# CT-guided percutaneous radiofrequency ablation of pulmonary malignancies

A thesis submitted for partial fulfillment of M.D. degree in Radio-diagnosis and intervention

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**Faculty of medicine**
**Ain Shams University**
**2013**

# حرق أورام الرئة بواسطة التردد الحراري

رسالة
توطئة للحصول على درجة الدكتوراه فى الأشعة التشخيصية


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# Acknowledgement

First of all, I thank **Allah** who gave me the power to finish this work.

I would like to express my deepest gratitude and cardinal appreciation to **Prof. Dr. Wahid Hussin Tantawy** Professor of radio diagnosis, Faculty of Medicine, Ain Shams University, for his kind Guidance and supervision.

Thanks to **Dr. Ahmed Samir Ibrahim** Professor of Radio diagnosis, Faculty of Medicine, Ain Shams University, for his supervision and participation in this work.

Thanks to **Dr. Merihan Ahmed Nasr** lecturer of Radio diagnosis, Faculty of Medicine, Ain Shams University, for her supervision and participation in this work.

Last but not least I would like to express my best regards and thanks to all who gave me a hand while working on this research and I'd like to dedicate this work to my beloved **Family** who supported me to complete this work.

# List of Abbreviations

| | |
|---|---|
| ACCP: | American College of Chest Physician |
| AJCC: | American Joint Committee on Cancer |
| AS: | Analgosedation |
| BAC: | Bronchioloalveolar carcinoma |
| BOS: | Boston Scientific |
| BPF: | Broncho pleural fistula |
| BTS: | British Thoracic Society |
| CEA: | Carcinoembryonic antigen |
| CT: | Computed tomography |
| ECG: | Electric cardiogram. |
| FDG: | Fluorodeoxyglucose; |
| GA: | General anesthesia |
| GGO: | Ground glass opacification |
| HU: | Hounsfield units |
| IASLC: | International Association for the Study of Lung Cancer |
| INR: | International normalized ratio |
| LCNEC: | large cell neuroendocrine carcinoma |
| MRI: | Magnetic resonance imaging |
| MWA: | Microwave Ablation |
| NSAID: | Non-steroidal anti-inflammatory drugs |
| NSCLC: | Non-small cell lung cancer |
| PET: | Positron emission tomography |
| PMCT : | Percutaneous Microwave Coagulation Therapy |

# List of Abbreviations

| | |
|---|---|
| PSP: | Primary spontaneous pneumothorax |
| PT: | Prothrombin time |
| RECIST: | Response Evaluation Criteria in Solid Tumors |
| RF: | Radiofrequency |
| RFA: | Radiofrequency ablation |
| SCC | Squamous cell carcinoma |
| SCLC: | Small cell lung cancer |
| SUV: | Standardized uptake value |
| UICC: | Union Internationale Contre le Cancer |
| US: | Ultrasonography |
| VL: | Valleylab |
| WHO: | World Health Organization |

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# 1- Introduction:

Lung cancer is the leading cause of cancer deaths. The survival rates for lung cancers diagnosed at the earliest stage are higher, with approximately 49% surviving for five years or longer. Most lung tumors are malignant. This means that they invade and destroy the healthy tissues around them and can spread throughout the body **(Stöppler, 2007).**

Treatment decisions in lung cancer depend on whether small cell lung cancer (SCLC) or non small cell lung cancer (NSCLC) is present. Treatment also depends on tumor stage, particularly in NSCLC. A person's general physical condition (the ability to withstand treatment procedures) is also taken into account. The most widely used therapies for lung cancer are surgery, chemotherapy, and radiation therapy. Surgery is the preferred treatment for patients with early stage NSCLC. Unfortunately, 60%-80% of patients have advanced or metastatic disease and are not suitable candidates for surgery **(Stöppler, 2007).**

Surgery is not widely used in SCLC. Because SCLC spreads widely and rapidly through the body, removing it all by surgery usually is impossible. Chemotherapy and radiation may lead to a cure in a small number of patients. These therapies result in shrinking of the tumor and are known to prolong life for extended periods in most patients. Chemotherapy and radiation are very effective at relieving symptoms. Inoperable NSCLC are treated with chemotherapy or a combination of chemotherapy and radiation **(Stöppler, 2007).**

Many patients are poor surgical candidates owing to insufficient cardiopulmonary function, old age, or other medical co-morbidities as well as those with pulmonary metastasis tumors, a life-threatening event with bad survival rates. In recent years, tumor heating ablation such as radiofrequency ablation (RFA) under the guidance of image has been proved to be an alternative treatment method for these patients with definite effects **(Lu et al., 2012)**.

RFA is not intended to replace surgery, radiation therapy or chemotherapy in all patients. It may be effective when used alone or in conjunction with these treatments **(RadiologyInfo, 2014).**

A number of patients with primary bronchogenic carcinoma and some patients with isolated lung metastases are not suitable for operation due to comorbid disease. Conventional treatment with radiation and/or systemic chemotherapy may not significantly improve survival in these patients. RFA is a minimally invasive, effective, and safe method for the treatment of some malignant and benign conditions. Recent improvements in technology have made it possible to treat larger lesions by RFA and this has led to wider clinical applications **(Schaefer, et al., 2003).**

# 2- Aim of work:

The goal of this study is to assess the role of CT guided radiofrequency ablation in treatment of lung tumors.

# Epidemiology

Lung cancer is the leading cause of cancer death in the United States and around the world **(Siegel et al., 2011).**

According to National Cancer Institute - in Egypt, primary malignant tumors of the respiratory system were the fifth most common tumors (578 cases) in this registry material, constituting 5.90% of total malignancy, with high male predominance of 73% and high adult predominance 98.62%. Malignant tumors of the lower respiratory system including the lungs and bronchi constituted 24.16% of respiratory organ malignancies, and 1.54% of total malignancy **(Mokhtar et al., 2007).**

The 1-year relative survival for lung cancer increased from 37% in 1975-1979 to 44% in 2005-2008, largely due to improvements in surgical techniques and combined therapies. However, the 5-year survival rate for all stages combined is only 16%. Only 15% of lung cancers are diagnosed at a localized stage, for which the 5-year survival rate is 52%. The 5-year survival for small cell lung cancer (6%) is lower than that for non-small cell (18%) **(American Cancer Society, 2013).**

The epidemic among women followed that among men, with a sharp rise in rates from the 1960s to the present, propelling lung cancer to become the most frequent cause of female cancer mortality **(American Cancer Society, 2006).**

# Pathogenesis of lung cancer

The cancer cell evolves through a series of steps from normal , initiated and pre-neoplastic to pre-malignant and finally to highly malignant neoplasm. The three major steps in this process are **initiation, promotion** and tumour **progression (van Zandwijk, 2001).**

A single brief exposure to a carcinogen induces changes in the tissue , termed **initiation**. **Promotion** is ability of a compound to induce an area of proliferation in initiated tissue and stimulate tumour formation. Tumor