of close clinical and scintygraphic evolution because alterations non-detected earlier increases morbidity and irreversible damage to patient.

Radiobiologia/Instrumentação

• Painel •

CORRELAÇÃO ENTRE A VARIAÇÃO DE TEMPERATURA, UMIDADE, TENSÃO, CORRENTE E UNIFORMIDADE EM UM SISTEMA SPECT.

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Objetivo: O objetivo deste trabalho foi analisar temperatura, umidade, tensão e corrente para verificar se dentro das condições atuais de funcionamento de um determinado sistema SPECT é possível detectar variações significativas na Uniformidade do sistema. A Uniformidade avalia a diferença de resposta do detector em diferentes pontos do campo visual, sendo um dos parâmetros mais importantes no desempenho de um sistema SPECT. **Metodologia:** O estudo do comportamento dos valores da Uniformidade foi realizado num sistema SPECT dotado de dois detectores. Este equipamento está sujeito a variações térmicas e umidade devido à região climática em que se encontra. As variações de tensão e corrente foram analisadas, pois a rede elétrica que alimenta este equipamento é a mesma que alimenta todos os equipamentos de radiodiagnóstico. Este equipamento tem sua Uniformidade analisada diariamente conforme recomendações do IAEA e do fabricante. Registraram-se diariamente os valores de Uniformidade, temperatura e umidade ambiente, tensão e corrente. **Resultados:** Por meio do termo-higrômetro e do MUG, verificamos a possível constância das grandezas avaliadas. A variação de temperatura ocorre entre os 23 e 25 C e a umidade entre 36,5 e 51%, o que indica uma faixa de variação muito reduzida. Apesar da umidade apresentar certa variação, quando confrontado com a Uniformidade percebe-se que esta não é significativa. O fabricante sugere que não se exponha o detector a variações de temperatura superiores a 5 C/hora e que os limites sejam de 15 e 27 C. A temperatura média verificada foi de 20,55 C, não havendo variação de 5 C e a variação de umidade indicada pelo fabricante é de 20 a 80%, e em nossa análise verificamos uma média de 44,75%. O fabricante define a tensão de entrada 120 V (± 10%) e a média encontrada foi de 112 V (± 6%). A corrente de entrada é fixada em 5 A (± 10%), sendo que a média foi de 6,16 A (± 1,2%). **Conclusões:** Neste trabalho, percebemos que todas as grandezas analisadas não interferem na Uniformidade medida para este sistema SPECT. Além disso, constatamos que não há porque imaginar que possa haver desgaste elétrico no sistema, se o nobreak estiver em bom funcionamento, bem como atribuir à falta de qualidade da imagem, à tensão e a corrente recebida ou a variações de temperatura e umidade se essas grandezas permanecerem controladas e constantes. Verificamos, a partir da análise realizada, que as variações percebidas na Uniformidade são muito pequenas (para este sistema) de modo que as grandezas analisadas não interferem significativamente na mesma.

• Tema Livre •

EFFECT OF RECOMBINANT TSH (rTSH) ON IODINE-131 RESIDENCE TIME AND DOSIMETRY ON THYROID GLAND: FINAL RESULTS.

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Introduction: Patients with total thyroidectomy are strongly depended on hormone reposition therapy to maintain a normal metabolic status. The hormone therapy is mandatory for serum TSH levels suppression and for avoiding undesirable symptoms of hypothyroidism such as tiredness and slowness. However, patients with differentiated thyroid carcinoma need at least two whole body iodine-131 surveys within the first 2 years of total thyroidectomy, which requires increased levels of serum TSH to residual thyroid tissue or even metastases. Recombinant human thyrotropin (rTSH) was developed to avoid the interruption on hormone therapy, which brings comfort and safety to the patient. **Objective:** Our purpose was to estimate the effect of rTSH on thyroid-absorbed dose and total glandular residence time after an oral administration of iodine-131. **Methodology:** In this experimental model, 27 Wistar rats, 200 g of weight each, received 11,1 MBq of I-131 orally. Nine of these animals received rTSH (IPEN-CNEN) and, nine received Thyrogen (Gensyme), respectively, on the day before. Twenty four hours urine was collected for each animal. The urine was collected in metabolic cages and the tube collectors that contained the urine were verified on hourly basis. A CRC-15R Capintec dose calibrator was used to determinate their activities. The accumulated activity in thyroid and the residence time were calculated by MIRD standards. The absorbed dose was calculated by the Monte Carlo Method through the program MCNP-4C. **Results:** The accumulated activity of 9 rats who received I-131 without rTSH stimulus was: Ã = 2087,50 ± 374,11 MBq.h and the average residence time was: RT = 188,00 ± 33,69 h. The 9 rats who ingested I-131 preceded by Thyrogen presented accumulated activity on thyroid: Ã = 2105,26 ± 328,01 MBq.h. The residence time was: RT = 189,70 ± 29,56 h. The 9 rats who ingested I-131 preceded by rTSH/IPEN presented accumulated activity on thyroid: Ã = 2291,11 ± 514,40. The residence time was: 204,80 ± 46,57 h. The absorbed dose in thyroid was respectively: D = 2.295,8 Gy (I-131), 2.315,4 Gy (Thyrogen) and 2.522,6 (rTSH – IPEN). **Conclusions:** These data suggest that rTSH promotes rates of accumulated activity of I-131 in the thyroid gland and also prolongs the residence time of iodine in normal glands, in this case about 10%. So far, these preliminary results had not been associated with an increase in the genetic damage.

• Painel •

HIGH SPATIAL AND TEMPORAL RESOLUTION SCINTIGRAPHIC IMAGES OF SMALL VOLUMES USING CODED MASKS AND STANDARD CLINICAL GAMMA CAMERAS.

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Rationale: Non invasive imaging techniques, used in experimental protocols with small animals, are very powerful tools for making sequential in vivo studies on the same subject, so reducing research time and costs and providing more reliable results. These techniques can be very useful for studies of human diseases, and discovery and development of new drugs. **Objectives:** Given the small size of some animal organs, we propose to implement hardware and software techniques which allow us to obtain high spatial (better than 1 mm) and temporal (equivalent to that of clinical studies) resolution scintigraphic images of small volumes using conventional clinical SPECT gamma cameras. The proposed techniques include coded mask-based multipinhole collimators and iterative image restoration algorithms. **Method:** In order to reach high spatial resolution in scintigraphy, it is necessary to reduce the collimator hole size (in pin-hole or parallel-hole collimators), conveying a simultaneous reduction in camera's sensitivity. Initially, we have made Monte Carlo simulations (MCS) of a pinhole collimator camera with inserts of different sizes to gain a better understanding of those effects. After that, MCS of the effect of a multipinhole collimator (1-mm size), based on a MURA 7x7 coded mask, were carried out. We built and tested this collimator with a Siemens Orbiter NaI(Tl)-based clinical gamma

camera, obtaining images of small-size phantoms in different configurations. The images were reconstructed by using a Richardson-Lucy-based image restoration algorithm. All the phantoms were imaged with the same magnification factor of 4. **Results:** MCS and images of small objects were obtained and reconstructed including: point sources, sets of point sources and small-size continuous sources. The resulting images show spatial resolution better than 1 mm on the object, and temporal resolution equivalent to that of a 4-mm diameter single pinhole. Additionally, the simulations show that, using this kind of collimator, identification of individual planes perpendicular to the camera's axis is possible. In this way, we can perform tomography with a single image. **Conclusions:** We have shown that, by using small-size, multipinhole collimators, in combination with a clinical gamma camera, it is possible to obtain, simultaneously, high spatial and temporal resolution images of small volumes, which can be used in dynamic studies of radio-tracers. Given the collimator configuration, tomography can be done with a single image.

• Painel •

PHARMACOKINETIC AND TISSUE DISTRIBUTION OF NEUTRON IRRADIATED PENTAVALENT ANTIMONIALS AS ANTI-LEISHMANIAL DRUGS.

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Introduction: Visceral Leishmaniasis (VL) is a systemic protozoan parasite infection of tropical and subtropical areas, which afflicts a million people each year and may be fatal if untreated. Despite lengthened treatment regimes, parenteral administration and toxic side effects, the pentavalent antimonial meglumine antimoniate or sodium antimony gluconate have remained the first-line treatment for VL. Besides over half a century of clinical use, their mechanism of action, toxicity and pharmacokinetics data remain unknown. **Objectives:** The aim of the present study was to compare the pharmacokinetic and the tissue distribution of non-complexed pentavalent antimony and of meglumine antimoniate. **Methods:** Both drugs were neutron irradiated inside IEA-R1 nuclear reactor (IPEN-CNEN-SP). Two radioisotopes of antimony - 122Sb and 124Sb, were produced and were suitable for use in biodistribution studies. Healthy or mice experimentally infected with *Leishmania chagasi* received a single intraperitoneal dose of either drugs. At different times after injection, the tissues and the organs were excised and activity measured in a NaI (Tl) scintillation counter. **Results:** Analysis of the curve of the concentration in blood after administration of meglumine antimoniate showed two compartments, a distribution in the central compartment and other associated to drug equilibrium and excretion. It was found higher uptake in the liver of healthy or infected mice, where approximately 55% of the injected activity at 30 minutes is accumulated and retained. At 24h post injection, no significant activity was seen in any major organ other than liver, which could also be associated with selective anti-parasitic effect. The elimination is mostly by biliary excretion with a small and fast proportion of the drug excreted by kidney. Free pentavalent antimony showed fast elimination predominant by kidney and great proportion of the drug is excreted by biliary route, thus indicating that complexed drug favors the distribution of antimony in organs and increases its residence time in tissues. This would explain the superior antileishmanial efficacy of this formulation compared to those of the free drug in mice. **Conclusions:** The use of the radiotracers, easily created by neutron irradiation, could be an interesting tool to solve important questions in antimonial pharmacology. Besides its useful results for leishmaniasis treatment, this radiopharmaceutical system has great potential for evaluating various kinds of drugs. This work was supported by CNPq Proj.476666/2004-0 and SETB fellowship PhD Program Proj.142839/2005-1.

• Painel •

SITUAÇÃO DO PET NO BRASIL.

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O objetivo deste trabalho é analisar a situação dos tomógrafos PET (positron emission tomography) no Brasil, do ponto de vista do licenciamento. Os Serviços de Medicina Nuclear utilizam em sua rotina calibradores de radionuclídeos para medir a atividade de soluções contendo radiofármacos como I-131, Ga-67 e Tc-99m, entre outros. Estas soluções são administradas a pacientes com o propósito de obter o diagnóstico de doenças ou sua terapia; o procedimento é simples: a dose de radiofármaco a ser administrada ao paciente é medida no calibrador de radionuclídeo e, após a administração e absorção do medicamento, o paciente realiza uma tomografia computadorizada. O PET é um tomógrafo de geração mais avançada que o tomógrafo computadorizado e detecta dois fótons num sistema de coincidência; para tal, utiliza o F-18, um radiofármaco que emite dois fótons de 511 keV. A realização de exames com o F-18 é semelhante a outros exames de medicina nuclear, mas o projeto de uma instalação com PET requer uma série de cuidados que não se aplicam num Serviço de Medicina Nuclear convencional. Entre esses aspectos, podemos destacar o tratamento do paciente injetado com F-18, a dosimetria dos indivíduos ocupacionalmente expostos e a blindagem da instalação. Existe uma grande lacuna na literatura brasileira sobre este assunto e, inclusive nas Normas da Comissão Nacional de Energia Nuclear (CNEN), órgão que licencia instalações nucleares e radioativas no Brasil, não existem itens específicos contemplando instalações com PET. Este trabalho pretende minimizar esta lacuna e evidencia a necessidade de estudos direcionados à realidade brasileira no tocante ao PET.

• Painel •

STUDY OF DOSIMETRY AND TOXICITY OF 177Lu-DOTA-Y3-OCTREOTATE IN RATS.

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Introduction: It has been demonstrated that radiolabeled somatostatin analogs bears some effectiveness for targeted radiotherapy of somatostatin receptor tumor in rat's models and humans. Usually, one of the radionuclides used in this purpose for cancer therapy is the 177Lu (ß- 100% and T1/2 = 6.6 days). Reasonable therapeutic efficacy of the somatostatin analog 177Lu-DOTA-Tyr3-octreotate (DOTA-Y3-TATE) has been demonstrated on many studies published in the literature. **Objective:** To evaluate the toxicity and dosimetry of 177Lu-DOTA-Y3-TATE through an experimental tumor model in rats. **Methodology:** Total activity of 1.11 MBq of 177Lu-DOTA-Y3-TATE was administered in 15 NUDE Swiss rats and sequentially complete total blood counts were obtained 24 hours after the IV injection. The biodistribution of 177Lu-DOTA-Y3-TATE was determined using a well detector and a scintilation camera dedicated to experimental studies. The dosimetry (accumulated activity and residence time in target organs) was calculated using MIRD method. **Results:** No overt signs of toxicity were observed. The absorbed dose in tumor was determined in comparison with the other organs in the total body. The average absorbed dose on the rat tumor was estimated to be 0.44 ± 0.04 mGy/MBq. The absorbed dose in pancreas was 0.43 ± 0.04 mGy/MBq, kidneys was 0.22 ± 0.03 mGy/MBq and total body 0.029 ± 0. 006. **Conclusions:** These preliminary data suggest that 177Lu-DOTA-Y3-TATE bears adequate dosimetric and lack of toxicity enough to rise clinical interest for its indication as an alternative modality of treatment for somatostatin receptor-positive tumors.