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SHORT COMMUNICATION

STUDY OF A RAPIDLY PROGRESSIVE METASTATIC LUNG ADENOCARCINOMA THROUGH POSITRON EMISSION TOMOGRAPHY

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ABSTRACT

Adenocarcinoma is the most common type of lung cancer, making up 30%-40% of all cases. Recently PET (Positron emission tomography) scan has played remarkable role to identify lung *adenocarcinoma* as well as the progression of disease in metastatic stage.

INTRODUCTION

Lung cancer claims a global toll of 3,000 lives each day, largely as a result of cigarette smoking. Smoking also is linked to at least 18 other types of cancer. Evidence indicates that harmful substances in tobacco smoke termed polycyclic aromatic hydrocarbons, or PAHs, are one of the culprits in causing lung cancer. Until now, however, scientists had not detailed the specific way in which the PAHs in cigarette smoke cause DNA damage in humans. It was found that phenanthrene quickly forms a toxic substance in the blood known to trash DNA, causing mutations that can cause cancer. Lung cancer has surpassed breast cancer as the leading cause of cancer deaths in women. Some tumors in the lung are metastatic, and form carcinogenous development elsewhere in the body. The lungs are common site for metastasis. Lung cancers usually are divided into two main groups that account for about 95% of all such cases. Adenocarcinoma is the most common type of lung cancer, making up 30%-40% of all cases. A subtype of adenocarcinoma is called bronchoalveolar cell carcinoma, which show a pneumonia-like appearance on chest X-rays. Lung cancers are generally divided into two main categories: small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC). NSCLC accounts for approximately 85% of all lung cancers. NSCLC is divided further into adenocarcinoma, squamous cell carcinoma (SCC), and large cell carcinoma histology. Most lung carcinomas are diagnosed at an advanced stage, conferring a poor prognosis. The need to diagnose lung cancer at an early and potentially curable stage is thus obvious.

Approximately 7-10% of patients with lung cancer are asymptomatic, and their cancers are diagnosed incidentally after a chest radiograph performed for other reasons. Systemic findings may include unexplained weight loss and low-grade fever. Progression of lung cancer is very difficult to study at least when the cancer is in metastatic condition. Now a day, a new edge technology has evolved called PET (Positron emission tomography) scan to identify lung adenocarcinoma as well as the progression of disease in metastatic stage. PET is actually a nuclear medicine imaging technique, which develops and produces a 3D image of a workable system in the human body.

The system detects, pairs of gamma rays emitted indirectly by a positron-emitting radionuclide (tracer), which is introduced into the body on a biologically active molecule (Song *et al.,* 2009). Generally, biologically active molecules, like an analogue of glucose are chosen for PET is FDG. The molecule most commonly used for this purpose is Fluorodeoxyglucose (FDG), a sugar (Pratihar and Kundu, 2010). Lung cancer can be detected by whole body PET scan (from base of skull to the middle of the thigh) after injecting10mCi of 18F FDG, intravenously (i.v.). Standerdized uptake value (SUV) is also calculated for body surface area (BSA) at cm^2/ml unit. In one study we have found that previous PET CT study primary lung mass has decreased (after 2 cycle of chemotherapy and 25 radiation therapy) in size and metabolic activity.

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Table 1. Rapid progression of metastatic lung cancer (primary diagnosis and after four month) detected through PET scan

LESION	Primary SUV max (bw)	Comments	After four month SUV max (bw)	Comments
Soft tissue mass in the posterior segment of upper lobe of right lung	11.7	High metabolic activity	3.8	Significantly reduced
Necrotic soft tissue mass in the uncinate process of pancreas	Mild FDG uptake	No finding	3.9	New finding
Multiple inter-muscular masses in the back of the neck	-	No finding	5.3	New finding
Multiple Liver lesions	-	No finding	2.8	New finding
Adrenal gland	-	No finding	2.8	New finding
Tail of the pancreas	-	No finding	1.6	New finding
Stomach wall	-	No finding	2.0	New finding
Mesenteric nodules	-	No finding	4.3	New finding

However in comparison, the metastatic burden has significantly increased suggestive of rapid progression of disease in multiple organs (Table 1). Chemotherapy works by stopping or slowing the growth of cancer cells, which grow and divide quickly. But it can also harm healthy cells that divide quickly, such as those that line our mouth and intestines or cause our hair to grow. Damage to healthy cells may cause side effects. Often, side effects get better or go away after chemotherapy is over. The use of high-energy rays to damage cancer cells, stopping them from growing and dividing. Like surgery, radiation therapy is a local treatment that affects cancer cells only in the treated area. External radiation therapy is usually given on an outpatient basis in a hospital or clinic, five days a week for several weeks. Patients are not radioactive during or after the treatment. For internal radiation therapy, admission in the hospital is a must for few days. Side effects of radiation therapy depend on the treatment dose and the part of the body that is treated.

The most common side effects are tiredness, skin reactions (such as a rash or redness) in the treated area, and loss of appetite. Although the side effects of radiation therapy can be unpleasant, they can usually be treated or controlled. Surgery is the preferred treatment for patients with early stage. Unfortunately, 60%-80% of all patients who have advanced or metastatic disease is not suitable for surgery. Cure rates for small cancers at the edges of the lung are around 80%. Despite complete surgical removal, a large proportion of patients with early stage cancer have a recurrence of the cancer and die from it. We still do not understand how cancer cells learn to invade and create the metastases that are responsible for 90% of cancer mortality. We have only a very imperfect understanding of the role of the immune system in preventing cancer development. Involving a new discipline of "system biology", will surely benefit cancer research. Imagine a day – still years away when the biological responses of various human cells, normal and malignant, can be predicted by mathematical models of these cells and their internal control circuits.

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