



钇-90微球选择性内放射治疗在肝细胞癌降期转化中的应用1例报告

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· 专题报道 ·

钇-90 微球选择性内放射治疗在肝细胞癌降期转化中的应用 1 例报告



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〔摘要〕 本文报告了 1 例 68 岁男性原发性肝细胞癌 (hepatocellular carcinoma, HCC) 患者, 经过钇-90 微球选择性内放射治疗 (Yttrium-90 microsphere selective internal radiation therapy, ⁹⁰Y-SIRT) 后, 肿瘤明显缩小, 肿瘤标志物甲胎蛋白 (alpha fetoprotein, AFP) 和异常凝血酶原 (abnormal prothrombin, PIVKA-II) 显著降低。术后病理结果显示残余肿瘤细胞很少, 表明⁹⁰Y-SIRT 在 HCC 的降期转化中具有良好的疗效和安全性, 并为后续外科手术治疗创造条件。

〔关键词〕 肝细胞癌; 钇-90; 降期; 转化

〔中图分类号〕 R 735.7 〔文献标志码〕 B

Application of Yttrium-90 microsphere selective internal radiation therapy in downstaging and conversion of hepatocellular carcinoma: a case report

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〔Abstract〕 This case report describes a 68-year-old male patient diagnosed with primary hepatocellular carcinoma (HCC). After receiving Yttrium-90 microsphere selective internal radiation therapy (⁹⁰Y-SIRT), the tumor significantly reduced in size, and tumor markers alpha fetoprotein (AFP) and abnormal prothrombin (PIVKA-II) decreased. Postoperative pathological results showed minimal residual tumor cells, indicating that ⁹⁰Y-SIRT has good efficacy and safety in downstaging and conversion of HCC, thereby facilitating subsequent surgical resection.

〔Key Words〕 hepatocellular carcinoma; Yttrium-90; downstaging; conversion

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1 病例资料

1.1 临床特征 患者男性, 68岁, 2023年1月出现肝区反复胀痛, 可自行缓解。患者于当地医院就诊, 超声检查示: 肝脏占位性病变, 10 cm左右, 有包膜。患者自发病以来, 精神、食欲可, 睡眠较差, 大小便正常, 体质量未见明显改变。2023年5月10日, 患者于清华大学附属北京清华长庚医院就诊, 上腹部钆塞酸二钠增强磁共振成像 (magnetic resonance imaging, MRI) 示: 肝V段原发性肝细胞癌 (hepatocellular carcinoma, HCC; 107 mm×94 mm×122 mm), 肝VI段肝内转移灶 (13 mm×14 mm), 无血管侵犯; 肝硬化 (图1)。肿瘤标志物: 甲胎蛋白 (alpha fetoprotein, AFP) 103.31 ng/mL, 异常凝血酶原 (abnormal prothrombin, PIVKA-II) 714.41 mAU/mL。患者有乙肝病史30年, 未治疗。

1.2 诊断和钇-90 (^{90}Y) 治疗 患者诊断为HCC, 中国肝癌分期 (China liver cancer staging, CNLC) IIa期、巴塞罗那临床肝癌分期 (Barcelona Clinic Liver Cancer, BCLC) B期。经

多学科诊疗 (multi-disciplinary team, MDT), 考虑患者病灶多发、较大且有肝硬化背景, 制订 ^{90}Y 微球选择性内放射治疗 (Yttrium-90 microsphere selective internal radiation therapy, ^{90}Y -SIRT) 使HCC降期转化后手术切除的方案。2023年6月8日, 患者接受经肝动脉钆-99m标记的大颗粒聚合白蛋白 (Technetium-99m-macroaggregated albumin, $^{99\text{m}}\text{Tc}$ -MAA) 介入手术 (图2), 肺分流百分数 (lung shunt fraction, LSF) 为14.4%, 肿瘤/肝脏比值 (tumor to normal ratio, TNR) 为8.2。采用医学内照射剂量 (medical internal radiation dose, MIRD) 方案, 处方剂量3.6 GBq (肝右动脉S6段分支3.3 GBq, 肝右动脉S5段分支0.3 GBq, 两支动脉供血区无明显重叠), 肿瘤剂量200 Gy, 肝脏剂量200 Gy, 肺剂量19.6 Gy。2023年6月13日, 患者接受 ^{90}Y -SIRT以及正电子发射计算机体层显像 (positron emission tomography and computed tomography, PET/CT) 检查 (图3)。患者术后恢复顺利, 无明显不良反应, 并于术后第2天出院。

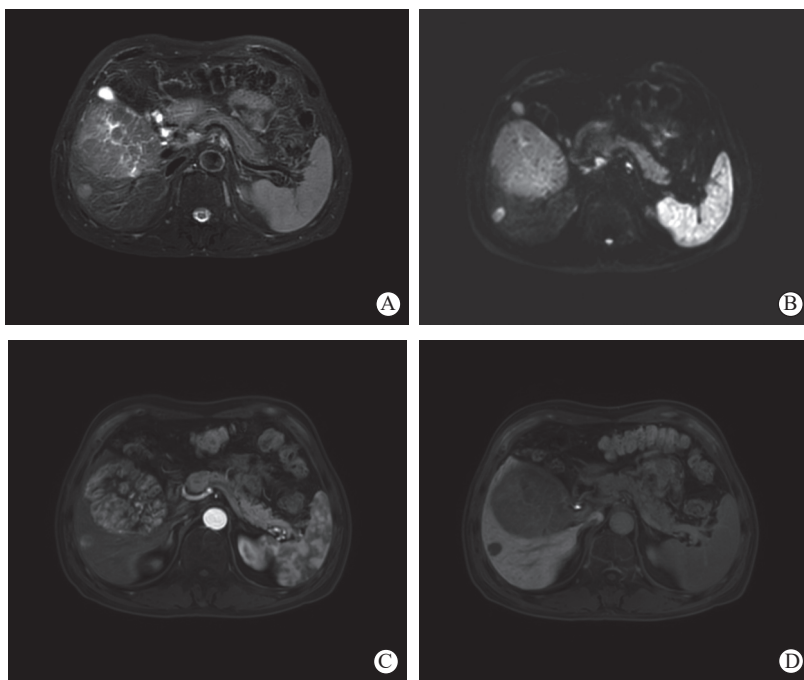


图1 ^{90}Y -SIRT术前上腹部增强MRI

Figure 1 Enhanced MRI of the upper abdomen before ^{90}Y -SIRT

A: T₂WI; B: DWI; C: Arterial phase; D: T₁WI. ^{90}Y -SIRT: Yttrium-90 microsphere selective internal radiation therapy; MRI: magnetic resonance imaging.

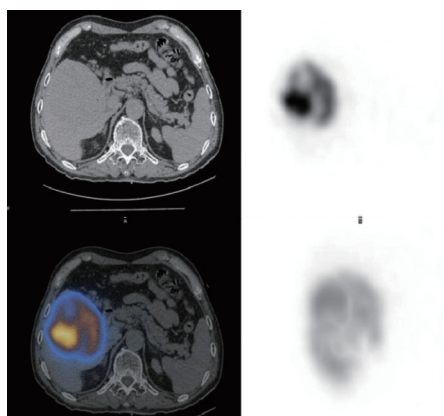


图2 经肝动脉^{99m}Tc-MAA介入手术后SPECT/CT检查
Figure 2 SPECT/CT scan after ^{99m}Tc-MAA
interventional surgery

^{99m}Tc-MAA: Technetium-99m-macroaggregated albumin;
SPECT/CT: single photon emission computed tomography/
computed tomography.

1.3 外科手术治疗 ⁹⁰Y-SIRT 术后3个月患者复查MRI示：肝V段恶性肿瘤治疗后改变，病灶较前缩小（77 mm×77 mm×88 mm），未见明确活性。肝VI病灶显示不清（图4）。复查肝肾功能

未见明显异常，AFP由103.31 ng/mL降低至4.56 ng/mL，PIVKA-II由714.41 mAU/mL降低至20.92 mAU/mL（表1）。肿瘤降期至CNLC Ib期、BCLC A期，修订后实体瘤疗效评价标准（modified Response Evaluation Criteria in Solid Tumors, mRECIST）评估为部分缓解（partial response, PR）。患者转化成功，符合手术治疗指征。

2023年10月9日，患者于北京清华长庚医院行肝部分切除（R0切除），术后患者恢复顺利，切口甲级愈合，顺利出院。术后病理标本（图5）：肝右后叶HCC，非特指型，中分化。瘤床大小9 cm×7 cm×7 cm，其中可见5%健活肿瘤细胞残余，分布于肝被膜下，镜下最大灶最大径约5.5 mm。免疫组化：AFP（-）、HepPar-1（+）、GPC3（+）、GS（+）、HSP70（+）、CK7（-）、CK19（-）、CD10（毛细胆管+）、CD34（血管+）、Ki67（40%+）。特殊染色：网状纤维染色示纤维组织增生，Masson染色示纤维组织增生。患者定期复查无异常。

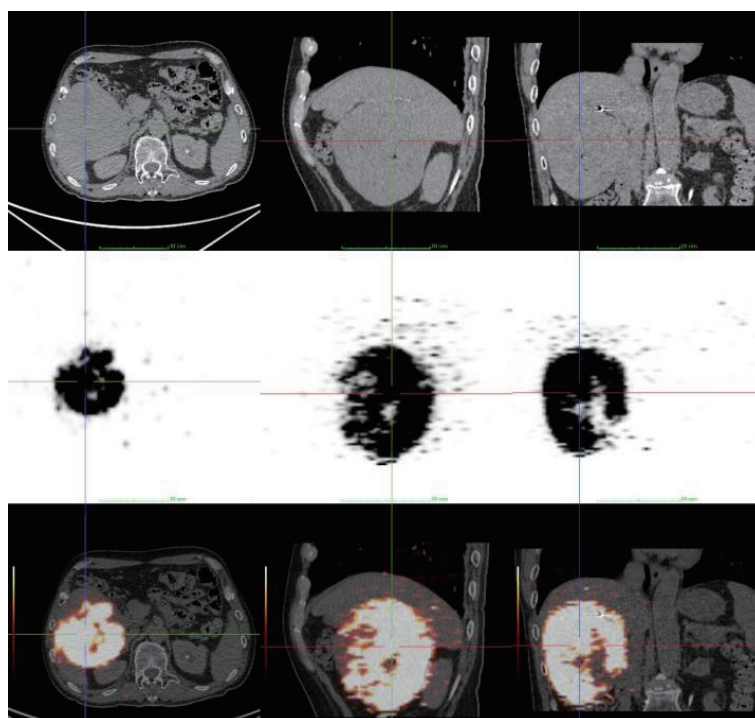
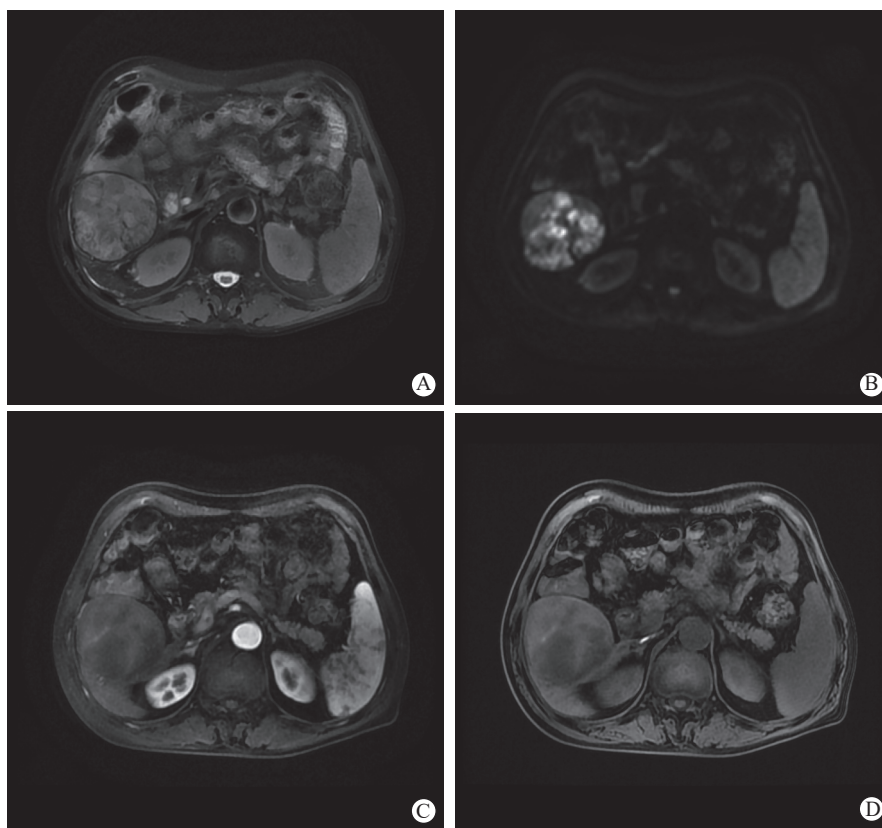


图3 ⁹⁰Y-SIRT术后PET/CT检查

Figure 3 PET/CT scan after ⁹⁰Y-SIRT

⁹⁰Y-SIRT: Yttrium-90 microsphere selective internal radiation therapy; PET/CT: positron emission tomography and computed tomography.

图4 ^{90}Y -SIRT 术后3个月复查 MRIFigure 4 Follow-up MRI scan 3 months after ^{90}Y -SIRT

A: T₂WI; B: DWI; C: Enhanced arterial phase; D: T₁WI. ^{90}Y -SIRT: Yttrium-90 microsphere selective internal radiation therapy; MRI: magnetic resonance imaging.

表1 ^{90}Y -SIRT 前后 AFP、PIVKA-II 变化Table 1 Changes in AFP and PIVKA-II before and after ^{90}Y -SIRT

Time	AFP/(ng·mL ⁻¹)	PIVKA-II/(mAU·mL ⁻¹)
20 d before therapy	103.31	714.41
1 d before therapy	144.83	530.17
1 month after therapy	23.19	59.85
3 months after therapy	5.09	25.19
4 months after therapy	4.56	20.92

^{90}Y -SIRT: Yttrium-90 microsphere selective internal radiation therapy; AFP: alpha fetoprotein; PIVKA-II: abnormal prothrombin.

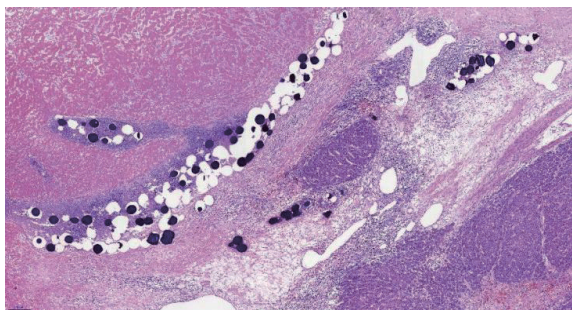


图5 H-E 染色病理图

Figure 5 H-E staining pathological image

H-E: hematoxylin-eosin. Original magnification: $\times 50$.

2 讨论

^{90}Y -SIRT 是一种针对肝脏肿瘤的局部治疗方法，其将放射性同位素 ^{90}Y 封装在微小的树脂或玻璃微球中，通过肝动脉直接输送至肿瘤所在的肝脏部位。由于肝肿瘤通常通过肝动脉供血，而正常肝组织主要通过门静脉供血，这种输送方式可使微球更集中地聚集在肿瘤组织内，释放高剂量的 β 射线，达到局部消融肿瘤的效果。根据《原发性肝癌诊疗指南（2024年版）》^[1]， ^{90}Y -SIRT

在肝癌患者中的主要临床应用包括(1)早期肝癌患者的根治性治疗,可使肿瘤完全坏死;(2)中期肝癌患者的降期治疗,为外科手术切除或肝移植创造条件;(3)晚期肝癌患者(伴门静脉癌栓)的姑息性治疗,延长患者生存期;(4)放射性肝段/肝叶切除,治疗肿瘤的同时增加余肝体积,为外科手术切除创造机会;(5)与系统抗肿瘤治疗联合,提高疗效。

本例患者 ^{90}Y -SIRT术后随访时AFP和PIVKA-II显著降低,且MRI评估发现肿瘤体积缩小,符合降期标准。术后病理结果显示,HCC的残余肿瘤细胞仅占很小比例,进一步验证了 ^{90}Y -SIRT的有效性^[2]。 ^{90}Y -SIRT不仅增加患者的生存机会,还为后续的手术切除创造了条件。此外, ^{90}Y -SIRT的安全性也是其广泛应用的重要基础^[3]。本例患者术后恢复良好,未出现明显的不良反应,显示了 ^{90}Y -SIRT在选择适应证和剂量控制上的有效性。

综上所述, ^{90}Y -SIRT为HCC患者提供了一个有效的降期和桥接治疗选择^[4-5]。通过适当的患者筛选和精准的治疗方案, ^{90}Y -SIRT能够显著提高患者的生存率,改善生活质量,且在多学科合作的背景下,进一步提升了肝癌综合治疗的效果。未来,随着临床研究的深入, ^{90}Y -SIRT有望在肝癌治疗领域发挥更为重要的作用。

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廖勇、黄鑫:手术操作;梁斌:靶区勾画、图像重建;张琳、冯晓彬、霍力:论文指导、审阅和经费支持。

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