

Development of a novel device to enhance local control after solid tumor resection

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Researcher, **Takuya Ishii**
National Cancer Center Hospital East



Vision

- Minimally invasive and organ-preserving surgical approaches, including endoscopic resection for solid tumors, are being adopted. However, postoperative local recurrence remains a significant unmet clinical need.
- In cases with suspected microscopic residual tumor at the surgical margins, the risk of local recurrence is high. Additional treatments such as re-surgery, radiation therapy, and chemotherapy are required, but are associated with significant invasiveness and systemic burden.
- To address this issue, this study aims to develop a minimally invasive and tumor-selective local therapeutic approach using Cold Atmospheric Plasma (CAP), applicable intraoperatively to reduce local recurrence.

Marketability

- In Japan, intraoperative radiotherapy (IORT) may be used as additional treatment to the surgical margin in solid tumor resection. However, it requires specialized operating facilities and appropriate radiation planning.
- This device is expected to be applicable to surgical treatment of various cancers where margin-directed therapy is beneficial, including esophageal, head and neck, rectal, liver, pancreatic, and breast cancers.

Innovation

[Current Limitations]

The treatment depth of conventional cold atmospheric plasma (CAP) is limited to several tens of micrometers, requiring target tissues to be exposed at the surface.

[Key Advantages]

This technology aims to increase CAP treatment depth, enabling the treatment of residual cancer cells a few millimeters beneath the tissue surface after solid tumor resection.

Partnering

[Expected partners]

Machinery/Device · CMO/CDMO/CRO/SMO · Medical/Diagnosis/Research Devices · Venture capitals

[Expectation]

Device prototyping and scalable manufacturing · Non-clinical and clinical studies · FDA approval strategy · Startup formation and talent development

Research Outline

Key Words: #Medical device, #Cold Atmospheric Plasma, #Cancer therapy

■ Unmet Clinical Needs in Surgical Resection of Solid Tumors

- In highly invasive cancers such as pancreatic, rectal, and esophageal cancers, sufficient surgical margins are often difficult to achieve due to anatomical constraints.
- These cases are considered at high risk of local recurrence due to possible microscopic residual disease, requiring additional treatment.
- However, current options have limitations: resection is restricted by invasiveness and functional preservation, while radiation and chemotherapy pose risks of local and systemic adverse effects.

■ Clinical Positioning of the Device

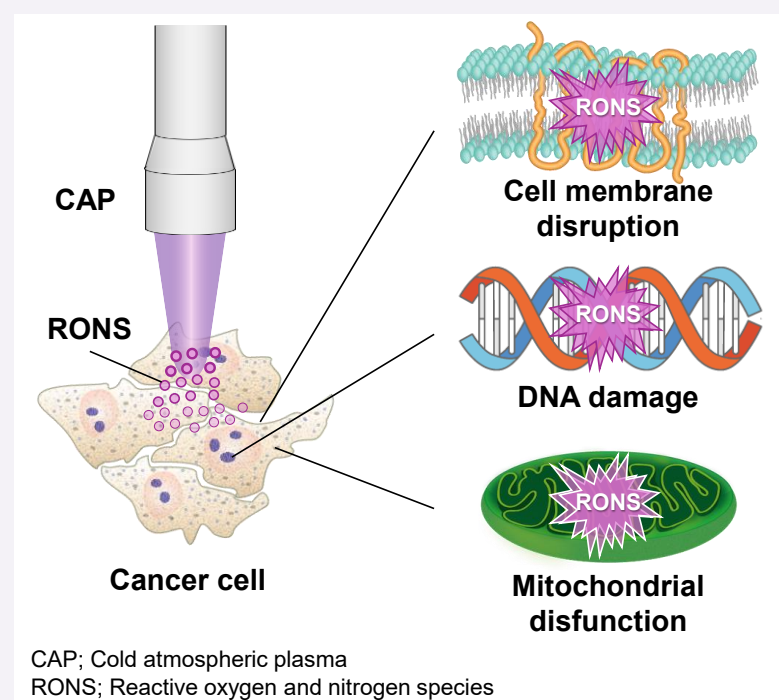
- This device is intended to provide an additional minimally invasive local treatment intraoperatively, targeting areas suspected of residual tumor following surgical resection.

■ Clinical Value

- The approach aims to reduce local recurrence caused by microscopic residual disease after tumor resection.

■ Core Technology: Cold Atmospheric Plasma (CAP)

- Plasma is considered the fourth state of matter. CAP, generated at atmospheric pressure and low temperature, has been explored for medical applications since the early 2000s.
- In oncology, CAP interacts with nitrogen, oxygen, and water to generate reactive oxygen and nitrogen species (RONS), such as OH radicals, hydrogen peroxide, superoxide, and NO, which induce oxidative stress and apoptosis in cancer cells.



Schematic illustration of cancer treatment by cold atmospheric plasma. This figure was created by modifying images of cancer cells, the cell membrane, DNA, and mitochondria from TogoTV.