HealthManagement
Promoting Management and Leadership

Volume 13 - Issue 2, 2013 - Interventions

The Role of Interventional Radiology in Lung Tumours

Authors

Prof. **Philippe L. Pereira** (photo)

Director, Clinic of Radiology, Minimally

Invasive Therapies and Nuclear

Medicine

Dr**. Ernst Hohenstein**

Senior Physician, Clinic of Radiology,

Minimally Invasive Therapies and

Nuclear Medicine

Prof. **Jens Rassweiler**

Director, Clinic of Urology

Prof. **Uwe Martens**

Director, Clinic for Oncology, Haematology and Palliative Medicine

SLK-Kliniken GmbH

Academic Hospital, Ruprecht-Karls- University Heidelberg

Heilbronn, Germany

Lung cancer remains the number one cause of cancer-related deaths in women and men, and the incidence of lung tumours continues to increase. There are a variety of treatments for lung cancer, including surgical resection, radiation therapy, systemic chemotherapy, percutaneous thermal ablation or a combination of these treatment modalities in a multidisciplinary approach. However, only patients with limited disease are candidates for surgery, and some lung cancers (such as small cell lung cancer) are usually inoperable because metastases are present at the time of diagnosis. Another limitation of surgery as a treatment option is that a large number of patients present with either too limited a pulmonary function for surgery or are unable to tolerate an operation because of other comorbidities. In these patients, radiotherapy remains an option but only in a palliative setting. Radiotherapy offers overall survivals that are definitively worse than surgery at 5 years, ranging from 6 percent to 27 percent (Crocetti and Lencioni 2010).

A New Treatment Option

In the last 10 years, the efficacy of image-guided thermoablation for treatment of lung cancer and lung metastases has been demonstrated, especially in patients with limited disease (Crocetti and Lencioni 2010). Of the modalities available, radiofrequency (RF) and microwave (MW) ablation are considered to be useful in the therapy of lung tumours Rose, producing irreversible tumour destruction through application of thermal energy (see box). Planning, monitoring, targeting and controlling are mostly performed by computed tomography (CT).

The Advantages

Ablation is minimally invasive, requiring only local anaesthesia. A further benefit is that it can be used to treat patients with a history of lung surgery or pulmonary disease with subsequent limited pulmonary function, as there is no lower limit of pulmonary function if treatment is performed by percutaneous thermal ablation. The major limitation factor for thermal ablation as a treatment is the size of the tumour – the maximum tumour diameter should not exceed 3.5-4cm However this may change, as preliminary results suggest that RF ablation combined with

radiation therapy improves local disease control and survival in patients with larger lung cancer (Dupuy et al. 2006).

RF ablation plays an important role in treating pulmonary metastatic disease, being performed in patients with metastases from colorectal and lung cancers, renal cell carcinoma, melanoma, hepatocellular carcinoma and sarcoma. The maximum number of lung metastases that may be ablated is currently not defined, but the majority of hospitals prefer to treat patients with 5 or fewer pulmonary metastases.

Ablation as a Complementary Therapy

By combining RF ablation and surgery to treat a larger number of lesions in bilateral metastatic tumours, the chance of curing the disease whilst limiting invasiveness may be improved (Sano et al. 2008). Additionally, combining percutaneous thermal ablation with systemic chemotherapy may offer improved survival in patients with non-resectable

colorectal pulmonary metastases (Chua et al. 2010). Due to the excellent tolerance of percutaneous thermal therapy, it is difficult to identify reasons against providing this treatment in the majority of cases, with the exception of severe untreatable coagulopathies.

Performing Thermal Ablation of Lung Tumours

Pre-treatment evaluation should include a chest CT in order to assess the size and location of the tumour, as well as its vascularity. CT is also used for placement of the ablation device and monitoring of the treatment. Staging for patients presenting with metastatic disease should also include abdominal and pelvic CT. When treating patients with primary lung cancer, positron emission tomography (PET)-CT should be performed to search for metastases. The superiority of PET-CT over CT has been demonstrated for the staging of primary lung cancers.

The thermal ablation procedure can be performed under general anaesthesia or local anaesthesia with conscious sedation, depending on the preference of the patient and interventional radiologist. The procedure involves inserting a needle-like device (RF-applicator or MW-antenna) through the skin directly into the target tissue under CT guidance. CT is the most accurate imaging modality for percutaneous thermal ablation procedures to treat lung tumours. While the procedure is underway, vital signs are monitored and pain medication may be administered on demand. During thermal ablation, changes in the CT imaging (socalled ground-glass opacities or GGO) allow optimal monitoring of the extent of the tumour's destruction. The extent of these GGO surrounding the treated tumour on immediate post-ablation CT imaging has been shown to predict the effectiveness of thermal ablation (Lencioni et al. 2008). The patient may be discharged one day after the ablation procedure is completed. A chest X-ray is recommended four hours after the procedure to exclude any asymptomatic complications. CT imaging has been shown to be the most widely used imaging modality for post-procedural assessment. It is important to note that in the 1- to 6-month followup CT scans, the GGO increases in size from the baseline and then remains stable or decreases in size.

Promising Outcomes

Clinical results of thermal ablation in lung tumours have mainly been achieved in nonsurgical candidates. A systematic review of 17 studies reports the high efficacy of RF ablation for lung tumours (Zhu et al. 2008). On average, the rate of complete tumour destruction was 90 percent for a median tumour size of 2.2 cm, with a median survival ranging between 8.6 to 33 months and an overall 3-year survival rate up to 46 percent in patients with non-resectable tumours (Shu Yan Huo et al. 2009).

The advantages of percutaneous thermal ablation over surgery include the possibility to obtain complete tumour eradication, even in patients with limited pulmonary reserve, as well as to repeat the treatment or to treat several tumours with a low risk of complications. In a retrospective study of 39 patients with non-resectable pulmonary metastases from renal cell carcinoma, curative ablation was performed in patients with 6 or fewer lung lesions measuring less than 6cm, whereas palliative ablation was performed in patients with more than 6 metastases or with tumours larger than 6cm. There were significant differences in the overall survival rates between both groups, with 5-year survival of 100 percent and 52 percent respectively, thus suggesting that patients with up to 6 metastases may benefit from thermal ablation (Shu Yan Huo et al. 2009) when complete ablation is obtained. Among the different pulmonary tumours, tumour type did not significantly influence local tumour control.

Not only is a combination of RF ablation and conventional radiotherapy possible, it has already shown a better local control and survival than radiotherapy alone. Grieco et al. Reported a 3-year survival of 57 percent after combined therapy in 41 patients with lung cancer (Grieco et al. 2006). Yan et al. achieved an overall median survival of 33 months in 55 patients with colorectal pulmonary metastases (Yan et al. 2006).

Percutaneous lung thermal ablation is considered to be a very safe procedure,with a low procedure-related morbidity rate compared with surgery, ranging between 15 percent and 56 percent, and a very low mortality rate from 0 to 5.6 percent (Zhu et al. 2008). Some patients will experience mild to moderate periprocedural pain, which can usually be managed with standard pain medication or non-steroidal anti-inflammatory drugs. Pneumothorax and pleural effusions are the most common complications, occurring in nearly 40 percent of patients. The frequency of chest tube placement is about 5 percent. Delayed pneumothorax at follow-up has also been reported. Percutaneous radiofrequency ablations have even been performed in single-lung patients particularly when ineligible to surgery or stereotactic ablative radiation therapy.

Conclusion

It is clear that thermal ablation of lung tumours with radiofrequency or microwave has many advantages – it is feasible and safe, incurs lower costs (Alexander et al. 2013), allows quicker recovery, offers reduced morbidity and mortality, and therefore represents an alternative to surgery

in selected patients. As lung thermal ablation is a new treatment, we recommend not only that patients should be informed about the benefits and risks of the procedure, but that they be treated in a centre with experience in thermal ablation which discusses indications in a multidisciplinary tumour board. Recent and ongoing developments in percutaneous ablation, as well as in minimally-invasive surgical techniques and radiation therapies, have opened up exciting new possibilities to provide optimal therapeutic care to patients with lung tumours, and further evidence and debate may allow us to reach definitive guidelines in the near future.

Published on : Thu, 19 Sep 2013