Rotating Electric Spark: Innovative Medical Device

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Every year many people die from blood loss. There are some modern medical devices (coagulators) allowing to prevent extra bleeding. However, each of them has disadvantages. My goal is to explore the possibility of creating new coagulator with non-contact coagulation and small impact depth. It is also necessary to cover large area by electric spark discharge in order to reduce operation time. Since it is impossible to obtain a planar discharge, I proposed to make a plane consisting of discharges between rotating electrodes. I created a unit able to supply high voltage to rotating electrodes through roller bearing races. My experimental setup consists of unit, motor, battery and high-voltage power supply. I carried out the experiment on the pileup of frequencies of sparking and rotating. Low frequencies showed a ‘star’ – rays between center and vertices of polygon inscribed in a circle. The number of rays is directly proportional to the sparking frequency and power. Based on collected data I calculated frequency suitable for uniform coagulation. Electrical circuit allows regulating the power depending on required coagulation depth. Maximum current is safe (about 10mA). Nozzles and electrodes are disposable and removable. To test the operability of my method I conducted an experiment with a pork liver. It proved that it is possible to coagulate a circle area (1 sqr cm), an interval (1cm long) or point from 0.5 to 5 mm deep without contact with tissue depending on nozzles kind, sparking frequency and area of coagulation. Overall, my experimental setup integrates best features of its competitors creating new opportunities for surgeons. Cheap elements and simple technology ensure low cost of the device. Also, it can be used in ambulance or field medicine.

Awards Won:

Third Award of $1,000

NASA: Second Award of $750