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**磁感应热疗联合125I籽源近距离放疗的可行性[[1]](#footnote-1)**

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**摘要** 磁感应热疗植入合金热籽与放射籽源在尺度上处于同一水平，当热籽和放射籽源同时植入肿瘤组织，热场和辐射将共同作用于肿瘤细胞，提高肿瘤细胞的杀灭作用。本文应用电磁学理论计算射频磁场中热籽和放射籽源的产热功率。将不同分布的热籽和放射籽源置于磁感应设备射频磁场中，调节磁场参数，观察不同条件下的温升曲线。研究了放射籽源在磁感应射频磁场下的升温情况以验证放射籽源的安全性、合金热籽与放射籽源混合排布情况下的升温情况以验证联合治疗的有效性。理论计算和实验结果表明，放射籽源在磁感应治疗射频磁场下（50~500 kHz）磁热效应不显著，验证了用于热放疗的安全性。将放射籽源与热籽混合植入琼脂体模和离体肌肉组织，在介质植入区域内温度均远超过43 ℃，可实现植入区域内热疗对放疗的增敏作用。

**关键词** 近距离放疗；磁感应热疗；热籽；放射籽源；琼脂体模

**Feasibility of the magnetic induction hyperthermia combined with 125I brachytherapy**

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**Abstract** Magnetic induction hyperthermia implanted alloy thermo seed and radiation seed are at the same level in the scale. When the thermo seed and radiation seed implant into the tumor tissue at the same time, thermal field and radiation will act together on the tumor cells, enhancing the destruction effect of tumor cell. The electromagnetic theory was applied to calculate the heat production power of thermo seed and radiation seed in the RF magnetic field; and the thermo seed and radiation seed were placed with different distribution into the RF magnetic field of the magnetic induction equipment, in order to examine the temperature rise curve under various conditions by adjusting the magnetic field parameters. The heating effect of radiation seed in the RF magnetic field was studied in order to verify the safety of the radiation seed; and the heating effect when alloy thermo seed and radiation seed were in mixed configuration was studied in order to verify the effectiveness of the combined therapy. The theoretical calculations indicate that the magnetocaloric effect of radiation seed source in the RF magnetic field of magnetic induction therapy (50-500 kHz) is not significant, and its safety of hyperthermia and radiotherapy had been verified. When implanting radiation seed mixed with thermo seed into the agar model and the muscle tissue in vitro, the temperature in the media implanted area is much higher than 43 degrees, realizing the sensibilization that hyperthermia has on radiotherapy in the implanted area.

**Keywords** brachytherapy; magnetic induction hyperthermia; thermoseed; radiation seed; agar model

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