

Misericordia University

Misericordia Digital Commons

Student Research Poster Presentations 2026

Student Research Poster Presentations

2026

Cryoablation to Treat Cancer Utilizing Computed Tomography Guidance

Mia D. Ruckle
Misericordia University

Follow this and additional works at: https://digitalcommons.misericordia.edu/research_posters2026



Part of the [Medicine and Health Sciences Commons](#)

Recommended Citation

Ruckle, Mia D., "Cryoablation to Treat Cancer Utilizing Computed Tomography Guidance" (2026). *Student Research Poster Presentations 2026*. 12.

https://digitalcommons.misericordia.edu/research_posters2026/12

This Poster is brought to you for free and open access by the Student Research Poster Presentations at Misericordia Digital Commons. It has been accepted for inclusion in Student Research Poster Presentations 2026 by an authorized administrator of Misericordia Digital Commons. For more information, please contact mcech@misericordia.edu.

Introduction

Cryoablation is a minimally invasive treatment that uses extremely cold temperatures to destroy tumor cells. It is often used as an alternative for patients who are not good candidates for surgery or other standard treatments (Zhang et al., 2025). Computed Tomography (CT) is the preferred imaging method for deep tissue cryoablation procedures because it provides clear, detailed images with high sensitivity and accuracy. CT also allows physicians to precisely guide the cryoprobes to the targeted area during the procedure (Kwak et al., 2022).

What is CT?

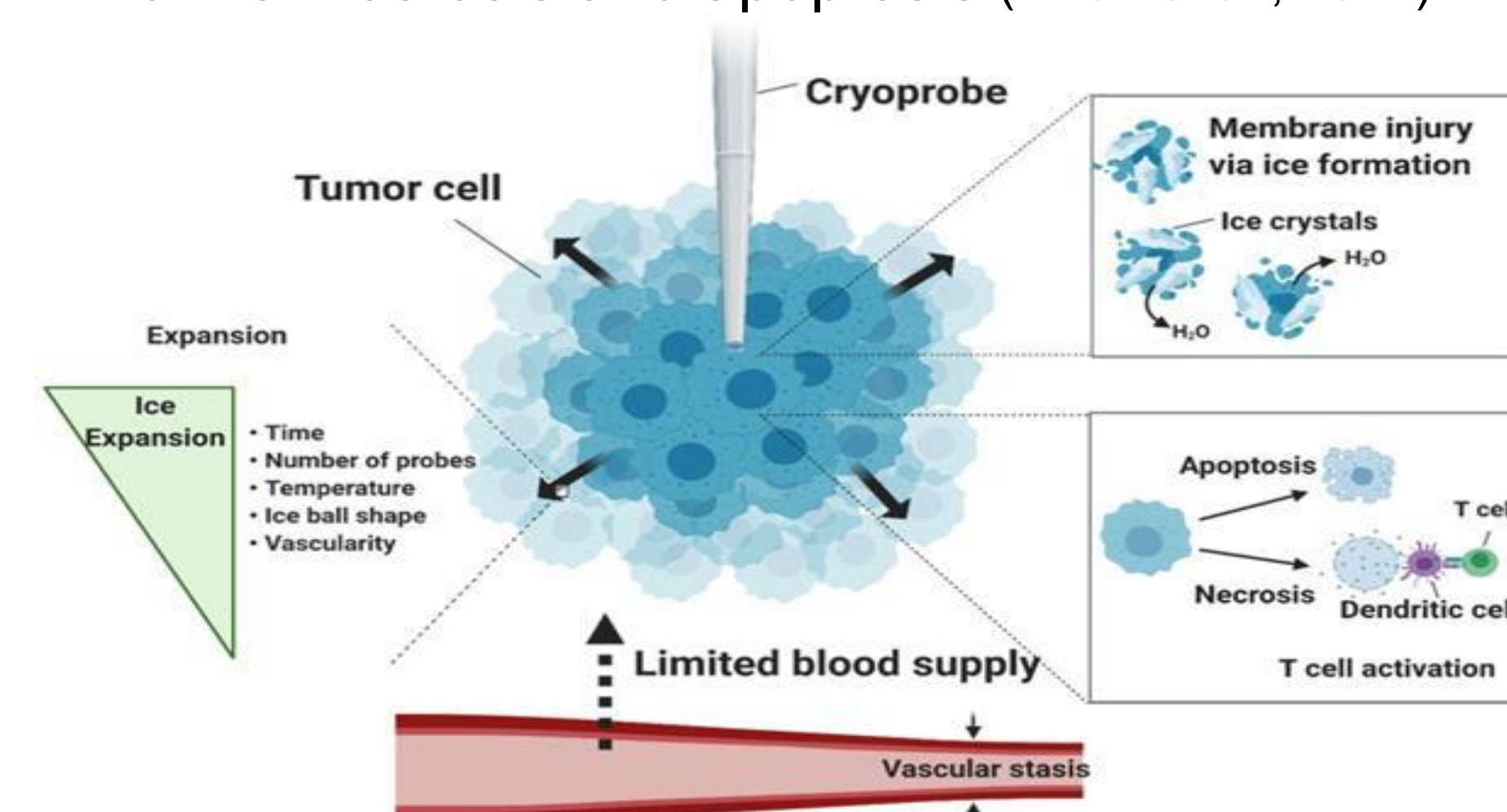
- CT is the process of creating cross-sectional images of any area of the body.
- An x-ray tube rotates around the body part being examined.
- Cross sectional images produced are axial, coronal, and sagittal.
- Three-dimensional reconstruction images are utilized for surgical planning.
- Administration of contrast media may be required to visualize specific structures including location of masses or foreign bodies.

(Palazzolo, 2023)

What is Cryoablation?

- Cryoablation is a procedure that uses extremely cold gas contained in needles called cryoprobes to freeze and destroy abnormal tissue.
- Cryoablation is used to treat a variety of conditions, including cancer.
- The procedure shrinks cancerous tumors by freezing and killing cancer cells.
- The main mechanism of cryoablation occurs through the formation of intracellular ice crystals below temperature -20 Celsius. This temperature is where subsequent cell death occurs in two forms: necrosis and apoptosis (Kwak et al., 2022)

(Cleveland Clinic, n.d)



The Image is of ice formation at -20 Celsius (Kwak et al., 2022)

Cryoablation Across Cancer Types

Liver Cancer

- Cryoablation is proven to be effective in patients with hepatocellular carcinoma (HCC) and metastatic colorectal adenocarcinoma who were not amenable to resection.
- The size of the liver tumor is important; hepatic tumors exceeding 4 cm leads to decreased technical efficacy rate, a higher rate of local tumor progression and greater adverse events.
- Cryoablation of painful hepatic tumors have shown to alleviate pain for 5 to 8 weeks after the procedure.

Renal Cell Carcinoma

- Renal cryoablation is a minimally invasive alternative to surgery for poor operative candidates or those with multiple renal tumors.
- Oncological outcomes from cryoablation are dependent on tumor size.

Prostate Cancer

- Cryoablation has emerged as a focal tool for the treatment of localized prostate cancer.
- Cryoablation allows for decreased hospital time, reduced postoperative morbidity, decreased time to return to regular activities, and reduced treatment cost.
- Patients who underwent cryoablation showed no change in sexual function at 15 month follow up.

Breast Cancer

- Cryoablation has been used to treat breast cancer ranging from early to late-stage disease.
- Cryoablation is safe and effective for singular, small tumors
- Cryoablation is not recommended in cases of multifocal lobular carcinoma, due to risk of fat necrosis and cryoinjury to healthy issues.

(Kwak et al., 2022)

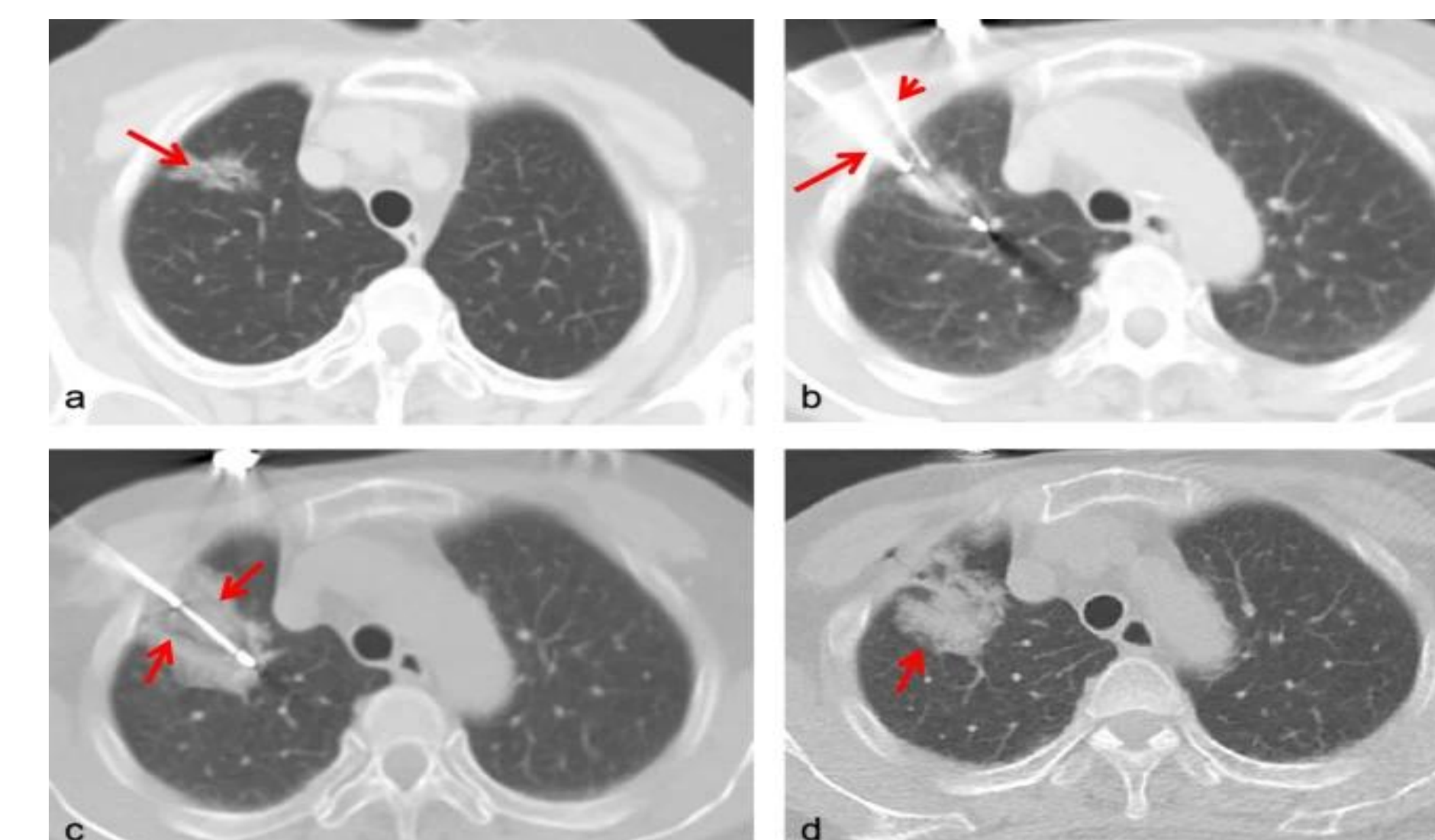
Lung Cancer

- Cryoablations are performed with high suspicion of malignant pulmonary nodules based on imaging finding and tumor histories.
- Combination of percutaneous biopsy and cryoablation allow patients to get tissue diagnosis while receiving therapeutic benefits in a single session.

(Zhang et al., 2025)

Procedure

- Before the procedure, a CT scan will be done to evaluate tumor characteristics such as size, location, proximity to critical structures, and how many probes required.
 - Patients are positioned in the prone, supine, or lateral position, depending where the lesion is located.
- (Zhang et al., 2025)
- The procedure is done under sterile technique. (Pisano et al, 2021)
 - An anesthesiologist may give the patient local anesthesia to numb the area where the incision is being made.(Cleveland Clinic, n.d)
 - CT guided insertion of cryoprobes in the lesion.(Pisano et al, 2021)
 - The cryoprobe touches the tumor for a few second or minutes and the intense cold freezes and destroys the tumor. (Cleveland Clinic, n.d)
 - CT allows for physicians to monitor the real time formation of the ice ball so that the edge of the ice ball does not overextend into healthy tissues. (Kwak et al., 2022)

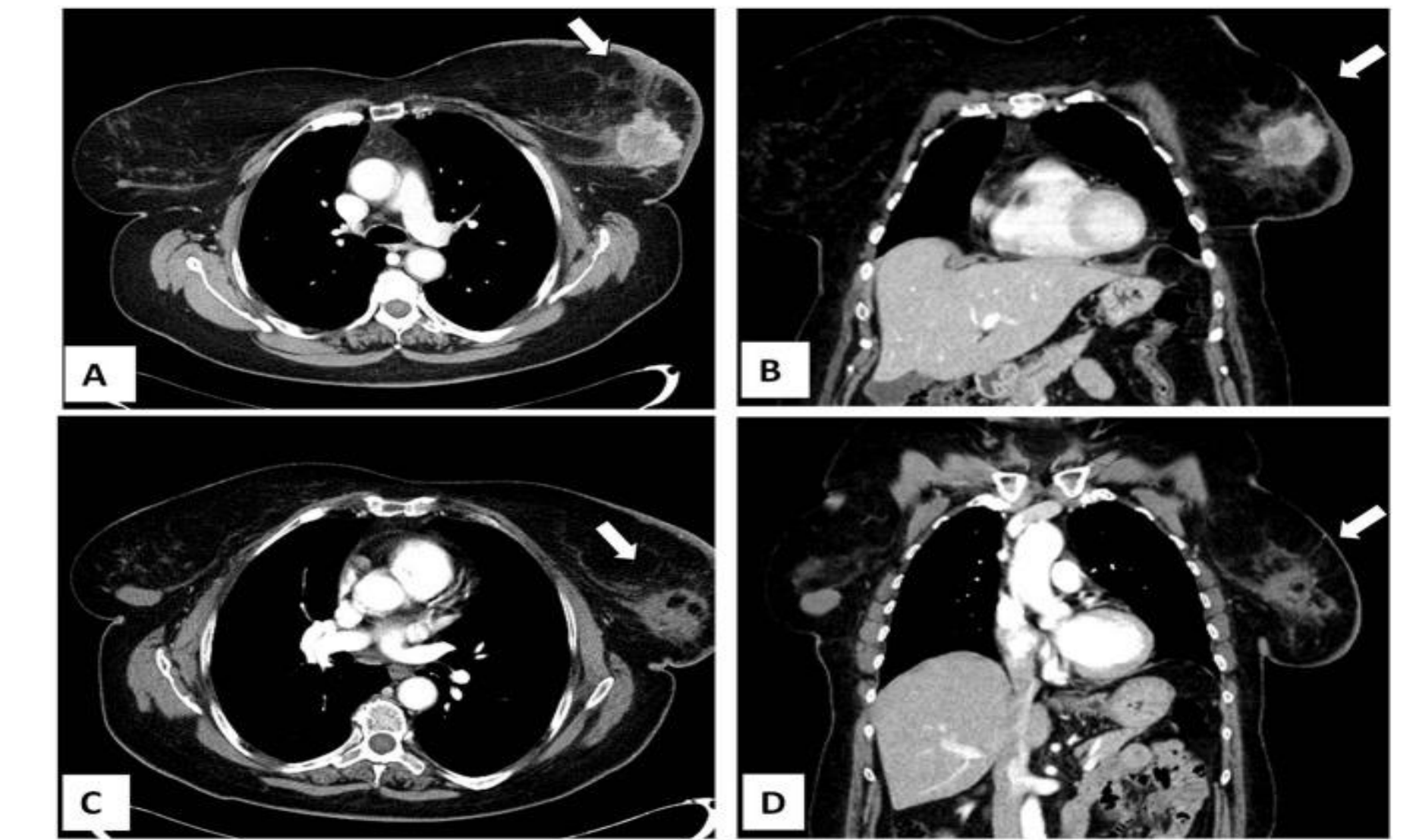


(a) Axial image showing a single sub-solid nodule (arrow). (b) A cryoprobe (long arrow) placed into the nodule while biopsy needle at the edge of the lesion (short arrow). (c) the ice ball emerges.(d) CT scan taken immediately after cryoablation (Kwak et al., 2022).

Post-Cryoablation

- After the procedure patients are monitored in a recovery area for a specified period. (Zhang et al., 2025)
- Post procedural CT scans are obtained to assess of cryoablation efficiency. (Kwak et al., 2022)
- Most patients go home on the same day as the procedure.
- In some cases, patients may need to stay longer if there are complications from the procedure.

(Cleveland Clinic, n.d)



Cryoablation of breast carcinoma in stage IV (a) axial image (b) coronal image. Both a and b demonstrate a contrast-enhanced CT scan showing a 4cm mass in left breast. (c-d) contrast-enhanced CT scan 2 months after cryoablation showing tumor size reduction. (Pusceddu et al., 2019)

Risks/complications

- Skin burn
- Damage to nearby tissues or organs
- Infection and nerve damage
- Complications with anesthesia

Benefits

- Not invasive
- Fewer side effects/scarring
- Less damage to nearby tissues

(Cleveland Clinic, n.d)

Success Rates

- Cryoablation studies show a technical success rate of 100%.
 - Lung cancer success rate was 88%
 - Liver cancer success rate was 90%
 - Breast cancer at early stage showed 75.9% overall success.
 - Study of cryoablation for prostate cancer was successful in 14 out of 21 patients. (Kwak et al., 2022)
- (Zhang et al., 2025)

Conclusion

Research shows that cryoablation is a safe and effective method for treating certain types of cancer (Cleveland Clinic, n.d). It can also trigger a stronger immune response after treatment and has demonstrated high diagnostic accuracy, technical success rates, and good control of local tumors (Zhang et al., 2025). The use of CT is essential to the success of the procedure because it helps guide the cryoprobe to the tumor, allows physicians to monitor the growth of the ice ball in real time during treatment, and enables evaluation after the procedure to check for any remaining tumor tissue or possible complications. Recent advances with biomaterials, especially nanoparticles, have improved cryoablation by enhancing aspects of the freezing process and tumor damage (Kwak et al.,2022).