Electrode Array for Radiofrequency Tissue Ablation

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Technology description

The liver is a common site for both primary and metastasizing cancer. Surgical resection, the preferred treatment for liver cancer, is a time consuming procedure during which the surgeon must cut through tissue while avoiding or closing large blood vessels. Blood loss during resection can increase the chance of post-operative complications and decrease patient survival rates.
One method of reducing blood loss is radiofrequency (RF) ablation, which involves passing an electrical current from a probe inserted into the tissue to a ground pad situated on the patient’ s skin. The electric current coagulates tissue near the probe with heat, sealing it against blood flow. RF ablation originally involved inserting, removing and reapplying a single mono-polar probe at many locations along a tissue slice, a process that generally took too long for clinical practice. UW-Madison researchers have developed a faster method of bipolar RF ablation that uses an electrode array to heat tissue between electrodes. The electrodes are inserted into the tissue along a resection cut line. To heat the tissue, RF energy is applied in bipolar mode between pairs of probes set in a comb-like configuration. Power is switched between pairs of electrodes in half-second intervals, allowing all probes to heat the tissue, but avoiding increased impedance, which compromises effective heating.

Application area

Thermal coagulation of tissue during surgery to minimize blood loss

Advantages

More rapidly ablates areas of tissue than previous methods
Allows a surgeon to thermally coagulate tissue, rather than having to close tissue surgically, saving time and preventing blood loss
Coagulates vessels up to five mm in diameter; in contrast, mono-polar probes can only coagulate vessels up to three mm
No ground pads are necessary, eliminating risk of skin burns below the pads
May be used on any solid organ, including the liver, kidney, spleen, or brain
Heat is concentrated between electrodes, allowing ablation of thin slices of tissue
Ablation region can have a variety of shapes

Electrodes may be inserted separately to mold to the organ’ s shape or rapidly inserted in unison Feedback control and localized application of power result in uniform ablation despite varying tissue characteristics.

Institution

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