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APPLICATORS FOR TISSUE ABLATION BY IRREVERSIBLE ELECTROPORATION METHOD IN ONCOLOGY APPLICATION – A REVIEW OF CURRENT SOLUTIONS

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Cancers are the civilization diseases of the 21st century. They have both genetic and environmental source. They are increasingly linked to lifestyle. After cardiovascular disease, cancer is the second most common cause of premature death. According to the World Health Organization, a significant increase in the incidence of cancer is expected in the near future in many countries of the world. Therefore, the development of new therapies for their treatment remains extremely important.

One of the newest method to remove cancerous lesions is tissue ablation by irreversible electroporation. When tissues are exposed to a series of short-time high-voltage pulses, cell membranes are damaged. Pores are then formed in the cell membrane, and the cell is unable to rebuild itself. This leads to the process of apoptosis, which is the natural, controlled process of cell death in a multicellular organism. Remnants of this cell are removed of the immunological system. A device called an electroporator is used to generate microsecond pulses of high voltage. Connected to the electroporator are applicators that transmit the voltage pulses to the tissue. However, it is necessary to develop modern surgical instruments and devices so that this method can be widely used and introduced into clinical practice.

The aim of this study is to select a suitable shape and materials for applicators. The development of the structural form of the applicator will make it possible to undertake preclinical studies on animal models and clinical studies with patients in the future. These studies will be aimed at optimizing therapeutic processes in oncology using the irreversible electroporation method.

The study analyzed the thermal ablation applicators used in oncology therapy, including their construction and shape presented in the literature. Based on the analysis, basic parameters such as length, diameter and shape of the applicator were adopted. The parameters determined in this way, will serve as design requirements, for the construction of an applicator dedicated to electroporation for research applications in oncology therapy.