ROLE OF [(18)F]FDG-PET/CT IN INTRAPERITONEAL HYPERTHERMIC-ANTIBLASTIC THERAPY FOR PERITONEAL CARCINOSIS: PRELIMINARY RESULTS OF A PROSPECTIVE STUDY

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Peritoneal carcinosis is a common evolution of many neoplasias and it is the terminal stage of disease, as most of patients dies within 6 months. A combined surgical technique aiming at the total removal of parietal and visceral peritoneal lesions (peritonectomy) and at the perfusion of peritoneal cavity with chemo-drugs in hyper-thermia (IPCH) has been developed. Proper patient selection is mandatory for optimizing the results of treatment.

[(18)F]fluoro-2-deoxy-d-glucose positron emission tomography (FDG-PET) has remarkably improved the management of cancer patients. The usefulness of FDG-PET is now considered in assessing tumor viability, monitoring tumor response to treatment and detecting distant metastases. Nevertheless, the clinical interpretation of FDG-PET scan can be difficult for anatomical localization of FDG uptake. Normal physiological accumulation of FDG can be misinterpreted as a pathologic area. A novel combined PET/CT system improves the capacity to correctly localize and interpret FDG uptake.

The aim of this prospective study was to investigate the role of whole body FDG-PET/CT in patients with peritoneal carcinosis that are going to be managed with peritonectomy procedure (PP) and intraperitoneal chemohyperthermia (IPCH). Our secondary aim was to identify characteristic patterns of abdominal FDG uptake in biopsy-proven peritoneal disease and to correlate these patterns with available anatomic findings after surgery. In order to evaluate a potential role of FDG-PET/CT, as useful tool in the measurement of clinical and subclinical tumor response, we attempt to measure the maximum standardised uptake values (\(SUV_{\text{max}}\)) over peritoneal lesions in the area of most intense intestinal uptake.

**Methods:** This is an open, prospective, non-randomized, monocentric study. Consecutive patients, with either histologically confirmed peritoneal carcinosis (by peritoneal biopsy or ascitic aspirate) or suspected upon clinical follow-up (including a detailed physical examination and serum tumoral marker evaluation) and/or radiographic findings (ultrasound, CT, MRI), if histology was negative or unavailable, are accrued in this prospective study. Eligible patients for PP and IPCH for peritoneal carcinosis from colorectal cancer, gastric cancer, appendiceal cancer, ovarian cancer, peritoneal malignant mesothelioma and peritoneal pseudomyxoma are submitted to pre-surgery whole body FDG-PET/CT scan. The treatment protocol is directly related to PET/CT results: only those patients without evidence of extra-abdominal metastases at PET/CT scan will be treated with PP and IPCH, while in case of distant metastases clinical benefit by palliation will be aimed. The patients subjected to surgery will be evaluated with FDG-PET/CT within 3 months post-surgery, in order to measure tumor response to therapy by \(SUV_{\text{max}}\).

**Results:** At the moment, eleven patients with peritoneal carcinosis [4 ovarian cancer, 1 pancreatic carcinoma, 5 colorectal cancer and 1 unknown primitive cancer (CUP)], age ranged from 28 to 68 years, have been evaluated with pre-surgery FDG-PET/CT. In all cases PET/CT scan showed multiple peritoneal implants.

In 6 out of 11 cases (54%) distant metastases were evidenced by FDG-PET/CT: 2 cases with not resectable liver metastases; 1 case of bone metastases; 3 patients had lymph-node involvement. These patients were not treatable with a locoregional approach. In gastrointestinal cancer group (5 colorectal cancer and 1 pancreatic adenocarcinoma) 60% of stage was modified by PET/CT scan, with changing on management in 3 colorectal cancer and 1 pancreatic adenocarcinoma. In ovarian group 2 out of 4 cases were not eligible for locoregional treatments because of extra-abdominal metastatic disease, revealed by PET/CT scan. In the unique presentation of metastatic CUP of peritoneal cavity (a 66-year old man), stage of disease let our combined strategy. However, PET/CT scan didn’t result in some improvements in diagnosis, because the primary site remained unknown.
PET/CT findings were confirmed accurate by the observation during surgical procedure and by the histological findings.

We have identified two distinctly abnormal scintigraphic patterns, focal and diffuse increased FDG uptake, in a distribution that correlated with surgical findings of peritoneal seeding. PET/CT scanning appears to predict accurately the presence, respectively, of either nodular or diffuse peritoneal disease on pathologic examination. The pre-surgery $\text{SUV}_{\text{max}}$ was between 3 and 14.4, the post-surgery $\text{SUV}_{\text{max}}$ was from zero to 5.2.

**Conclusions:** According to literature FDG-PET changes the therapeutic approach in almost 30% of oncologic patients. Morphologic imaging studies are neither sensitive nor specific for detecting peritoneal carcinosis itself; tumor markers might offer a poor relatively effective tool for detecting progression of disease with distant metastases in this peculiar clinical background. [(18)F]FDG-PET/CT adds to conventional imaging in the staging of peritoneal carcinosis. The information provided by PET/CT may still be useful in the diagnostic and therapeutic management of these patients, as we have shown it would have contributed to a modification of stage, changing treatment strategy, in 6 out of 11 of our patients (54%).

Moreover preoperative FDG-PET/CT study seems to be a reliable tool for characterization of peritoneal tumor implants, as we have identified two distinct patterns that appear to predict the presence of either nodular or diffuse peritoneal pathology. It is necessary to establish the two following items: is there a correlation between FDG-uptake patterns and patient prognosis? Is the $\text{SUV}_{\text{max}}$ evaluation a useful tool to measure tumor response to therapy in this patient cohort, as in lymphoma patients?

Therefore the use of FDG-PET/CT, approaching eligibility in a careful and methodical manner, in this subset of patients seems to be appropriated. In our opinion IPCH combined with PP seems to be an effective therapeutic approach, in carefully selected patients, and offers a chance for cure or palliation in this condition with few alternative treatment options. Nevertheless, due to the very small number of patients available, we are aware considerable research must be performed to validate the results of our pilot study and to clarify the impact of this new diagnostic and therapeutic management.