

Abstract:

Purpose: To evaluate the effect of various interactive metal artifact reduction (iMAR) algorithms on attenuation correction in the vicinity of port chambers in PET/CT.

Material and methods: In this prospective study, 30 oncological patients (12 female, 18 male, mean age 59.6 ± 10.5 y) with implanted port chambers undergoing ^{18}F -FDG PET/CT were included. CT images were reconstructed with standard weighted filtered back projection (WFBP) and three different iMAR algorithms (hip, dental filling (DF) and pacemaker (PM)). PET attenuation correction was performed with all four CT datasets. SUVmean, SUVmax and HU measurements were performed in fat and muscle tissue in the vicinity of the port chamber at the location of the strongest bright and dark band artifacts. Differences between HU and SUV values across all CT- and PET-images were investigated using a paired t-test. Bonferroni correction was used to prevent alpha-error accumulation ($p < 0.008$).

Results: In comparison to WFBP (fat: 94.2 ± 53.9 HU, muscle: 197.6 ± 49.2 HU) all three iMAR algorithms led to a decrease of HU in bright band artifacts. iMAR-DF led to a decrease of 159.2 % (fat: -51.9 ± 58.5 HU, muscle: 94.5 ± 55.3 HU), iMAR-hip of 138.3 % (fat: -30.3 ± 58.5 , muscle: 70.4 ± 28.8) and iMAR-PM of 122.3 % (fat: -21.2 ± 47.2 HU, muscle: 72.5 ± 25.1 HU; for all $p < 0.008$). There was no significant effect of iMAR on SUV measurements in comparison to WFBP.

Conclusion: iMAR leads to a significant change of HU values in artifacts caused by port catheter chambers in comparison to WFBP. However, no significant differences in attenuation correction and consecutive changes in SUV measurements can be observed.

Reference:

Martin, O., Boos, J., Aissa, J., Vay, C., Heusch, P., Gaspers, S., Antke, C., Sedlmair, M., Antoch, G. and Schaarschmidt, B. M. (2020) Impact of different iterative metal artifact reduction (iMAR) algorithms on PET/CT attenuation correction after port implementation. *European Journal of Radiology*. May 15th. <https://doi.org/10.1016/j.ejrad.2020.109065>.