

Performance Evaluations of Microwave Snare

Kazuyuki Saito⁽¹⁾ and Masashi Sugiyama⁽²⁾

(1) Center for Frontier Medical Engineering, Chiba University, Chiba 2638522, Japan
(2) Graduate School of Science and Engineering, Chiba University, Chiba 2638522, Japan

In recent years, various types of medical applications of microwave have widely been investigated and reported. The authors have been studying surgical devices which employ the microwave thermal effect. As part of this study, a microwave snare has been developed. The snare is one of the surgical devices for removing affected part such as small tumor non-invasively. Figure 1 illustrates overview of the treatment. In order to remove the affected part, this part is surrounded by snare wire and is squeezed by hand operation of surgeon. In addition, the radio frequency (RF: from several hundred kHz to several MHz) current is adopted by the snare wire for tissue coagulation (stop bleeding). However, the RF current induces excessive heating and may generate fog and perforation of organ. On the other hand, according to our previous investigations, the microwave energy could realize gentle heating. Therefore, in this study, the microwave snare has been developed.

Figure 2 shows an analytical model of developed microwave snare. A feeding point is placed an edge of the feeding coaxial cable which is connected the snare wire. The snare wire constitutes a loop antenna and size of the snare can be changed by shifting a sheath. In this study, heating capability of the microwave snare under various snare sizes.

Figure 3 indicates a calculated temperature distribution as an example. In the practical RF snare, high temperature region is observed at a small region around root of the snare. However, in the developed microwave snare, high temperature values are distributed inside the loop. In addition, actually, the snare size will be reduced continuously and the temperatures will be changed. In these cases, a characteristic temperature distribution has also been kept. It is considered a merit by comparison with the practical device. From the results, it can be said that the proposed microwave snare is useful for the surgical operations.

As a further study, prototype devices, which can be used for actual treatment, will be developed by considering usability of surgeons.

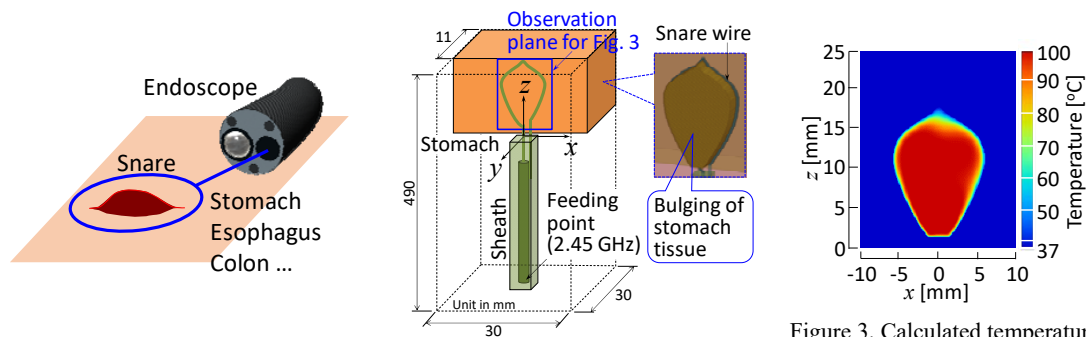


Figure 1. Using of snare.

Figure 2. Calculation model.

Figure 3. Calculated temperature distribution.