Session de perfectionnement : Clinical NECR in 18F-FDG PET scans: use for optimization purposes

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Résumé

Clinical NECR in 18F-FDG PET scans: use for optimization purposes
The injected activity and the acquisition time per bed position for 18F-FDG PET scans are usually optimized by using metrics obtained from phantom experiments. However, optimal activity and time duration can significantly vary from a phantom set-up and from patient to patient. In this presentation, we will give an overview of the different approach used for determining optimal acquisition settings using either clinical or experimental data. We will focus next on an approach using a patient-specific noise equivalent count rate (NECR) modelling that has been previously proposed for optimizing clinical scanning protocols [1]. This methodology has been recently extended and assessed using a large population as a function of the body mass index (BMI) for deriving the optimal injected activity and acquisition duration per bed position [2]. The relationship between the NEC and the signal-to-noise ratio (SNR) was assessed both in a phantom and in a clinical setting. 491 consecutive patients were retrospectively evaluated and divided into 4 BMI subgroups. Two criteria were used to optimize the injected activity and the time per bed position was adjusted using the NECR value while keeping the total acquisition time constant. Finally, the relationship between NEC and SNR was investigated using an anthropomorphic phantom and a population of 507 other patients. While the first dose regimen suggested a unique injected activity (665 MBq) regardless of the BMI, the second dose regimen proposed a variable activity and a total acquisition time according to the BMI. The NEC improvement was around 35% as compared with the local current injection rule. Variable time per bed position was derived according to BMI and anatomical region. NEC and number of true events were found to be highly correlated with SNR for the phantom set-up and partially confirmed in the patient study for the BMI subgroup under 28 kg/m2 suggesting that for the scanner, the nonlinear reconstruction algorithm used in this study and BMI

References:

Watson CC, Casey ME, Bendriem B, Carney JP, Townsend DW, Eberl S, Meikle S, DiFilippo FP 2005 Optimizing injected dose in clinical PET by accurately modeling the counting-rate response functions specific to individual patient scans *J. Nucl. Med.* **46** 1825-34

Carlier T, Ferrer L, Necib H, Bodet-Milin C, Rousseau C, Kraeber-Bodéré F 2014 Clinical NECR in 18F-FDG PET scans: optimization of injected activity and variable acquisition time. Relationship with SNR *Phys. Med. Biol.* **59** 6417-30

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