



Increasing diagnostic confidence by using Q.Clear in the evaluation of small lesions

By Vinicius Bittencourt Ludwig, MD and Vitor Lopes Galvão Vieira, MD. DAPI, Curitiba, Brazil.

“FDG PET examination is widely used in the diagnosis, staging and the monitoring of therapeutic response of many malignant diseases. Over the past decade, PET-CT equipments and image reconstruction algorithms have been developed to provide higher signal to noise ratio (SNR) so that the clinicians could have the tools to differentiate noise from the real lesion. Q.Clear is an iterative reconstruction algorithm that increases clinical effectiveness, decreasing noise and providing more accurate quantitative detail, especially required in small lesions, increasing this way the diagnostic confidence of the physician.”

About the Authors:



Vinicius Bittencourt Ludwig graduated in Medicine from PUC / Paraná (1998). Nuclear medicine and Radiology and Diagnostic Imaging certified.



Vitor Lopes Galvão is graduated in Medicine from the Federal University of Paraná (2014). He concluded his residency in medicine at Federal University of Paraná (2018). He is specialized in radiology and imaging diagnostics.

About the Institution:



With state-of-the-art equipment and a highly trained medical staff, DAPI carries out accurate and extremely important diagnoses for medical and patient decisions. DAPI values pioneering technology and advanced knowledge, ensuring accurate results, combined with safe and humanized service.

GE Healthcare Collaborators:

Patricia Marin, Clinical Marketing Leader.
Thomas Doring, PhD, GROE Latam.

Introduction

FDG PET/CT is widely used in the diagnosis, staging, and therapeutic response monitoring of several malignant diseases. Tumor spread to other organs or lymph nodes is very common in different types of cancer, and it is crucial to detect and identify them.

With an increased interest in clinical quantitative PET imaging, there is an increased clinical interest in assuring the most accurate standard uptake values (SUV). SUVs are commonly utilized to gauge the success, or failure, of oncology treatments. The SUV's accuracy depends on the signal to noise ratio (SNR), which is primarily affected by the detectors' sensitivity although image reconstruction algorithms may also play an important role.

Ordered Subset Expectation Maximization (OSEM) method is one of the most used PET/CT iterative reconstruction algorithms. However, by using this method, the noise in the image with each iterative cycle is increasing, and the algorithm ends after a small number of iterations, with the result that the images contain relatively high noise.

Q.Clear is a Bayesian penalized likelihood reconstruction algorithm which has shown an improvement in lesion detectability and quantitation compared to conventional imaging methods¹. The main reason is due to the power to provide a fully convergent PET image reconstruction technique, allowing physicians to achieve excellent image quality with lower signal to noise ratios at lower radiation doses and shorter acquisition times.

In addition to the Q.Clear algorithm, the GE Lightburst Digital Detector brings more stability, reliability and robustness in its Discovery MI configuration².

Clinical Case

Patient History

Female patient, 48 years old, treated for breast neoplasia and rectal melanoma.

Acquisition

The patient underwent digital PET CT examination (**Discovery MI, GE Healthcare, Waukesha, USA**), for evolutionary control examination and initial post-treatment evaluation. Images were acquired after 60min of a FDG-18 190MBq injection, 1min per bed position.

Image Findings

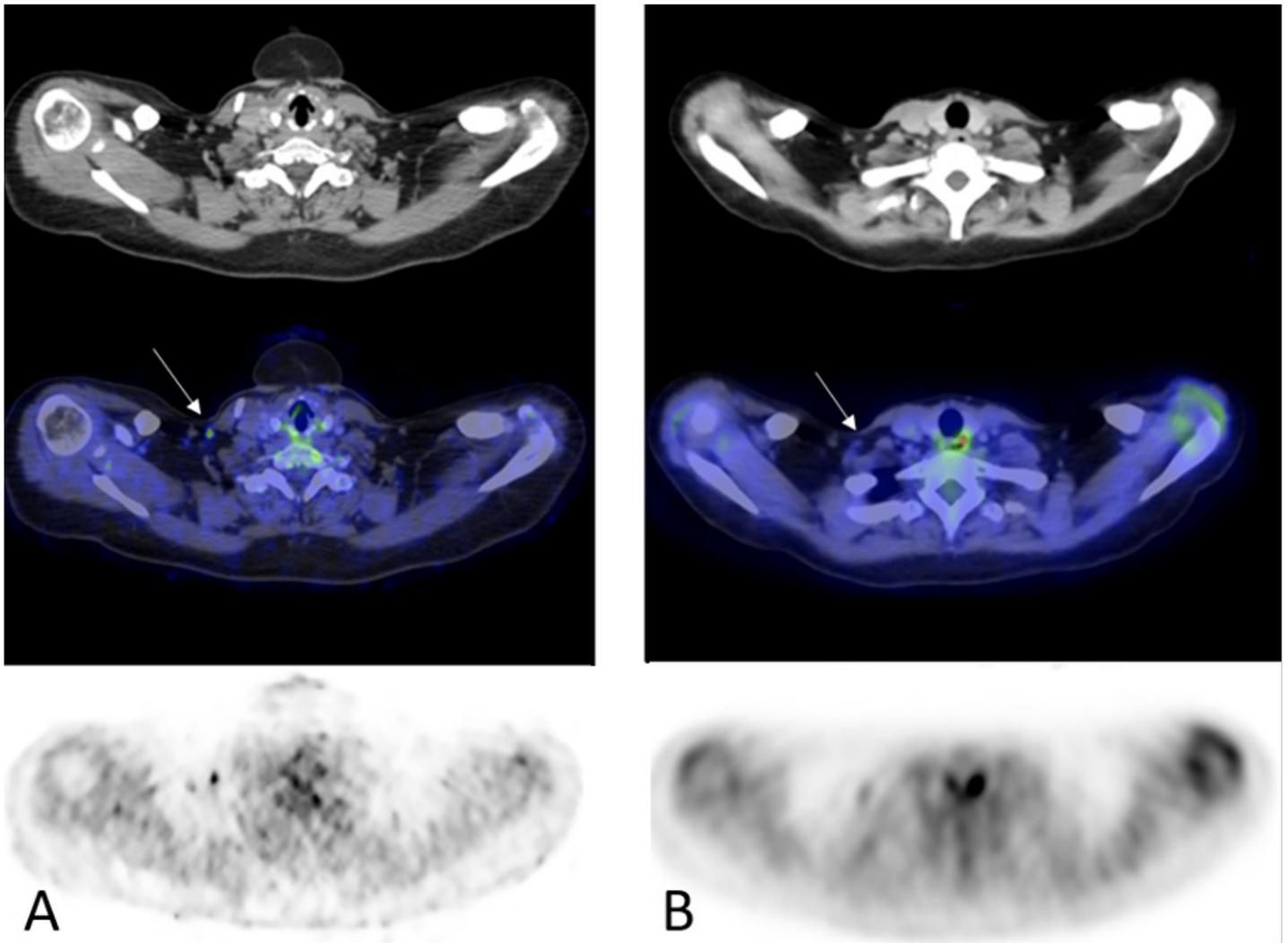


Figure 1. A: Images acquired in a DMI 4R – Digital system with Q.Clear reconstruction. **B:** Images acquired in a standard analogic system. As shown by the white arrow, the **combination of Q.Clear and digital detector improved the lesion detectability** in the right supraclavicular lymph node.

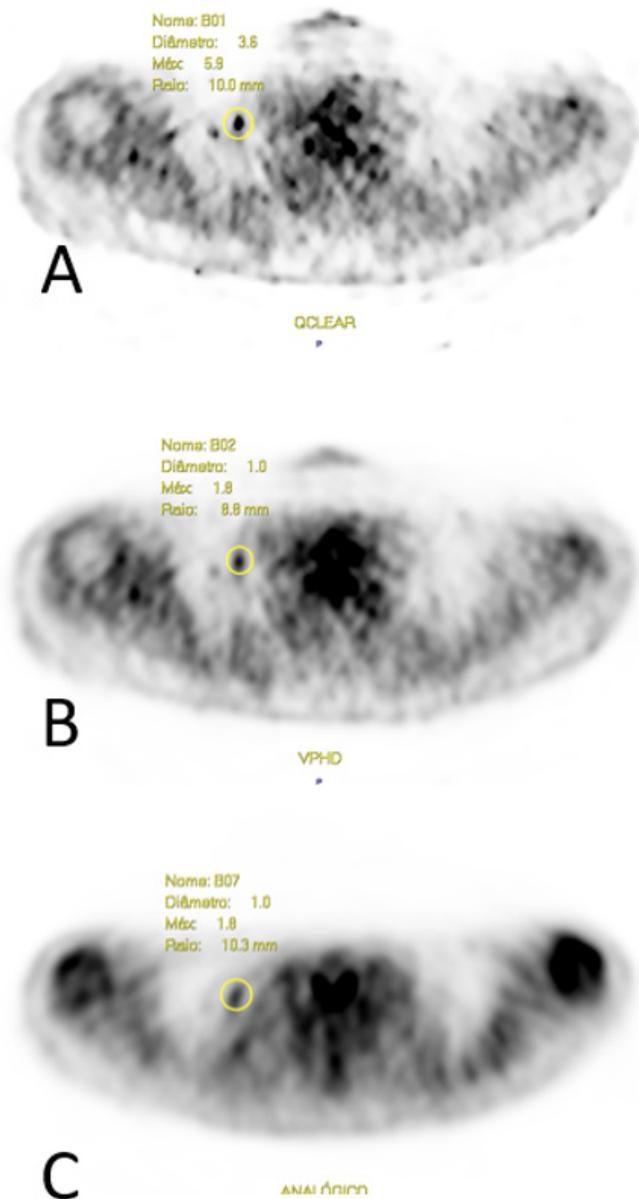


Figure 2. A. OSEM + Q.Clear recon image provided by digital PET, **B:** OSEM recon image provided by digital PET, **C:** Analogic PET image. **OSEM and Q.Clear reconstruction provided a more accurate SUV than OSEM recon alone or analogic PET acquisition.**

Discussion

By using the digital PET system combined with Q.Clear, a better delineation of hypermetabolism in the supraclavicular lymph node was possible through the follow up examination. It was also possible to better characterize hyper vascular hepatic lesions suspected to be melanoma metastasis, which are better characterized on tomographic images in the arterial phase (images not showed in this article).

Previous analogic PET examination did not detect the right supraclavicular lymph node, demonstrating the importance of digital technology combined with Q.Clear to increase diagnostic confidence. This has also a direct impact on the referring physician and the patient, as this brings security in making decision regarding the correct treatment options.

Clinical Key points

- **The combination of a Digital PET detector, with its increased sensitivity, and Q.Clear reconstruction algorithm significantly increases detectability of small lesions.**

Technical Highlight Lightburst detector

The development of the Lightburst Digital Detector encompasses an array of design considerations that deliver the sensitivity, resolution, image quality, reliability and clinical confidence that clinicians need to detect diseases at an early stage when treatment may be most effective. Most importantly, the Lightburst Digital Detector is positively impacting clinical excellence by enabling visualization of small lesions, fast scan times and lower dose as well as propelling new research opportunities with novel tracers for detecting and monitoring disease³.

References

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3. *Light Burst Digital Detector.* GE Healthcare White Paper. 2017 link: https://static1.squarespace.com/static/5a25ac3c914e6b61f6 b983d8/t/5a31f8a8ec212deac346e90d/1513224366471/L_DD_whitepaper_Final+JB50594XX.pdf

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