A low-cost and effective ethanol ablation tumor treatment

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Unmet Need

Cervical cancer is the fourth most common cancer among woman globally, with an estimated 342,000 deaths in 2020, of which 90% of deaths occurred in low-and middle-income countries. A primary reason for this disparity between low- and high-income countries is the discrepancy in treatment options. High-income countries have the “gold-standard” for cervical cancer treatment, with severe lesions being treated with a loop electrosurgical excision procedure (LEEP). The cancerous tissue is excised with an electrified wire, and minor lesions are treated with cryotherapy to essentially freeze the abnormal tissue. On the other hand, in low-income countries there is limited availability of cryotherapy and LEEP. LEEP has a high initial cost, a need for uninterrupted power, and trained personnel. Cryotherapy is cheaper and not dependent on the power grid, requires specialized equipment and hard-to-supply compressed gas tanks. There is a need for a new cost-effective strategy to treat cervical cancer at the point-of-care in developing countries.

Technology

Duke inventors have developed and optimized an ethanol ablation tumor treatment for resource-limited settings. This is intended to be used for non-encapsulated carcinomas in resource-limited settings where surgery is not an option, or among patient populations that have non-aggressive tumors and are reluctant to either undergo surgery or make a return hospital visit after imaging. Specifically, the inventors have improved upon standard-of-care manual ethanol ablation by reducing the injection rate and adding ethyl cellulose to the solution. The ability for the ethyl cellulose gel solution to slowly release ethanol over time into the tumor and the optimized injection rate both significantly increase therapeutic efficacy of the treatment in epithelial tumors. This method is ultra-low cost (<$1), requires no specialized equipment and can effectively treat lesions up to 5cm. This has been demonstrated in a preclinical model with a current focus on treatment of epithelial cervical lesions.

Other Applications

This technology could also be used to treat any tumor that

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Inventor(s)

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Links

- From the lab of Dr. Robert Morhard
- From the lab of Dr. Nimmi Ramanujam
- From the lab of Dr. David Katz
- Cleaning Lab Equipment leads to a Breakthrough Discovery (Duke Global Health Institute, 2017)

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can be injected as it requires a low volume of ethanol. While the current focus is cervical lesions, the treatment can also be applied to larger lesions such as breast tumors.

Advantages

- Enhanced fluid distribution and retention of inventors improved ethanol ablation treatment within the tumor.
- Low-cost, accessible, and effective cervical cancer treatment
- Reduction of injection rate and addition of ethyl cellulose to standard ethanol ablation treatment significantly increase therapeutic efficacy in treatment of epithelial tumors

Publications

- Published PCT Patent Application (US2018/020,589)
- Published U.S. Patent Application (US16/490,227)
- Optimizing ethyl cellulose-ethanol delivery towards enabling ablation of cervical dysplasia (Scientific Reports, 2021)
- Development of enhanced ethanol ablation as an alternative to surgery in treatment of superficial solid tumors (Scientific Reports, 2017)
- Understanding factors governing distribution volume of ethyl cellulose-ethanol to optimize ablative therapy in the liver (IEEE Transactions of Biomedical Engineering, 2019)
- Polymer-assisted intratumoral delivery of ethanol: Preclinical investigation of safety and efficacy in a murine breast cancer model (PloS one, 2021)
- Minimally invasive ethyl cellulose ethanol ablation in domesticated cats with naturally occurring head and neck cancers: six cats (Veterinary and Comparative Oncology, 2021)
- Averting tumor growth in rodent breast cancer models with a liquid ablation approach (Cancer Research, 2020)
- Radiologic-pathologic analysis of increased ethanol localization and ablative extent achieved by ethyl cellulose (Scientific Reports, 2021)
- Development of an Injectable Ablative Therapy for Resource-Limited Settings: Applications in Tumor Ablation (Duke University, 2020)