The Clinical Use of PEM in Diagnosis of Breast Cancer

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Introduction: The diagnostic performance of the first European PEM (PET mammography) is evaluated in 158 females with 219 suspected breast lesions.

Methods: PEM imaging of the breast was performed in 158 consecutive females with 158 suspicious breast lesions or known breast cancer (BC) 90 min after i.v. application of 3.5 MBq/kg F-18-FDG per kg body weight. The maximum PEM uptake value (PUV max) was derived from a ROI around the target lesion and was correlated with a corresponding non-target ROI in the contra lateral healthy breast to determine the target/non-target ratio (PUV-ratio). Images were analyzed by 2 experienced readers independently as compared to histopathology in all cases. The between group analyses for all malignant, benign and corresponding non-target lesions were calculated by paired Student t-Test. The mean target/non-target ratio in patients with BC compared to healthy patients was calculated by independent Student t-Test. Significance level was considered at p value <0.05. Receiver operating characteristic (ROC) analyses were employed to determine associations with PUV and PUV-ratio.

Results: A total of 47 out of 219 (21,5%) lesions were malignant. Mean of PUV was estimated to be 3,8±2.4 in malignant lesions and 1.2±0.4 for the contra-lateral healthy breast (p<0.001). The mean PUV-ratio in patients with BC of 3.3±2.1 was significantly higher as compared to benign lesions 1.2±0.3 (p<0.001). The area under the ROC curve was 0.997(0.000-1.000) for PUV and 0.986(0.965-1.000) for PUV-ratio.
PEM was true-positive in 47 out of 50 cancers and false positive in 3 case (mastopathia and papilloma), resulting in sensitivity of 100%, specificity of 98%, positive predictive value of 90%, and a negative predictive value of 100%.

Conclusion: The different European approach in PEM using personalized FDG-dosage enables the comparability of FDG-metabolism in patients, resulting in a high diagnostic accuracy of PEM tests. Therefore an evidence-based study is started in Germany to improve the clinical accuarcy of breast cancer diagnosis.