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Images of Interest / Imagens de Interesse

Seasonal Variability of [^{18}F]FDG uptake in Brown Fat on the same Patient

Variabilidade Sazonal da Captação de [^{18}F]FDG em Gordura Castanha na mesma Doente

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Abstract

A patient with history of breast cancer with bone metastasis, during evaluation of therapy response, underwent several PET-CT studies with [^{18}F]FDG. In the different exams, a variation in brown fat uptake was observed, validating in the same patient the multiple factors described in the literature as those that most predispose to the occurrence of this phenomenon. Namely, outdoor temperature, gender, body mass index, blood glucose and uptake in previous studies.

Keywords

Brown fat; PET-CT; [^{18}F]FDG.

Resumo

Doente com antecedentes de carcinoma da mama com metastização óssea, no seguimento de avaliação da resposta à terapêutica instituída, realizou vários estudos de PET-CT com [^{18}F]FDG. Nos diferentes exames foi observada variação de activação de gordura castanha, validando numa mesma doente os múltiplos factores descritos na literatura como os que mais predispõem à ocorrência deste fenómeno. Nomeadamente, temperatura exterior, género, índice de massa corporal, glicémia e captação em estudos anteriores.

Palavras-chave

Gordura castanha; PET-CT; [^{18}F]FDG.

[^{18}F]FDG PET-CT allows the study of pathologies of benign and malignant etiology that present an increase in glucose metabolism. The usual biodistribution of this radiopharmaceutical is characterized by increased uptake in the brain and liver, variable uptake in the heart, and visualization of renal and vesical activity through its renal excretion. Abnormal accumulation of [^{18}F]FDG occurs in tissues with increased glucose transporters and enzymatic changes that promote the retention of the radiopharmaceutical within cells. However, incidental artefacts of radiopharmaceutical accumulation may occur which challenge the diagnostic accuracy of this exam. One of the examples is the activation of brown fat with an increase in radiopharmaceutical uptake, making it difficult to correctly assess the metabolic activity in these locations.

Brown fat is responsible for the body thermogenesis that occurs at the expense of glucose consumption. More often, brown fat is located in cervical, supraclavicular and thoracic paravertebral topography, being also observed in axillary, mediastinal and abdominal topography, more frequently in the adrenal regions.[1] In imaging activated brown fat is characterized by increased PET image uptake corresponding on CT to sites with fat density. The activation mechanism is not fully known, however, factors that predispose to a greater degree of brown fat activation are described. Namely, female gender, young age, low body mass index, outdoor temperature and blood glucose.[2]
Figure 1 shows five PET-CT studies of the same 56-year-old patient, with a personal history of breast cancer

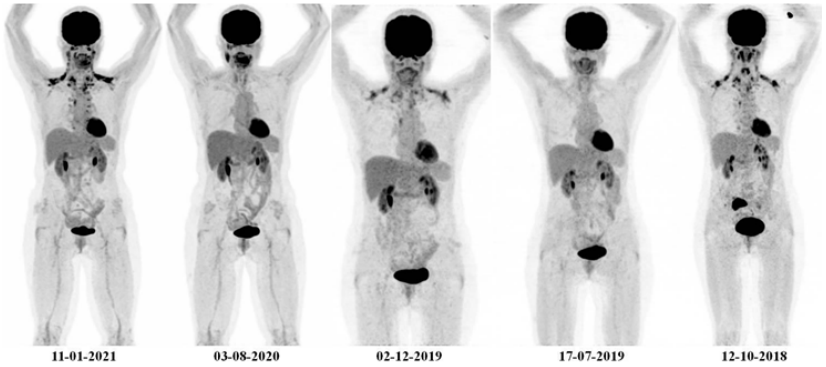

Figure 1 – Variability of brown fat uptake in different PET-CT studies with [^{18}F]FDG.

and clinical indication for PET-CT for follow-up and assessment of response to treatment in patient with breast cancer with bone metastasis (stage IV). In the five studies, images were acquired from the head to the upper proximal third of the lower limbs, 1 hour after radiopharmaceutical administration. In the acquired images, a variability of brown fat activation was observed between the different studies, being this more intense in the studies carried out in the period of lower outdoor temperature (January, October and December) and practically absent in studies acquired during the period of higher outdoor temperature (July and August). This variability of brown fat uptake is in line with what is described in the literature, being the greater uptake observed in periods with lower outdoor temperatures. In this patient, the presence of additional factors favors the activation of brown fat, specifically, being a female, having low body mass index, normoglycemia, history of breast cancer and activation of brown fat in previous studies. According to the literature, other factors may also alter the activation of brown fat, such as prior intake of diazepam, often used to alleviate the problem. In the vast majority of PET-CT studies with [^{18}F]FDG in which this increase in uptake occurs with some degree of ease, it is attributed to the process of activation of brown fat. However, in certain exams, the characterization and detection of small lesions in these locations may be undetermined. It is suggested, in some studies, to warm the patients in the post-injection period or to administer beta-blockers, such as propranolol, in order to avoid this phenomenon.[1]

Ethical disclosures / Divulgações Éticas

Conflicts of interest: The authors have no conflicts of interest to declare.

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Confidentiality of data: The authors declare that they have followed the protocols of their work center on the publication of data from patients.

Confidencialidade dos dados: Os autores declaram ter seguido os protocolos do seu centro de trabalho acerca da publicação dos dados de doentes.

Protection of human and animal subjects: The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Protecção de pessoas e animais: Os autores declaram que os procedimentos seguidos estavam de acordo com os regulamentos estabelecidos pelos responsáveis da Comissão de Investigação Clínica e Ética e de acordo com a Declaração de Helsínquia da Associação Médica Mundial.

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