

Title: Propagation of a Cold Atmospheric Plasma Jet through an Endoscopic Tube

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Research Question:

Current cold plasma jets strictly produce a plasma bullet that propagates approximately 5 cm. Unfortunately, the propagation distance is too short and not conducive to the purpose of internal surgery. This research focuses on a novel way to effectively extend the distance and the range of motion for the plasma plume, to allow the cold atmospheric jet to be used internally of the human body. How can distance of the path plasma bullet travels be extended without it dissipating or being harmful to the patient?

Motivation for the Research:

The field of cold plasma physics has gained notoriety as a field for medical research and application. This research seeks to create a possible extension of the plasma plume, currently used in medical applications, through endoscopic tubing so the medical and research community can expand the use of cold plasma medicine from strictly internal use, to external. Its applications range from oral and esophageal cancers, to leukemia and possible brain disorders, since it no longer has to be constrained outside of the human body.

Research Method/Approach:

The main method of this research was a trial and error experiment by prototype construction. The main piece was a pliable endoscopic tube, which would allow full range of motion. The trial and error method was used to find a way to propagate the plasma bullet farther than its previously limited 5 cm distance. The trials included copper wire in the endoscopic tube, coiled copper wire in the endoscopic tube, coiled copper wire around the endoscopic tube and copper mesh plated tube.

Research Results:

The plasma jet bullet propagation travel path without dissipation was extended a total of 55 cm (50 cm inside the tube and 5 cm outside the tube). The tubing is also versatile and safe which theoretically allows the elimination of cancer anywhere in the body. The tubing is plated internally with copper and does not use a wire to propagate the plasma.

Research Conclusions:

The endoscopic tube extension to the cold atmospheric plasma jet allows for a more versatile product for medical purposes. Future research can include coupling the endoscopic tube with OCT imaging for endoscopic cancer treatments and various other forms of medicinal applications.