

Always on spectral results eliminates the patient selection dilemma

PURPOSE OF STUDY

This study evaluated the differences between prospectively prescribing a dual-energy (or Spectral CT) scan versus the need to access on-demand spectral information retrospectively. The study identified scans that would be prescribed prospectively for dual energy, compared to routine CT scans that would benefit from on-demand spectral information and evaluates the clinical significance of the retrospectively generated spectral information.

The following is a summary of the study, “Benefit and clinical significance of retrospectively obtained spectral data with a novel detector-based spectral computed tomography – Initial experiences and results,” published in the Journal of Clinical Imaging, October 2017.

Overview

Dual-energy CT scanners have been available for a long time and are being used for several clinical applications. However, the existing source-based dual-energy scanners have not been completely adopted into clinical workflow since the decision to operate the scanner in dual-energy mode needs to be made prior to the scan being performed. Specific

protocols are required for source-based dual-energy scanners to make spectral results available. On the IQon Spectral CT, a detector-based spectral CT scanner, there is no special protocol required for scanning in spectral mode, and spectral results are always available on-demand. Spectral results may be used retrospectively for material characterization, boosting contrast, decreasing artifacts and improving lesion detection.

This study included 118 consecutive body CT cases that were scanned using IQon Spectral Detector CT. Data analysis was performed by two independent radiologists. Based on the clinical indication of the scan, the two radiologists were asked if they would have prospectively requested a dual-energy scan for the patient. The radiologists then reviewed the conventional CT images from the IQon Spectral CT independently, blinded to each other, and selected cases which would benefit from having spectral images available. The on-demand capabilities of IQon were then used to generate the requested spectral images. The clinical benefit of the spectral images in improving the diagnostic capability were evaluated on a 5-point scale: 1- very low significance; 2- low significance; 3- intermediate significance; 4- moderate significance; and 5-high significance. A score of 3 was considered useful and a score of 4 and 5 was considered clinically significant, making an impact on the final diagnosis.

Results

Based on the clinical indications, Reader 1 would have prospectively opted for a dual-energy scan in 20 (17%) of the 118 cases and Reader 2 would have been prospectively opted for dual-energy scan in 25 (21%) of the 118 cases.

Following review of the conventional images, Reader 1 desired retrospective spectral images in 94 cases (80%), and Reader 2 chose additional retrospective spectral images in 96 cases (81%). Reader 1 assigned a score of 3 to 36% of the cases and score of 4 or 5 to 31% of cases. Reader 2 assigned a score of 3 to 36% of the cases and a score of 4 or 5 to 28% of the cases.

Different spectral results—including low and high monoE, virtual non-contrast, iodine-based images, Z-effective images, and uric acid results—were of clinical benefit based on the different indications of the scans.

Conclusion

Retrospective spectral results reconstructed from IQon Spectral CT provide significant clinical benefits by eliminating artifacts, improving contrast in vascular structures, and characterizing lesions. IQon Spectral CT allows retrospective reconstruction of spectral results, providing benefits even in patients who would not have been preselected for a dual energy protocol.

CLINICAL RELEVANCE

Spectral results are always available on IQon Spectral CT, providing significant clinical benefits to patients who may not have been selected for dual-energy protocol.

Clinical benefits of retrospectively obtained spectral results using Spectral Detector CT (SDCT)

Distribution of cases with score of ≥ 4 .		Number of Spectral Image Sets	
		Reader 1	Reader 2
1	Kidney Stone composition	10	14
2	Lung perfusion	1	1
3	Boosting contrast	7	10
4	Artifact reduction	10	2
	Blooming	9	
	Metal	1	
5	Lesion characterization	24	12
	Adrenal	5	3
	Kidney	8	
	Liver	2	
	Lung	2	6
	Rectum	1	
	GB	1	
	Testis	2	
	Bowel	1	
	Retroperitoneal	2	
	Renal		2
	Left Atrial appendage		1
	Improved visualization		2
	Pancreas		1
	Liver		1
Total		56	41



Prabhakar Rajiah, Rong Rong, Claudia Martinez-Rios, Negin Rassouli, Luis Landeras. Benefit and clinical significance of retrospectively obtained spectral data with a novel detector-based spectral computed tomography - Initial experiences and results. Clin Imaging 2017 Oct 31;49:65-72. Epub 2017 Oct 31.

Results from case studies are not predictive of results in other cases. Results in other cases may vary.

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