ROLE OF PET/CT IN STAGING AND TREATMENT MONITORING OF COLORECTAL CANCER

ESSAY

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List of Abbreviations

ACF	Attenuation correction factor
AC/AL	Attenuation correction/Alignment
CEA	Carcinoembryonic antigen
cm	Centimeter
CMS	Centers for Medicare and Medicaid Services
CT	Computed Tomography
ECT	Emission Computed Tomography
FDG	FluoroDeoxyGlucose
18FDG	^{18}F- FluoroDeoxyGlucose
FLT	F-18-3-Fluoro-3-deoxy-L-Thymidine
GLUT	Glucose transporters
GSO	Gadolinium Silicate
H+	Hydrogen ion
HK	Hexokinase
HU	Hounsfield Unit
IV	Intravenous
KeV	Killo electron Volt
KV	Killo Volt
KVp	Killo Volt peak
LSO	Lutetium Oxyorthosilicate
MA	Milli Ampere
MAS	Milli Ampere Second
mCi	Micro Curies
MeV	Mega electron Volt
MRI	Magnetic Resonance Imaging

PET	Positron Emission Tomography
PET/CT	Positron Emission Tomography/ Computed Tomography
PDGF	Platelet-Derived Growth Factor
PMTs	Photomultiplier Tubes
RFA	Radiofrequency Ablation
SPECT	Single Photon Emission Computed tomography
SUV	Standardized uptake value
TNM	Tumor Node Metastasis
VEGF	Vascular Endothelial Growth Factor
$ß^+$	Positron
ß-	Electron

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Abstract

PET/CT is developing a major role in assessing colorectal cancer. The information provided by PET/CT is likely to combine the best imaging features of both modalities and become the gold standard for staging in colorectal carcinoma.

PET/CT proved significantly more accurate in staging, restaging, and detection of metastatic as well as recurrent colorectal cancer. PET/CT is also useful for differentiating post-treatment changes from residual/ recurrent cancer and in monitoring tumor response to therapy.

Keyword PET/CT – Colorectal cancer

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Mohamed Moustafa Esmat

Introduction and aim of work

Introduction

Colorectal cancer is the third leading cause of cancer worldwide; it accounts for a large number of tumor related deaths. As with all types of cancer, early diagnosis of colorectal cancer is the key for its cure. Before a true cancer develops, there are often earlier changes in the lining of the colon or rectum. If diagnosed early, before it has metastasized, the disease is considered curable. If the cancer has already spread to distant organs, the long term survival is much lower **(50).**

Determining the stage of colorectal cancer often requires multi-modality, multi-step imaging approach. Optical colonoscopy represents the reference standard in terms of cancer detection and tissue sampling. However optical colonoscopy only offers an endo-luminal view. Complete "conventional" staging concepts require additional imaging procedures to assess potential metastatic spread to lymph nodes and solid organs **(17).**

Of these conventional imaging procedures, contrast enhanced computed tomography (CT) is the most common for both the abdomen and pelvis. However, CT offers only morphological data for the evaluation of tumor stage.

Glucose analogue [18F] fluorodeoxyglucose-positron emission tomography (FDG-PET) can display functional information and has been found to be accurate in the detection of colorectal cancer and its distant metastasis. However, based on its limited spatial resolution, FDG-PET often makes exact anatomical localization and demarcation of the lesion difficult **(17).**

Thus fusion of functional with morphological data may be of benefit for tumor staging. As a consequence, combined PET/CT scanner has been introduced into clinical practice. Its ability to detect and characterize malignant lesions, with advantages over morphology and function alone, has been documented for different tumors including colorectal cancer **(51).**

Before PET was introduced, it was extremely difficult to monitor for suspected recurrence. The other techniques available for staging and assessment of potential recurrences lack sensitivity and precision. Moreover, frequent non-conclusive investigations result in diagnostic and therapeutic delay. In many colorectal cancer patients, pelvic CT will demonstrate a suspicious mass, but cannot distinguish mass tumor recurrence from post-operative or post-radiation scar **(51).**

Whole body PET/CT imaging is said to be the most accurate diagnostic test for detection of recurrent colorectal cancer, and is a cost effective way to differentiate resectable from non-resectable disease **(52).**

Aim of work:

The aim of this study is to evaluate the role of PET/CT in work-up, staging and treatment monitoring in colorectal cancer.

Colorectal anatomy

Colorectal anatomy

The large intestine extends from the end of the ileum to the anus. It is about 1.5 meters long, being one-fifth of the whole extent of the intestinal canal. It differs from the small intestine in its greater caliber, its more fixed position, its sacculated form, and in possessing certain appendages to its external coat, the appendices epiploicae. Further, its longitudinal muscular fibers do not form a continuous layer around the gut, but are arranged in three longitudinal bands or taeniae. The large intestine, in its course, describes an arch which surrounds the convolutions of the small intestine. The large intestine is divided into the cecum, colon, rectum, and anal canal **(42).**

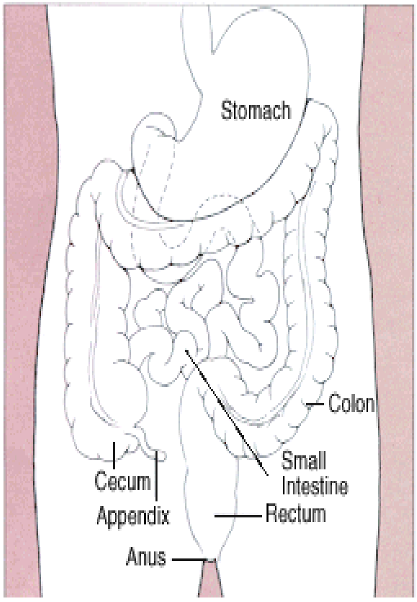

Fig 1. Normal Colon Anatomy **(29).**

I-The Cecum:

It is attached to the ileum and extends approximately two and one-half inches below it. The cecum in an adult usually is adherent to the posterior wall of the peritoneal cavity and has a serosal covering on its anterior wall only. The cecum forms a blind pouch from which the appendix projects **(42).**

Its size is variously estimated by different authors, but on an average it may be said to be 6.25 cm in length and 7.5 cm in width. It is situated in the right iliac fossa above the lateral half of the inguinal ligament. It rests on the iliacus & psoas major muscles, usually in contact with the anterior abdominal wall. However; the greater omentum and, if the cecum be empty, some coils of small intestine may lie in front of it **(42).**