Percutaneous liquid nitrogen cryoablation for bone lesions:
feasibility and preliminary results

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Purpose

- To assess safety and feasibility of cryoablation using a **liquid nitrogen-based cryogenic system** in patients with metastatic bone lesions.
Methods and Materials

9 patients → 5 males; 4 females treated with percutaneous cryoablation using a liquid nitrogen-based cryogenic system under general anaesthesia and CT imaging guidance from January to December 2020.

9 Metastatic bone lesions →

- 3/9 renal cell carcinomas (RCC)
- 2/9 lung carcinoma
- 1/9 breast carcinoma, 1/9 sarcoma, 1/9 mesothelioma and 1/9 colorectal cancer

All cases were contraindicated for other treatments, such as surgery or radiotherapy, due to comorbidity or prior irradiation.
The Cryogenic system uses **liquid nitrogen as a cryogen**, which reaches temperatures as low as **-196°C**.

- The cryogen **under low pressure** causes the cryoprobe to reach a very low temperature, thereby freezing the malignant tissue, which causes irreversible membrane damage and cell death.

- By **modulating the temperature in a freeze-thaw-freeze pattern**, the cryoprobe produces an **ice ball**, with adjustable sizes that can ensure proper cytocidal temperatures throughout the tumor lesion.

- **Main advantages** of this novel system include **lower procedure temperatures** that are assumed to be more effective in treating tumors and **better safety profile due to lower working pressure**.
Results

- The treatments were feasible in all cases, allowing to complete the treatment as preoperatively planned (technical success 100%).

- On average 2/3 cycles of cryoablation were performed with a mean procedure duration time of 45 minutes (range 12-120 minutes).

- At a median follow-up of 5 months ➔ only two minor adverse events were reported in 2/9 lesions (22%). No reported major or severe adverse events.
Results – A real case

History
Female 72yo
Left lobectomy for lung cancer
RT for chest wall relapse (rib)
Pain of single tumor site

Approach
MDTB: Cryo with radical intent
Left rib tumor cryoablation

The max tumor diameter is calculated and lies outside of the CT axial plane.
Results – A real case

The ideal approach is planned using a CT-navigation system.

Local anesthesia is applied with the patient being in GA.
Results – A real case

The coaxial introducer is placed in the needle holder

The coaxial-needle is inserted

The CT is used to check the cryo-probe insertion before treatment
Results – A real case

CT control of the iceball using the pull-back technique

- The treatment is performed in 3 cycles of 10’-15’-10’
Results – A real case

CT control after 24h

- The lesion was fully covered by treatment margins

VAS=8/10  VAS=1/10
Conclusions

- CT-guided cryoablation is a clinically safe and feasible technique

- Longer follow-up and larger groups of patients are needed to obtain stronger clinical outcomes