

## CUSTOMER SPOTLIGHT

## Q.Clear Helps Royal University Hospital Maintain Image Quality with Reduced Scan Time and Patient Dose

Royal University Hospital, Saskatoon, is a leader in providing healthcare for patients throughout the province of Saskatchewan, located in west-central Canada. The majority of Saskatchewan residents live in the southern third of the province, with roughly half of the estimated 1.2 million residents residing in and around Saskatoon. The hospital serves as the main trauma center for the entire province and many patients travel long distances for diagnostic exams and surgical procedures at the hospital.

In May 2013, the hospital opened its PET/CT Centre within the existing seven-story building on the campus of the University of Saskatchewan. Scott Mildenerger, RTNM CTIC, oversees the department as supervisor. Rajan Rakheja, MD, is one of three nuclear medicine physicians on staff at Royal University Hospital. The center, featuring

the Discovery™ PET/CT 710, remains the only PET/CT service in the province. Currently, 95% of PET/CT exams are for oncology—with lung, head and neck, lymphoma and colorectal being the most common—and the remaining 5% are for neurology, primarily for neurodegenerative disorders such as dementia and Parkinson's.

“Our hospital purchased the Discovery PET/CT 710 for many reasons, with some being the superior technological advancements, patient comfort and imaging speed,” says Dr. Rakheja.

Due to the absence of a local cyclotron until one was built in 2016, the PET tracer was initially flown in daily from Hamilton, Ontario—a distance of over 2500 km and a nearly four-hour flight. According to Dr. Rakheja, tracer could only arrive once a day and this limited the number of PET exams the hospital could perform.



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**Figure 1.** The PET/CT Centre at Royal University Hospital in Saskatoon serves over 1 million people and is the only PET/CT system in the province of Saskatchewan.



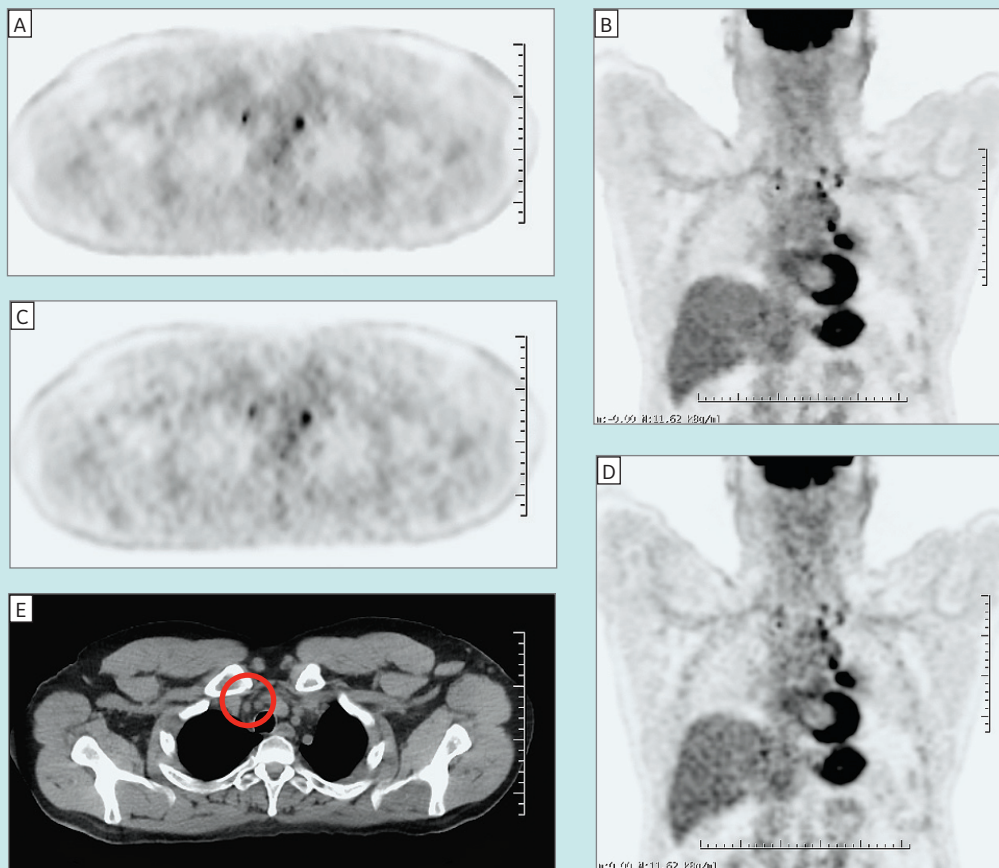
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“Our department serves over 1 million people with one PET/CT scanner,” Dr. Rakheja says. The demand for PET studies far exceeded the supply of FDG. Initially, the center only had enough FDG for six oncology studies/day. As a result, patients were placed on a waiting list for their exam and in some instances that wait time could be as long as four to six weeks—a time period that Dr. Rakheja says was unacceptable. Because of this, the PET/CT Centre began investigating potential solutions that could help alleviate this issue.

In 2015, GE Healthcare released a pioneering technology for PET images called Q.Clear. It is a full convergence PET image reconstruction algorithm that delivers up to 2x improvement in both PET image quality (SNR) and quantitation accuracy ( $SUV_{MEAN}$ ).

When Dr. Rakheja and Mildenberger first learned about Q.Clear from their GE representatives, the focus was on image quality enhancement, quantitative accuracy and visualization of small lesions. While these were all important benefits to them and their colleagues, they were already very happy with the image quality and capabilities of the Discovery PET/CT 710.

But then they realized that because of the SNR improvement, they could reduce scan time or lower the dose and still obtain a diagnostic quality exam. That capability would make a significant impact for the center by allowing an increase in patient volume by using less FDG per patient. Armed with this knowledge, the PET/CT Centre at Royal University Hospital, with the support of the Saskatchewan Cancer Agency, implemented Q.Clear on its Discovery PET/CT 710 system in May 2015.



**Figure 2.** The right upper mediastinal node, measuring 6 mm, has excellent image quality with (A, B) Q.Clear compared to (C, D) non Q.Clear images. (E) CT image shows location of node (red circle).

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**Faster scan, lower dose**

Through a series of phantom calculations and image evaluations, GE Healthcare worked with Dr. Rakheja and Mildenberger to determine the optimum FDG dose reduction that would not impact image quality. According to Mildenberger, they began by calculating an acceptable dose reduction and imaged a few patients with a slightly longer scan time to compensate. Data was then acquired in list mode, allowing a step-by-step reduction in data collection from 4 minutes to 3 minutes to 2 minutes. Within a short period of time, it became clear that by utilizing the image improvements provided by Q.Clear, the hospital could use up to 25% less dose per patient.<sup>1</sup>

According to Mildenberger, prior to implementing Q.Clear each patient received 4.5 MBq per kilo, with a maximum dose of 450 MBq. “Now, thanks to the image quality enhancement Q.Clear provides, we are able to reduce that to 3.5 MBq per kilo, with a maximum dose of 350 MBq per patient,” he adds.<sup>2</sup>

While a 25% reduction in dose could translate to a 25% reduction in cost, Royal University Hospital is using the additional dose to scan more patients. As a result, Mildenberger says the center was able to accommodate two more patients each day.

Q.Clear also helped reduce scan time. Dr. Rakheja says, “We went from 3-4 minutes per bed position to 2 minutes per bed position.<sup>1</sup> A faster scan is also important for patient comfort and image quality—the longer the scan the more likely the patient will move or not tolerate the scan. Q.Clear enabled us to use less tracer and scan each patient faster while maintaining image quality.”

This increase in available PET/CT slots also opened up more opportunities for urgent and inpatient imaging requests. Mildenberger heard indirectly that previously there were patients who would have to wait for their PET/CT scan before being discharged, using up valuable hospital resources and increasing the overall costs for that patient’s care. Now with Q.Clear he can open up more available slots for those inpatients needing a PET/CT exam.

Another change further increased the center’s ability to scan more patients each day. In June 2016, a local cyclotron was commissioned, increasing the available volume of FDG. The impact was significant; today the PET/CT Centre can accommodate up to 14 patients each day.

**High diagnostic confidence**

Dr. Rakheja believes the Q.Clear reconstructed images further enhance diagnostic confidence. Currently, all exams are processed with and without Q.Clear so the physicians can review a prior study with the current one.

“When we have to refer to a study without Q.Clear, the difference is obvious in the overall quality of the exam and the ease of reading it. The ease of reading Q.Clear studies is an advantage, yet the greatest benefit is the confidence,” Dr. Rakheja says.

“The Q.Clear images are very smooth, crisp and clear. I’m more confident about the findings being true positives versus false positives or statistical artifacts,” he adds. This advantage is especially important when evaluating smaller lesions less than 1.5 cm. “These lesions appear more obvious, sharper and conspicuous, so I feel more confident in the diagnosis.”

Dr. Rakheja and his colleagues are using Q.SUV and he believes it makes a difference in evaluating smaller lesions. The Q.SUV is typically higher than the non-Q.Clear reconstructed images. He has also noticed that in benign adrenal adenomas the Q.SUV can be the same or less than the traditional SUV—and in both instances he finds the Q.SUV is more accurate.

Implementing Q.Clear into the center’s clinical routine has been seamless. Mildenberger says the processing time is longer; however, he is processing both Q.Clear and non-Q.Clear images for clinical comparisons. Yet, even if Q.Clear takes slightly longer to process, the benefits far outweigh that additional processing time, Dr. Rakheja adds.

Plus, Mildenberger says that Q.Clear eliminates several factors and steps that would have to be completed with any conventional PET image processing. “Q.Clear is easier and it removes a lot of things that you can change and make a mistake on, such as different types of filters and filter cut off when doing post processing,” he adds.

“I’ve told colleagues there are a lot of reasons to implement Q.Clear,” says Dr. Rakheja. “You can scan more patients, lower costs and lower dose to patients. Each presents a clear benefit to patients and hospitals.” ■

1. This represents a single user’s experience and may not be representative of other clinical settings and use cases.

2. Consult full prescribing information for indications for use and administration information of radiopharmaceutical.