]对 160 例患者进行 13 点穿刺, 相对系统 6 点穿刺法, 前列腺癌的检出率提高了 21%。Scattoni 等^[17]对 617 例可疑患者进行 24 针饱和穿刺, 其癌灶阳性检出率为 46.8%。饱和穿刺法对前列腺造成很大的损伤, 并且费用也会相应有所提高, 这些都限制饱和穿刺法成为标准穿刺模式。因此以 MR 多序列成像为指导的靶向穿刺被更多地应用, 以提高超声引导穿刺活检术阳性发现率。

3 MR 成像在前列腺癌诊断中的应用

MR 成像已逐渐被用于前列腺癌早期发现及定

位、指导穿刺, 甚至在 MR 导引下穿刺活检。前列腺癌通常发生于外周带, 呈圆形或不规则形, T2WI 呈低信号灶, 但是诸如前列腺炎、血肿、增生、萎缩、癌治疗后改变等疾病都可以在 T2WI 呈低信号影而与癌相混淆。发生在中央腺体(移行区)的癌肿与正常组织在 T2WI 都呈低信号灶而无法区分。根据以往报道, 单独应用 MR T2WI 诊断前列腺癌其灵敏度和特异度分别为 77% ~ 91% 和 45% ~ 73%^[18-20]。

由于 T2WI 的局限性, 现在多是将 T2WI 与功能成像联合应用诊断前列腺癌。前列腺功能成像包括动态增强扫描 (dynamic contrast enhanced imaging, DCEI)、弥散加权成像 (diffusion-weighted imaging, DWI)、波谱成像 (MR spectroscopy, MRS)。已有大量研究表明应用功能成像或联合应用 T2WI 能提高前列腺癌的诊断准确性。Kim 等^[20]研究在外周带应用 DCEI 诊断癌灶的灵敏度和特异度可达到 96% 和 97%, 而 T2WI 只有 75% 和 53%。Kitajima 等^[21]对一组 53 例患者以穿刺活检为标准的研究中, 单独应用 T2WI 其灵敏度和特异度为 61% 和 91%, 准确度为 84%; 而应用 DCE 结合 T2WI 的灵敏度和特异度为 77% 和 93%, 准确度为 89%; 应用 DWI + T2WI 灵敏度和特异度为 76% 和 94%, 准确度为 90%。Scheidler 等^[19]报道单独应用 T2WI 诊断前列腺癌灵敏度和特异度为 46% 和 61%, 而单独应用 MRS 为 63% 和 75%, 联合应用 MRS 和 T2WI 的灵敏度和特异度则提高到 91% 和 95%。Yoshizako 等^[22]对一组 26 例患者前列腺移行区癌灶进行研究, 应用 T2WI、DCEI、DWI 序列成像并与前列腺全切术后病理对照, 其单独应用 T2WI 的灵敏度、特异度、准确度和阳性预测值分别为 61.5%、68.8%、64.3% 和 76.2%, 应用 T2WI、DWI 联合 DCEI 分别为 69.2%、93.8%、78.6% 和 94.7%, 他们认为对于移行区癌灶应用 DWI 联合 T2WI 可以提高诊断准确度, 应用 DCEI、DWI 联合 T2WI 可以提高其特异度和阳性预测值。

4 MR 在指导穿刺及重复穿刺中的应用

前列腺 MR 多序列成像对于癌灶的定位显示具有重要的临床意义^[23]。前列腺癌灶准确定位可以提高前列腺癌靶向穿刺的发现率并有助于前列腺癌准确分期, 还有助于对前列腺癌放疗定位和对于微创治疗的定焦^[24-30]。

近年来国内外越来越多的学者应用 MR 多序列成像对前列腺癌进行定位以指导超声引导下靶向穿刺活检, 无论是初次活检抑或重复活检, 均提

高了穿刺活检的阳性发现率^[31]。戚庭月等^[32]对 50 例临床怀疑前列腺癌的患者在超声引导穿刺活检术前行 3.0T MR 成像,根据 DWI 发现病灶并定位,采用系统穿刺、以 DWI 为指导靶向穿刺、系统穿刺与靶向穿刺相结合经会阴穿刺后比较,3 种方法的前列腺癌检出率分别为 46%、54%、66%,穿刺阳性率分别为 9.33%、40.41%和 14.23%,统计学表明 DWI 靶向穿刺结合系统穿刺与单纯系统穿刺差异有统计学意义。因而认为联合应用 DWI 靶向穿刺结合系统穿刺可以提高前列腺癌检出率和穿刺阳性率,降低重复穿刺的风险。国外诸多学者研究表明 MRS 靶向穿刺可以提高前列腺癌检出率^[33-36]。Kumar 等^[37]在对一组 44 例患者在超声引导穿刺活检术前应用 MRS 进行前列腺扫描,发现可疑病灶后以靶向穿刺结合 6 针系统穿刺法对前列腺进行穿刺,其检出率为 25%,而另一组 120 例患者行单纯系统穿刺法进行穿刺得到的检出率仅为 9%。

根据 Zackrisson 等^[38]研究 6 针系统穿刺法首次活检检出率为 23%,而第 2~5 次活检的检出率依次递减,分别为 17.6%、11.7%、8.7%和 0%。由于 MR 及其功能成像对前列腺癌发现及定位有较高的灵敏度和特异度,有学者研究将 MR 多序列成像应用于那些有超声穿刺活检阴性史,而临床又高度怀疑前列腺癌而需要进行重复穿刺活检的患者^[37,39-43],结果表明有助于提高前列腺癌检出率。Amsellem-Ouazana 等^[39]对一组 42 例患者进行重复穿刺前应用 MR T2W 联合 MRS 成像后再行穿刺进行研究,其平均穿刺次数为 2.04 次,前列腺癌检出率为 35.7%(15/42),T2W 联合 MRS 成像灵敏度、特异度、阳性预测值、阴性预测值和准确度分别为 73.3%、96.3%、91.6%、86.6%和 88%。他们认为 T2W 联合 MRS 可以指导重复穿刺,以减少重复穿刺次数和穿刺针数。Sciarra 等^[44]对 180 例怀疑前列腺癌患者分为两组,A 组行系统穿刺,B 组行 T2W、MRS 联合 DCEI 靶向穿刺结合系统穿刺。B 组检出率为 45.5%(41/90),显著高于 A 组检出率 24.4%(22/90),DCEI 诊断前列腺癌灵敏度、特异度、阳性预测值、阴性预测值和准确度分别为 84.6%、82.3%、78.5%、87.5%和 83.3%。MRSI 联合 DCEI 灵敏度、特异度、阳性预测值、阴性预测值和准确度分别为 92.6%、88.8%、88.7%、92.7%和 90.7%。Park 等^[45]应用 3.0T DWI 联合 T2W 对 43 例怀疑前列腺癌而初次活检阴性的患者进行研究,其检出率为 39.5%(17/43),DWI 提供了癌灶定位的信息,有助于提高

癌灶检出率和减少重复穿刺次数。

5 MR 联合超声指导穿刺的局限性及前景

由于多数前列腺癌在超声成像中不能显示,当应用 MR 图像指导超声穿刺活检时,最为重要的是将 MR 病灶定位与超声成像定位相统一。戚庭月等^[32]应用 DW 图像指导超声经会阴穿刺时,应用双平面探头中的线阵组探头进行引导,进行前列腺组织穿刺取材。而在退针之前将换能器转为凸阵组以获取前列腺的横切图,观察并对比穿刺针针尖位置是否与 DW 图像病灶位置相匹配,如不符,则调整穿刺路径并确认后穿刺。在国外已有学者应用 MR 图像与超声图像融合后进行实时指导穿刺活检^[46-48]。他们应用特制的软件,应用经直肠超声取得的横断面 2D 图像重建为 3D 容积超声图像,并与穿刺前取得的 MR 容积图像(使用直肠线圈)进行匹配,并在同一工作站中将两者进行手工注册。注册后实时的超声图像就会自动与 MR 容积图像进行融合,这样可疑病灶会显示在 MR 图像和实时融合图像中,在 MR-超声实时融合系统下穿刺活检会有更高的准确性。但是至今还未有应用于临床的商业软件系统,因此这项技术尚不能大规模推广。

基于 MR 图像对前列腺癌发现有着较高的灵敏度和特异度,在西方国家 MR 引导下前列腺穿刺活检术越来越多地应用于临床^[49-52]。其优点在于清晰显示病灶,并定向引导穿刺;由于 MRI 弥散加权成像的表观弥散系数(ADC 值)与肿瘤的侵袭性有较高的相关性,MR 指导下可以定向穿刺那些有可能得到更高 Gleason 得分的病灶;MR 引导下穿刺活检有更高的发现率(38%~59%)。MR 引导下穿刺活检的缺点是费用高、操作时长。

鉴于 MR 及其功能成像对前列腺癌发现、定位及分期的诸多优点,应该提倡对于那些具有患前列腺癌高风险的患者在超声引导下穿刺活检术前行常规 MR 及至少一种功能成像。对于那些首次活检阴性或屡次活检阴性而临床又高度怀疑前列腺癌的患者更应在再次超声穿刺活检前行 MR 多序列成像,发现、定位可疑癌灶、指导穿刺活检,以提高前列腺癌检出率和穿刺阳性率,减少不必要的重复活检次数和穿刺针数。

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