Keywords: Anti-EGFr peptides, Cancer, Radiolabeled peptides.

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COMPARATIVE STABILITY OF CT-BASED BONE VOLUME QUANTIFICATION USING 18F-FDG AND 68GA-PSMA PET/CT IN MULTIPLE MYELOMA

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A B S T R A C T

Introduction/Justification: Computed Tomography (CT) images obtained from hybrid nuclear medicine equipment have shown great potential for PET image segmentation. Previous studies in patients with Multiple Myeloma (MM) have demonstrated the feasibility of calculating bone volume (BV) from CT data in 18F-FDG PET/CT images. This segmentation technique allows for the extraction of variables such as mean Standardized Uptake Value (SUVmean), Percentage of Bone Involvement (PBI), and Intensity of Bone Involvement (IBI) across the entire skeleton. The aim of this study is to determine whether BV quantification based on CT Hounsfield units (HU) is stable across different radiotracers. **Objectives:** To compare BV calculations from PET/CT scans using 18F-FDG and 68Ga-PSMA in patients with MM. **Materials and Methods:** This study included 18F-FDG and 68Ga-PSMA PET/CT scans performed within a 1 to 8-day interval in 15 patients (53% male, mean age 66.7 ± 10.7 years) with biopsy- confirmed symptomatic MM. The study was approved by the local Ethics Committee (CAAE 91231918.0.0000.5404). BV was calculated using the Beth Israel plugin for PET image pre-segmentation, applying a threshold of HU > 100. The cropped PET images were converted to binary format using FIJI, followed by the application of a morphological closing image processing tool to include areas such as bone marrow within the binary contour. For 18F-FDG PET, the skull was excluded during pre-segmentation due to overlapping artifacts caused by cerebral uptake. Descriptive statistics were used to compare FDG and PSMA BV calculations for each patient, with individual percentage deviation assessed relative to the FDG-derived BV. The correlation between BV values was evaluated using Spearman's rank correlation coefficient (r_s), with a significance level of $p < 0.05$. **Results:** The average individual percentage deviation in BV between 18F-FDG PET/CT and 68Ga-PSMA PET/CT was 13 ± 3%, with a range of 7% to 20%. A strong positive correlation was observed between BV values ($p = 3 \times 10^{-10}$), with a very strong Spearman correlation coefficient ($r_s = 0.98$). **Conclusion:** Despite the exclusion of the skull in BV calculations for 18F-FDG, the results indicate a minimal decrease in BV compared to whole-skeleton BV derived from PSMA PET/CT. The very strong correlation between BV values for the two radiotracers suggests that the segmentation approach remains consistent across different PET tracers. Additionally, the proportional exclusion of the skull across patients supports the reliability of the method for BV quantification.

Keywords: 18F-FDG, 68Ga-PSMA, Bone Volume Quantification, Multiple Myeloma, PET/CT imaging.

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SERUM METABOLOMIC ANALYSES IN RECTAL CANCER PATIENTS: AN EXPLORATORY STUDY FROM A TIME-COURSE PERSPECTIVE

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A B S T R A C T

Introduction/Justification: Patients with colorectal cancer frequently develop cachexia, leading to severe depletion of skeletal muscle. Metabolomics, through the analysis of

metabolite profiles using nuclear magnetic resonance (NMR), shows promise in identifying biomarkers for diagnosis and treatment, providing crucial insights into tumours and metabolic changes, allowing for an enhanced understanding of the mechanisms related to the cancer-cachexia process. **Objectives:** In the present study, we analysed the most impacted metabolic pathways affected after a glycaemic clamp in the serum of patients with rectal cancer diagnosed with sarcopenia (S) or not (NS). **Materials and Methods:** In this preliminary study, serum samples collected from rectal cancer patients were prepared through filtration to remove proteins and lipids, followed by the addition of deuterium buffer for magnetic field calibration. The spectra were obtained using NMR (500 MHz), allowing precise identification and quantification of metabolites in biological samples. The obtained spectra were processed by CHENOMX software for phase adjustment, baseline correction, and spectral alignment, and then analysed for metabolic pathways using MetaboAnalyst software. Finally, metabolic profiles were correlated with clinical data from patients ((S) or (NS)) and the time course of the glycaemic clamp (initial time (T0) and final time (after 120 minutes, T1)). Institutional Review Board approval (CAAE: 91217418.2.0000.5404). **Results:** A total of 7 patients were analysed, 3 S and 4 NS. All S were female, and NS group had 3 males and 1 female. The median age was 64 (43-66) years for S and 69 (58-74) years for the NS group. The M-value-TBW and M-value-FFM median (P25-P75) were 4,2 (3,40-5,55) and 4,4 (3,75-5,25), for the S group, and 7,20 (5,65-8,95) and 6,10 (5,63-6,63) for the NS group, respectively. Sarcopenic patients – S –, compared to NS patients, at T0, exhibited increased levels of glycerol (indicating mobilisation of body fat), glycine and threonine (suggesting lean body mass depletion), as well as methylhistidine (corresponding to skeletal muscle degradation), with maintained levels of alanine and urea. After 120 minutes (T1), S patients showed an increase in serum alanine, glycine, and urea, still with a high serum concentration of glycerol, though similar to NS patients, and a reduction in threonine and methylhistidine levels compared to NS patients. These metabolite alterations directly impacted metabolic pathway vias related to lipoic acid metabolism, glutathione metabolism, tryptophan metabolism, branched-chain amino acid degradation (leucine, isoleucine, and valine), glycolytic and gluconeogenic pathways, and pyruvate and pyrimidine metabolism in S patients compared to NS patients. **Conclusion:** The study reveals that S patients present a distinct metabolic profile, impacting metabolic pathways, mainly related to cachexia syndrome effects, compared to NS individuals, thereby enhancing our understanding of the metabolic disturbances in this condition. Mendes, MCS and Madeira, BSM are sharing the first authorship. Gomes-Marcondes, MCC and Carvalheira, JBC were co-advisors in these studies.

Keywords: Cachexia, Metabolism, Metabolomic analysis, Rectal cancer, Sarcopenia.

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PREPARATION OF 1-[18F]FLUORO-2-IODOETHANE AS A PROSTHETIC GROUP FOR [18F]FLUOROETILATION

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A B S T R A C T

Introduction/Justification: [18F]Fluorine is of considerable importance in radiochemistry for positron emission tomography (PET) due to its decay characteristics (18F; beta+ 96.7%, T1 = 2. 109:8 min). Numerous methods for introducing 18F into organic molecules have been developed, with alkylation being one of the methods. Thus, developing the radiochemistry process for the fluorination of dihaloalkyl compounds is a crucial step for the development of new radiotracers. **Objectives:** This work aims to prepare the 1-[18F]fluoro-2-iodo-ethane as a prosthetic group for radiolabeling amine or alcohol functionalized molecules, focusing on developing the radiotracers for molecular imaging. **Materials and Methods:** [18F] Fluoride was produced by the 18O(p,n)18F reaction on [18O] water using cyclotron (GE 16.5 MeV). Radiolabeling method 1: [18F]Fluoride was trapped in a QMA cartridge and released by eluting tetraethylammonium bicarbonate (TEAHCO3 (7.5 mg, 2.47 μmol) in methanol into a vial. The methanol solution was heated at 100oC with a gentle stream of N2 until methanol was evaporated. Acetonitrile (AcN) was added (0.5 mL $\times$ 2) and evaporated to complete drying the system. A solution containing 9 mg (3.19 μmol) of 1,2-diiodoethane in 0.5 mL AcN was added and heated at 100oC for 10 or 15 min. Radiolabeling method 2: Water solution containing [18F]fluoride was added to a vial and dried by azeotropic evaporation with acetonitrile (0.5 mL $\times$ 2) at 100 oC with a gentle stream of N2 over 10 min. An acetonitrile solution containing TEAHCO3 (7.5 mg, 2.47 μmol) or TBAHSO4 (8.3 mg, 2.47 μmol) was added and evaporated; finally, 9 mg (3.19 μmol) of 1,2-diiodoethane in 0.5 mL of AcN was added and heated at 100oC for 10 min. At the end of the reactions, vials were allowed to reach room temperature; a sample was removed and analyzed in TLC-SG and TLC-RPc18 using ethyl acetate or ethanol as the mobile phase. [18F]fluoride ion and [18F]fluoride/ammonium quaternary ion pair were also analyzed by TLC chromatography. Stripes were cut in segments of 1 cm and read in a well