SUVmax-to-HU ratio in diagnosis of hepatic metastases of colon cancer on FDG PET/CT.

A new semiquantitative parameter

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SUVmax-to-HU ratio in diagnosis of hepatic metastases of colon cancer on FDG PET/CT. A new semiquantitative parameter

PURPOSE: *We aimed to use new semiquantitative parameter, maximum standardized uptake value (SUVmax)-to-Hounsfield unit density (HU) ratio for differentiation of colonic adenocarcinoma metastases from normal liver parenchyma on fluorine-18-fluorodeoxyglucose (18F-FDG) positron emission tomography (PET)/computed tomography (CT) fusion images.*
MATERIALS AND METHODS: We *retrospectively evaluated 18F-FDG PET/CT images of 97 liver metastases from colonic adenocarcinoma in 32 adult patients. SUVmax-to-HU ratios of the metastases and non-lesion areas were calculated and compared. The correlation between SUVmax-to-HU ratio and the volume of the metastases was evaluated. Total lesion glycolysis (TLG) was obtained and correlated with SUVmax-to-HU ratios.*
RESULTS: *The mean SUVmax, HU and SUVmax-to-HU ratio of liver metastases were significantly different than those of the normal liver parenchyma ($p<0.05$). There was significant correlation between SUVmax-to-HU ratios and volumes of the metastatic lesions ($r=0.471$, $p=0.006$). The correlation between TLG and SUVmax-to-HU ratio of the liver metastases was statistically significant ($r=0.712$, $p=0.000$).*
CONCLUSION*: SUVmax-to-HU ratio is a useful parameter in differentiating liver metastases of colonic adenocarcinoma from normal liver parenchyma on 18F-FDG PET/CT images which will be helpful for staging of colonic cancer.*

KEY WORDS: Colonic Neoplasms, Liver, Neoplasm Metastasis, Positron-Emission Tomography, Tomography, X-Ray Computed

Introduction

Colonic (colorectal) cancer was reported to be the third most frequent cause of cancer-related mortality both in men and women [1]. Most of these cancers are adenocarcinoma [2] and the liver is the most frequent location for metastasis because of the portal circulation [3,4]. About 10%-25% of hepatic metastases of the patients with colonic cancer are diagnosed at the time of primary surgery [2,5]. Detection rate of hepatic metastases can increase up to 35% when computed tomography (CT) or ultrasonography is performed [5]. Prompt diagnosis of hepatic metastases is extremely important from the point of initial staging and treatment. Today, fluorine-18-fluorodeoxyglucose (18F-FDG) positron emission tomography (PET)/computed tomography (CT) has become the standard tool for the assessment of metastatic disease before surgery and chemotherapy [6-12]. Most hepatic metastases including the ones from colonic adenocarcinoma tend to display a decreased density on plain CT with an increased uptake on 18F-FDG PET/CT images [13,14]. However in some subtle lesions with relatively smaller dimensions, a slightly lower Hounsfield unit density (HU) and a maximum standardized uptake value (SUVmax), only slightly higher than the background

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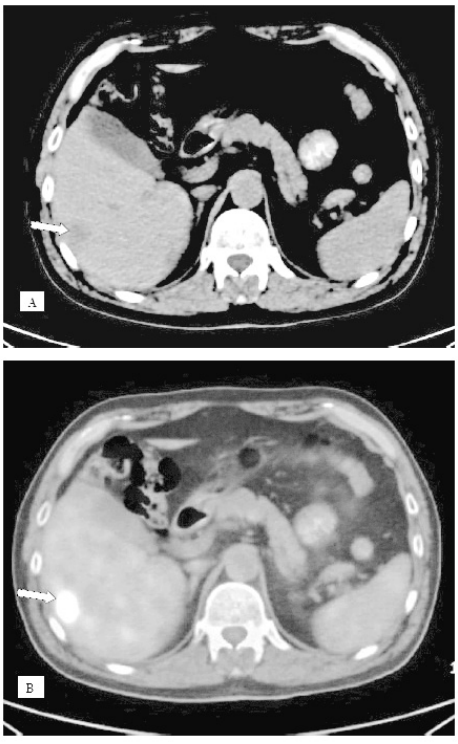

Fig. 1: Axial plain CT (A) and 18F-FDG PET/CT fusion (B) images of a solitary hepatic metastasis of colonic adenocarcinoma. SUVmax-to-HU ratios of the metastatic lesion (arrows) and the neighbouring normal hepatic tissue were 0.280 and 0.050, respectively.

uptake of the surrounding normal liver parenchyma make the diagnosis of metastases difficult [15]. Compared to magnetic resonance imaging (MRI), the sensitivity of 18F-FDG PET/CT in the detection of the liver metastases from adenocarcinomas of the gastrointestinal tract including colonic cancer, is significantly lower particularly for metastatic lesions with smaller size [16,17]. In such cases, SUVmax alone may not be sufficient for the diagnosis. To overcome this difficulty especially in lesions evaluated at the border of the liver we aimed to use a reliable and newer semiquantitative parameter, namely SUVmax-to-HU ratio for the differentiation of the metastases from normal liver parenchyme. By dividing the SUVmax to the CT density of the lesion which are the two major 18F-FDG PET/CT parameters, we wanted to further accentuate the difference between the suspicious lesion and the normal hepatic tissue. To our knowledge, this parameter has not yet been studied for hepatic metastases. The sentence should be: Also, the correlation between total lesion glycolysis (TLG) of all metastases and their SUVmax-to-HU ratios were evaluated.

Materials and Methods

Study Population

In this retrospective study, we recruited 36 patients with histopathologically proven colonic adenocarcinoma after flexible colonoscopic biopsies, who also had hepatic metastases and underwent both contrast-enhanced (CE) MRI of the liver at 1.5 T and18F-FDG PET/CT before any treatment, between the years 2014–2017. We excluded four patients because of insufficient clinical data. We included 102 liver metastases from colonic adenocarcinoma which were detected on CE MRI in the rest 32 patients (21 men, 11 women). Among these 102 lesions, we could detect and evaluate 97 liver metastases on 18F-FDG PET/CT fusion images. All the liver metastases that could be detected on 18F-FDG PET/CT fusion images were correlated and matched with the corresponding lesions on CE MRI, which was utilized as the reference standard tool to confirm the diagnosis of metastasis (Table I). All of the relevant liver metastases from colonic adenocarcinoma showed peripheral ring enhancement on arterial phase images, peripheral washout of the contrast media (CM) on portal venous and delayed phase images on CE MRI. The mean age of the patients was 65.4±5.9 years (range, 47-71 years). There were multiple liver metastases in 20 patients, and 12 patients had a single metastasis. According to the AJCC (American Joint Committee on Cancer) 8th Edition classification [18], the majority of the patients (n=28/32) were stratified as stage 4A and the rest of the patients (n=4/32) were stratified as stage 4B. All the procedures were performed according to the World Medical Association Declaration of Helsinki (revised in 2000, Edinburgh) and conformed to the ethics granted by the local institution. All the patients were informed about 18F-FDG PET/CT examination procedures and written informed consent was obtained from them.

Table I - *Comparison of the number of liver metastases detected on 18F-FDG PET/CT with that of the ones detected on CE MRI (reference standard).*

	Number of the liver metastases detected on 18F-FDG PET/CT	Number of the liver metastases detected on CE MRI	Sensitivity of 18F-FDG PET/CT with regard to CE MRI
Small liver metastases*	28	32	87.5%
Large liver metastases**	69	70	98.5%
All the liver metastases	97	102	95%

CE: Contrast-enhanced; ≤2, **large liver metastases: metastases >2 cm in diameter

18F-FDG PET/CT Protocol

Examination by 18F-FDG PET/CT of each patient was done within 30 days of colonic adenocarcinoma diagnosis, before radiotherapy or chemotherapy was performed. The patients fasted minimally 6 hours prior to examination, with a blood sugar level below 150–200mg/dL measured at the time of 18F-FDG injection (mean, 110mg/dL). The radionuclide was administered via an intravenous route at a dosage of 292.3–379.3MBq. Whole-body emission scanning (7-8 bed positions; acquisition time, 2.5 min/bed position) was done 50 minutes after 18F-FDG injection in supine position, from head to the proximal thigh. Hybrid imaging was performed using a Discovery 610 PET/CT device (General Electric Medical Systems, LLC, Waukesha, WI, USA) device. Images by CT were acquired during patient breath holding with the following parameters: detector row configuration, 16x1.25mm; tube voltage, 120kVp; maximum tube current, 200mA; beam collimation, 20.0mm; table speed, 27.5mm/rotation; pitch, 1.375:1; helical thickness, 3.75 mm and 512x512 matrix. Attenuation-correction was performed. Transaxial, coronal and sagittal image reconstruction was done. For the opacification of the intestines, dilute iodinated nonionic CM was administered orally before the examination. Intravenous iodinated CM was not given.

Quantification of 18F-FDG PET/CT Parameters

In all patients HU and SUVmax measurements were done on axial plain CT and in corresponding 18F-FDG PET/CT fusion images. For SUVmax measurements on fusion images, circular regions of interest (ROI) with a mean pixel area of 34.7±6.8 pixel² were used and placed on the highest uptake areas within the metastases and on the non-lesion areas without visible vascular structures in close proximity of the metastases. For HU measurements on axial plain CT images, circular ROIs with a mean area of 32.7±6.7 mm² were placed on the same location within the metastases where the highest SUVmax was obtained to avoid measuring the necrotic parts of the lesion, and on the same non-lesion areas used for SUVmax measurements on 18F-FDG PET/CT fusion images. The SUVmax was calculated as maximum activity in ROI (MBq/mL)/[injected dose (MBq)/body weight (g)] [19–21]. Regarding the metastatic lesions, the HU measurements were done from the same site where SUVmax was obtained, avoiding to measure the necrotic parts of the lesion. Total lesion glycolysis was calculated for all metastases as metabolic tumour volume (MTV)xSUV-mean [22]. Metastatic lesions were also divided into two groups as small hepatic metastases (n=28/97) and large ones (n=69/97) with regard to their being ≤2 cm in diameter or larger, respectively [23]. 18F-FDG

Table II - *18F-FDG PET/CT parameters and their statistical significance regarding all the liver metastases of colonic adenocarcinomas and normal liver parenchyma close to these metastases, given as mean±SD with (95% CI) and P value.*

	Liver metastases of colonic adenocarcinoma (n=97)	Normal liver parenchyma (n=28)	Significance level
SUVmax (g/mL)	12.2±5.3 (95% CI: 10.3–14.1)	2.7±0.3 (95% CI: 2.6–2.8)	P=0.000
HU	34.5±6.3 (95% CI: 32.3–36.7)	51.2±5.6 (95% CI: 49.2–53.3)	P=0.000
SUVmax-to-HU ratio	0.361±0.169 (95% CI: 0.301–0.421)	0.053±0.008 (95% CI: 0.050–0.056)	P=0.000

SUV_{max}: Maximum standardized uptake value; HU: Hounsfield unit density; CI: confidence interval. P values < 0.05 are considered as statistically significant.

Table III - *18F-FDG PET/CT parameters and their statistical significance in small liver metastases (≤ 2cm in diameter) of colonic adenocarcinomas and normal liver parenchyma close to the small metastases, given as mean±SD with (95% CI) and P value.*

	Small liver metastases (n=28)	Normal liver parenchyma (n=28)	Significance level
SUVmax (g/mL)	6.3±1.8 (95% CI: 4.9–7.7)	2.5±0.2 (95% CI: 2.3–2.7)	P=0.000
HU	33.5±6.5 (95% CI: 28.5–38.6)	51.5±10.1 (95% CI: 43.7–59.2)	P=0.000
SUVmax-to-HU ratio	0.192±0.058 (95% CI: 0.148–0.237)	0.050±0.010 (95% CI: 0.043–0.059)	P=0.000

SUV_{max}: Maximum standardized uptake value; HU: Hounsfield unit density; CI: confidence interval. P values <0.05 are considered as statistically significant.

Table IV - *18F-FDG PET/CT parameters and their statistical significance in large liver metastases (>2cm in diameter) of colonic adenocarcinomas and normal liver parenchyma close to the large metastases, given as mean±SD with (95% CI) and P value.*

	Large liver metastases (n=69)	Normal liver parenchyma (n=69)	Significance level
SUVmax (g/mL)	14.4±4.5 (95% CI: 12.5–16.3)	2.7±0.4 (95% CI: 2.6–2.9)	P=0.000
HU	34.9±6.3 (95% CI: 32.2–37.6)	51.2±3.0 (95% CI: 49.9–52.4)	P=0.000
SUVmax-to-HU ratio	0.425±0.152 (95% CI: 0.361–0.489)	0.054±0.008 (95% CI: 0.050–0.057)	P=0.000

SUV_{max}: Maximum standardized uptake value; HU: Hounsfield unit density; CI: confidence interval. P values <0.05 are considered as statistically significant.

Table V - *Comparison of 18F-FDG PET/CT parameters of small (≤2 cm in diameter) and large (>2 cm in diameter) liver metastases of colonic adenocarcinomas, given as mean±SD with (95% CI) and P value.*

	Small liver metastases (n=28)	Large liver metastases (n=69)	Significance level
Volume (mL)	2.3±0.9 (95% CI: 1.6–3.0)	28.9±19.8 (95% CI: 20.7–37.0)	P=0.000
SUVmax (g/mL)	6.3±1.8 (95% CI: 4.9–7.7)	14.4±4.5 (95% CI: 12.5–16.3)	P=0.000
HU	33.5±6.5 (95% CI: 28.5–38.6)	34.9±6.3 (95% CI: 32.2–37.6)	P=0.974
SUVmax-to-HU ratio	0.192±0.058(95% CI: 0.148–0.237)	0.425±0.152(95% CI: 0.361–0.489)	P=0.000

SUV_{max}: Maximum standardized uptake value; HU: Hounsfield unit density; CI: confidence interval. P values <0.05 are considered as statistically significant.

PET/CT parameters of small and large liver metastases of colonic adenocarcinomas were obtained. The 18F-FDG PET/CT images were interpreted by a board-certified nuclear medicine specialist and a board-certified radiologist with more than 10 years of experience, in consensus.

Statistical Analysis

The mean, standard deviation and 95% confidence interval (CI) were calculated for all the quantitative variables. The SUVmax, HU and SUVmax-to-HU ratios of both the metastases and the normal liver parenchyma (non-lesion areas in close proximity of them) were calculated and compared with each other statistically by independent sample t-test. The mean SUVmax, HU and SUVmax-to-HU ratios of small hepatic metastases and the large ones were compared both with each other and with those of the normal liver parenchyma statistically by independent sample t-test. The correlation between SUVmax-to-HU density and the size (volume) of the metastatic lesions was evaluated by Pearson correlation test. The mean TLG of the liver metastases was correlated with their mean SUVmax-to-HU ratios using Pearson correlation test. P values < 0.05 were accepted as statistically significant. All analyses were done with SPSS software (version 16.0; SPSS Inc; Chicago, IL, USA).

Results

The mean SUVmax, HU values and SUVmax-to-HU ratio of all the liver metastases of colonic adenocarcinoma were significantly different than those of the normal liver parenchyma ($p < 0.05$) (Fig. 1) (Tables II to IV). The mean volume, SUVmax and SUVmax-to-HU ratio of small hepatic metastases were significantly different than those of the large ones ($p < 0.05$). There was no significant difference between the mean HU values of small hepatic metastases and the large ones ($p > 0.05$) (Table V). There was significant correlation between SUVmax of the metastases and their volumes ($r = 0.452$, $p = 0.008$). The correlation between HU values of the metastases and their volumes was statistically insignificant ($r = 0.049$, $p = 0.788$). There was significant correlation between SUVmax-to-HU ratio and the volume of the metastatic lesions ($r = 0.471$, $p = 0.006$). The mean TLG of the lesions was 148.3±141.2 g/mL x mL (95% CI: 98.2–198.4 g/mL x mL). The correlation between TLG and SUVmax-to-HU ratio of the liver metastases was statistically significant ($r = 0.712$, $p = 0.000$).

Discussion

Since SUVmax is strongly correlated with the rate of cell proliferation and turnover which cause increased glu-

cose metabolism of the cell, it is a very significant parameter in measuring the activity of tissue metabolism in both the primary tumours and metastases [24,25]. In order to semi-quantify 18F-FDG PET/CT findings in oncological imaging and make them more specific for malignancy including metastases, several ratio parameters such as SUV-Lymph node/Tumour ratio (N/T ratio)[24], Tumour/Lymph node (T/LN) SUVmax ratio [26], adrenal-to-liver SUV ratio [27], tumour-to-liver uptake ratio (TLR) [28,29], metastatic tumour SUVmax/normal liver SUVmean ratio (11), retention index [30–32] and TLG [21, 22,33,34] have been used. The diagnosis of liver metastases can sometimes be challenging since the use of intravenous CM which can easily demonstrate metastases can also change/increase SUVmax on 18F-FDG PET/CT [35,36], cause overestimation of the tracer activity [37] and increase CT attenuation [38]. Moreover, relatively high 18F-FDG uptake of normal liver tissue may mask the uptake of hepatic metastases. Because of these reasons, we needed to use a new marker which was recently utilized for the detection and evaluation of intrahepatic hepatocellular cancer. This marker was named by the authors as "lesion SUVmax/HUmean"[15]. Since most hepatic metastases display a decreased CT density with an increased SUVmax, we wanted to semi-quantitatively enhance the obviousness of the lesions within the normal liver parenchyma by dividing SUVmax of the metastases to their own mean HU value. Our basic 18F-FDG PET/CT parameters for the precise calculation of SUVmax-to-HU ratio were similar or close to those mentioned in current literature. The mean HU of the non-lesion areas within the liver in the present study was similar to the values obtained from unenhanced abdominal CT scans performed by various researchers which were 47.5 ± 11.8–56.3 ± 8.1 HU [39, 40]. Also the mean HU of the metastases in the present study was close to the measurements done by Bethke et al. [40] on unenhanced CT images which was 40.4 ± 8.3 HU. The mean SUVmax of the non-lesion areas within the liver in the present study was similar to the value mentioned in current literature as around 3.0 [41]. And finally the mean SUVmax of the metastases in the present study was close to that of the study conducted by Fendler et al [42] which was 11.5±6.3.

Larger malignant tumours were reported to harbour more tumour cells which show increased glucose consumption and display a higher SUVmax on 18F-FDG PET/CT images which is a necessary feature for their detection [21, 28, 43]. Similarly in the present study, larger metastases displayed higher SUVmax which can be explained not only by their growing hunger for 18F-FDG, but by increased aggressivity and modifications in their behaviour as they grow further during the course of the disease [44]. From the diagnostic point of view, this also means that the interpreter will experience difficulty in differentiating metastatic lesions with smaller size such as the ones as small as 2 cm in diameter or less, which will have SUVmax relatively closer to normal liver background activity as compared to the larger ones. Unlike SUVmax, we have found that there was no correlation between HU value of the metastases and their volumes, which supposedly brought equality to smaller and larger lesions for their detection on plain (unenhanced) CT component of 18F-FDG PET/CT images. However, practically as the lesions get smaller, it becomes harder to differentiate them from normal liver parenchyme because of partial volume effects, and also from the neighbouring unenhanced and hypodense vascular structures. Though we have found significant correlation between SUVmax-to-HU ratio and volume of the metastatic lesions which at first sight seems to be less beneficial for the differentiation of small lesions from normal liver parenchyma, the ratio of the metastases within the confidence interval is so high that even the lower limit of it does not interfere with the upper limit of that of the normal liver. Therefore, we consider that this ratio can safely be used for the detection of metastases with smaller volumes such as the lesions as small as 2 cm in diameter or less. Moreover, it can be noticed in Table IIwhich included all the metastases in the study that, while the mean SUVmax of the liver metastases of colon adenocarcinomas is about 4.5 fold higher than the normal liver parenchyma and the mean HU of the liver metastases is only 1.5 fold lower than that of the normal liver parenchyma, the mean SUVmax-to-HU ratio of the metastases is about 6.8 fold greater than that of the normal liver parenchyme which is high enough to diagnose them with certainty as metastases. If only the small metastases which already display relatively little density and SUVmax differences as compared to the normal liver parenchyma are taken into consideration, the above mentioned outcomes will not be very different. As clearly be seen in Table III that though the mean SUVmax of the small liver metastases of colon adenocarcinomas is only about 2.5 fold higher than the normal liver parenchyma and the mean HU of the liver metastases is only 1.5 fold lower than that of the normal liver parenchyma, the mean SUVmax-to-HU ratio of the metastases is about 3.8 fold greater than that of the normal liver parenchyme, which is concluded to semi-quantitatively augment the remarkability of the small lesions more than SUVmax alone could do. Although there is a statistically significant difference between the mean SUVmax-to-HU ratios of the small liver metastases and the large ones as mentioned in Table V, the end result regarding their effect on increasing the semi-quantitative noticeability of the lesions is inferred to be similar in our practice. Therefore we consider that this ratio can reliably be used not only for large metastases more than 2 cm in diameter but for smaller and rather occult lesions, as well.

It is known that TLG is an important prognostic biomarker being directly related with the density of cancer cells and metabolic tumour volume [21]. Promising stud-

ies demonstated the utility and reliability of TLG in predicting prognosis by means of overall survival in patients who have colon cancer with liver metastases [45–47]. In the present study, there was a strong correlation between TLG and SUVmax-to-HU ratio of the hepatic metastases (r = 0.712, p = 0.000). We consider that this can be attributed to the direct influence of the two main factors, metabolic activity (18F-FDG uptake) of the metastases and their volumes, on both TLG and SUVmax-to-HU ratio. So, we think that SUVmax-to-HU ratio is a reliable parameter for the evaluation of liver metastases from colon adenocarcinomas. Future follow-up studies will further demonstrate the roboust prognostic utility of this ratio.

For correct measurement of SUVmean, the midportion of a rather larger lesion (such as the central 2 cm diameter part of a tumour mass with a diameter of 5 cm), which also has to display a uniform SUV should be used [48]. However, most of the metastases in the present study were not suitable for an ideal SUVmean measurement because of the presence of necrotic parts in their central parts and the relatively non-uniform peripheral 18F-FDG uptake. Unlike SUVmean, SUVmax is a more reproducible parameter and rather independent of the reader [48, 49]. Moreover, SUVmax is less likely to be influenced from partial volume effects [49]. Because of these reasons and in order not to underestimate 18F-FDG uptake of liver metastases in the present study, we preferred to use SUVmax instead of SUVmean.

Our study had few limitations mostly due to its retrospective design. Firstly, liver metastases in our study were only from colon adenocarcinomas and therefore, we did not compare our findings with hepatic metastases from different types of tumours. Secondly, we could not evaluate the utility of SUVmax-to-HU density in predicting prognosis since we did not follow-up our patients. However, the strong correlation between SUVmax-to-HU ratio and TLG to detecting colonic liver metastases led us consider that this ratio is also promising for the assessment of the severity of the metastatic disease and its prognosis.

Conclusion

SUVmax-to-HU ratio measured on 18F-FDG PET/CT fusion images can be used as a semiquantitative marker for both small and large liver metastases from colonic adenocarcinomas. This marker is found to be useful in distinguishing between colonic adenocarcinoma metastases and normal tissues within the liver, which will be helpful for staging of colonic cancer.

Riassunto

Scopo: La diagnosi tempestiva delle metastasi epatiche da cancro del colon è estremamente importante dal punto di stadiazione e trattamento iniziali. In alcune metastasi epatiche sottili con dimensioni più piccole, con una densità di unità di Hounsfield (HU) leggermente inferiore e un valore di captazione massimo standardizzato (SUVmax) leggermente più alto, la diagnosi fluoro-18-fluorodesossiglucosio (18F-FDG) tomografia a emissione di positroni (PET)/tomografia computerizzata (CT) immagini di fusione delle metastasi può essere difficile. In tali casi, SUVmax da solo potrebbe non essere sufficiente per la diagnosi. Per superare questa difficoltà, specialmente nelle lesioni valutate al confine del fegato, abbiamo mirato a utilizzare un parametro semiquantitativo affidabile e più recente, vale a dire il rapporto SUVmax-HU per la differenziazione delle metastasi dal normale parenchima epatico.

Materiali e Methodi: Abbiamo valutato retrospettivamente 97 metastasi epatiche di adenocarcinoma del colon in 32 pazienti adulti. Sono stati calcolati e confrontati i rapporti SUVmax-HU delle metastasi e delle aree senza lesioni. È stata valutata la correlazione tra il rapporto SUVmax-HU e il volume delle metastasi. La glicolisi totale della lesione (TLG) è stata ottenuta e correlata con i rapporti SUVmax-HU.

Risultati: Il rapporto medio HU, SUVmax e SUVmax-a-HU delle metastasi epatiche era significativamente diverso da quello del normale parenchima epatico (p <0,05). L'HU media di metastasi epatiche e fegato normale parenchima erano rispettivamente di 34,5±6,3 e 51,2±5,6. Il SUVmax medio di metastasi epatiche e fegato normale parenchima erano 12,2±5,3 e 2,7±0,3, rispettivamente. Il rapporto medio SUVmax-HU di metastasi epatiche e fegato normale parenchima erano 0,361±0,169 0,053±0,008, rispettivamente. C'era una correlazione significativa tra i rapporti SUVmax-HU e i volumi delle lesioni metastatiche (r = 0,471, p = 0,006). Il rapporto medio SUVmax-HU delle metastasi epatiche piccole (≤2 cm) e grandi (>2 m) era rispettivamente di 0,192±0,058 e 0,425±0,152, entrambe significativamente più alte di quelle del parenchima epatico normale (0,053±0,008). La correlazione tra TLG e rapporto SUVmax-HU delle metastasi epatiche era statisticamente significativa (r = 0,712, p = 0,000).

Conclusioni: Il rapporto SUVmax-HU misurato su immagini di fusione PET/CT 18F-FDG può essere utilizzato come marker semiquantitativo per metastasi epatiche sia piccole che grandi da adenocarcinomi del colon. Questo marker è utile per distinguere tra metastasi di adenocarcinoma del colon e tessuti normali all'interno del fegato, che sarà utile per la stadiazione del cancro del colon.

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Commento e Commentary

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4). 18F-FDG PET è un metodo qualitativo e quantitativo utilizzato per valutare lo sviluppo del tumore. Il valore di assorbimento standardizzato (SUV) è uno dei parametri semiquantitativi importanti, che viene utilizzato per valutare il grado di accumulo di 18F-FDG. In precedenza, diversi studi hanno riportato che il SUV massimo (SUVmax) era associato alla metastasi cancro colorettale (CRC) è il terzo tumore maligno più comune e la seconda causa più comune di decessi per cancro nel mondo [1]. La prognosi dei pazienti con CRC è notevolmente migliorato con l'avanzamento del trattamento multimodale.

Tuttavia, la prognosi rimane sfavorevole per i pazienti in fase avanzata (stadi clinici III e IV) poiché questi pazienti presentano metastasi tumorali e scarsa risposta al trattamento [2,3].
Molti pazienti con CRC vengono diagnosticati in fase avanzata. Pertanto, la diagnosi precoce e la previsione del CRC è ancora una sfida per i medici. Attualmente, l'indicatore più comunemente usato per predire la sopravvivenza dei pazienti è lo stadio di metastasi del nodo tumorale (TNM).
Ad oggi, la tomografia computerizzata (TC) con tomografia a emissione di positroni (PET) con 18F-fluorodeossiglucosio (18F-FDG) è stata utilizzata per la diagnosi, il monitoraggio della risposta al trattamento, la sorveglianza della recidiva locale e la prognosi del CRC (linfonodale del CRC e fungeva da potenziale predittore di sopravvivenza nei pazienti con CRC, indicando il suo valore di previdenza.
Inoltre, gli studi hanno suggerito che il SUVmax fosse notevolmente aumentato nei pazienti con mutazioni KRAS, che è particolarmente cruciale per la strategia terapeutica [4].
Il Dr. Ümit Yaşar Ayaz et al. in questo studio [5] ha valutato un nuovo parametro semiquantitativo, il rapporto tra il valore massimo standardizzato di assorbimento (SUVmax) e la densità unitaria di Hounsfield (HU) per la differenziazione delle metastasi dell'adenocarcinoma del colon dal parenchima epatico normale su fluoro-18-fluorodeossiglucosio (18F-FDG) Immagini di fusione con tomografia a emissione di positroni (PET)/tomografia computerizzata (TC).
I risultati di questo studio hanno evidenziato che il rapporto SUVmax-to-HU è un parametro utile per differenziare le metastasi epatiche dell'adenocarcinoma del colon dal parenchima epatico normale su immagini PET/CT 18F-FDG che saranno utili per la stadiazione del cancro del colon.
In effetti, il rapporto SUVmax-to-HU misurato su immagini di fusione PET/CT 18F-FDG può essere utilizzato come marker semiquantitativo per metastasi epatiche sia piccole che grandi da adenocarcinomi del colon. Si è scoperto che questo marcatore è utile per distinguere tra metastasi da adenocarcinoma del colon e tessuti normali all'interno del fegato, che saranno utili per la stadiazione del cancro del colon.

* * *

Colorectal cancer (CRC) is the third most common malignancy and the second most common cause of cancer-related deaths worldwide [1]. The outcome of patients with CRC has greatly improved with the advancement of multimodality treatment. However, the prognosis remains poor for patients at late stages (clinical stages III and IV) since these patients present tumor metastasis and poor response to treatment [2,3] Many patients with CRC are diagnosed at the advanced stage. Therefore, the early detection and prediction of CRC is still a challenge for physicians Currently, the most commonly used indicator in predicting the survival of patients is the tumor-node-metastasis (TNM) stage.
To date, 18F-flurodeoxyglucose (18F-FDG) positron emission tomography (PET) computed tomography (CT) has been used for the diagnosis, monitoring treatment response, surveillance of local recurrence, and prognosis for CRC [4]. 18F-FDG PET is a qualitative and quantitative method used to evaluate tumor development. The standardized uptake value (SUV) is one of the important semi-quantitative parameters, which is used to assess the degree of 18F-FDG accumulation. Previously, several studies reported that the maximum SUV (SUVmax) was associated with the lymph node metastasis of CRC, and served as a potential predictor of survival in patients with CRC, indicating its promising value
Furthermore, studies suggested that the SUVmax was greatly increased in patients with KRAS mutations, which is particularly crucial to the therapeutic strategy [4].
Dr. Ümit Yaşar Ayaz et al. in this study [5] evaluared a newer semiquantitative parameter, maximum standardized uptake value (SUVmax)-to-Hounsfield unit density (HU) ratio for differentiation of colonic adenocarcinoma metastases from normal liver parenchyma on fluorine-18-fluorodeoxyglucose (18F-FDG) positron emission tomography (PET)/computed tomography (CT) fusion images.
The results of this study pointed out SUVmax-to-HU ratio is a useful parameter in differentiating liver metastases of colonic adenocarcinoma from normal liver parenchyma on 18F-FDG PET/CT images which will be helpful for staging of colonic cancer.
Indeed, SUVmax-to-HU ratio measured on 18F-FDG PET/CT fusion images can be used as a semiquantitative marker for both small and large liver metastases from colonic adenocarcinomas. This marker is found to be useful in distinguishing between colonic adenocarcinoma metastases and normal tissues within the liver, which will be helpful for staging of colonic cancer.

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