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A B S T R A C T

Introduction/Justification: Liposomes are microscopic vesicles containing an aqueous core surrounded by a lipid bilayer, enabling lipophilic and hydrophilic drugs to be encapsulated. Due to this characteristic, they have been used as transporters of substances to treat or diagnose diseases, including radiopharmaceuticals. **Objectives:** This work aims to prepare liposome from phosphatidylserine, encapsulate 99mTc- MDP inside it, and compare murine 4T1 breast cell tumor uptake for 99mTc-MDP and 99mTc-MDP-liposome. **Materials and Methods:** Liposome was prepared by adding 90 mg of phosphatidylserine in a chloroform/methanol solution at a concentration of (9:1). The solvents were evaporated in a desiccator until the lipids formed a film at the bottom of the vial. The radiopharmaceutical 99mTc-MDP was obtained from the reconstitution of a lyophilized kit with a 99mTcO4- solution, according to radiolabeling instructions. The liposome was reconstituted with saline and 99mTc-MDP was added; the solution was sonicated for 10 min. The purification and encapsulation of percentage were done by size exclusion filtration in an Amicon® 10 kD filter, including two water washes. Murine 4T1 breast cancer cells were grown in RPMI-1640 culture medium supplemented with 10% fetal bovine serum, under 37°C in a humidified atmosphere with 5% CO2 and seed at 5 × 104 cell/well and stood overnight in culture conditions. 99mTc-MDP and 99mTc-MDP-liposome were added to wells, in triplicate, and stood in culture conditions for 15, 30, 60 and 120 min. Culture medium was removed, cells were washed twice with PBS, the cells were detached from the wells, and radioactivity was measured in a gamma counter. The cell internalization percentage was determined by dividing cells counts by a standard sample. **Results:** The 99mTc-MDP encapsulation in the liposome reached an average of 68 ± 26% (n = 3), determined by size exclusion filtration. In vitro tumor cells uptake for 99mTc-MDP fluctuated between 0.2% during interval time. On the other hand, 99mTc-MDP-liposome tumor cells uptake had 0.7% ± 0.1% (15 min), 0.8 ± 0.2% (30 min) 0.9 ± 0.2% (60 min) and 1.2 ± 0,4 (120 min). **Conclusion:** The experiments demonstrated the feasibility of liposome production and their use for encapsulate 99mTc-MDP radiopharmaceutical. Loaded 99mTc-MDP-liposome had significantly high tumor uptake compared to 99mTc-MDP alone, demonstrating the effectivity of the phosphatidylserine liposome in delivering radiopharmaceuticals in tumor cells.

Keywords: 99mTc, Liposome, Phosphatidylserine, Radiopharmaceuticals.

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AUTOIMMUNE ENCEPHALITIS AND PARANEOPLASTIC SYNDROMES: A CLINICAL AND FDG-PET/CT STUDY

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A B S T R A C T

Introduction/Justification: Autoimmune encephalitis (AE) is a debilitating neurological disorder characterized by inflammation of brain tissue. Frequently, it is associated with the detection of highly specific antibodies, as such as NMDA, Yo, GAD, Hu, among others. Oftentimes, this condition is expressed as a paraneoplastic syndrome (PNS), for which the neurological manifestation precedes the tumor diagnosis up to 4 years in about two-thirds of the patients. **Objectives:** This work applied the review of clinical findings and FDG-PET/CT images analysis to characterize and explore the outcomes of patients diagnosed with AE, both clinically and by antibodies test. **Materials and Methods:** The study includes 37 patients, aged from 13 to 75 (47.08 ± 20,00 years), 65% female, who had been presented neurological manifestations of encephalitis and PNS. The group of patients was divided according to the antibodies detected (NMDA, Yo, Hu, LGI1, GAD, Amphiphysin, Aquaporin-4), being also studied a group of patients with negative antibodies and untested. Retrospectively, the clinical records were analyzed by the neurology staff, being the clinical manifestations and the results of antibodies tests correlated with FDG-PET/CT brain images, analyzed by an expert in nuclear medicine. **Results:** Among the groups studied, 24.3% had suspicion or confirmed neoplasia (most of them breast or thyroid lesions), being 49% of the patients positive for antibodies related autoimmune encephalitis (AE). In the pretreatment phase, patients with Yo antibodies, manifested epilepsy and cerebellar ataxia, with FDG-PET/CT revealing hypermetabolism in the basal ganglia, cingulate gyri, thalamus, and midbrain, with hypometabolism in the cerebellar hemispheres. Hu antibodies has been associated with epilepsy, sensitive and behavior alterations, being the hypermetabolism in the cingulate gyrus and hypometabolism in the cerebellar hemispheres identified in the PET/CT images; on the other side, GAD antibodies resulted in higher FDG uptake in the thalamus and midbrain, with hypometabolism in the

frontal lobes. In this case, the neurological manifestations include epilepsy, ataxia with aspects of stiff-person syndrome, behavior and sensitive alterations. Most of the clinical manifestations mentioned has also been observed in patients with NMDA antibodies, who expressed cingulate gyri, precuneus, parietal lobes and basal ganglia hypermetabolism, and cingulate hypermetabolism, with cerebellar hemispheres hypometabolism, characterizing an anteroposterior gradient of FDG uptake. LGI1 antibodies resulted in hypermetabolism in the basal ganglia and temporal mesial lobe, with frontal hypometabolism. For most of the groups of patients, epilepsy was a common manifestation, followed by behavior and sensitive alterations. The exception is the aquaporin-4 antibody for which muscular disorders are the main symptom, also highlighted in GAD patients. **Conclusion:** PET/CT FDG is able to detect metabolic alterations in brain images with a high sensitivity. Different anti-bodies can show different patterns of hypermetabolism and hypometabolism. More studies with higher casuistic are necessary to better identify each pattern. Moreover, PET/CT FDG with whole body studies is able to detect neoplasm or suspicious neoplasm lesions.

Keywords: Autoimmune encephalitis, FDG-PET/CT images, Paraneoplastic syndromes.

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DIRECT COMPARISON BETWEEN 18F-FDG PET/CT AND 18F-PSMA PET/CT IN RADIOIODINE-REFRACTORY DIFFERENTIATED THYROID CARCINOMA PATIENTS

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A B S T R A C T

Introduction/Justification: Differentiated thyroid carcinoma (DTC) is the most common endocrine malignancy and generally has a good prognosis when properly treated. However, approximately 5-15% of cases become refractory to radioiodine therapy (rRIT), limiting diagnostic and therapeutic options and significantly impacting patient survival. Recent studies have demonstrated prostate-specific membrane antigen (PSMA) uptake in positron emission tomography/computed tomography (PET/CT) scans of advanced DTC, suggesting its potential as a diagnostic imaging target and possibly opening new avenues for theranostic approaches. **Objectives:** To compare 18F-PSMA and 18F-fluorodeoxyglucose (18F-FDG) PET/CT scans of patients with rRIT DTC. **Materials and Methods:** This cross-sectional study included 21 patients with rRIT DTC and locoregional or distant metastases. All patients underwent both 18F-FDG PET/CT and 18F-PSMA PET/CT scans. Uptake intensity was assessed using the maximum standardized uptake value (SUVmax), and lesion location was categorized as thyroid bed, cervical, thoracic, and abdominal lymph nodes, lungs, liver, and bones. The median SUVmax (range) was calculated for both radiotracers. **Results:** Both radiotracers detected lesions in all patients. The number of patients with active disease identified by 18F-FDG PET/CT and 18F-PSMA PET/CT, respectively, in each region was: thyroid bed (6 vs. 5), cervical lymph nodes (15 vs. 15), thoracic lymph nodes (11 vs. 11), abdominal lymph nodes (3 vs. 0), lungs (16 vs. 15), bones (4 vs. 6), and liver (1 vs. 1). In five patients, 18F-FDG identified more affected regions than 18F-PSMA, while in three patients, the opposite was observed. The median SUVmax was 24.2 (5.6–80.9) for 18F-FDG and 17.3 (4.1–73.3) for 18F-PSMA. In 12 patients (57.14%), the SUVmax of 18F-PSMA was higher than that of 18F-FDG. **Conclusion:** Both radiotracers demonstrated uptake in at least some lesions in all rRIT DTC patients. Uptake intensity varied among lesions, with some showing higher 18F-FDG uptake and others higher 18F-PSMA uptake, suggesting a potential complementary role for these tracers in this disease. 18F-PSMA demonstrated a higher SUVmax than 18F-FDG in more than half of the patients, indicating that, in selected cases, PSMA-labeled theranostic approaches may be a viable option.

Keywords: 18F-FDG PET/CT, 18F-PSMA PET/CT, Differentiated thyroid carcinoma, Radioiodine-refractory.

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BRAIN-TO-LIVER RATIO FROM 18F-FDG-PET/CT AS A PROGNOSTIC MARKER IN MULTIPLE MYELOMA

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