
Summary & conclusion

Colorectal cancer is the second leading cause of cancer-related deaths in western world.

The prognosis of colorectal cancer closely related to disease Stage at initial diagnosis & ability to achieve surgical clearance. Thus, accurate preoperative staging is of at most importance for optimal therapeutic planning.

Although conventional preoperative staging & evaluation of colorectal cancer has been performed by computed tomography (CT), ultrasound (US), magnetic resonance image (MRI) & positron emission tomography (PET), there is no ideal imaging modality in terms of diagnostic accuracy & staging due to potential limitations of these imaging modalities.

Several studies have investigated the potential role of CT in the diagnosis and staging of colorectal cancer, with the accuracy rate ranging between 64% and 81%.

Although CT has limitations in terms of detecting lymph nodes that contain tumor, preoperative CT is useful for planning surgery.

PET/CT is superior to CT alone because its PET component depends on the physiologically mediated distribution of glucose uptake, rather than on the anatomic and structural characteristics of tissue.

PET with 2-[fluorine-18] fluoro-2-deoxy-D-glucose (FDG) has been recognized as a useful diagnostic technique in cancer imaging. In patients with colorectal cancer, PET has been used to detect distant metastases and local recurrences. Despite its high sensitivity for the detection of malignant diseases, PET is occasionally not able to differentiate increased but physiologic uptake from malignant lesion because of limited visualization of the underlying structure & limited spatial resolution.

PET/CT is a unique combination of the cross sectional anatomy provided by CT & the metabolic information provided by PET which are acquired during a single examination & fused.

Synergistic advantage of adding CT is that the attenuation correction needed for PET can also be derived from the CT data, an advantage not obtainable by integrating PET and magnetic resonance imaging. This makes PET/CT 25%-30% faster than PET alone with standard attenuation-correction methods, leading to higher patient throughput and a more comfortable examination.

In primary tumor detection PET/CT as well as PET is a very sensitive with a detection rate between 95% & 100%.

PET/CT has been very successful in identifying distant metastases including hepatic & extra hepatic disease that can have a drastic effect on operative planning.

There was also improved diagnostic ability in relation to bone and lymph node metastases, which were often difficult to detect on CECT. With respect to skeletal changes, the detection of bone metastases on CECT relies on large changes in bone mineralization, which is often only a late feature. Lymph node identification is also limited on CT and can be challenging, since assessment of nodal size is relatively inaccurate. ¹⁸F-FDG PET/CT is better in this respect; since it can often detect nodal metabolic activity therefore it might be helpful especially in rectal cancer where node-positive patients often receive preoperative chemotherapy.

PET/CT provides whole body over view at one examination consequently it has become an efficient & accurate non invasive examination technique in postoperative follow-up of colorectal cancer patients & may be of great value for detection & evaluation of local recurrence as well as L.N metastases.

It could detect not only recurrent tumor and/or occult metastasis in early stage, but also any other lesions showing abnormal metabolism level within the whole body of postoperative CRC patients.

Regardless of the type of lesion as seen on imaging, differentiation of benign from malignant disease is always a challenge. PET/CT is the best option when atypical lesions need be characterized at the highest possible level of accuracy, especially in cases where a definitive diagnosis through pathology cannot be obtained.

The main limitations of PET/CT are related to tumor size & FDG avidity where small tumors (<10mm) may not be detected with PET/CT & certain tumors, such as mucinous tumors may show significantly lower FDG uptake than do other pathological types.

In conclusion PET/CT is the latest innovation in oncology imaging, but is in reality, just the combination of the cross sectional anatomy provided by CT and the metabolic information provided by PET which are acquired during a single examination so fused PET/CT is superior to both PET alone and CT alone and has the ability to detect colorectal cancer early with high accuracy, increases the number of patients with correctly staged colorectal cancer, has the ability to differentiate between recurrence, residual, operative scar and post irradiation fibrosis and also has a positive effect on treatment with a profound effect on therapy so it is more accurate in patient follow up.

The future of PET/CT looks bright. Developments in systems technology and Radio-pharmaceuticals promise to make PET/CT much more useful and versatile in the future.