GE HealthCare

Visibility of the pancreatic main duct and side branches on Deep Silicon photon-counting CT: A case report

Giuseppe V. Toia, M.D., M.S.[1,2], Rachel Bladorn, B.S., RT(R)(CT)[1], Aria Salyapongse, B.S., M.S.[1,2], Andrew W. Chen Ph.D.[4], Manmohan Singh, B.S., M.S.[4], Tim Szczykutowicz, Ph.D.[1,2,3], Meghan G. Lubner, M.D.[1]

[1]Department of Radiology, University of Wisconsin–Madison, Madison, WI
[2]Departmet of Medical Physics, University of Wisconsin–Madison, Madison, WI
[3]Department of Biomedical Engineering, University of Wisconsin–Madison, Madison, WI
[4]GE HealthCare, Waukesha, WI

Abstract

Background: Depiction of the pancreatic microanatomy, particularly the ductal system (including side branches and accessory duct), could be challenging on conventional energy-integrating detector (EID) CT due to spatial resolution constraints. Photon-counting CT (PCCT) offers higher spatial resolution and effective low-keV monoenergetic reconstructions that may improve contrast between ducts and enhancing parenchyma, facilitating side-duct visualization.

The ultra-high definition (UHD) resolution, spectral information, with Deep Silicon (dSi) PCCT, presents a hardware solution which enhances spatial resolution and contrast-to-noise, designed to enable depiction of small-caliber pancreatic ducts that are typically much more challenging to visualize on conventional EID CT.

Case description

Age/sex: 70-year-old male, BMI 26.1

Clinical history: Neuroendocrine carcinoma (NET); undergoing restaging. Prior resection of heterogeneous enhancing mass in the right lower quadrant resected, hemicolectomy due to masses in the ilium and ileocecal regions, and ablation of metastasis in liver. Post treatment changes (stable).

Indication for CT: Restaging neuroendocrine carcinoma.

Case discussion

This case illustrates how HD spectral low(65)-keV images from dSi PCCT could improve contrast and resolve fine detail in the pancreas.[1] dSi PCCT images delineated the main pancreatic duct (MPD) side branch ducts (**Figure 2**) with the main duct narrowing to 1 mm and side ducts on the order of 0.5 mm (**Figure 3**), even the accessory duct/minor papilla are present, while prior EID CT was not able resolve structures aside from the MPD (**Figure 4**).[2] The ability for dSi PCCT to resolve these microanatomical structures in this particular case may increase confidence in pancreatic imaging in a variety of clinical situations, including earlier detection of certain pathology.[3]

The increased ability of detecting small ductal anatomy in the pancreas has the potential to improve accurate assessment of branch duct IPMNs, improve early identification of IPMNs before main duct involvement, and improve confidence in assessing for ductal communication in IPMNs. This potential is critical for pancreatic assessment with CT as a study of patients who underwent surgery for IPMNs showed that Sendai negative branch duct IPMNs had a malignancy rate of 18%.[4] With spectral UHD dSi PCCT potentially unlocking the visualization of pancreatic side ducts, there is also the possibility for enhanced early detection of pancreatic ductal adenocarcinoma (PDAC) where an early sign of disease is focal pancreatic side branch dilation.[5] Similarly, side branch dilation is an identifier of chronic pancreatitis and can be a factor when evaluating the nuance of disease severity at lower grades.[6]

The ability to see herringbone side ducts and periampullary structures as shown in this case may refine reporting of ductal variants and early cystic change. If proven to be consistently seen in larger cohort studies, the potential to detect these subtle changes could have an impact on surveillance paradigms in oncology follow-up.

Photon-counting CT acquisition details

Examination was performed on a GE HealthCare Photonova™ Spectra PCCT scanner using a standardized acquisition protocol. A contrast-enhanced scan including both late arterial and portal venous phases was acquired using a large body SFOV. Imaging parameters included 120 kVp, with tube current settings of 364 mA for the late arterial phase and 366 mA for the portal venous phase. The scan was performed with a pitch of 0.9:1 and a 0.6-second rotation time, with 40 mm collimation. Images were reconstructed at a slice thickness of 0.417 mm using an HD Standard kernel, with DLIR-H deep learning image reconstruction applied for noise reduction. A total of 90 mL of Iohexol 350 contrast was administered at 5 mL/s with a 34-second delay. Radiation dose per phase included: late arterial phase CTDIvol of 15.04 mGy, DLP of 555.33, and effective dose of 9.05 mSv; and portal venous phase CTDIvol of 15.12 mGy, DLP of 558.42, and effective dose of 9.10 mSv (conversion factor 0.0163). No special patient preparation was required aside from water administration to improve bowel visualization.

Imaging findings (structured)

EID CT

Primary findings: During neuroendocrine carcinoma restaging, no new or growing lesions were detected in the liver. Pancreas, spleen, adrenals, kidneys, ureters and bladder all appeared normal.

Enhancement: The pancreas is homogenously enhancing. Main pancreatic duct appears hypoattenuating and can be seen against the enhancing parenchyma.

Ancillary signs: No peripancreatic fat stranding or fluid collection, no focal pancreatic mass or cyst. No pancreaticolith.

Incidental findings: Stable appearance of minor nodularity of left adrenal gland, no concerning adrenal nodules.

Artifacts/limitations: Image texture and signal-to-noise ratio on EID CT prevents sharp delineation of the main pancreatic duct wall. The accessory pancreatic duct is visible but also lacks sharp boundaries.

dSi PCCT

Primary findings: Main pancreatic duct (head: 3.1 mm, body: 1 mm, tail: 0.5 mm **Figure 3**) with smooth contour; multiple side branches inserting at near-right angles in a herringbone pattern (**Figure 1**). Secondary branch ducts are also visible (**Figure 2**). Distal portions of size branches can be seen to have a diameter of ~0.5mm (**Figure 3b**).

Enhancement: Ducts appear hypoattenuating relative to hyperenhancing parenchyma on 65-keV reconstructions; visible intrapancreatic microvasculature contributes to non-uniform parenchymal enhancement.

Differential diagnosis

In a low spatial resolution setting, the differential for a normal pancreatic duct side may include interdigitating peri-pancreatic fat, a small side-branch intraductal papillary mucinous neoplasm, or pancreatic cyst.

Clinical course / outcome

dSi PCCT provided confident ductal and periampullary visualization, structures not routinely visible on prior EID CT, supporting the role of dSi PCCT for fine ductal anatomy in oncologic follow-up. Specifically, this case demonstrates the utility of (1) Low-keV monoenergetic reconstructions for duct–parenchyma contrast. (2) Curved MPR along MPD plus thin-slice scrolling highlights herringbone side branches. (3) Distinguish physiologic side ducts (hairline, tapering) from branch-duct IPMN (cystic ≥5 mm, communicates with MPD, ± mural nodules).

Figures / image documentation

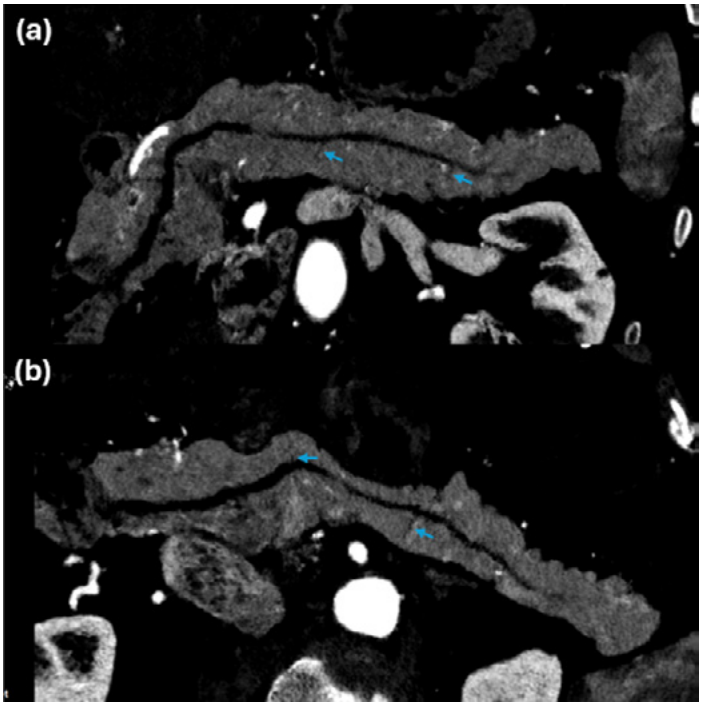


Figure 1. Curved minimum intensity projection reformats at 65 keV, portal venous phase, with, WW:560 WL:340 following the main pancreatic duct. Side ducts are indicated by blue arrows and are clearly differentiated from the surrounding pancreatic parenchyma.

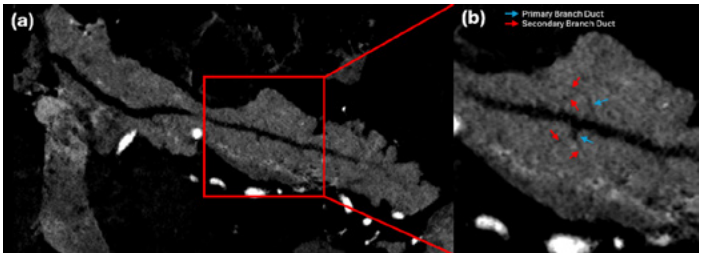


Figure 2. **(a)** Curved minimum intensity projection reformats at 65 keV, portal venous phase, WW:560 WL:340. **(b)** Zoomed view of the pancreas highlighting in blue arrows the primary branch duct and in red arrows secondary branch ducts.

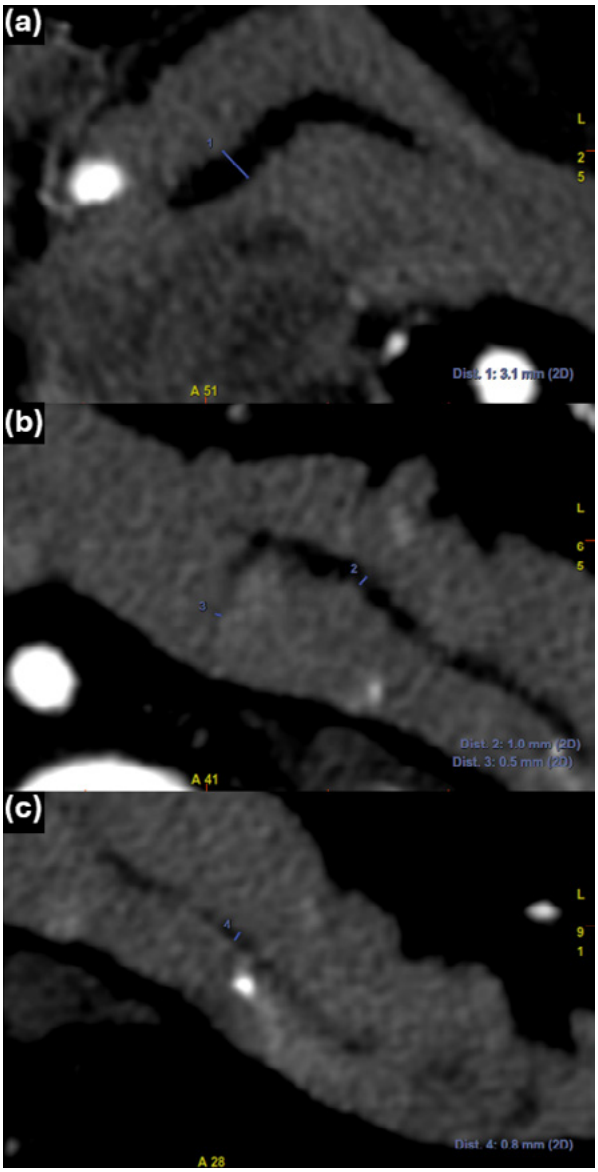


Figure 3. Axial view at 65 keV, portal venous phase, WW:560 WL:340. Measurements along the main duct at **(a)** head, **(b)** body, and **(c)** tail are 3.1 mm, 1 mm and 0.8 mm respectively. Distal portion of the branch duct **(b)** can be seen to have a diameter of 0.5 mm.

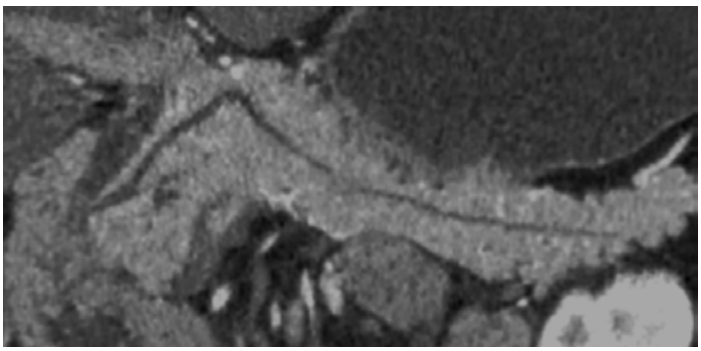


Figure 4. Curved reformat at 100 kV, portal venous phase, of prior scan with EID CT. The main branch is visible but increased noise texture and decreased spatial resolution renders side branches irresolvable.

References

1. A. Salyapongse *et al.*, “Comparison of iodine quantification accuracy on prototype deep silicon photon-counting and energy-integrating detector CT,” *Abdom. Radiol.*, Jul. 2025, doi: 10.1007/s00261-025-05098-1.
2. A. M. Salyapongse *et al.*, “Spatial Resolution Fidelity Comparison Between Energy Integrating and Deep Silicon Photon Counting CT: Implications for Pulmonary Imaging,” *J. Thorac. Imaging*, vol. 39, no. 6, p. 344, Nov. 2024, doi: 10.1097/RTI.0000000000000788.
3. H. Almqvist *et al.*, “Initial Clinical Images From a Second-Generation Prototype Silicon-Based Photon-Counting Computed Tomography System,” *Acad. Radiol.*, vol. 31, no. 2, pp. 572–581, Feb. 2024, doi: 10.1016/j.acra.2023.06.031.
4. S. Fritz *et al.*, “Pancreatic Main-Duct Involvement in Branch-Duct IPMNs: An Underestimated Risk,” *Ann. Surg.*, vol. 260, no. 5, p. 848, Nov. 2014, doi: 10.1097/SLA.0000000000000980.
5. A. Johnston *et al.*, “The abrupt pancreatic duct cutoff sign on MDCT and MRI,” *Abdom. Radiol.*, vol. 45, no. 8, pp. 2476–2484, Aug. 2020, doi: 10.1007/s00261-020-02582-8.
6. T. Tirkes *et al.*, “Reporting Standards for Chronic Pancreatitis by Using CT, MRI, and MR Cholangiopancreatography: The Consortium for the Study of Chronic Pancreatitis, Diabetes, and Pancreatic Cancer,” *Radiology*, vol. 290, no. 1, pp. 207–215, Jan. 2019, doi: 10.1148/radiol.2018181353.

*Photonova Spectra is not available for sale in all countries

© 2026 GE HealthCare. Photonova is a trademark of GE HealthCare.
GE is a trademark of General Electric Company used under trademark license.

July 2026 | JB03795XU

GE HealthCare