



Use of Molecular Imaging in Identifying Colorectal Tumors

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DESCRIPTION

Cancer that begins in the colon is called colon cancer whereas the cancer that begins in the rectum is called rectal cancer. Cancer that starts in either of these organs is often referred to as colorectal cancer. Colorectal cancer is the third leading cause of cancer-related deaths in men and in women in United States and the second most common cause of cancer deaths when men and women are combined. The ways in which colorectal cancer is diagnosed and treated are dramatically improving due to the new developments in molecular imaging technologies.

Molecular imaging helps in providing the detailed pictures of what is happening in the body at molecular and cellular level whereas X-rays, computed tomography (CT) and ultrasound which offers anatomical pictures predominantly. This allows the physicians to measure the chemical and biological processes inside the body.

The high specific expression in tumor cells is the most important feature of molecular imaging target. The target molecule should ideally not only be overexpressed in tumors but also not expressed in surrounding non-neoplastic mucosa in the molecular imaging of colorectal tumors. Positron emission tomography (PET) scanning and PET combined with computed tomography (PET-CT) is used for detection of colorectal cancer.

Positron emission tomography (PET) involves the use of an imaging device (PET scanner) and a radiotracer that is injected into the patient's bloodstream. 18F-fluorodeoxyglucose (FDG) is a compound derived from a simple sugar and a small amount of radioactive fluorine which is a frequently used PET radiotracer. PET-CT is a combination of PET and computed tomography (CT) that produces highly detailed views of the body.

Co-registration, fusion imaging or hybrid imaging is the combination of two imaging techniques which allows information from two different types of scans to be viewed in a single set of

images. In order to produce three dimensional images, CT imaging uses advanced x-ray equipment and in some cases a contrast-enhancing material.

In colorectal cancer, the PET-CT is used in determining the exact location of the tumor, the extent of the disease, selecting the most effective therapy based on the unique molecular properties of the disease. This also helps in determining the patient's response to ongoing therapy and also detects the recurrence of cancer.

Scans obtained from PET are reviewed and interpreted by a qualified imaging profession such as nuclear medicine physician or radiologist. The advantages of PET in people with colorectal cancer include:

- i. It helps in eliminating the need for surgical biopsy by detecting whether the lesions are benign or malignant.
- ii. It is more accurate than CT for staging colorectal cancer.
- iii. It is able to confirm the presence of secondary cancers in lungs and liver.
- iv. These are the effective means of detecting a cancer recurrence. Also helps in determining the cancer recurrence and post-therapy scarring in the colon.
- v. PET is useful in detecting cancer recurrence in patients who have an increased blood protein called carcinoembryonic antigen (CEA)

Molecular imaging endoscopy is expected to play an important role in the diagnosis of colorectal tumors and in guiding decision-making regarding the choice of treatment, as well as to provide a means for early-phase treatment of colorectal tumors. The development of this technology is in its early stages, and several challenges remain before it can be brought to fruition, including target identification, compound screening, preclinical testing, and phase 1-3 trials. If successful, this technology could lead to great progress in clinical oncology.

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