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**METHODOLOGY DEVELOPMENT OF FDG-PET/CT BASED DIAGNOSIS OF CROHN DISEASE**

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**Background:** We studied the efficiency of immunotherapy on patients with Crohn disease using PET/CT technology in a clinical trial. The goal of the study was to develop new protocol and parameters based on automatic 3D segmentation and parametric surface visualization. Thus the patient follow-up and the efficiency of applied therapy can be characterized quantitatively at a population level.

**Material and methods:** We used region growing technique on to mark activity accumulating lesions that presumably refer to inflamed tissues on PET images of the involved patients. The low threshold of region growing process was set to 150% of the mean SUV (Standard Uptake Value) calculated in sphere VOI with 10 mm radius in patient liver. Furthermore the volume of colon was marked off using freehand contour technique on the patients low-dose CT images. The normalized (on liver) and summarized SU values of the inflamed lesions (weighted with their volumes) before and after the treatment were determined for each patient. The mean SUV parameters of inflamed lesions for each colon segment were calculated. We also studied the rations of inflamed volumes to the whole colon volumes segmented and dawned on CT images. The 3D surface models of colons were created using CT contours, which were colored according to PET radiopharmaceutical accumulations. The trajectory of colon midlines were also calculated and the parametric surfaces were represented as a function of length of these lines. In this way the localization and SUV data of pathological areas can be visualized quantitatively.

**Results:** During this study we worked out a PET/CT imaging based protocol and suggested two parameters witch which the status of patients with Crohn disease can be characterized in objective way. These parameters are as follows: mean PET tracer accumulation for each colon sections and a ratio value describing the expansion of inflamed colon lesions. Furthermore we also worked out a methodology to quantitatively illustrate the position of inflamed regions along the length of colon.

**Conclusion:** We worked out a semi-automatized image processing protocol and parameters which make it enable to objectively characterize the efficiency of immunotherapy applied to patients suffer from Crohn disease. As a further step we plan to validate our parameters with colonoscopy data determined by clinical practice.

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**ASSESSMENT OF CROHN'S DISEASE ACTIVITY BY FDG PET-CT**L. Galuska<sup>1</sup>, S.A. Kiss<sup>1</sup>, N. Fedinecz<sup>2</sup>, K. Palatka<sup>2</sup>, Sz. Lovas<sup>2</sup>, I. Garai<sup>3</sup>, J. Varga<sup>1</sup><sup>1</sup>University of Debrecen, Departments of Nuclear Medicine, Debrecen, Hungary<sup>2</sup>University of Debrecen, Internal Medicine (Gastroenterology), Debrecen, Hungary<sup>3</sup>ScanoMed Ltd, Debrecen, Hungary

**Background:** Crohn's disease (CD) may start and persist at different parts of the gastrointestinal tract. The endoscopic evaluation is the usual way to assess inflammatory lesions for staging and the follow-up of the patients; however, this method is limited in the small bowel system, and not suitable for quantitatively characterizing the inflammatory activity (IA) that would be crucial for staging as well as the prognosis, treatment and follow-up. A good sensitivity and specificity of 18F-FDG PET-CT

(PET) was shown in pilot studies for detecting the lesions of CD. Our aim was to evaluate the use of PET for assessing the location and inflammatory activity of CD, and compare them to the endoscopic and clinical data (Clinical Disease Activity Score Index = CDAI).

**Material and methods:** Eleven non-treated patients with active CD (ages: 18–39, mean 25 years; 6 males) were entered into a prospective study. The main inclusion criteria were CDAI above 300, and an ileocolonoscopy result typical of CD. Within 2 weeks ileocolonoscopy, PET-CT was performed before and 10–11 months after the initiation of biological immunosuppressive therapy. We administered 350–370 MBq FDG and data acquisition was performed by a Philips TOF PET-CT. The visual assessment and FDG SUV uptake score of the PET, were calculated on the terminal ileum and 3 colon and sigma bowel regions. The summarized scores of the 5 segments formed the global PET and SPECT scores, which have been compared with CDAI before and after treatment.

**Results:** We found a good correlation between the CDAI and global PET scores. The PET identified more and larger inflammatory sites than either endoscopy both for primary staging and follow-up. It seems to be a sensitive method to detect lesions of CD, but further studies are needed evaluate the further use in clinical practice.

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**CHARACTERISTICS OF BROWN ADIPOSE TISSUE FDG UPTAKE ON PET-CT IMAGES**Z. Toth<sup>1</sup>, A. Forgacs<sup>1</sup>, J. Varga<sup>2</sup>, L. Kiss<sup>1</sup>, L. Papp<sup>3</sup>, A. Fekeshazy<sup>1</sup>, T. Gyorke<sup>1</sup>, P. Szabo<sup>1</sup>, I. Garai<sup>1</sup><sup>1</sup>Scanomed Ltd., Budapest-Debrecen, Hungary<sup>2</sup>Department of Nuclear Medicine, University of Debrecen Medical and Health Science Centre, Debrecen, Hungary<sup>3</sup>Mediso Medical Imaging Systems, Budapest, Hungary

**Background:** To characterize the brown adipose tissue (BAT) 18F-FDG uptake influencing factors on positron emission tomography (PET)-computer tomography (CT) imaging.

**Material and methods:** We retrospectively analysed 3776 consecutive PET-CT examinations performed in 2011, and evaluated the presence and intensity score of increased BAT activity. The subjects' gender, age (3–91), BMI (12.7–56.9), blood glucose level (2.4–22.6 mmol/L), and medical history of diabetes mellitus were recorded. The month and season of the study were also surveyed.

**Results:** The overall prevalence of BAT activity was 5.5%, with female predominance (odds ratio 3.4). BAT activity was more frequent (Mann-Whitney test:  $p < 0.0001$ ) and more intense (Kruskal-Wallis test:  $p < 0.0001$ ) in younger subjects, in those with lower BMI and those with lower plasma glucose levels. None of our patients with diabetes (0/510) had increased BAT activity at all. We could not find correlation of BAT uptake and the month or season of the study.

**Conclusion:** Female predominance, negative correlation between BAT activity and age, BMI, blood glucose level was found, similarly to the published international data. Its potential role in glucose metabolism should be further clarified.

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**RADIOSYNOVIORTHESIS IN THE ERA OF BIOLOGICAL THERAPY**

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The first article about radiosynoviorthesis (RSO) was published by Fellingner in 1952. This way of treatment has been used successfully all over