Chromatography (HPLC). The partition coefficient (Log P) and serum protein binding were determined, as well as the stability in saline and serum up to 90 min. After these studies, assays were carried out to determine the binding of the radiopharmaceuticals to "Staphylococcus aureus" bacteria. For the clinical study, the patient selected had a diagnosis of chronic osteomyelitis in the distal tibia, a positive blood culture for "Staphylococcus aureus" and a possible infectious/inflammatory process at the site identified by magnetic resonance imaging. The patient was injected intravenously with 281 MBq of 68Ga-DOTA-UBI to confirm the presence of an infectious process by PET-CT and the images were obtained 1 h post-administration. Resultados: The radiochemical purity (RP) of the radiopharmaceuticals after purification was 99.28±0.28% and 99.78±0.06% for 68Ga-NOTA-UBI and 68Ga-DOTA-UBI, respectively. Log P was -3.57±0.20 for 68Ga-NOTA-UBI and -3.63±0.17 for 68Ga-DOTA-UBI. Stability studies up to 90 min showed RP of 98.13±0.78% and 99.75±0.08% in saline; and 79.94±5.10% and 94.69±1.14% in serum, for 68Ga-NOTA-UBI and 68Ga-DOTA-UBI, respectively. The percentage of serum protein binding, evaluated at 30 and 60 min, was 59.90±1.21% and 53.45±2.16% for 68Ga-NOTA-UBI and 60.22±2.96% and 44.06±1.88% for 68Ga-DOTA-UBI, respectively. The binding of radiopharmaceuticals to "Staphylococcus aureus" revealed a direct relation to the amount of bacteria in the culture. Clinical images showed intense uptake of the radiopharmaceutical in the entire remnant of the talus and in the adjacent soft tissues of the left ankle. After scan, the secretion collected from the surgical site was cultured and the presence of "Staphylococcus aureus" was confirmed. **Conclusion:** The radiochemical and "in vitro" assays showed that the radiopharmaceuticals studied presented similar characteristics with the potential to be implemented in clinical practice. The clinical study showed that the UBI(29-41) fragment radiolabeled with 68Ga can be used as a potential biomarker for infectious processes, according to the availability of the chelating agent.

Keywords: 68Ga-DOTA-UBI, 68Ga-NOTA-UBI, Infectious processes imaging, PET-CT imaging, Ubiquicidin.

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DUAL TIME PSMA PET/CT WITH DIURETICS AND CONTRAST TO DETECT PROSTATE CANCER PELVIC METASTASES: IS THERE A BENEFIT?

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Introduction/Justification: The renal excretion of PSMA radiotracer may render PSMA PET/CT imaging interpretation difficult to identify local recurrence and lymph node metastases in prostate cancer patients. **Objectives:** To evaluate the best acquisition method to increase the detection rate of local recurrence and pelvic metastases on PSMA PET/CT by performing dual time-point imaging (delayed imaging) after hyperhydration, diuretics, and contrast enhancement. **Materials and Methods:** Patients with prior history of prostate adenocarcinoma underwent PSMA PET/CT for primary staging or due to biochemical recurrence. PSMA PET/CT acquisition consisted of delayed pelvic imaging after hyperhydration, diuretics, and excretory-phase contrast. SUV values obtained in local recurrence lesions, locoregional lymph node metastases, and bone metastases in the early and delayed PSMA PET/CT images were compared. **Results:** A total of 182 patients (medians: age = 66.5; Gleason score = 7.0; total PSA = 1.5) underwent PSMA PET/CT. Twenty-one patients (12%) were scanned due to primary staging, and 161 patients due to biochemical recurrence (88%). Delayed images (with only hyperhydration, without contrast or diuretics) increased diagnostic certainty in identifying local recurrence in 26.6% of patients and locoregional lymph nodes in 25%. There was a significant increase in SUV values in the delayed images compared to early images in the local recurrence ($p < 0.0001$), locoregional lymph node metastases ($p < 0.0001$), and bone metastases ($p < 0.0199$). Adding excretory-phase contrast to the delayed images increased diagnostic certainty in identifying local recurrence in 9.4% of patients and locoregional lymph nodes in 8.3%. The use of diuretics only in delayed images (without excretory-phase contrast) increased diagnostic certainty in identifying local recurrence in 14% of patients; while for identifying pelvic lymph nodes increase was only mild (2.8%). The association of diuretics with excretory-phase contrast increased the diagnostic certainty in identifying local recurrence in 15.6% of patients and locoregional lymph nodes in 5.6%. **Conclusion:** Delayed PSMA PET/CT images increase the diagnostic certainty of identifying local recurrence and locoregional metastases in prostate cancer patients. The addition of diuretics increases diagnostic certainty and may be useful in selected cases. However, the addition of excretory-phase contrast (regardless of the use of diuretics) only mildly impacted diagnostic certainty and may be omitted.

Keywords: Câncer de prostata, PET-CT imaging, PSMA.

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ARTIFICIAL INTELLIGENCE TO EVALUATE METABOLIC TUMOR BURDEN IN PRIMARY STAGING OF RECTAL CANCER WITH 18F-FDG PET/CT

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Introduction/Justification: The use of artificial intelligence using convolutional neural networks in clinical practice is

recent. Thus, a growing need exists to validate software performance in different tasks in different diseases. **Objectives:** To evaluate the performance of artificial intelligence software to determine metabolic tumor burden in the primary staging of rectal cancer. **Materials and Methods:** A cross-sectional retrospective analysis was conducted on 51 histology-proven rectal cancer patients (35% females; mean age = 61 years) who underwent a staging 18F-FDG PET/CT. Whole-body metabolic tumor burden parameters (wbMTV and wbTLG) were quantified semi-automatically and through AI algorithm (Syngovia VB60; Siemens Healthineers Medical Solutions). The AI software's ability to correctly identify and classify the primary lesion, regional lymph nodes, and distant metastases was evaluated. In addition, the intraclass correlation coefficient (ICC) was applied to evaluate concordance between the AI-based software and the semiautomatic software in determining wbMTV and wbTLG. Values above 0.7 were considered to indicate substantial agreement. Resultados: The AI and semiautomatic tumor burden metrics correlated strongly for both wbMTV (ICC = 1.00; 95% CI = 0.94 - 0.99; P < 0.0000) and wbTLG (ICC = 1.00; 95% CI = 0.80 – 0.90; P < 0.0000). Additionally, the AI software's ability to correctly identify lesions compared to the documented staging was better for the identification of distant metastasis (78,57% of patients), mildly adequate to identify regional lymph nodes (50,00%) and had poor performance for identification of the primary lesion (5,76%). On the other hand, the time spent calculating these metrics was less by AI than by the semiautomatic method, especially in patients with advanced disease. **Conclusion:** The determination of whole-body metabolic tumor burden on 18F-FDG PET/CT with artificial intelligence software is challenging because of the physiologic bowel activity. However, deep learning may have the ability to overcome these challenges and may therefore improve the primary staging of rectal cancer.

Keywords: 18F-FDG PET/CT, Artificial intelligence., Rectal cancer.

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SYNTHESIS, CHARACTERIZATION, AND RADIOLABELING OF MODIFIED PEPTIDE FRAGMENTS TARGETING AVB3 INTEGRIN ADHESION MOLECULE OVEREXPRESSED IN TUMORS

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Introduction/Justification: Peptides are biomolecules that have been associated with various physiological responses and have great potential for the diagnosis or treatment of diseases, including various types of tumors. Several studies have shown that biologically active peptides containing the RGD domain have a high affinity with the $\alpha v\beta 3$ integrin adhesion molecule overexpressed in tumor cells, assisting in molecular imaging or targeted radionuclide therapy (TRT) as an anti-tumor agent. **Objectives:** To obtain an anti-integrin peptide fragment modified by incorporating two spacers — hexa-aminocaproic acid (C6) or dodeca-aminocaproic acid (C12) — and by adding the chelating agent DOTA for subsequent radiolabeling with yttrium-86 (86Y). **Materials and Methods:** The modified peptides were synthesized by the solid-phase peptide synthesis method using the Fmoc/tBut strategy. In this strategy, the Fmoc group removal step was carried out with 20% 4-methylpiperidine / 80% DMF, and the amino acid coupling step is usually performed with the diisopropylcarbodiimide/1-hydroxybenzotriazole (DIC/HOBt) acylation mixture. In this step, an excess of Fmoc-amino acids and acylating agents of 2.5 times were used relative to the synthesis scale utilized in mmol/g. Peptide cleavage from the resin and removal of side chain protecting groups were carried out using a mixture containing a high concentration of TFA (reagent K). After synthesis and cleavage, the peptides underwent characterization and purification process through high-performance liquid chromatography (HPLC) and mass spectrometry. The radiolabeling process was conducted utilizing cyclotron-produced 86Y, employing a NaOAc buffer (pH = 5.5). The radiochemical reaction was performed at 95°C for 30 min, followed by filtration through a Sep-Pak C18 cartridge for purification and determination of the radiolabeling yield. **Results:** The DOTA-C6-anti-integrin and DOTA-C12-anti-integrin peptides were efficiently synthesized, and the yields obtained were approximately 12.7% and 26.4%, respectively. Chromatographic analyses obtained by HPLC, as well as mass spectrometry, showed that the entire synthesis, cleavage, and characterization process were carried out properly with visualization of profiles and molecular masses of 1165.3 g/mol and 1249.1 g/mol for the DOTA-C6-anti-integrin and DOTA-C12-anti-integrin peptides, respectively. After the purification process, 14.6 mg and 66.2 mg of pure peptides were obtained. The preliminary 86Y-labeling data indicated a radiochemical yield of approximately 97% for both peptides. **Conclusion:** The proposed modified anti-integrin peptides were efficiently synthesized, characterized, and purified. Preliminary radiolabeling studies with 86Y demonstrated a high radiochemical yield, paving the way for further exploration in radiochemical studies and assays of affinity to tumor cells.

Keywords: Anti-integrin peptides, Tumor cells, Yttrium-86, $\alpha v\beta 3$ integrin.

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AVALIAÇÃO DA BIODISTRIBUIÇÃO DO RADIOFÁRMACO 177LU-PSMA I&T EM ANIMAIS COM MODELO TUMORAL.

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