

## Sentinel lymph node biopsy using magnetic nanoparticles and magnetic probe

M. Kusakabe<sup>1,2</sup>, H. Takei<sup>3</sup>, S. Nakamura<sup>4</sup> and M. Sekino<sup>5</sup>

<sup>1</sup>Graduate School of Agricultural and Life Sciences, The University of Tokyo, Tokyo, Japan

<sup>2</sup>Matrix Cell Research Institute Inc., Ibaraki, Japan

<sup>3</sup>Department of Breast Oncology, Nippon Medical School Hospital, Tokyo, Japan

<sup>4</sup>Division of Breast Surgical Oncology, Department of Surgery, Showa University Hospital, Tokyo, Japan.

<sup>5</sup>Graduate School of Engineering, The University of Tokyo, Tokyo, Japan

In surgery for early breast cancer, it is important that much less invasive breast conservation therapy is done and that axillary lymph node dissection is avoided to increase the patient's quality of life (QOL). For this purpose, a sentinel lymph node biopsy (SLNB) has been established to determine the sentinel lymph node (SLN) in which lymph fluid containing cancer cells from a tumor first flowed.

With the current method using radioisotopes (RIs), <sup>99m</sup>Tc phytic acid is subcutaneously injected into the areola one day prior to surgery. On the following day, the SLN that contains the radioactive tracer is detected with a radiation detector and is excised. However, RIs not only directly radiate patients but also require specific radiation control areas, making it difficult to implement in small and medium hospitals.

To solve this problem, novel methods for detecting a SLN by using a non-RI tracer such as dye (patent blue) or fluorescence (indocyanine green: ICG) have been used. However, the results of these methods are subjective, and the methods have the problem of having low detection rates. In my presentation, we introduce a novel system for breast SNLB that uses a magnetic probe developed by us and magnetic nanoparticles (ferucarbotran).

### References

- 1) M. Shiozawa *et al.*, Breast Cancer. 20(3) (2012) 223-229.
- 2) M. Sekino *et al.*, Sci. Rep. 19;8(1)(2018) 1195.

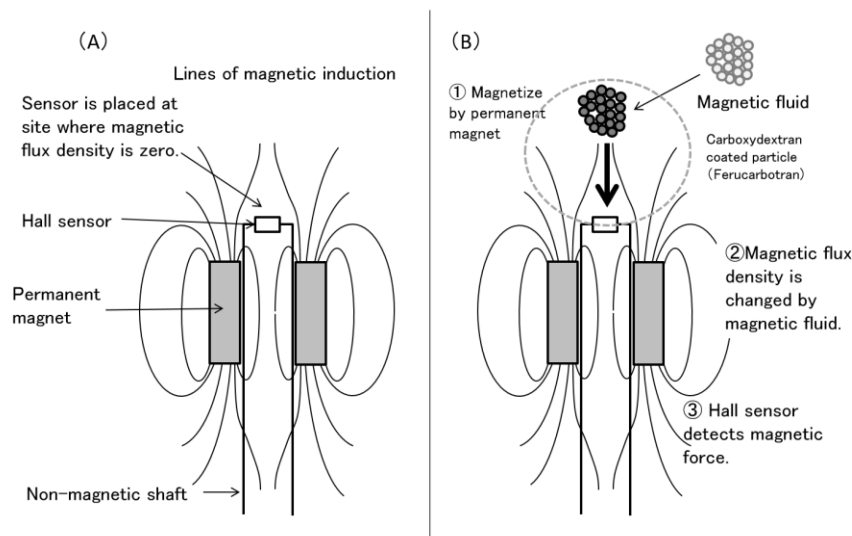


Fig. 1 Measurement principle of magnetic probe.

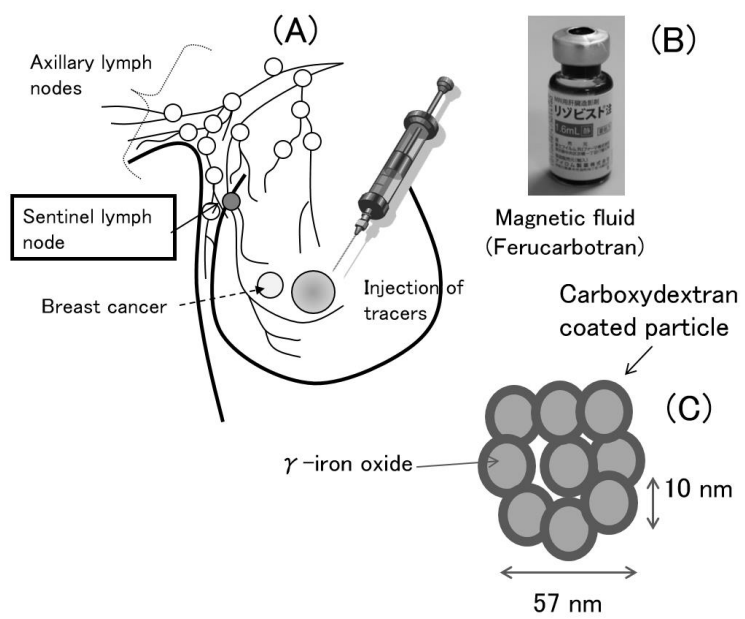


Fig. 2 SLN detection method using magnetic particles.