

SS-4

Sentinel Lymph Node Biopsy by a High Tc SQUID

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The performance of a lymph node detection system used with an ultra-small superparamagnetic iron oxide and a high-Tc SQUID was investigated. This system is applicable for sentinel lymph node biopsy which is a newly developed surgical technology. The sentinel node biopsy is a kind of examination to investigate whether the sentinel node, which initially receives malignant cells from a breast carcinoma is disease-free or not. If the sentinel node is free of disease, you can leave the rest of the lymph-nodes because of no concern for progression. Conventionally, a radio isotope was used to identify the sentinel lymph node. We propose the use of radio exposure-safe ultra small iron oxide particles such as a magnetic resonance imaging (MRI) contrast agent. The ultra-small iron oxide particles of 360 picograms in weight of iron dispersed in a solution could be detected with a spacing of 1mm. When a spherical pseudo lymph node was used with spacing of 20 mm, the detectable weight of the particles was 40 micrograms. The resolutions are good enough to apply the technology for a sentinel-node biopsy and a lymphatic mapping. Frequency dependence of the magnetic field was also measured and discussed. This work was partially supported by a Grant-in-Aid for Scientific Research (B) from the Ministry of Education, Culture, Sports, Science and Technology.